EXPLORING FACTORS THAT CONTRIBUTE TO HEALTH BEHAVIOURS IN PEOPLE WITH SEVERE MENTAL ILLNESS TO REDUCE CARDIOVASCULAR DISEASE RISK: A MIXED-METHODS APPROACH.

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This thesis is submitted for the award of Doctor of Philosophy (PhD).

Field of study: Behavioural Science and Healthcare

Institute of Epidemiology and Healthcare

University College London

2021
DECLARATION

I, Suzan Alev Hassan confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

____________________

Suzan Alev Hassan
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I am very grateful to the National Institute for Health Research (NIHR) School of Primary Care Research (SPCR) for funding my PhD studentship. I have really valued this opportunity and will continue to apply all the skills and knowledge I have gained throughout my research career.

This thesis would not have been possible without the participants that took the time to participate in the research studies. Thank you to all the PRIMROSE staff and patients. Thank you to the staff at the integrated healthcare setting who allowed me to attend meetings and clinics for patient recruitment, provided me with desk space to continue my PhD work in between clinics, accompanied me on tea breaks and supported patient and staff recruitment. I would particularly like to thank all the staff and patients that took part in my qualitative study on integrated care and health behaviours and the McPin Foundation for facilitating access to patient and public involvement for this study.

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Finally, a huge thank you to my husband who has never stopped believing in me or encouraging me. Despite being trapped with me writing this thesis during the Covid-19 pandemic, you have always managed to lift my spirits. Thank you for listening to me talk about my research endlessly and for always taking an active interest in my work.
ABSTRACT

Background: Unhealthy behaviours may contribute to the increased risk of cardiovascular disease in people with severe mental illness (SMI). Much is still unknown on how to overcome such challenges, particularly across healthcare contexts.

Objectives: To explore in people with SMI:

- Literature on factors associated with physical activity (PA) and diet related longitudinal outcomes.
- Associations between baseline sociodemographic, health, social, wellbeing, quality of life, behavioural factors and PA/dietary-related changes over 12-months.
- Staff and patient perspectives on how health behaviours may be supported and changed within a primary care-led intervention and integrated healthcare context.

Methods: 1) Systematic review, 2) secondary longitudinal analyses, 3) secondary qualitative thematic analysis and 4) primary qualitative study and thematic analysis.

Results: 1) Few studies have explored associations between baseline factors and PA/dietary-related outcomes.

2) Few factors were associated with PA or dietary-related changes. Higher alcohol intake was associated with worsening PA levels.

3) Various behaviour change techniques (BCTs) were reported in the primary care intervention. Visible benefits of healthy behaviours, health knowledge/perceptions, mental health symptoms, social networks, physical environment, access to time/resource, and staff skills affected supporting/changing health behaviours.

4) BCTs were variably reported in the integrated healthcare context but shaping knowledge, social support, natural consequences, and biofeedback were more consistently reported. The consistency of health information provided by staff, patient
self-awareness of consequences of behaviours, habitual behaviours, financial, environmental circumstances, social networks, staff support, staff behaviour change knowledge, staff time availability, staff role perceptions, capitalising on specialist staff knowledge/skills influenced supporting/changing behaviours.

**Conclusions:** There are few established factors predictive of health behaviour change in people with SMI. Primary care and mental health professionals could work together using complementary skills to engage patients and support healthy behaviours, but organisations may need to support this way of working. Flexible strategies targeting patients’ individual needs could be adopted.
IMPACT STATEMENT

Early mortality due to cardiovascular disease in people with SMI may be prevented by modifying unhealthy behaviours. However, there is limited information regarding how to do this in people with SMI, despite recommending this in various healthcare settings. This is not surprising as health behaviours are poorly understood in people with SMI. Health behaviour change interventions yield conflicting results and there is very limited research that explores what influences long-term change, the ‘active’ components of interventions and what works well for whom under what healthcare contexts. My PhD aimed to shed light on these issues.

I conducted the first systematic review to explore factors prospectively associated with diet and PA outcomes over time in people with SMI and I found very limited high-quality evidence in this area. I published this work in Psychiatry Research journal in 2019. I then conducted a quantitative study to explore factors prospectively associated with changes in diet and PA to address this important research gap. Though few findings were identified in both studies, recommendations for further research were identified, including the use of objective measures, larger sample sizes and representative samples. The quantitative study has also been submitted for publication. Future prospective quantitative studies which consider these recommendations could have the potential to inform the development of interventions to increase their effectiveness.

I conducted the first qualitative studies comparing staff and patient perspectives exploring how health behaviours were supported and changed in people with SMI within a primary care based intervention and an integrated mental and physical health context. Some of this work was published in the British Journal of Health Psychology in 2020, BMC Health Services Research in 2020 and presented at the Public Health Science conference in 2019. Findings from the integrated setting are being prepared for publication and will be presented to the integrated service that participated to help inform the development of their service.

This was the first thesis to compare findings from both settings to identify how to best support health behaviours in people with SMI under different contexts. Based on the
findings, I identified methods on how to best support patients whilst considering their individual needs within different healthcare contexts. Further suggestions were identified regarding primary and secondary care responsibilities, joint working, training requirements and organisational responsibilities to develop services in clinical practice to support health behaviour change in people with SMI. I also identified BCTs that were reported among staff and patients in both studies using a standardised framework, with descriptions on the methods employed and illustrative quotes. This can also be used as a basis to inform clinical guidelines given the vague strategies described in these guidelines. Recommendations were also identified from the qualitative studies regarding ways to evaluate behaviour change interventions and services including identifying the use of BCTs and how different patients engage with them within different services. When considered, this has the potential to further increase our understanding of how behaviour change interventions may/may not work for people with SMI within different settings.
DISSEMINATION OF WORK

Published work/ conference proceedings (see “Publications” section):


Submitted for publication:

Hassan S, Marston L, Osborn D, Walters, K. Factors prospectively associated with physical activity and diet changes in people with severe mental illness: A secondary analysis of 12-month PRIMROSE trial data. (Based on Chapter 4)
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Hassan S, Ross J, Marston L, Osborn D, Walters, K. What approaches ‘work’ for whom when supporting and changing health behaviours in people with severe mental illness? A comparison of an integrated mental and physical health setting and primary care-led behavioural intervention. (Based on Chapter 7)

Blog post:

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<tr>
<td>AMSTAR</td>
<td>Assessing the Methodological Quality of Systematic Reviews</td>
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<tr>
<td>AUDIT</td>
<td>Alcohol Use Disorders Identification Test</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>Alcohol Use Disorders Identification Test Consumption</td>
</tr>
<tr>
<td>BCT</td>
<td>Behaviour change technique</td>
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<tr>
<td>BCTT</td>
<td>Behaviour change techniques taxonomy</td>
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<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>BNF</td>
<td>British National Formulary</td>
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<tr>
<td>CBT</td>
<td>Cognitive behavioural therapy</td>
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<tr>
<td>COM-B</td>
<td>Capability, Opportunity, Motivation - Behaviour</td>
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<tr>
<td>COPD</td>
<td>Chronic obstructive pulmonary disease</td>
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<tr>
<td>CQUIN</td>
<td>Commissioning for Quality and Innovation payment framework</td>
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<tr>
<td>CVD</td>
<td>Cardiovascular disease</td>
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<tr>
<td>DINE</td>
<td>Dietary Instrument for Nutrition Education</td>
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<tr>
<td>FGAs</td>
<td>First-generation antipsychotics</td>
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<tr>
<td>GP</td>
<td>General practitioner</td>
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<tr>
<td>HCA</td>
<td>Healthcare assistant</td>
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<tr>
<td>HCP</td>
<td>Healthcare professional</td>
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<td>Abbreviation</td>
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<td>HR</td>
<td>Hazards ratio</td>
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<td>HRA</td>
<td>Health Research Authority</td>
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<td>IPAQ</td>
<td>International Physical Activity Questionnaire</td>
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<td>IQR</td>
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<tr>
<td>MeSH</td>
<td>Medical Subject Headings</td>
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<td>MDT</td>
<td>Multidisciplinary team</td>
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<tr>
<td>MET</td>
<td>Metabolic equivalent of task</td>
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<tr>
<td>MI</td>
<td>Motivational interviewing</td>
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<tr>
<td>NHS</td>
<td>National Health Service</td>
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<td>NICE</td>
<td>National Institute for Health and Care Excellence</td>
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<td>NOS</td>
<td>Newcastle-Ottawa Scale</td>
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<tr>
<td>NR</td>
<td>Not reported</td>
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<tr>
<td>ONS</td>
<td>Office for National Statistics</td>
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<tr>
<td>OR</td>
<td>Odds ratio</td>
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<tr>
<td>OT</td>
<td>Occupational therapist</td>
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<tr>
<td>PA</td>
<td>Physical activity</td>
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<tr>
<td>PICOSS</td>
<td>Population Intervention Comparison Outcome Setting Study design</td>
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<td>PPI</td>
<td>Patient and public involvement</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>PRIME</td>
<td>Plans, Responses, Impulses, Motives and Evaluations</td>
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<tr>
<td>PRIMROSE</td>
<td>Prediction and management of cardiovascular disease risk for people with severe mental illness: research programme in primary care</td>
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<tr>
<td>PRISMA</td>
<td>Preferred Reporting Items for Systematic Reviews and Meta-Analyses</td>
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<tr>
<td>QOF</td>
<td>Quality Outcomes Framework</td>
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<tr>
<td>RCT</td>
<td>Randomised controlled trial</td>
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<td>REC</td>
<td>Research Ethics Committee</td>
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<tr>
<td>ROB</td>
<td>Risk of bias</td>
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<tr>
<td>SGAs</td>
<td>Second-generation antipsychotics</td>
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<tr>
<td>SB</td>
<td>Sedentary behaviour</td>
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<tr>
<td>SD</td>
<td>Standard deviation</td>
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<tr>
<td>SE</td>
<td>Standard error</td>
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<tr>
<td>TDF</td>
<td>Theoretical Domains Framework</td>
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<tr>
<td>VIF</td>
<td>Variance inflation factor</td>
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<tr>
<td>95% CI</td>
<td>95% confidence interval</td>
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Chapter 1  Introduction

1.1  Chapter summary

In this chapter, I provide an overview of the topic of this thesis, the association between severe mental illness (SMI) and cardiovascular disease (CVD), and the role of health risk behaviours in this association. I firstly define SMI, CVD, discuss their association, and consider the impact on people with SMI and wider economy. I next consider the impact of health behaviour change on the prevention of CVD, the role of different healthcare contexts in supporting behaviour change and discuss findings from recent interventions for people with SMI on health behaviour change. Finally, I explore methods to improve health risk behaviours for people with SMI in different healthcare contexts, identify the limitations and gaps in this research area and form a rationale for the present aims and objectives of this thesis.

1.2  Severe mental illness (SMI): definition, incidence, prevalence, impact, and treatments

Though there is no agreed definition, severe mental illnesses (SMI) are commonly defined in academic literature as a group of mental health conditions including: schizophrenia, schizoaffective, bipolar disorders and other psychoses (i.e. psychotic depression) (SMI) (2, 3). This is consistent with the definition of SMI adopted by Primary Care services in England as part of the Quality Outcomes Framework (QOF); a pay-for-performance financial incentive scheme (4). These conditions are recorded within the “SMI register” in primary care services as part of the QOF.

A meta-analysis of studies conducted in England reported that the estimated annual incidence of schizophrenia was 15.2 per 100,000 person years with an annual prevalence of 4.1 per 1000 (5, 6). Another systematic review conducted globally estimated a lifetime prevalence of 6.35 per 1000 (7). The occurrence of bipolar disorder is estimated to be less than schizophrenia. The incidence of bipolar was estimated to be 12.4 per 100,000 person years in England (5). Other reviews have also estimated a global lifetime prevalence of 2.4% (8). The findings from these systematic reviews should however be interpreted with caution as there was a high degree of heterogeneity between studies, causing difficulties reliably drawing comparisons between studies.
The burden of experiencing a SMI is large and can have severe debilitating effects. Presentations of SMI differ; therefore, no two experiences may necessarily be the same and may vary according to specific diagnoses (9). However, people with SMI may experience positive, negative, and other symptoms. Positive symptoms involve experiencing distortions in perceptions of reality including: seeing, hearing or tasting things that other people cannot (‘hallucinations’), maintaining beliefs that may not be true (‘delusions’), rapid thoughts causing speech problems (‘thought disorders’) or agitation and stress (10). Negative symptoms may involve experiencing: a lack of motivation, inability to conduct daily activities such as self-care, inability to enjoy activities and reduced displays of emotion (11). Other symptoms may include manic episodes, experiencing extreme highs and lows, depression, suicidal thoughts or attempts and cognitive impairment.

The annual economic burden of SMIs are also estimated to be high. In the United Kingdom (UK), annual service costs for non-affective psychosis/ schizophrenia in 2009 were estimated at £3.5 billion and annual informal care costs amounted to £1.2 billion (5). The annual cost of lost employment in people with non-affective psychosis/schizophrenia amounted to £4.1 billion and annual psychiatric inpatient care was estimated at £1.7 billion. Annual service costs in 2009 for affective psychosis/bipolar were estimated at £5 billion (5). This included NHS costs of £4.05 billion, informal care costs of £167 million and lost employment costs of £829 million.

Although common mental illnesses can also impact cognitive, personal and daily functioning, SMI may have greater consequences (12, 13). A systematic review reported that the relative risk (RR) ratio for all-cause mortality was highest in people with psychosis (RR=2.54, 95% CI=2.35 to 2.75) compared to other mental health conditions and higher in people with bipolar (RR=2.00, 95% CI=1.70 to 2.34) compared with those diagnosed with anxiety (RR=1.43, 95% CI=1.24 to 1.64) or depression (RR=1.71, 95% CI=1.54 to 1.90) (14).

Schizophrenia treatments include oral antipsychotic medication and psychological interventions (including individual cognitive behavioural therapy (CBT) or family interventions) and is usually long-term (15). Depot/long-acting injectable antipsychotics are offered to those who are non-compliant with medication and/or who are acutely unwell and may prefer this rather than oral antipsychotics. It is suggested that first-generation antipsychotics (FGAs) (developed in the 1950s) have more extrapyramidal side-effects (i.e. involuntary movements) compared with second-
generation antipsychotics (SGAs) (developed in the 1980s) (16, 17). Some studies have reported that the prevalence of metabolic syndrome is higher in those taking SGAs compared to FGAs (18). However, systematic reviews indicate that medications may have differential side-effects (19). These include sedative effects and weight gain, though the highest amount of weight gain was shown in zotepine, olanzapine and sertindole (SGAs) (20). Some studies have reported that SGAs contribute toward increased appetite/consumption of fats (21).

Pharmacological interventions for bipolar include antipsychotics (i.e. haloperidol, olanzapine, quetiapine or risperidone), antidepressants (i.e. fluoxetine) and mood stabilisers (i.e. lithium, valproate, lamotrigine) to treat mania/hypomania (22). In addition to the side-effects of antipsychotics as described earlier, mood stabilisers and antidepressants are also associated with various side-effects including tremor, cognition problems, increased thirst, weight gain, dysarthria, ataxia, headaches, nausea, vomiting and drowsiness (23, 24).

1.3 Cardiovascular disease (CVD): definition and impact

Conditions affecting the heart and blood vessels (i.e. cardiovascular system) are grouped together to comprise cardiovascular disease (CVD) (25). These include conditions such as coronary heart disease and stroke. It is caused by a build-up of substances (i.e. plaque/‘atheroma’) in the walls of the arteries which carry oxygen-rich blood to the brain and heart. It comprises of fat, cholesterol, calcium and over time this hardens and narrows the arteries, restricting blood flow to vital organs and is known as “atherosclerosis” (see Figure 1-1) (26).

Though individuals may experience some symptoms of CVD, it is not normally noticed until it progresses (25). In some cases, a sudden heart attack (i.e. myocardial infarction), ischemic or haemorrhagic stroke may occur. Myocardial infarction (MI) may occur due to restricted blood flow to the heart due to atherosclerosis. Ischemic strokes occur due to blood clots in the arteries whilst haemorrhagic strokes result from a ruptured artery either on the surface of or within the brain (27, 28). Both MI and stroke can result in mortality (25).
In 2016, it was estimated that CVD was the leading cause of mortality worldwide with heart disease and stroke contributing to 15.2 million deaths (30). In the UK, the leading cause of death from 2001-2018 for men was ischemic heart disease, though over time the total number of deaths from ischaemic heart disease and cerebrovascular disease decreased (31). Healthcare related costs in England amount to approximately £7.4 billion and £15.8 billion for wider annual economy costs (32).

1.4 Defining the problem: early mortality and CVD in people with SMI

“The mortality gap for people with SMI is an ongoing scandal that contravenes the universally accepted right to health for all. Urgent action to address it is long overdue.” (p.131) (33)

People with SMI are at greater risk of mortality compared to those with common mental illnesses and those in the general population (14, 34, 35). The World Health Organisation (WHO) estimated that people with SMI die on average 10-20 years younger than the general population (36). Whilst the rate of mortality due to ischemic heart disease and cerebrovascular disease may have declined between 2001-2018 for people in the UK general population, the mortality rate for people with SMI between 2004-2014 increased and the mortality gap between those in the general population and those with SMI widened (37). For people with schizophrenia, the hazards ratio (HR) for all-cause mortality increased per year by 0.11 (95% CI= 0.04 to 0.17) from 2004 to 2010 and by 0.34 (95% CI= 0.18 to 0.49) from 2010 to 2014. For people with
bipolar disorder, the HR for all-cause mortality increased by 0.14 (95% CI= 0.10 to 0.19) from 2006-2014 per year.

It is consistently reported that the leading factor associated with early mortality in people with SMI is CVD (36, 38-40). It also consistently reported that people with SMI have an increased risk of CVD and CVD related mortality compared to the general population both in the UK and other countries worldwide (36-41). The increased risk of CVD and mortality due to CVD in people with SMI has been referred to as:

“… a public health concern in its own right” (p.22) (42).

A meta-analysis of international studies identified a 9.9% prevalence of CVD in people with SMI, with a prevalence of 8.4% in bipolar disorder and 11.8% in schizophrenia (41). In comparison with controls, the risk of mortality due to CVD in people with SMI were greater in longitudinal studies (HR=1.85, 95% CI=1.53 to 2.24). In cross-sectional studies, there was a higher odds of experiencing coronary heart disease (OR=1.51, 95% CI=1.47 to 1.55) and cerebrovascular disease (OR=1.42, 95% CI=1.21 to 1.66) in those with SMI. Similar findings were reported in longitudinal studies, where there was a higher incidence of CVD (HR=1.78, 95% CI=1.60 to 1.98), coronary heart disease (HR=1.54, 95% CI=1.30 to 1.82), cerebrovascular disease (HR=1.64, 95% CI=1.26 to 2.14) and congestive heart failure (HR=2.10, 95% CI=1.64 to 2.70) in people with SMI compared with controls. There were no differences in CVD risk by region when comparing each region with their control groups.

1.4.1 Overview of aetiology

The aetiology of CVD in people with SMI is complex as multiple factors contribute most of which are interrelated. In the following section, I explain how each factor may contribute toward the onset of CVD in people with SMI and how these may affect each other. The factors displayed in the Venn diagram in Figure 1-2 are modifiable to a greater or lesser extent. Other factors including genetics are non-modifiable. Inflammation pathways and CVD risk in people with SMI are still being explored.
1.4.1.1 **Physical comorbidities**

Metabolic, cardiometabolic syndrome or diseases are terms commonly used to describe a cluster of risk factors that predispose individuals to CVD risk (43). This includes obesity, impaired glucose tolerance, insulin resistance, elevated blood pressure, triglycerides, low high-density lipoprotein (HDL) and high low-density lipoprotein (LDL) cholesterol concentrations. Though these factors may individually impact health, when experienced together they increase the risk of CVD.

People with SMI show evidence of physical comorbidities (35). The proportion of people with schizophrenia with at least one cardiometabolic comorbidity was 66.1% (from 57,506) and 60.5% (from 124,803) in people with bipolar disorder (44). A meta-
analysis of people with schizophrenia reported that compared with controls, people with schizophrenia were four times more likely to be at risk of abdominal obesity (OR=4.43, 95% CI= 2.52 to 7.82) (45). Compared with controls, people with schizophrenia also had a greater risk of low HDL cholesterol (OR=2.35, 95% CI=1.78 to 3.10) hypertriglyceridemia (OR=2.73, 95% CI=1.95 to 3.83), diabetes (OR=1.99, 95% CI=1.55 to 2.54) and hypertension (OR=1.36, 95% CI=1.21 to 1.53). There was a lower proportion of participants with abdominal obesity (16.6%) who had not been treated with antipsychotics compared with those being treated with antipsychotics (50%). In a meta-analysis people with bipolar were at greater risk of metabolic syndrome compared with controls (OR=1.98, 95% CI= 1.74 to 2.25) (46). There was a greater proportion of those with metabolic syndrome being treated with antipsychotics (62.4%) versus those not being treated with antipsychotics (32.4%).

Another systematic review reported that older age, longer illness duration and higher body mass index (BMI) increased the risk of metabolic syndrome in people with SMI (47). It was also reported that there was a higher proportion of metabolic syndrome among those that were that prescribed clozapine (47.2%) antipsychotics compared to other antipsychotics. A recent systematic review reported that olanzapine and clozapine antipsychotics had the worst metabolic effects in people with schizophrenia affecting body weight, BMI, total cholesterol, LDL cholesterol, HDL cholesterol, triglyceride and glucose (48).

Mendelian randomisation (MR) offers a way of causally exploring the link between exposure and outcomes using genetics associated with exposure and outcome factors (49). As genetics are naturally occurring and fixed, this offers a way of exploring cause and effect links and therefore overcoming issues related to confounding. When genes related to schizophrenia were considered as the exposure in MR analysis, this was causally linked to genes linked to raised triglycerides (50).

### 1.4.1.2 Health risk behaviours

People with SMI show evidence of unhealthy behaviours. The term health risk behaviours refer to diet, physical activity (PA), sedentary behaviour (SB), smoking, substance and alcohol use. I use this term throughout this thesis rather than ‘lifestyle factors’, which is commonly used in this research area. This term is thought of as controversial and there is a call to abandon it in public health (51). It is suggested that the term implies control and choice, suggesting that individuals are responsible
for their behaviour ignoring the broader factors affecting health inequalities. The term health risk behaviours makes fewer assumptions about the processes by which they arise.

*Cigarette smoking*

A review reported that compared with people without psychiatric diagnoses, people with bipolar were 2 to 3 times more likely to smoke and unlikely to quit or initiate quit attempts (52). In England, the prevalence of smoking among people with SMI in 2014/2015 was more than double (40.5%) compared with people in the general population (16.4%) and greater than those with anxiety or depression (28%) (53). There is also some evidence to suggest that people with SMI are heavy smokers, smoke more than the general population and inhale more intensely excess amounts of nicotine (54-56).

Smoking is a well-known risk factor for CVD and has been reported as an important contributor to mortality in people with SMI (57, 58). Longitudinal studies have found the prevalence of smoking in people with SMI to be around 70% (40, 59). The relative risk of mortality was twice as greater in smokers versus non-smokers (RR=2.16, 95% CI=1.31 to 3.59) and 70% of the excess natural mortality was explained by smoking related diseases (59).

*Comorbid substance use disorder or dual diagnosis*

Dual diagnosis or comorbid substance use disorders describe individuals with co-occurring severe mental health diagnoses and substance use problems (60, 61). This includes illicit substance and/or alcohol misuse in a way that causes mental and/or physical harm. Research has demonstrated that people with SMI have an increased risk of heavy alcohol and recreational drug use and are likely to be diagnosed with substance related problems at some point in their lives (60-64). Dual diagnoses are a separate topic combining mental health and addiction diagnoses and are not considered nor treated as purely health risk behaviours. Therefore, this was out of the scope of my PhD topic as this is a different, more complex body of research that may require a separate research project. However, the consumption of alcohol in more general terms as opposed to dependency is relevant to health risk behaviours and is considered within in my PhD topic.
It is however important to note that alcohol and drug dependency disorders in people with SMI are also related to increased mortality rates. In a prospective cohort study conducted in Denmark, there was a higher risk of mortality among people with SMI with substance abuse disorders (62). More specifically, in schizophrenia the risk of mortality increased for substance use disorders related to alcohol (HR=1.52, 95% CI=1.40 to 1.65), cannabis (HR=1.24, 95% CI=1.04 to 1.48) and hard drugs (HR=1.78, 95% CI=1.56 to 2.04). Similarly, in bipolar disorder the risk of mortality increased for substance use disorders related to alcohol (HR=1.52, 95% CI=1.27 to 1.81) and hard drugs (HR=1.89, 95% CI=1.34 to 2.66). There is also some evidence to suggest that people with SMI and substance use disorders had higher proportions of heart disease and were at greater risk of ischemic heart disease, congestive heart failure, hypertension, atrial fibrillation and stroke (65, 66). There is also evidence to suggest that heavy alcohol use was predictive of CVD in people with SMI (67).

Smoking and substance use may be related to one another in people with SMI, where the presence of one may increase the occurrence of another. In a longitudinal study it was reported that continued smoking at follow-up was associated with a higher odds of substance use (OR=1.56, 95% CI=1.10 to 2.20) or substance use relapse (OR=2.02, 95% CI=1.65 to 2.47) compared with those who were no longer smoking at follow-up (68).

Dietary intake

Studies have reported that people with SMI were more likely to consume less fibre, less fruit and vegetables, more saturated fat, total fat, more calories, less monounsaturated and polyunsaturated fatty acids, more carbohydrates, more total fat, fewer healthy fatty acids, vitamins and minerals (vitamin B12 and B6, folate, vitamin C, zinc, and selenium), higher total energy and sodium intake, more convenience foods, sugar and sugary beverages (21, 69-71).

It was also reported that those consuming an unhealthy diet and other unhealthy behaviours were overweight or obese, had an increased fasting glucose and greater risk of CVD (21). There was some evidence to suggest that non-smokers had healthier diets compared with smokers. There was mixed evidence regarding the impact of antipsychotic medication on diet, with some studies reporting that certain medications affected consumption of unhealthier foods and increased appetite. Obesity has been linked to consumption of unhealthier diets in both people with SMI
and the general population and poorer diet is thought to contribute toward other metabolic abnormalities including hypertension, raised cholesterol, impaired insulin and glucose metabolism which contribute toward CVD (21, 34, 58). In 2017, unhealthy dietary risk alone accounted for 10.9 million deaths in the general population globally, highlighting the importance of the role in diet in mortality (72).

**Physical activity and sedentary behaviour**

Sedentary behaviour (SB) refers to behaviour that comprises of sitting and/or lying for prolonged periods during waking hours. SB is usually defined as the equivalent of ≤1.5 metabolic equivalents of task (METs) (see Chapter 4, section 4.4.3.3 for METs definition). Systematic reviews reported that people with SMI were more sedentary than controls spending an average of 476 to 661 minutes per day being sedentary (73, 74). People with bipolar were more sedentary (615 minutes per day) than those with schizophrenia (493 minutes per day) (73).

Other systematic reviews have shown that people with SMI showed less moderate and vigorous PA, spent more time (80 minutes per day) engaging in light PA (1.5 to 3 METs) as opposed to moderate (47 minutes per day) (3 to 6 METs) to vigorous PA (>6 METs) (73, 75). However, people with bipolar spent longer (84 minutes per day) engaging in moderate or vigorous PA compared with those with schizophrenia (37 minutes per day) (73). The proportion of people with SMI not meeting the recommended PA guidelines of 150 minutes moderate PA per week was 54.7%, but people with schizophrenia were more likely not to meet guidelines (54.8%) compared with people with bipolar (31.4%) (73). Recent cross-sectional data containing 3287 individuals with SMI in the UK support previous systematic review findings that people with SMI generally tend to engage in less and/or low levels of PA (76). The proportion of those who reported rarely (“once per week to never”) engaging in PA was 62.3%. However, this was based on self-reported information which can be liable to recall bias. I reviewed this paper for the Mental Elf Blog (see ‘Dissemination of work’ section) as part of the launch for the Closing the Gap Network (a network to explore reasons for physical health inequalities in people with SMI) (77, 78). There is also some evidence to suggest that the psychotropic medication contains sedative effects which affects engagement in PA in people with SMI (79).

Cardiorespiratory fitness (CRF) is defined as: “the ability of the circulatory and respiratory systems to supply oxygen to working muscles during sustained physical
activity” (80)(p. 344). Research suggests that CRF independently predicted CVD in the general population and engaging in regular PA is thought to improve CRF (81). A systematic review reported that compared with controls, people with SMI had lower levels of CRF (80). It was also reported that being an inpatient and a first episode of psychosis was associated with higher levels CRF.

A meta-analysis of studies conducted in the general population showed that sedentary behaviour (SB) was independently associated with all-cause mortality, CVD related mortality, CVD and type 2 diabetes (82). Similarly, a study of people with SMI reported that SB was associated with an increased risk of metabolic syndrome (83). Higher BMI, higher waist circumference, higher fasting glucose concentrations, higher diastolic blood pressure, higher triglycerides and greater extrapyramidal side-effects of antipsychotic medications were identified in those sitting for >10.4 hours per day compared with those reporting sitting less than 5.8 hours per day. However, another systematic review in the general population reported the risk of mortality associated with sitting for prolonged periods can be mitigated with high levels of moderate PA (84). In a study conducted with people with SMI, though SB was associated with higher fasting blood glucose, this improved when daily steps were taken into consideration and improved high-density lipoprotein cholesterol was associated with higher daily steps (85).

Other health risk behaviours may also be associated with PA in people with SMI. There is some evidence to suggest that increased substance and cigarette use were associated with reports of no regular PA in people with schizophrenia (86). Similarly, people with SMI that had never smoked were also more likely to report engaging in regular PA compared with previous smokers (76). Further, lower fruit and vegetable consumption were associated with reports of lower PA levels or less regular PA (76, 87).

1.4.1.3 Antipsychotic adverse effects

As well being associated with sedative effects, increased appetite, and greater risk of metabolic abnormalities through health risk behaviours, antipsychotic medications contain pharmacological properties that may directly affect metabolic abnormalities in people with SMI. Research has demonstrated that antipsychotics block dopaminergic receptors (D2), which may result in greater food intake and therefore obesity (88). It has also been suggested that antipsychotics may block M3 receptors which increase
insulin resistance and therefore increase the risk of diabetes (88). Antipsychotics have been suggested to adversely disrupt the way cholesterol is processed and produced (89). It is suggested that these trigger reactions which reduce cholesterol and increase fatty acids.

1.4.1.4 Symptoms and treatment adherence

Mental illness related factors may also increase CVD risk (90). People with SMI may have cognitive impairment causing them difficulty understanding their own health needs, seeking appropriate care, and understanding healthcare advice. Symptoms including paranoia, suspicion, low motivation, and social withdrawal may also cause difficulty for patients to seek appropriate care, modify their unhealthy behaviours or repeatedly engage with services. People with SMI may be less inclined to adhere to treatment which could worsen their physical health. However, there is evidence to suggest that people with schizophrenia adhered to diabetes and statin medication more than the general population or those without psychiatric illness (91, 92). A lack of confidence and fear regarding medical results were related to avoidance of appointments and rushed consultations (93).

Though the features of SMI can adversely impact health risk behaviours, health behaviours also positively and negatively impact mental wellbeing. There may be a lower odds of developing depression when performing PA and consuming certain vitamins (folate, B6 and B12) may improve negative symptoms and illness duration in people with schizophrenia and first episode psychosis (94-97). It is also a commonly held belief that smoking reduces anxiety or stress by prompting the release of dopamine. However, smoking affects the long-term natural supply of dopamine by stopping its release. Further, smoking increases anxiety levels as the short-term ‘positive’ effects of nicotine wear off and withdrawal symptoms occur. Further, substance misuse in people with SMI can result in a longer, more serious illness duration due to non-adherence, lack of engagement with treatment and effect the efficacy of medication and psychological therapies (15, 22, 98). A recent systematic review also identified the use of PA in preventing and treating SMI and casual relationships between smoking and the onset of psychosis (99).

1.4.1.5 Access to appropriate care

Compared with people without mental illnesses, people with SMI were less likely to receive physical health checks or receive treatment for hyperlipidaemia in primary
care (35, 100-102). People with SMI in the United States (US) were also more likely to be refused medical insurance (35, 103).

The physical health needs of people with SMI may also be overlooked by healthcare providers including diagnostic overshadowing (35, 90, 93, 104-107). Healthcare professionals (HCPs) may mistakenly ascribe physical health symptoms to mental health or focus on providing mental healthcare rather than physical healthcare. Physical health diagnoses may therefore be missed, and appropriate physical healthcare not provided. Other HCP factors include the stigmatisation of patients with SMI and the belief that patients will not engage with physical healthcare or modify their unhealthy behaviours (35, 90, 93, 100, 107). This may also affect patient engagement with services.

Primary HCPs lacking skill and knowledge on the symptoms of SMI and how to engage with patients with SMI have been reported as negatively impacting their ability to provide physical healthcare (93). Similarly, a lack of confidence among secondary care mental HCPs to support the physical health needs of patients with SMI have also been reported as barriers to providing physical healthcare (108). There is also hesitancy among HCPs to offer medical interventions due to fear of exacerbating symptoms, concerns over gaining informed consent, compliance with follow-up care or contraindications (35). A study reported less beta blockers and angiotensin-converting enzyme inhibitor/angiotensin receptor blockers (ACEI/ARB) prescribing among those with SMI and coronary heart disease and heart failure (109). Both mental health services and primary care services are under pressure to meet various targets and meet the physical and mental health needs of patients which may affect the extent they can address the physical health needs of patients appropriately (110).

Healthcare for people with SMI has also often been described as fragmented (35, 42, 57, 93, 107, 110). The mental and physical health needs of people with SMI have been poorly coordinated between primary and secondary care services and across broader health and social care services, despite efforts to integrate services (107, 110).

1.4.1.6 **Social and economic factors**

Several studies have reported the link between socioeconomic factors and CVD in the general population (111). Those who reside in England’s most deprived areas are
more likely to die from CVD compared with those in least deprived areas (32). CVD is also higher amongst those who are older male, or South Asian or African Caribbean (32). Similar risk factors are also associated with the onset of SMI (112-116). A recent study reported that lower socioeconomic status was associated with greater risk of interrelated health conditions including psychiatric disorders, substance abuse and later renal diseases, ischaemic heart disease, cerebral infarction, chronic obstructive bronchitis, lung cancer and dementia (117). Research shows that socioeconomic factors partly explain the association between SMI and CVD (38). Reviews have identified that poorer socioeconomic status may be linked with reduced healthcare access and unhealthy behaviours (111). Poorer socioeconomic status was linked with smoking in vulnerable groups, particularly those with mental illness (118). There is mixed evidence regarding the role of socioeconomic factors on dietary behaviours, with some research reporting a link and others not (21). It has also been identified that those who are unemployed reported lower levels of PA compared with employed individuals (73, 76, 87).

1.4.1.7 Genetics

Genetics may contribute toward the development of SMI (112, 115, 116). Other research in the general population supports the role of genetics in the onset of CVD (58). However, research has also demonstrated overlap between genes associated with SMI and CVD risk factors. Of 25 loci (i.e. position and location of gene/ genetic marker on chromosome) associated with schizophrenia, 10 were also associated with triglycerides, LDL, HDL, waist-to-hip ratio, systolic blood pressure and BMI (119). Several bipolar related genes have also been found to overlap with genes associated with cardiometabolic disease risk (120). Other studies have shown that adolescents with a family history of bipolar disorder had the highest CVD risk compared with adolescents without a family history of bipolar disorder and healthy controls (121).

1.4.1.8 Inflammation

There is evidence linking inflammation to atherosclerosis and CVD (58, 122). Research has also explored the association between the onset of SMI and inflammation, however the findings are mixed and there is a call for studies which control for weight gain/ obesity and psychological distress as these may affect inflammation (58, 123). Several studies have reported an association between inflammation and elevated levels of metabolic syndrome in those with schizophrenia (124). There is also a call for more research which attempts to disentangle the
pathways linking inflammation to CVD risk in people with SMI (41). There is some evidence to suggest that that people with schizophrenia show evidence of diets (i.e. added sugars, processed meats and processed carbohydrates) more commonly associated with inflammation compared with the general population (71). Using the dietary inflammatory index (DII), scores were higher in people with schizophrenia versus controls. However, more work is needed to understand the association between diet-associated inflammation and physical health problems in people with SMI.

1.4.2 Prevention and management

The mortality rates in people with SMI have not improved in recent years in the UK and worldwide, implying that problems related to accessing appropriate healthcare still exist (37, 41). In the UK, it is recognised that it is the responsibility of both primary and secondary mental health services to monitor physical health status in people with SMI (15, 22). Secondary care services are encouraged to monitor physical health and facilitate access to physical healthcare from primary care services in guidelines (125). Patients who have been managed solely in primary care, have been discharged by secondary care services to primary care, have been in contact with secondary care teams for more than 12 months, or whose symptoms stabilise, should be monitored in primary care (125). According to guidelines, once this responsibility has been transferred to primary care from secondary care, physical health checks should be conducted annually in primary care (15, 22).

Primary care services in the UK are financially incentivised under the QOF to screen patients with SMI regarding their smoking status, blood pressure and BMI (126). Secondary care mental health services in the UK were previously (2017-2019) financially incentivised for monitoring cardiometabolic parameters under the Commissioning for Quality and Innovation payment framework (CQUIN) but more recently (2020/21) there is no suggestion they are still incentivised (127, 128). Despite greater clarity on what physical health screening should involve, there is limited evidence on the effectiveness of physical health screening to reduce mortality and there is a greater push for intervening and primary prevention strategies rather than screening alone (125, 129). Though there is some evidence to suggest that annual reviews in primary care were associated with reduced risk of accident and emergency (A&E) visits and unplanned hospital admissions, the impact of annual reviews on mortality was not assessed (130).
1.4.2.1 The focus on health risk behaviour change

There is evidence connecting unhealthy behaviours in people with SMI with CVD risk. It is therefore not surprising that multiple guidelines and reports advocate targeting health risk behaviours to prevent and reduce CVD risk and, in some cases, suggest this should be considered first before the initiation of physical health medication, both in the general population and in those with SMI (15, 22, 125, 131-143). In fact, a recent meta-analysis reported that non-pharmacological interventions including dietary, PA and ‘lifestyle’ interventions were effective at improving metabolic factors and showed similar effectiveness compared with pharmacological interventions (144).

Guidelines suggest that referrals to specialist exercise therapy/programmes, weight management, smoking and alcohol cessation services should be supported. It is however unclear whether such services used by the general population are useful for people with SMI. Further, recent guidelines suggest that health risk behaviours should be assessed and recorded when screening patients physical health (125). However, there is no mention of which screening tools can be used to identify unhealthy behaviours. Details regarding how HCPs should prompt or encourage ‘healthy’ changes and the uptake of such specialist services are also very limited and vague with minimal detail on the types of strategies that should be used and how to identify strategies to suit individual needs. This was supported in a review conducted by Holt (2019) on obesity in people with SMI where the following statement was made about clinical guidelines advocating health behavioural interventions:

“Healthcare providers are however left in the quandary of being required to provide services for people with severe mental illness without knowing exactly what these should involve.” (145) (p.329)

1.4.2.2 Models of care and healthcare settings

“As a first step in reducing physical health disparities for people with mental illness is the adoption, translation, and routine provision of evidence-based lifestyle interventions as a standard component of mental health care.” (35) (p.689)

As highlighted previously, healthcare for people with SMI has often been termed as fragmented and there are various challenges for people with SMI associated with accessing appropriate healthcare. A lack of communication between primary care and secondary mental health services regarding the healthcare needs of patients has
been affected by a lack of information sharing infrastructures (57, 93, 107, 108). In some cases, a lack of agreed protocols caused confusion regarding the responsibilities of staff, mental health stigma and lack of access to joint funding negatively affected integration of services (107). It is also suggested that shared protocols, co-location of services, joint funding and commissioning, involvement of voluntary and community sector organisations, multidisciplinary teams, liaison services, navigators, the reduction of stigma, protected time for training and joint working to increase opportunities to share skills, changing educational curriculums to ensure that HCPs share both physical and mental health knowledge and involving carers and service users should be considered in the design of integrated models to ensure better integration (42, 107, 146, 147). However, it is recognised that healthcare settings play a vital role in the supporting healthy behavioural change in people with SMI.

The role of primary care

Primary care is considered as ideal for the management of physical health interventions for people with SMI (35). Long-term physical health conditions are usually managed in primary care, those with mental health problems commonly present first to primary care services and even when patients were receiving secondary mental health care, primary care involvement would still be required to address physical health needs (35, 148, 149).

Guidelines for the management of physical health conditions in people with SMI in primary care recommend following-up on annual physical health assessments with appropriate interventions, personalised care plans and social prescribing (137). These guidelines signpost practitioners to other guidelines specifically for alcohol, obesity, hypertension, type 1 and 2 diabetes, lipid modification and smoking cessation which promote the modification of health risk behaviours including diet and PA (131, 150-155). However, details regarding how behaviours can be changed specifically for people with SMI are vague.

Joint working, integrated and/or collaborative care

Mental and physical healthcare for people with SMI are traditionally separated but in recent years their integration has been emphasised more. Several guidelines, reviews and reports advocate an integrated way of working between different health sectors
to address patients mental and physical health needs (35, 107, 136-139, 156). There are various terms used to describe integrated care including collaborative care or joint working. However more commonly, integrated care refers to both the co-ordination of mental and physical health services and the consideration of both mental and physical health needs for people with SMI to better address their needs.

The NHS’s (2016) five-year forward mental health view made integrating mental and physical health services for people with SMI a national priority so that physical and mental health was better addressed and more accessible including physical health screening in primary care and specialist services including smoking cessation, exercise therapy and programmes etc. (157). In response to this, a report published by the King’s Fund identified what an integrated approach could comprise of with health promotion as one of the ten priorities including health risk behaviour change services (42). Research on integrated models conducted by the Royal College of Psychiatrists supported that one of the indicators of the success for integrated care would be the focus on health risk behaviour change for people with SMI to prevent health issues (158).

The CQUIN framework also provided financial incentives for secondary care services where evidence of collaborative working with primary care was demonstrated (127). Primary care services are also encouraged to work collaboratively with secondary care services to ensure that health assessments and care plans are shared (137). It is advised that follow-up interventions should be offered to help modify health risk behaviours in people with SMI and should be recorded by both primary and secondary care services (130). Much of research in this area focuses on how to better integrate services. Whilst this is helpful, it is unclear how health risk behaviours may be supported effectively in integrated mental and physical health settings even though integrated care for people with SMI is part of the NHS’s long-term plans (159, 160).

1.4.3 Health behaviour change interventions for people with SMI – what ‘works’?

The evidence base for the effectiveness of health promotion interventions in people with SMI is mixed and the quality varies. To my knowledge, there are few trials set in primary care contexts and most of the trials were delivered in secondary care settings or by mental HCPs. I next briefly provide an overview of the evidence base.
1.4.3.1 ‘Lifestyle’

A systematic review reported that lifestyle interventions reduced weight, however some of the trials contained small samples with short follow-up durations and participants recruited from community outpatient mental health services (161). A recent meta-analysis reported that lifestyle interventions reduced weight by 2.2 kg and waist circumference by 2.13 cm but was reported as not clinically significant (162). There was heterogeneity between the trials and were at high risk of bias due to lack of allocation concealment and blinding. The overall sample contained mostly those with established and chronic SMI and most (75%) were diagnosed with schizophrenia reducing generalisability to those with bipolar disorder.

1.4.3.2 Diet

A systematic review reported that nutrition interventions were effective in reducing BMI, increasing weight loss, decreasing waist circumference and lowering blood glucose (163). Interventions initiated before the start of antipsychotic treatment, delivered by qualified dieticians were more effective. Whilst several studies were included (n=20), studies mostly contained participants with schizophrenia recruited mostly from outpatient settings. The trials were, in some cases, short in duration and some were conducted as part of a ‘lifestyle’ programme targeting PA which may have influenced outcomes. More recently, a lifestyle intervention programme (“STEPWISE”) designed to promote healthy eating and PA through community mental health settings was not associated with any differences in diet, PA or anthropometric measures and therefore not effective (164). The trial only included those with schizophrenia/schizoaffective disorder and those identified in community mental health settings but did however consider a wide representation of those with schizophrenia, first episode psychosis, BMI range and community mental health teams and was conducted over a long duration (12 months).

1.4.3.3 Smoking

A systematic review reported no evidence of the benefit of smoking cessation programmes in the medium or long-term (165). However, some of the trials included were short in duration and contained participants with mostly schizophrenia/schizoaffective disorder. A recent trial (“SCIMITAR +”) on tailored smoking cessation programme by mental HCPs reported whilst there was a higher proportion of those who quit smoking in the intervention group compared with usual care at 6 months,
this finding was no longer statistically significant at 12 months (166). This study contained both those with bipolar and schizophrenia/ schizoaffective disorder recruited in both primary care and community mental health settings thereby increasing the generalisability of the findings to these populations. However, the sample size lacked power due to unexpected quitting rates in the usual care group and there were difficulties ensuring GPs prescribing pharmacological smoking cessation services.

1.4.3.4 Physical activity

A recent systematic review on PA interventions showed that while some PA interventions were found to be effective in increasing PA in people with SMI, studies were heterogeneous and therefore difficult to compare (167). The evidence base was considered as low quality where some studies lacked control groups, were not randomised and there was uncertainty regarding the reliability of the measurement of outcomes. Some reviews explored predictors of treatment drop-out in PA interventions and narratively the role of social support in PA interventions (168, 169). It was reported that certified/qualified providers such as yoga instructors, physical therapists or other HCPs with professional PA qualifications had lower treatment drop-outs compared to others delivering PA interventions. Providing esteem support, emotional support and verbal reinforcement, general social support and peer/group social support was reported to facilitate individuals’ compliance and attendance of PA programmes.

1.4.3.5 Peer support

Another systematic review based on the effectiveness of peer-based health interventions for people with SMI reported mixed findings (170). Peer-support interventions improved dietary related outcomes in a small number of studies (n=5). However, there was mixed evidence regarding the benefits of peer support for PA and smoking behaviours. As meta-analysis was not possible due to the small sample sizes and heterogeneity between studies, it was difficult to infer the strength of the findings. There is some work regarding the role of peer support workers in supporting patients with SMI access primary care to improve their health risk behaviours. A trial conducted in America reported that a peer support programme increased PA levels but was only conducted in one community mental health centre thereby limiting generalisability to other types of settings (171). Another study involving peer supporters in the UK is currently being piloted (172).
1.4.3.6 Primary care

One small-scale study was conducted among nurses in a primary care setting in the UK involving physical health checks and health promotion advice (173). The effectiveness of this intervention was not quantitatively assessed, but qualitative interviews suggested that patients made health behavioural changes. However, it is not possible to draw strong conclusions from an uncontrolled qualitative evaluation. More recently, a behavioural intervention (Prediction and management of cardiovascular disease risk for people with severe mental illness: research programme in primary care—"PRIMROSE") delivered in primary care was not effective at reducing CVD risk, or any health risk behaviours but was associated with reduced psychiatric admissions and therefore lower costs (174). The intervention was pragmatic, delivered in a clinical setting by up-skilling existing staff. I cover this study in more detail in Chapter 2 as this forms the basis of my PhD.

1.4.3.7 Integrated care

As discussed in section 1.4.2.2, there are various terms used to describe integrated care including collaborative care or joint working. For the purposes of this thesis I use the more often used definition of integrated care as the co-ordination of mental and physical health services including joint-working between primary and secondary mental healthcare settings. Essentially, integrated care for people with SMI refers to considering both mental and physical health needs and not just focusing on one aspect of health to ensure these needs are better met. These models can be adopted using various approaches and in this section, I discuss the evidence base for some of these models of care.

In trials I describe next, one form of integrated care was delivered to people with SMI whereby HCPs with multidisciplinary backgrounds in mental and physical healthcare were attempting to address both the mental and physical health needs of people with SMI. Unlike other forms of integrated care, this did not involve a collaboration between primary and secondary care services and care was delivered only in secondary care settings. These have shown reduced weight gain and an increase in healthier diets and PA (175, 176).

There are several other trials which aligned more closely with joint working between primary and secondary care services. In these cases, both primary care and secondary mental health services were involved in health behaviour change.
interventions but mostly led by mental health services. These have mixed findings. Some showed improved mental health, reduced CVD risk, reduced impaired functioning, depressive symptoms, BMI, and rates of smoking (177-180). However, some also showed no effect on cardiometabolic factors, CVD risk, CRF, PA, diet, and smoking (178, 181, 182).

The quality of the studies also varied. Some contained small sample sizes (175, 176, 178, 179), short follow-up durations (12 and 16 weeks) (175, 176), were not randomised (175, 176) and had no control arm (176). Whilst other studies were randomised and had a longer follow-up duration (≥12 months) (177, 180, 182). The populations in the studies varied including only first episode psychosis (175), bipolar disorder (178, 179), schizophrenia (181) or a combination of SMI (176, 177, 180, 182) and most of the studies recruited participants from community mental health outpatient settings (175, 177-180, 182). However, there were no apparent differences between the studies in terms of effectiveness and population type.

1.5 Improving health behaviour change interventions for people with SMI: what do we currently know, what are the gaps and limitations?

Studies on the effectiveness of health promotion interventions in people with SMI yield conflicting results and it is important to understand health behaviour change in detail before interventions are developed and adopted by different healthcare settings. This includes understanding factors that are associated with health behaviour change, the barriers and facilitators to supporting and changing health behaviours. This is particularly important as guidelines advocate targeting health risk behaviours in primary care and integrated mental and physical health settings. I previously briefly covered some interrelated factors contributing to health risk behaviours and CVD risk in people with SMI in section 1.4.1. In this section, I take a closer look at the evidence base and discuss in detail findings on factors associated with health behaviours in people with SMI. I also cover qualitative and mixed-methods literature exploring the barriers and facilitators behind supporting and changing health behaviours. In this section, I identify gaps in the literature and critique the evidence.
1.5.1 The epidemiology behind health behaviour change in people with SMI: a closer look

1.5.1.1 Smoking and alcohol use

A longitudinal study reported that higher self-efficacy and coping skills were associated with reduced alcohol use in people with SMI (183). Other longitudinal studies of people with SMI reported that higher cognitive attention speed, older age, smoking less at baseline, less perceived cigarette withdrawal symptoms and lower expectations of peer support to assist in quitting smoking were associated with smoking cessation (184, 185). However, increased nicotine dependence scores were associated with lower rates of smoking cessation (186). Readiness to change were associated with reduction in carbon monoxide levels in people with SMI (187).

In cross-sectional studies of people with SMI, the risk of being a smoker increased in men if they had smoked cannabis in the last year, but this risk reduced if they were employed or had a post-school qualification (188). In women, a diagnosis of alcohol abuse/dependence and a greater number of hours spent sitting on a weekday were associated with an increased risk of smoking (188). Quit attempts, quitting or preparations for quitting smoking were associated with preparing to improve sleep, consuming a low fat diet, consuming fruit and vegetables, managing stress, doing more PA, quitting cannabis and stimulant use, being a weekly/regular smoker (as opposed to daily), smoking for ≤10 years, perceptions that psychiatrists supported patients and not living with other smokers (189, 190).

Longitudinal studies are considered stronger designs than cross-sectional studies since exposure and outcome data are collected at separate time points. Therefore, it is possible to determine the temporal sequence of events and identify factors associated with behaviour over time. However, most of the longitudinal studies were secondary analyses of trial data (184, 185, 187, 191). Further, the longitudinal studies comprised of smaller sample sizes (n=82-278) compared with the cross-sectional studies (n=402-754). Most of the studies were conducted in community outpatient settings comprising of a range of SMI diagnoses, but one was conducted in patients with schizophrenia only (184) and one within inpatient services (189).
1.5.1.2 Diet

To my knowledge, only one systematic review narratively addressed factors associated with dietary related outcomes in people with schizophrenia (21). However, the evidence base consisted of cross-sectional studies and several inconsistencies were reported. Poorer socioeconomic status, being male, female, a non-smoker, having a history of child abuse, clozapine medication and antipsychotic medication overall was associated with poorer diet. There was also evidence which reported no association between these factors and diet (21).

In more recently conducted cross-sectional studies, being a smoker was associated with not meeting guidelines for fruit and vegetable consumption and higher negative symptoms associated with lower dietary quality scores in people with SMI (192, 193). Higher global assessment of functioning scores were associated with higher dietary quality scores (193). Higher levels of depressive symptoms were associated with unhealthy family eating environments and greater readiness to change portion size related to receiving more encouragement from friends for healthy eating (194). Other research suggests that those reporting obvious to severe social dysfunction were less likely to consume breakfast (195).

The evidence base for this area is small and inconsistent, and it is therefore difficult to infer the strength of these associations. To my knowledge no longitudinal studies have been conducted and it is therefore difficult to disentangle cause and effect relationships as well as identify factors associated with change over time. Further, the only review exploring factors associated with diet was not generalisable to those with bipolar disorder.

1.5.1.3 Physical activity

All the evidence I identified on factors associated with PA in people with SMI and were based on cross-sectional data.

Patient perceptions, attitudes and concepts with theoretical behavioural models

Higher levels of self-efficacy, perceived behavioural control and readiness for PA were associated with intentions to exercise and increased PA in people with SMI (86, 196, 197). Lower or less regular PA was associated with lower levels of self-efficacy and perceptions that maintaining a healthy lifestyle was either moderately or not
important (76, 86, 198). Other studies have found that attitude and self-efficacy towards PA was unrelated to activity counts per hour in inpatients with SMI (199).

Autonomous types of motivation related to people’s values and pleasure were positively correlated with walking, moderate, vigorous and total PA in people with SMI (197, 200, 201). Amotivation and external regulation (i.e. driven by others including family and friends) were negatively associated with self-reported minutes spent walking, doing moderate and vigorous PA in people with SMI (202). Intrinsic motivation (i.e. pleasure gained from PA) and identified regulation (i.e. values related to PA) were positively associated with all types of PA. Lower levels of amotivation were evident among those in the preparation, action and maintenance stage of PA compared with those in the pre-contemplation stages of change (202, 203) (see Prochaska and DiClemente’s “Stages of change model” in section 7.2.3.1, Figure 7-1). Those in the maintenance stage also showed higher intrinsic motivation including pleasure and enjoyment from PA compared with those in the action stage.

**Sociodemographic factors**

Being male and employed was associated with a greater number of minutes walked and doing more regular PA in some studies of people with SMI (76, 204). In narrative reviews and systematic reviews with meta-regression analyses, older age, being male, being unemployed and having a lower educational level or fewer years were associated with higher levels of light PA (1.5-3 METs), lower vigorous PA (>6 METs), greater levels of sedentary behaviour, not meeting PA guidelines (150 minutes of at least moderate intensity PA per week) and/or lower cardiorespiratory fitness (CRF) in people with bipolar, schizophrenia and psychosis (73-75, 86, 198, 205). Similarly, being older in age was associated with a reduced odds of being persistently moderately and/or vigorously active (at least once per week across six time points) across a ten year period (2002-2012) in a longitudinal study of PA in the general population in England (206). However, being wealthy was associated with a greater odds of being persistently moderately and/or vigorously active over this period.

**Physical and mental health related factors**

Higher BMI, being underweight (<18.5kg/m²) or overweight (>30kg/m²), poorer mobility, self-reported moderate to poor health, increased sleep, medical comorbidities and higher cardiometabolic comorbidity were associated with less
regular, lower or low PA (<150 minutes of moderate-vigorous PA), non-compliance with PA guidelines (150 minutes of at least moderate PA), lower vigorous, moderate or reduced physical fitness in people with SMI (73, 76, 86, 87, 198, 204, 205, 207). However, not having health problems that limited PA was associated with more regular PA (76). Similarly, long-standing illness, arthritis and obesity were reported to reduce the odds of being persistently moderately and/or vigorously active in the general population across ten years (206).

Higher negative symptoms, depressive symptoms/depression, longer mental illness duration, antipsychotic and antidepressant medication use, being an inpatient and having a first episode of psychosis was associated with reduced physical fitness, lower CRF, lower PA, non-compliance with PA guidelines, less vigorous or moderate PA (73, 75, 80, 86, 193, 208). Similarly, depressive symptoms were associated with a reduced odds of being persistently moderately and/or vigorously active in the general population (206).

Social and environmental factors

Greater readiness to change PA behaviours was associated with criticism from family regarding exercise behaviours in people with schizophrenia (194). Living in semi-detached houses and apartment buildings, higher scores on the traffic unsafety of the environment and living in an urban environment was associated with fewer minutes walked per week or low PA (87, 204). Access to equipment for PA within the home environment and being more emotionally satisfied with the neighbourhood was associated with a greater number of minutes spent doing moderate activity and/or walking minutes (204). Similar findings were reported in the general population for low and middle income countries where increased PA and walking were associated with increased safety (209).

Other health risk behaviours

Consuming <5 servings of fruit per day, <2 fruit and vegetables per day and cigarette use were associated with lower PA, low PA or less regular PA (76, 86, 207).

Whilst findings related to factors associated with PA are more extensive compared with diet, smoking and alcohol behaviours, the findings should be taken with caution as they are based on cross-sectional data. Further, the findings of narrative reviews
should be taken with caution since few studies explored each association and meta-analyses were not possible (86, 197, 198). To my knowledge, only one study recruited participants from both primary and secondary care services (76), whilst the remainder focussed on inpatient and/or outpatients from community mental health centres and differences may exist between those recruited from primary care as opposed to secondary care services.

1.5.2 Understanding how health behaviours can be supported and changed: barriers and facilitators

The literature I identified in section 1.5.2.1 referred to staff and/or patient perspectives on all health behaviours collectively including smoking, alcohol, diet and PA. However, sections 1.5.2.2 and 1.5.2.3 referred to literature that focussed on smoking, diet and PA specifically.

1.5.2.1 Combined ‘lifestyle’ behaviours

Mental health factors

Mental health symptoms including lack of motivation, suspiciousness of unfamiliar staff, cognitive problems, decreased social interaction, antipsychotic medication effects and a lack of ability to feel optimistic about the future due to mental health difficulties were reported as barriers to engaging in health behaviour interventions (100, 210-212). However, mental health symptom reduction due to adopting healthy behaviours facilitated engagement (210).

Social support and social modelling

A lack of support and unhealthy peer and family influences were barriers to patients engaging with healthy behaviours (210, 211). It was suggested that peer support may encourage patients but also hold them accountable and enable them to share their own personal experiences to develop self-worth which may aid behaviour change (210, 211, 213). However, peer support may prevent behaviour change in cases where there may be varying ability levels, with higher achievers negatively impacting the confidence of lower achievers (213). Encouragement and positive reinforcement from staff, staff participation in healthy living programmes, involvement of other supportive others in interventions and continuity of care between staff and patients to develop trusting relationships were all perceived as facilitators (100, 210, 211).
Health knowledge and beliefs

The health knowledge that patients gained through adopting healthy behaviours and the beliefs they formed about the negative consequences of unhealthy behaviours were in some cases reported as facilitators to changing health behaviours (210). A lack of patient awareness of the risks of unhealthy behaviours and patient concern regarding unhealthy behaviours prevented health behaviour change (211, 212). Setting small attainable goals were perceived as facilitators to experience success early and reinforce behaviour, but the inability to identify the visible benefits of healthy behaviours were barriers (100, 213).

Staff knowledge, beliefs and attitudes

A lack of staff awareness regarding CVD risk in people with SMI, negative attitudes from staff regarding mental illness, the belief among staff that patients were unable to change their health risk behaviours, the belief that it was inappropriate to offer behavioural interventions when patients were unwell and fear among GPs and primary care nurses due to patient mental health difficulties were barriers to supporting patients health risk behaviours (100).

Environmental and healthcare service factors

Limited access to GP services was perceived by patients as barriers to accessing health interventions but primary care HCPs suggested that patients’ lack of attendance at appointments caused difficulties offering interventions (100).

It was suggested that patients’ physical health needs were better met because of an integrated approach delivered in primary care by mental health staff (214). GPs suggested that they had more time to cover health risk behaviours because mental health needs were being addressed by mental health staff. Joint working between primary and secondary care services was also advocated to support patients effectively (100).
1.5.2.2 Smoking

Mental health and confidence

People with SMI reported that they used smoking as a way of coping with mental health problems, reducing negative affect, stress management and that smoking was their only pleasure (118, 215-219). In other cases, quitters reported improved mental wellbeing (220). Difficulties sustaining behaviour change following relapse, cognitive problems, mental illness, a lack of motivation and self-belief were perceived as barriers (219-221). It was suggested that smoking helped patients deal with their life events (220). Other barriers that were reported included low levels of motivation, boredom, addiction and lack of belief among patients regarding their capability to quit (118, 215-218).

Health knowledge and beliefs

Health concerns, the perceived benefits of quitting smoking and beliefs regarding the negative health consequences of smoking in some cases informed by personal experiences and family or friends were perceived as facilitators (216-220, 222). Carbon monoxide monitoring, reflecting on smoking behaviour through questionnaires and highlighting the financial costs of smoking facilitated smoking cessation (219). Receiving education about nicotine replacement therapies (NRTs) and the use of illustrations and information sheets regarding smoking cessation facilitated positive changes but there were literacy issues which prevented patient understanding in some cases (219, 220). In other cases there was a lack of or inadequate smoking cessation advice from HCPs, which was a barrier to smoking cessation (219).

Social support and modelling

In some cases, patients reported smoking to fit in with their social environment, adhere to social norms or to sometimes avoid social isolation (215-218, 222). Family and friends who criticised patients, staff who smoked with patients as a way of rewarding them and a lack of support from HCPs, were perceived as barriers (215-217, 222). However, peer support, social approval, the involvement of family and friends and pressure to quit from social networks were perceived as facilitators (215, 216, 222). Peer support in some cases facilitated change through encouragement,
ensuring accountability and allowing patients with successful outcomes to share advice (219, 220).

**Staff knowledge, skills, attitudes and responsibility**

A lack of knowledge among staff regarding NRT and behaviour change techniques, training and resources to support smoking cessation, and concerns among HCPs about the effects of NRT on physical health were perceived as barriers to supporting smoking cessation (215, 217).

The lack of perceived responsibility among HCPs to support patients with smoking cessation, staff concerns about the impact of smoking cessation on mental health and the fear among staff of damaging relationships with patients were also reported as barriers (215, 217).

In one study, patients reported that they valued the involvement of mental health professionals due to their compassionate and collaborative style due to the anxiety they experienced about mental health stigma in routine services (221). In other studies, there were concerns about the capability of mainstream smoking cessation services to work with people with SMI (118, 217).

**Environmental and healthcare service factors**

Financial savings were reported as a facilitator to smoking cessation in people with SMI (215, 217, 218). However, in some cases the perceived benefits of smoking outweighed the financial savings associated with quitting and hindered smoking cessation (215).

A collaborative approach between health services was also perceived as valuable, such as the use of general practitioners within mental health services (219, 221). However, mental health staff delivering a smoking cessation intervention found it difficult to communicate with primary care professionals in one study aiming to adopt an integrated care approach by linking with primary care to support patients smoking cessation (221).
1.5.2.3 Diet and physical activity

Mental health, confidence and physical health

Side-effects from mental health medication including sedation and lethargy were barriers to PA (79, 223-228). Mental health symptoms including a lack of motivation, anxiety, low mood, cognitive difficulties including memory or literacy were also reported as barriers to PA and healthy diets (79, 223, 224, 226, 228-231). However, PA improved mental wellbeing which facilitated PA participation (79, 223, 225, 228, 229, 232, 233). It was commonly reported that successful positive changes enabled patients to feel a sense of purpose, achievement and increased their confidence enabled behavioural changes (223, 225, 229, 232-234). Physical health problems such as arthritis were also barriers to PA (224, 228).

Health knowledge and beliefs

Several studies and reviews reported that when patients experienced success such as weight loss, improved body image and improved fitness, this facilitated changes to both diet and PA (79, 223, 226, 229, 231, 234). Monitoring and recording eating habits, PA behaviour and physical outcomes such as weight enabled patients to identify success and learn about their behaviour (226, 229, 230, 234). In some cases, increased knowledge regarding healthy living, good health and the negative effects of unhealthy diet and PA were facilitators to healthy changes (226, 229, 231, 234). The knowledge among patients that medications increased weight gain prevented them from making diet changes as they thought it would be harder to lose weight (226).

Habitual behaviours and normalising healthy changes

Habitual diet behaviours such as snacking at night was in one case perceived as difficult to change (224). Establishing a healthy routine facilitated changes and healthy behaviours were normalised when building them into routine such as walking instead of taking the bus (229, 231). Self-chosen, non-vigorous or preferred activities were therefore in some cases perceived as facilitators to PA change as these may have been more achievable to normalise (228, 231).
Social support, modelling and social anxiety

Group activities, exercise partners, family or friends who also adopted healthy changes, access to emotional and practical support such as transportation to PA activities and encouragement from family and friends and social inclusion facilitated healthy changes (79, 225, 226, 228, 229, 231-236). However, unhealthy social environments, a lack of support, experiences of social anxiety or intimidation in peer groups, competitive environments and physical appearance anxiety were all perceived as barriers to PA engagement (79, 223, 226, 228, 231, 233, 235, 236).

Staff knowledge and skills

Staff that considered individual needs, provided encouragement and advice about the positive effects of healthy behaviours, had positive relationships with patients, were involved in facilitating and partaking in PA groups, were non-judgemental, flexible and understanding regarding individual ability levels and were known to patients prior helped facilitate healthy changes in patients (79, 223, 225, 227, 229, 231-234). Poor relationships with patients, a lack of understanding about side-effects of mental health medications and a lack of belief regarding patient uptake of PA were barriers to increasing PA and/or supporting PA (223, 229). Further, a lack of ability to track patient progress during the intervention such as monitoring diet, PA and weight loss outcomes, meant that staff had no understanding of patients’ progress (230).

Environmental and healthcare service factors

Crime and safety in neighbourhoods, access to outdoor space, bad weather and financial support required to access healthy foods, lack of PA equipment, gym membership or transport to access PA related services were all perceived as barriers (79, 224-226, 228, 231).

In other cases, despite positive staff beliefs regarding the benefits of implementing a weight loss intervention for people with SMI, a lack of resources for patient transport and the resources required to facilitate intervention activities were reasons for difficulties implementing the intervention beyond the trial setting (230).
1.5.3 Research gaps and limitations

1.5.3.1 The epidemiology behind health behaviour change for people with SMI

Though there were some longitudinal studies on factors associated with smoking and alcohol, there was no longitudinal studies on diet and PA changes (i.e. change in PA or diet from baseline). In some systematic reviews on diet and PA, there was some attempt to include longitudinal studies, but meta-regression or narrative analyses only included cross-sectional associations (21, 73-75, 86, 197, 198, 205). Cross-sectional studies do not permit the measurement of long-term outcomes or changes since data are collected at one time point. PA or dietary related behaviours at one time point were therefore only considered as opposed to changes from baseline to follow-up in previous reviews. However, this information is important as PA and dietary changes are often targeted in people with SMI. It is also not possible to explore temporal associations in cross-sectional analyses since exposures and outcomes are collected simultaneously.

PA reviews containing meta-regressions did not specifically seek out studies which explored factors associated with PA or PA changes (73-75, 205). These reviews conducted meta-analyses on levels of PA among SMI populations, followed by meta-regression analyses to explore factors that were associated with levels of PA. Therefore, these reviews could only explore factors associated with PA with the data which were available. It is possible that some exposure variables were not included in meta-regression analyses if the data were not available across the studies. This may have led to some associations that were not explored. Additionally, these reviews did not specifically synthesise studies which explored factors associated with PA in people with SMI as this was not sought. The search strategies also contained narrow search terms and did not include grey literature including theses, potentially leading to some longitudinal studies being missed. Further, the only review on factors associated with diet outcomes conducted literature searches in November 2011 and focused only on people with schizophrenia (21). Therefore, it is possible that additional longitudinal studies including those with other SMI’s may have been conducted since this period. Additionally, methodological study quality assessments were not included in any of the reviews. Subsequently, the quality of the studies and areas for improvements for future studies is unclear.
1.5.3.2 Understanding how health risk behaviours can be supported and changed: barriers and facilitators

There were several reviews and primary studies on barriers and facilitators of supporting or changing health risk behaviours prior to receiving interventions and after in process evaluations. However, to my knowledge none of the studies I identified explored primary care based health behaviour interventions for people with SMI. There was also limited research on integrated services where primary and secondary mental health services worked together to support health behaviour change in people with SMI. Therefore, there was limited understanding on how health behaviours may be supported or changed in such healthcare settings and comparisons across different models of care.

To my knowledge, only one process evaluation identified the use of behaviour change techniques (BCTs) (230). There was no attempt in other qualitative process evaluations to identify what and how techniques were applied and how they were perceived to work or not particularly from those who were trained to deliver BCTs. Therefore, the ‘active’ components of interventions were unclear. Exploring the views of those trained in delivering BCTs or use BCTs would also be valuable to inform guidelines which lack detail on the application of BCTs and inform HCPs delivering such techniques. Further, few of the qualitative process evaluations compared both staff and patient perspectives (214, 219, 221, 230). Yet, this is important to provide a clearer picture of interventions and gain insight into how they may have been experienced from different perspectives. Further, although it is helpful to understand the barriers and facilitators of health behaviour change in people with SMI both before and after interventions, it is also important to understand how the barriers and facilitators occurred. That is, the underlying processes behind the barriers and facilitators. The use of psychological behavioural theory may help deepen understanding behind the reasons for why interventions may or may not be perceived to ‘work’. However, to my knowledge, none of the studies used theory to aid the interpretation of themes identified in qualitative analyses taking analyses beyond description and toward explanation.
1.5.3.3 Forming a rationale for this thesis

After reviewing literature, considering the opinions of stakeholders and experts in this field\(^1\) and the resources available to me, I identified that two research areas that could be targeted within my thesis to improve health behaviour change interventions for people with SMI in different healthcare contexts. It was clear there was a paucity of epidemiological research on factors associated with change in health behaviours. An understanding of the factors associated with health behavioural changes over time are important to inform interventions before they are developed and addresses stakeholder and expert recommendations on identifying what individual characteristics predict outcomes. Interventions could then be adapted to suit individual needs and practitioners may also be able to select tailored interventions to suit different sub-groups. For example, BMI, mental health diagnosis or socioeconomic positioning may be associated with health behaviour change and interventions may be designed with this mind.

Whilst this is important, this provides no understanding of the value of health behaviour change intervention components for people with SMI or how patients and staff delivering or experiencing the intervention interact with these in primary care and integrated mental and physical health settings. There was no research exploring these concepts in primary and integrated healthcare settings. Yet, understanding how health behaviours may be supported and changed within different healthcare interventions from those that experience and deliver interventions, identifying how BCTs are used and the application of psychological theory to uncover underlying reasons behind barriers and facilitators to health behaviour change, will further clarify the ‘active’ components of interventions in different healthcare contexts. This is line with one of the components of the Medical Research Council (MRC) Framework for process evaluations, to explore the underlying ‘mechanisms’ influencing change (237). This will provide an understanding of how to better support behaviour changes within different healthcare contexts given the lack of detail in guidelines and addresses stakeholder and expert recommendations on exploring: what gets people motivated, who may best support people with SMI with health behaviour change, what/how multidisciplinary approaches may help/work, the necessity of conducting

\(^1\) At the beginning of my PhD, I attended a workshop for HCAs and primary care nurses delivering the PRIMROSE intervention and people with SMI who originally helped inform the development of the intervention. I also attended a symposium with experts in the field where recent findings from different trials, areas for future research and improvement to healthcare were discussed.
service evaluations to better understand and learn from existing models of care and practice and the importance of exploring both patient and staff perspectives.

In summary, understanding factors that contribute towards health behaviour change in people with SMI both from an epidemiological stance and within interventions set within different healthcare settings may help to contribute to knowledge on how to improve and deliver health behaviour change services and interventions, where the evidence and guidance is scarce and limited. Ultimately, this knowledge could help to eventually reduce increasing CVD risk and early mortality rates among people with SMI. In the next section, I provide an overview of how I aimed to address these factors in my thesis.
Chapter 2  Overview of thesis aims methods and context

2.1  Chapter overview

In this chapter, I briefly cover the overall aims of this thesis, individual studies, and corresponding chapters. I describe the context of the studies, the rationale behind utilising a mixed-methods approach to address my aims and describe the behavioural science theory and framework I used to support my qualitative analyses and the rationale.

2.2  Aims of thesis

After considering expert academic and stakeholder perspectives, research gaps, limitations, and the resources available, the overall aim of this thesis was to explore factors that contributed toward health behaviour changes in people with SMI using both quantitative and qualitative methods and considering different healthcare contexts. More specifically, I conducted a series of four studies depicted in Figure 2-1. The objectives or research questions corresponding with each study are described in more detail within each chapter.

**Figure 2-1 Study aims with corresponding chapters.**

| Chapter 3 | • Study 1: To synthesise previous longitudinal studies on factors associated with PA and dietary related outcomes and/or changes in people with SMI. |
| Chapter 4 | • Study 2: To evaluate what baseline factors were associated with PA and dietary related changes over the course of 12-months in people with SMI enrolled in a primary care behavioural intervention. |
| Chapter 5 | • Study 3: To explore staff and patient perspectives and experiences on how health behaviours were supported and changed in a primary care-led behavioural intervention. |
| Chapter 6 | • Study 4: To explore staff and patient perspectives and experiences on how health behaviours were supported and changed in a real world integrated mental and physical healthcare context. |
2.3 Mixed-methods approach

“Positivism” and “constructivism” are two contrasting philosophical positions that exist in social and behavioural sciences. The philosophical stance adopted by researchers are important as this influences what is researched, how it is researched and how findings are interpreted (238). Positivists believe that only one form of reality exists; it is the same for each person, the investigator is independent of the research and should not influence or be influenced by it (239). Constructivism on the other hand posits that multiple forms of reality exist; these can differ between individuals or groups and knowledge is created from the interaction between the investigator and participant. Positivist beliefs are consistent with quantitative methodology whilst constructivist beliefs are consistent with qualitative methodology.

An alternative approach was founded in the 1960s, involving the mixing of qualitative and quantitative methods during the data collection and analysis phases of the research process (238). However, “incompatibility theorists” argued against the mixing of methods suggesting that the two contrasting philosophical beliefs were irreconcilable, and the selection of either positivism or constructivism was necessary. This led to the development of a third approach known as a pragmatic approach, which is increasingly used in applied research. This is concerned with seeking the most appropriate study design and methods to suit the research aims and questions rather than aligning with a philosophical stance. Pragmatic approaches still draw upon positivist and constructivist philosophical beliefs but use the principle of “what works” best to address the research aims rather than being guided by a particular philosophical stance.

My PhD used both qualitative and quantitative approaches to explore factors associated with health behaviours in people with SMI. The approach I adopted for this thesis was established through a pragmatic decision guided by the research aims and questions as opposed to being guided by a philosophical position. I selected a mixed-methods approach as certain research aims and questions were more appropriate for either quantitative (i.e. what factors were associated with PA and/or dietary related changes: studies 1 and 2) or qualitative approaches (i.e. how health behaviours were supported and changed: studies 3 and 4).

The advantage of adopting a mixed-methods approach was that the approaches complemented one another. The quantitative element of this PhD enabled a
mathematically replicable and objective approach to identifying factors associated with PA and dietary related changes in people with SMI, thereby seeking an ‘average picture’. However, quantitative data were limited by pre-determined data items. Qualitative methods allowed divergence from pre-defined categories or data items and enabled the exploration of different perspectives. This enabled me to flexibly explore how health behaviours were supported and changed through different staff and patient perspectives and experiences. Therefore, factors that influenced health behaviour change that could not be measured in quantitative analysis were also explored. I also acquired an in-depth understanding of why and how these factors were perceived as influencing change or not. The quantitative element therefore provided descriptive overview of dietary and PA related changes that could be quantified (i.e. what was associated with change, by how much and how much change occurred overall) whilst the qualitative element provided a deeper understanding of the different underlying meanings and processes behind supporting and changing health behaviours (i.e. perspectives on: how did change occur or not, why did change occur or not within different healthcare contexts) for different people with SMI and HCPs. Though the data from all studies were analysed individually, in the discussion (Chapter 7) section, I compared and synthesised the findings between both qualitative and quantitative studies. This led to new insights and therefore a comprehensive understanding of the overall research aim.

2.4 Theoretical underpinnings

Understanding how health behaviours may be supported and changed in people with SMI can be facilitated using behavioural science theories. This is because they attempt to explain the influences and processes behind human behaviour. Therefore, part of my PhD uses behavioural theories and frameworks to facilitate the interpretation of how health behaviours were supported and changed in people with SMI (studies 3 and 4). There is an abundance of behavioural theories; 82 theories have previously been identified and summarised in a scoping review of theories of behaviour and behaviour change (240). Selecting one theory from several covering multiple behavioural influences can be challenging.

2.4.1 Capability, Opportunity, Motivation – Behaviour (COM-B) model and the Theoretical Domains Framework (TDF)

The Capability, Opportunity, Motivation – Behaviour (COM-B) model was established to facilitate intervention design (241, 242). However, it has been used to evaluate
interventions and more generally to understand behaviour. The theory posits that for any behaviour to occur, there must be capability, opportunity, and motivation to carry out the desired behaviour as opposed to any competing behaviours (241, 242).

Capability can be physical (e.g. stamina or strength) or psychological (e.g. knowledge or attention), opportunity can be physical (e.g. time or resource) or social (e.g. social or cultural norms) and motivation can be reflective (e.g. beliefs about what is ‘good’ and ‘bad’, intentions or plans) or automatic (e.g. emotions, desires or reflex impulses).

Other theoretical models such as the Health Belief Model and Theory of Planned Behaviour are based on the notion that behaviours occur due to logical thought processes and intentions (reflective motivation) (243). However, it is argued that processes related to automatic motivation including emotions, habits, reflex responses are not described in these models (242). COM-B is comprehensive and offers an advantage over other models by considering multiple behavioural influences in one succinct theory.

COM-B is a working system which includes interactions between each of the components of the model (see Figure 2-2) (241, 242). Increased opportunity and/or capability may increase motivation to engage in a behaviour. For example, understanding what types of foods to consume may influence beliefs about good and bad eating habits or wanting to change eating habits. The only way motivation can influence capability and opportunity is through behaviour and therefore acting. For example, knowing about the health risks associated with consuming unhealthy takeaway meals may increase motivation to want to cook but will only improve cooking skills by cooking. Behaviour also influences motivation, capability and opportunity directly creating positive and negative feedback cycles. For example, purchasing healthy foods may increase the opportunity of consuming healthy foods and therefore increase motivation to eat healthily. Smoking cigarettes may temporarily curb cravings of wanting to smoke or eating food may reduce feelings of hunger and therefore reduce the drive to engage in these behaviours.

The TDF is an associated framework designed to synthesise 33 theories of behaviour and behaviour change and 84 theoretical constructs into one comprehensive framework and is aimed at understanding problems in implementation (244). It was created before COM-B and is essentially a descriptive version of it. As it is a framework rather than theory, there is no description of how the components of the framework are related to one another. The TDF is seen as an extension of the COM-
B and is often linked together to provide further description rather than explanation. It includes knowledge, skills, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, reinforcement, intentions, goals memory, attention and decision processes, environmental context and resources, social influences, emotion and behavioural regulation.

![COM-B Model](image)

**Figure 2-2 COM-B model of behaviour taken from Michie et al (241).**

I used the COM-B model to assist in the interpretation of themes in studies 3 and 4 as it is a simple yet comprehensive model considering multiple influences on behaviour. It was linked to the TDF and therefore multiple theories of behaviour and behaviour change, thereby considering multiple theoretical constructs. I decided against the use of the TDF as my aim was to explore the underlying processes behind supporting and changing health behaviours. This required explanations rather than descriptions of the data and the TDF only offered descriptions of behavioural influences. The methods used in the studies are described in greater detail in these chapters (5 and 6).

### 2.4.2 The behaviour change wheel and behaviour change techniques taxonomy (BCTT, version 1)

The COM-B model sits in the middle of the behaviour change wheel, which is a framework for designing interventions both at population and policy levels (241, 242).
Once the target behaviour is determined using COM-B, a selection of intervention functions can be selected which correspond with certain COM-B components. The nine intervention functions are broad and correspond with more descriptive and specific BCTs. The BCTT (v1) consists of 93 BCTs grouped into 16 broader BCT groupings agreed upon by international behavioural experts in a Delphi-type consensus exercise (245). BCTs can be selected to form the intervention components. The BCTT was designed in response to requests from CONSORT guidance to report within RCTs components of the intervention (245). There were no previously agreed definitions of BCTs. A common problem in intervention analysis is that BCTs are described using different labels and these labels may comprise of different techniques. Therefore, there is a lack of clarity as to what has been specifically applied. The BCTT therefore provides a way of reporting BCTs using standardised and shared language to increase the meaning and understanding of BCTs applied. I used the BCTT taxonomy in studies 3 and 4 to report on the perceived BCTs applied. This approach allowed me to gain a more detailed account of how techniques were applied by using standardised definitions and terminology provided in the BCTT and provided greater clarity in terms what techniques were used from the perspectives of staff and patients.

2.5 Context of overall thesis

Part of my PhD utilised quantitative data (study 2) collected as part of the PRIMROSE trial as well as qualitative data (study 3) from the PRIMROSE process evaluation. I also collected data from an integrated mental and physical health setting for study 4. In this section, I describe the context of my PhD and origins of the data collected.

2.5.1 PRIMROSE trial: development, process and evaluation

2.5.1.1 Background

The PRIMROSE programme aimed to reduce cholesterol and CVD risk among people with SMI by developing and evaluating an intervention delivered in primary care. The evaluation consisted of a cluster Randomised Clinical Trial (RCT) assessing the clinical and cost effectiveness of the intervention versus treatment as usual (TAU), with a linked process evaluation. Ethical approval for the programme was granted by City Road and Hampstead Research Ethics Committee (reference number 12/LO/1934; granted on January 10th 2013) (149). Participants in the intervention arm could choose to focus on one or more of the following behaviours: improving diet,
PA, alcohol use, smoking, increase adherence to statins, blood pressure or anti-diabetic medications. The intervention was delivered by trained primary care nurses and healthcare assistants (HCAs) across 8-12 sessions over 6 months.

TAU comprised of routine GP care and British Heart Foundation leaflets. Though there was no effect of the intervention on primary (total cholesterol) or secondary outcomes (blood pressure, BMI, waist circumference, smoking status, quality of life, adherence to mental and physical health medications, diet, PA and alcohol use) at 12-months, it was associated with lower costs due to reduced psychiatric admissions (174). I used the data collected from PRIMROSE participants at baseline at 12-month follow-up for the purposes of study 2 (Chapter 4) and conducted secondary analyses on the data. I had no role or involvement in the design, collection, or analysis of data of the original PRIMROSE trial.

2.5.1.2 Intervention characteristics

Qualitative findings from focus groups of primary care and mental health HCPs, patients and carers, patient and public involvement and a systematic review of interventions to reduce CVD risk in people with SMI were used to inform the development of the intervention. Qualitative interviews from the focus groups of stakeholders were underpinned by the COM-B model for patients and TDF (241, 242, 244).

The data arising from focus groups were mapped to COM-B, TDF and then subsequently the behaviour change wheel and intervention functions (241, 242). The process of these findings to COM-B, TDF and BCTs in the qualitative study to inform the intervention development are included in Appendix A. The BCTT was used to identify eight BCTs which formed the basis of the intervention manual and the training delivered to HCPs (149, 245). The behavioural strategies used can be found in Figure 2-3.
A logic model describing the way the intervention intended to work can be found in Appendix B. Primary care practice nurses and Health Care Assistants (HCAs) were trained to support people with SMI in behaviour change. The training was delivered by a practice nurse with a mental health background, psychologists and a person with lived experienced and held over two days. The training was designed to change any negative attitudes among HCPs regarding people with SMI and physical health problems, increase their confidence, knowledge, and skills to deliver the intervention. It was thought that positive behavioural changes among patients would improve their wellbeing and in the long-term, CVD risk factors reducing the chances of a CVD related event such as a heart attack/stroke and mortality.

<table>
<thead>
<tr>
<th>Eight behavioural strategies used in the PRIMROSE intervention:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goal setting (e.g. to achieve weight loss by improving diet)</td>
</tr>
<tr>
<td>2. Making an action plan (e.g. what food, how much food to consume and when)</td>
</tr>
<tr>
<td>3. Recording progress (e.g. recording weight or keeping a diary of weekly diet intake)</td>
</tr>
<tr>
<td>4. Providing positive feedback (e.g. nurse praising patient successes such as losing weight or adhering to dietary principles)</td>
</tr>
<tr>
<td>5. Involving supportive others (e.g. encouraging friends or family to also attend appointments and change their behaviours)</td>
</tr>
<tr>
<td>6. Reviewing progress (e.g. discussion of progress/identifying barriers to change)</td>
</tr>
<tr>
<td>7. Coping with setbacks (e.g. discussing tools or techniques to overcome problems)</td>
</tr>
<tr>
<td>8. Habit formation (e.g. encouraging patients to repeat healthy behaviours in the same context continuously)</td>
</tr>
</tbody>
</table>

Other factors included signposting to locally available behaviour change services such as smoking cessation services and providing patients with health plan diaries to track their goals and record their progress.

Figure 2-3 Behavioural strategies used in the PRIMROSE intervention to encourage health behaviour change, physical health medication adherence and/or uptake

2.5.1.3 Participants and recruitment

For the PRIMROSE RCT participants were identified across 76 general practices (GP) in England (174). Participants were included if they had a diagnosis of SMI as specified in GP practice mental health register (schizophrenia, persistent delusional disorder, schizoaffective disorder, bipolar affective disorder, psychosis, psychotic...
depression or other psychotic disorder), had the ability to provide consent, were 30-75 years old, with total cholesterol level of 5.0 mmol/l or over, or total cholesterol/HDL cholesterol ratio above 4 and one or more of the following risk factors: BMI ≥ 30 kg/m², current smoker, blood pressure ≥ 140 mmHg systolic and or ≥90 mmHg diastolic, HbA1c of 42 to 47 mmol/mol (6.0 to 6.4 %) and/or impaired fasting glucose (5.5 to 6.9 mmol/L), diagnosis of diabetes or hypertension.

Participants were excluded if they were under acute psychiatric care or accessing crisis services, pregnant, had a diagnosis of an organic mental health problem and/or severe cognitive impairment, personality disorder or depression/ anxiety without psychotic features, life expectancy of <6 months and/or pre-existing CVD.

2.5.1.4 Recruitment procedures

GP Practices were identified by the trial team through contacting local Clinical Research Networks (CRNs) across England (149). Practices were approached if they had 40 or more patients on the SMI register (register containing people with a diagnosis of schizophrenia, bipolar and psychosis) and HCA or practice nurses able to deliver PRIMROSE. Practices that agreed to take part received relevant training related to the study by the trial team and a site initiation visit. The recruitment of GP practices occurred from 10th December 2013 to 30th September 2015 (174). Thirty-eight GP practices were randomised to the intervention and 38 to treatment as usual.

Participants were then identified in practices that agreed to take part (149). Electronic searches containing pre-specified eligibility criteria were conducted within SMI registers on GP practice databases by GP practice administrators. These data were then extracted and screened for eligibility by a lead GP. Participants meeting initial screening criteria were sent information packs about the study including a leaflet and letter. Participants could indicate their interest in the study by posting a pre-paid envelope with a reply slip addressed to the practice. Those that did not respond to the letter were followed up by staff at the GP practice via telephone. Following agreement to take part, participants were invited to the next stage of screening.

Participants who had received a health check in the last three months and met the criteria specified above were deemed potentially eligible to partake in the study (149). Local CRN research nurses contacted these participants to arrange to gain written informed consent and begin the trial procedures. Participants who had not received
a health check were invited to take part in the next stage to assess eligibility. Practice nurses or HCAs assessed participant eligibility through clinical assessments and blood tests. Based on the results of these assessments, participants meeting eligibility criteria were then invited to take part. Any concerning results were additionally discussed with the GP. Participants who agreed to take part were contacted by the local CRN to gain informed consent and begin trial procedures. All participants were provided with information sheets a week prior to obtaining written informed consent. Participant recruitment to study occurred from May 9th 2014 until February 10th 2016 (approximately three years prior to the start of my PhD) (174).

2.5.1.5 Data collection

Research nurses working within CRNs were responsible for collecting all data. Participants were followed up across 12-months from baseline by research nurses. The research nurses were trained by members of the trial team on all aspects of the study procedures including the process of recruitment, informed consent and data collection and entry.

Research nurses were also provided with a manual with standard operating procedures for outcome assessment and data collection. This included instructions on how the data should be collected and entered. Research nurses uploaded the data collected onto an online database (‘Sealed Envelope’), which was created, tested and maintained by the trial manager (A.B). The trial manager and statistician (L.M) checked baseline data for potential errors. Discrepancies were resolved by comparing them against source data and noting any potential errors in the online form. Data collection ended in February 2017 (approximately seven months prior to the start of my PhD).

2.5.2 PRIMROSE process evaluation: methods

A qualitative process evaluation designed to explore the barriers and facilitators of implementing PRIMROSE into primary care contexts was conducted by the original researchers involved in the programme (A.B, S.He, T.M, R.B, D.O and K.W). An amendment to the original ethical approval was granted to conduct this study by City Road and Hampstead Research Ethics Committee (reference number 12/LO/1934; granted on February 12th 2016). I had no role or involvement in the collection of the data or design of the process evaluation. As part of additional work however, I led on
the analysis of this process evaluation and published this work (246). I then conducted second
ary analyses on the original data and used it for the purposes of study 3.

2.5.2.1 Sample and recruitment

Practices who delivered PRIMROSE were identified and a random 20% sample of these practices were selected for recruitment (n=8/38) (246). The sample consisted of staff who had delivered and patients who had received at least one PRIMROSE intervention appointment. Staff were additionally recruited if they were not part of the PRIMROSE pilot phase (n=31/41 HCPs) and attended PRIMROSE training.

A total of 15 nurses/HCAs out of 31 approached took part in the study. Six staff did not respond, some were not interested (n=3), unreachable (n=3), had not yet finished delivering the intervention (n=3) and busy (n=2). Fifteen out of 30 patients approached took part. Reasons for non-participation were unknown (n=6), not reachable (n=2), one patient was too busy, another explained that they could not offer much feedback, one patient experienced language difficulties and a few patients (n=2) stated that they were too unwell.

Face-to-face semi-structured interviews were conducted. Interviews with staff were conducted between April and June 2016 and between October to December 2016 with patients by researchers who had previously worked on the PRIMROSE trial (A.B & S.He). Researchers had no prior contact with patients as staff delivering PRIMROSE were required to collect data for the trial. However, it is possible that researchers had previous relationships with or pre-conceptions of staff that delivered PRIMROSE. Researchers in some cases supported staff with administrative and trial-based queries which may have resulted in telephone exchange or face-to-face contact. Interviews were audio-recorded and transcribed verbatim using an external transcription service. Transcripts were checked for accuracy by the original researchers.

2.5.2.2 Topic guides

Two semi-structured topic guides guided the interviews; one developed for patients and the other for staff (see Appendix C). The patient interviews were framed around the COM-B model and staff interviews were based on the TDF. As discussed previously, the COM-B and TDF are complementary and often presented together. The rationale used by previous researchers to apply the COM-B model to patient
interviews was based on the idea that it contained less, more broad components in comparison to the TDF and is useful for understanding generally the factors that affect behaviour. Interviews based on the TDF require detailed questions and probes, which researchers believed patients may have found difficult to answer since the TDF is geared toward assessing implementation issues. It was suggested that staff were more suited to answering such questions since they may have potentially been more aware of contextual issues and factors affecting implementation. The same method was employed in the qualitative study which informed the development of the intervention, which was informed by health psychology colleagues and considered successful in terms of the depth and comparability of information obtained between staff and patients (100).

2.5.3 Integrated mental and physical healthcare service: setting, aims and processes within service

2.5.3.1 Setting

The name and locations of the healthcare settings have been anonymised to maintain participant anonymity and confidentiality. However, the service is set within two boroughs of London involving a joint mental health trust and 23 primary care practices within these boroughs. The joint mental health trust is divided into five areas of care: acute, recovery and rehabilitation, services for ageing and mental health, substance misuse and community mental health. These comprise of over 70 services ranging from inpatient facilities, early intervention services (for those experiencing a first episode of psychosis), assertive outreach teams (for those with a history of mental health problems, mental health hospital admissions and difficulty engaging with services), psychological therapies services etc. The pathway to care include direct GPs referrals and crisis (if others or the individual in question are at in immediate risk of harm) referrals.

The community within these two regions of London are ethnically diverse comprising of White British, Bangladeshi, Black African, Other Asian, Other ethnic, Chinese and White (originating from Ireland, Europe and others) groups. The proportion of black and Minority Ethnic Groups (BME) in 2011 within these boroughs were 33.7% and 31.8% and the percentage of the population claiming out of work benefit in 2017/18 was 1.5% and 2.1% (247). The mortality rate from all cause cardiovascular disease for those under 75 years from 2017-19 were 58.5 per 100,000 and 73.9 per 100,000
The prevalence of SMI for all ages in 2018/19 was 1.45% and 1.5% as recorded on practice registers (247).

The integrated service itself is not one physical location but rather a set of principles (discussed further below) that guide the way that practitioners are encouraged to deliver healthcare. The principles are guided by a steering group containing senior members of staff with backgrounds in predominantly mental health or a combination of mental and physical health such as matrons and psychiatric consultants. Initially, senior GPs such as partners had more involvement in the steering group, but this reduced over time due staff shortages. I collected qualitative data from this service from October 2019 to February 2020 and analysed the data for the purposes of study 4. These methods are described in Chapter 6.

### 2.5.3.2 Aims of service

A five-year programme (launched in 2016) was designed within this setting with the aim of integrating the physical and mental health needs of those with a diagnosis of psychosis. It is focused on identifying patients with psychosis who also have physical health problems such as hypertension and diabetes and addressing their physical health needs at the same time as their mental health is being treated. The objective was to reduce mortality rates in this population by 2020. Further aims included preventing future health problems caused by lack of exercise, unhealthy diets, smoking and substance abuse.

### 2.5.3.3 Physical health screening

Within the service, patients are screened yearly for physical health problems in wellbeing clinics within the mental health trust alongside other clinics such as during depot, clozapine or routine clinic appointments with psychiatrists (see Figure 2-4 for the content of the physical health screening). In some wellbeing clinics, screening is undertaken over a period if patients begin to feel uncomfortable with the process. The physical health screening is usually conducted by a mental health nurse, physical health nurse, dual-trained (i.e. both mental and physical health trained) nurses known as “SMI nurses” and in some cases staff from other professions such as Occupational Therapists (OTs) or social workers trained to conduct tests by physical health staff. In primary care settings, physical health screening may already be conducted yearly within General Practices (GPs). In other cases, dual-trained (employed by the Trust) nurses attend primary care clinics and identify those on the SMI register requiring
physical health checks, invite patients for physical health screening in the practice or attend homes to conduct physical health checks and discuss mental health. In other cases, patients present with physical health symptoms to either care coordinators, GPs, or psychiatrists.

<table>
<thead>
<tr>
<th>Content of the Physical health Screening:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) Physical health history (i.e. diabetes, hypertension etc.)</td>
</tr>
<tr>
<td>II) Current medication and side-effects</td>
</tr>
<tr>
<td>III) General physical health measures (blood pressure, weight, height, BMI, blood test etc.)</td>
</tr>
<tr>
<td>IV) Sepsis screening</td>
</tr>
<tr>
<td>V) Whether relatives are concerned about mental health status, whether readings are concerning such as heart rate or blood pressure and guidance on calling emergency services or signposting to appropriate resources</td>
</tr>
<tr>
<td>VI) Further examinations (e.g. pain, incontinence, hearing etc.)</td>
</tr>
<tr>
<td>VII) Smoking behaviour and guidance on providing advice around smoking</td>
</tr>
<tr>
<td>VIII) Respiratory problems (e.g. breathlessness, COPD, wheezing) and guidance on discussing findings with respiratory specialists/GPs</td>
</tr>
<tr>
<td>IX) Coronary heart disease and guidance on referral to cardiology</td>
</tr>
<tr>
<td>X) Diabetes and guidance referring to diabetes services</td>
</tr>
<tr>
<td>XI) Alcohol behaviours using AUDIT</td>
</tr>
<tr>
<td>XII) Drug use behaviours using Drug Use Screening (DUDIT)</td>
</tr>
<tr>
<td>XIII) Malnutrition Universal Screening Tool (MUST) to assess nutritional risk with guidance on completing full nutrition screening within care notes</td>
</tr>
<tr>
<td>XIV) Global Physical Activity Questionnaire (GPAQ) and guidance on advice or referring to exercise services.</td>
</tr>
</tbody>
</table>

Figure 2-4 A list of physical health factors screened in patients with psychosis in integrated setting

2.5.3.4 Joint working

The service attempts to encourage joint working between mental and physical health services. The intention is that when physical health problems are identified, these are communicated to senior nurses or doctors and care plans targeting these factors are then formed and agreed upon which is communicated to the GP. In other cases, staff are encouraged to signpost patients to services such as smoking cessation, exercise on referral or PA groups organised by OTs and PA specialists, dietician services or drugs and alcohol addiction services. In some cases, smoking cessation services attend meetings in mental health settings to provide information on the services they provide. Staff within the mental health may also liaise with specialist services such as diabetes management to gain input on management of patient nutrition. In other cases, teams are set up in such a way within mental health trusts to encourage
multidisciplinary working (i.e. a team comprising of psychologist, social worker, OT, nurse, psychiatrist etc. within mental health settings). This does not cross settings with primary care, however dual-trained nurses may attend primary care services to screen patients with psychosis for physical health issues. While the philosophy is for integrated physical and mental healthcare, GPs who should be at the heart of the service are now less involved in the steering groups for this integrated service and it was unclear why. However, they were previously involved in designing and setting up the integrated service.

In summary, in this chapter I described the objectives and context for each of the studies. I will now proceed to describe each of my four studies in more detail in Chapters 3-6.
Chapter 3  Study 1: Factors prospectively associated with dietary and physical activity related outcomes and/or changes in people with severe mental illness: a systematic review of longitudinal studies

3.1  Chapter overview

In this chapter, I present the findings of my systematic review which aimed to identify factors prospectively associated with PA and dietary related outcomes and/or changes in people with SMI. The chapter begins with a rationale for the focus on dietary and PA related outcomes and/or changes as opposed to other health behaviours, proceeds with the methodology, findings and ends with a discussion of the findings and strengths and limitations. I conceived the present study, designed the search strategies with the guidance of an Information Scientist, extracted all the data and interpreted the findings. The findings from this study have been published in the journal Psychiatry Research (248).

3.2  Introduction and rationale

As discussed in Chapter 1, it is important to understand factors that may be associated with the health behaviours of people with SMI using epidemiological methods. Therefore, there have been several epidemiological systematic reviews exploring this area of research. However, given the limitations described in Chapter 1, there is a need to conduct further reviews that synthesise research addressing factors associated with longitudinal outcomes and changes in health behaviours over time.

My original plans involved conducting a review that explored factors prospectively associated with all four CVD risk health behaviour outcomes and/or changes in people with SMI (i.e. alcohol, smoking, diet and PA). However, during the literature scoping stages, preliminary searches in MEDLINE alone retrieved over 20,000 hits. It was therefore clear that the scope of this systematic review should be limited for pragmatic reasons. I researched how well these behaviours had been addressed more broadly, how they are classed and treated to inform the focus of this review.

I found that alcohol behaviours in people with SMI are somewhat under-researched in terms of interventions. However, as discussed in Chapter 1 these are often classed
as forms of substance-related and addiction behaviours, are not considered nor treated as purely health behaviours and are known and treated as "dual diagnosis" (60). Similarly, tobacco smoking is also classed as a substance related addiction. Further, there had been several systematic reviews on smoking in people with SMI (165, 215, 249-251).

There is was a large body of research focused on PA interventions for people with SMI as demonstrated in Chapter 1. Though there were many reviews on cross-sectional factors associated with PA related behaviours, these were limited as discussed in Chapter 1. There had been no high quality synthesis of longitudinal studies exploring PA change over time. Further, I only identified one systematic review that explored factors associated with dietary related outcomes in people with schizophrenia with literature searches dating back to 2011 and it is possible that longitudinal work may have been published since then (21).

Therefore, there was a gap in the evidence synthesising studies on factors associated with longitudinal PA and dietary related outcomes in people with SMI and more specifically changes from baseline to follow-up.

### 3.3 Aims and research questions

This study aimed to identify factors associated with longitudinal PA and/or dietary related changes outcomes and/or changes in people SMI. More specifically, the research questions were:

In people with SMI:

1) What factors are prospectively associated with: a) PA and b) dietary related outcomes and/or changes (positive or negative behaviour change) from baseline to follow-up?
2) What types of exposure variables are included in the analysis of factors associated with PA and dietary outcomes and/or changes?
3) How are PA and dietary related outcomes and/or changes measured?
4) What is the level and quality of research available?
3.4 Methods

The same methods were applied to address both PA and diet related outcomes/or changes. The results are however presented separately for the purposes of clarity. The review was registered under PROSPERO international register for systematic reviews under registration number: CRD42018098998 and there were no deviations from the original protocol (252). I also followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Assessing the Methodological Quality of Systematic Reviews (AMSTAR) guidelines in the reporting and formatting of my systematic review to increase the transparency of the methods, data reported and quality (253, 254).

3.4.1 Eligibility criteria for selection of studies

3.4.1.1 Types of studies

Quantitative study designs were included. Longitudinal studies where exposures had been collected before the outcome occurred were included. Embedded cohort studies within RCTs were only included where it was possible to separately assess the intervention and the exposure variable effects on the outcome, or studies where the intervention had no effect on the outcome. This was because intervention effects could distort any association observed between exposure and behavioural outcome variables. Pre- and post- test studies where all participants had received the same intervention with no comparator arm were excluded based on this rationale.

Cross-sectional and case-control studies which only reported baseline data were excluded as this was not the focus of this review. Case-control studies reporting historical exposure data (for example, data obtained from medical records) were included if the sequencing of exposure and outcome variables could be ascertained.

Mixed-methods studies were only eligible for inclusion if there was a quantitative element addressing longitudinal outcomes and/or changes. Qualitative studies were excluded as systematic reviews had been conducted in this area and were of high quality (79, 210, 223, 232). Thus, replication of this type of research was considered not to add any additional value to the research area.
3.4.1.2 Study duration

The latest follow-up points for PA and dietary related outcomes were extracted in studies that reported multiple follow-up periods to identify factors that were associated with long-term PA and dietary related outcomes and/or changes.

3.4.1.3 Types of participants

Studies containing the following participants were included:

I. Where the majority of the population had a diagnosis of a SMI including schizophrenia, persistent delusional disorder, schizoaffective disorder, bipolar affective disorder, psychosis (including first episode), psychotic depression or other psychotic disorder

II. Adults aged 18+

Studies containing following participants were excluded:

I. Diagnosis of personality, anxiety, or depressive disorders

II. Diagnosis of an organic mental health problem

III. Studies containing populations with mixed mental health diagnoses (including the less severe forms as specified in the exclusion criteria) where there was a minority of people with SMI since the focus of this review was participants with SMI. The inclusion of less severe populations within severe populations may have distorted findings and provide limited information regarding SMI alone.

3.4.1.4 Interventions/ exposures

This review did not focus on the effect of interventions, rather the impact of other exposure variables on outcomes within the study population. Therefore, no restrictions were applied where interventions were employed on condition that they met the initial criteria as specified in ‘types of studies’.

Only exposures collected prior to the outcome were extracted to enable examination of prospective associations with outcomes. This review focused on but was not limited to the following types of exposures:

- Sociodemographic characteristics: e.g. age, gender, ethnicity.
• Social characteristics: e.g. perceived social support, family support, quantity of social support networks.
• Clinical characteristics: e.g. BMI, mental health diagnosis, severity of illness, medication etc.
• Service characteristics: e.g. setting, type, duration, frequency of intervention, profession delivering intervention.
• Area characteristics: e.g. area-level deprivation, accessibility to services.
• Previous service use: e.g. nutrition/dietician services, exercise on referral from health professionals
• Previous health behaviour change attempts and/or other health behaviours: e.g. smoking, alcohol use.
• Psychological factors: e.g. motivation, self-efficacy.

3.4.1.5 Language and date restrictions

I decided not to apply any language or date restrictions to ensure that I was as comprehensive as possible in my approach to identifying articles. However, during the screening stages of articles, I excluded non-English papers as there was limited resource for translation. A list of these papers can be found in Appendix D.

3.4.1.6 Setting

As it was unclear the quantity of how much research would be available published in this area, the types of settings included in this review were broadened to maximise the possibility of identifying relevant studies. Studies that were conducted within primary, secondary, social care and the community with both inpatient and outpatients were therefore included.

3.4.2 Types of outcome measures

The primary outcomes included any aspects of PA and/or dietary related outcomes and where possible change in PA or diet from baseline to follow-up at the latest possible follow-up point. The approach used to measure PA and diet within studies was identified and was therefore not restricted to specific measures, on condition that a validated measure was employed. Although it was preferred that the measures were validated in people with SMI, I recognised that this would have been restrictive. One study reported that various PA measures had not been assessed for validity or reliability in people with SMI (255). Similarly, dietary measures that have not yet been
validated in this population are frequently used in people with SMI (21, 149, 164, 174, 256). Therefore, measures with studies on validity at least in the general population were included. Studies including outcomes related to PA or dietary attitudes, knowledge or intentions were excluded as the review was focused on the resulting PA or dietary related outcomes or changes (e.g. PA levels, cardiorespiratory fitness or dietary intake, quality etc.).

3.4.3 Search strategy

A comprehensive approach was applied to the identification of articles. The search strategy was conducted in three stages including:

- Stage 1: Electronic database searches were performed to identify academic research.
- Stage 2: Grey literature databases were searched to identify theses. During the scoping stages of these reviews, it was clear that conference proceedings, abstracts and national reports identified did not yield relevant information and were subsequently excluded from the present review.
- Stage 3: Backwards and forwards citation searches with included articles were performed to identify relevant academic research.

3.4.3.1 Stage 1 of search strategy: Electronic/ Bibliographic database search

Search format

I searched for relevant published papers using four electronic databases: MEDLINE, PsycINFO, EMBASE, CINAHL Plus from inception to 16th March 2018. I selected these databases as they cover a combination of healthcare, medicine, psychology, and nursing and are relevant to the present study topic. The searches were performed separately for PA and diet for the purposes of transparency. The search strategy was formulated using PICOSS criteria which involves considering terms related to the following: ‘Population’, ‘Intervention’, ‘Comparison’, ‘Outcome’, ‘Setting’ and ‘Study design’; an extension of the PICO criteria used by the Cochrane Collaboration (257). However, this was modified to suit the present research questions. Terms that related to intervention, comparison and setting (as all settings were relevant) were not required and were therefore not used.
The search strategy was formulated under the guidance of an Information Scientist (J.F) with expertise in bibliographic database searching at the Royal Free Medical Hospital Library. J.F gave guidance regarding the use of databases, search terms and ways of checking the sensitivity of search strategies. Once I formulated the search strategy, the terms were also discussed with my supervisory team and checked by J.F to ensure that the correct terminology had been used according to each database. The search strategy followed the general arrangement of:

- Domain 1: Population (e.g. severe mental illness)
- Domain 2: Outcome (e.g. physical activity)
- Domain 3: Study design (e.g. longitudinal)

The search was initially conducted in MEDLINE and adapted to suit the other databases.

*Identification of relevant search terms*

An example of a search conducted in MEDLINE for diet and PA is presented in Appendix E. The search terms were selected and modified using a three-stage process:

1. Scoping searches were conducted where potentially relevant academic papers were identified. Complete reference notes were checked to identify the Medical Subject Headings (MeSH) tagged to the article which were then incorporated in the strategy.
2. The expertise of my supervision team (K.W, D.O, L.M & J.R) was utilised and discussions were held where agreements were reached regarding relevant search terms.
3. The sensitivity of search terms was checked through running the searches and identifying whether relevant papers identified in the scoping stages of the review were retrieved. Two key papers were identified during the scoping searches (258, 259) and were identified in each of the searches conducted in each database when checking the sensitivity of search strategies.
3.4.3.2 Stage 2: Grey literature database search

I searched the following grey literature databases from inception to 14th March 2018 as they are specialised in storing theses:

- OpenGrey
- EthOS British Library e-theses online service
- ProQuest Dissertations and theses
- DART-Europe E-thesis portal

A simpler search strategy as compared to the prior electronic search strategy was employed limited to population and outcome components of the PICOSS criteria to avoid missing relevant theses by limiting the search by study design. This was because these databases operated a different interface to the bibliographic databases previously listed.

3.4.3.3 Stage 3: Backwards and forwards citation searches

I conducted backwards citation searches by examining reference lists within included papers to identify any relevant papers cited within the article. I also conducted forwards citation searches using either Web of Science or Google Scholar, depending on the availability of the article in either database, to identify more recent papers that had cited the original article.

3.4.4 Data collection

3.4.4.1 Data management

I exported the articles I identified from database searches and other information sources as specified above into the reference management system EndNote (Version 17.0.0.7072) and removed duplicates electronically. I also manually checked for duplicates and manually removed duplicates that had been missed.
3.4.4.2 Selection process

Articles were selected via a two-stage process:

1. Initially I screened the results of searches by applying the eligibility criteria. Abstracts and titles were initially screened and full-text articles that required reviewing at full-text were obtained.
2. Two reviewers (S.H and J.R) then independently screened full-text articles by applying the eligibility criteria previously described.

3.4.4.3 Data collection process

The data were extracted into an Excel spreadsheet with pre-defined data items (i.e. study background characteristics, participant characteristics, intervention (if applicable) and setting and outcomes) and risk of bias (ROB) components. The data extraction sheet was piloted on the first two studies extracted where it was found that the extraction spreadsheet did not require modification. I contacted authors via email where data were missing and/or ambiguous using a standardised email format. I extracted all the data independently, however 10% of studies were double-coded by the secondary reviewer (J.R).

3.4.5 Assessment of methodological quality of studies

Risk of bias (ROB) was assessed using the Newcastle-Ottawa Scale (NOS) risk of bias tool. I decided to use this tool to assess the quality of studies as it has been widely used in systematic reviews for observational studies and can be adapted to the study topic (260). It has previously been recommended by the Cochrane collaboration for assessing ROB in non-randomised studies (261).

The NOS comprises three sections: selection, comparability, and outcome. The selection element of the tool assesses the: representativeness of the exposed cohort, selection of the non-exposed cohort, ascertainment of exposure and demonstration that the outcome of interest was not present at the start of the study. The comparability section determines the comparability of cohorts based on the design or analysis. The outcome section determines how outcomes were assessed, whether outcomes were assessed at a follow-up period long enough for them to occur and how adequate the follow-up of cohorts were.
The NOS comprises a star rating system, whereby up to nine stars can be awarded. The greater the number of stars achieved, the less bias present within each domain and overall in the study.

I decided to not exclude studies in the review based on ROB to explore the quality and standard of research available in this area. Therefore, results were interpreted cautiously in cases where a high ROB was identified.

3.4.6 Data analysis

After data collection, it was evident that study measures (for both exposure and outcome variables) and analysis methods differed in all the studies I identified for inclusion. Therefore, pooling data in meta-analyses was not appropriate given the heterogeneity between the studies. I therefore took a narrative approach to the analysis and grouped similar exposures and explored their association with the outcomes to identify patterns. This approach was used in earlier narrative cross-sectional reviews to explore factors associated with PA people with schizophrenia and bipolar disorder (86, 198). When I explored studies relating to dietary outcomes, the analysis of exposures differed considerably. Therefore I described the data reported as no patterns were identified across the studies.

3.5 Results: Factors prospectively associated with PA related outcomes

3.5.1 Selection process

The total number of unique articles retrieved from bibliographic database and grey literature searches for PA are presented in Appendix F. This shows the number of articles retrieved within each concept domain, combined retrieval and the number of articles following the removal of duplicates. Figure 3-1 represents a flow diagram documenting the process of identifying articles from all sources for PA searches. Five articles were identified for inclusion for PA related outcomes.
Figure 3-1 PRISMA flow diagram for the process of identifying eligible articles for PA related outcomes

Source: This figure is based on Figure 1 published in the journal Psychiatry Research (248)
3.5.2 Study characteristics

The characteristics of the included studies are described in Table 3-1. There were three prospective longitudinal studies (258, 262, 263). Jakobsen et al. was a secondary analysis of trial data where both treatment arms were combined in the analysis of factors associated with cardiorespiratory fitness (CRF) at two-years, but there was no effect of the intervention on any of the outcomes (181, 259). Similarly, Beebe et al. was an RCT (264) but found no intervention effects on walking behaviour and combined treatment arms in the analysis of PA related correlates. This study was therefore treated as a cohort study in the present review.

Studies were conducted over one month to two years. Studies were diverse in terms geographical origin including Canada (258), the United States (264), Denmark (259, 262) and the United Kingdom (263). Study populations ranged from 97 to 428 participants, with a mean age range of 29 to 47 years and were mostly unemployed or on social security benefits (62-97%). The proportion of females varied from 33-65%. All studies contained a population where participants were diagnosed with either schizophrenia (16-100%) and/or schizoaffective disorder (10-71%) but none contained patients with bipolar disorder. The study setting varied across studies and were conducted across both inpatients and outpatients (258, 259), outpatients only (262, 264) and inpatients only (263).

All studies employed different measures in the assessment of outcomes. Three studies used objective measures such as pedometers for walking behaviours, accelerometers to monitor moderate-vigorous PA and maximal oxygen uptake (VO₂) for CRF (258, 259, 264). Two studies employed subjective self-reported measures including the Physical Activity Scale (PAS) and International Physical Activity Questionnaire (IPAQ) (262, 263). The analysis methods also differed between studies (Pearson’s correlation, logistic regression and linear regression). None of the studies appeared to explore factors associated with change in PA from baseline to follow-up. Although some controlled for self-reported PA at baseline, a different measure was employed for assessment of PA at follow-up (258). In one study it was not reported whether baseline PA was adjusted for in the analysis of PA outcomes (262).
<table>
<thead>
<tr>
<th>Author</th>
<th>Study design setting and location</th>
<th>Assessment of physical activity related outcome</th>
<th>Assessment of dietary related outcomes</th>
<th>Study duration</th>
<th>Participant characteristics</th>
<th>Analysis methods</th>
</tr>
</thead>
</table>
| Arbour-Niciteopoulos et al. (258) | Prospective, inpatients and outpatients, Canada. | Accelerometer worn over 7 days, moderate – vigorous physical activity (150 minutes of physical activity over a week) | - | 4 weeks | • Response rate=100% (n=132/132)  
• Baseline n=132, Follow-up n=101  
• 67% schizophrenia, 32% schizoaffective disorder, 1% psychosis.  
• 59% male.  
• 57% White, 19% African, 6% South Asian, 7% Asian, Other 11%  
• 59% unemployed, 3% student, 28% part-time, 2% full-time, 2% retired, 6% other.  
• Mean age (years) 41.5 SD 11.7  
• Psychiatric score (BRPS) mean 33.5  
SD7.3  
• BMI mean 31.2 SD 7.8 | • Hierarchical logistic regression  
• Exposures: age, gender, BMI, previous self-reported PA, social support, Health Action Process constructs- PA intentions, action planning, coping planning and self-efficacy.  
• No description of characteristics of those lost to follow-up or attempt to account for missing data. |
| Beebe et al. (264) | RCT, embedded prospective³, outpatients, United States. | Pedometerª, total minutes walked | - | 4 months | • Response rate= 60% (97/161)  
• Baseline n=97, Follow-up n=79  
• 71.1% schizoaffective disorder, 28.9% schizophrenia.  
• 52.6% male.  
• 55% Caucasian, 44% African American, 1% Asian  
• Mean age (years) 46.9 SD 2.0. | • Pearson’s correlation  
• Exposure: age  
• Participants lost to follow-up unlikely to introduce bias as less than 20% |
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Setting</th>
<th>Outcome Measures</th>
<th>Follow-up</th>
<th>Sample Characteristics</th>
<th>Exposures</th>
<th>Analysis</th>
<th>Findings</th>
</tr>
</thead>
</table>
| Gardner–Sood (263) | Prospective, inpatients, United Kingdom | The International Physical Activity Questionnaire (IPAQ) measured over the last 7-days (Self-administered) | The Dietary Instrument for Nutrition Education (DINE) measured over the last 7-days (Self-administered) | 12 months | • Response rate not reported  
• Baseline n=169, Follow-up n=72  
• All first episode psychosis, 20% schizophreniaform disorder, 16% schizophrenia, 11.2% manic episode with psychosis, 8.3% major depressive episode with psychotic feature, 5.9% psychotic disorder not otherwise specified, 3.6% schizoaffective disorder depressed, 3.6% schizophrenia, 3% delusional disorder, 1.8% major depressive disorder. 26.6% unknown.  
• 65% male.  
• 49% White, 37% Black, 14% Other  
• Mean age (years) 29.7. | Pearson’s correlation (bivariate) | Exposures: Protection Motivation Theory and Health risk perceptions constructs- Manageability of threat, Perceived personal vulnerability, Self-efficacy (diet), Self-efficacy (exercise), Intention (diet) and Intention (exercise).  
Analysis did not account for missing data, but there were no differences between non-completers and completers in terms of demographic characteristics. |
| Jakobsen et al. (259) | Embedded prospective<sup>+</sup>, primary and secondary care, Denmark | Cardiorespiratory fitness (CRF) calculated via maximal oxygen uptake VO2 using a bicycle test | The Dietary Quality Score (DQS) measured over the last 7 days (Self-report administered by trained assessor) | 24 months | • Response rate=85% (n=428/499)  
• Baseline n=428, Follow-up n=336  
• 88.3% schizophrenia, 10.5% schizoaffective psychosis, 1.2% persistent delusional disorder.  
• 45% male.  
• 96.5% unemployed.  
• Mean age (years) 38.6 SD 12.4.  
• BMI mean 34.2 SD 6.0  
• Positive symptoms (SAPS) mean 2.2 SD 1.6  
• Negative symptoms (SANS) mean 2.6 SD1.2  
• Antidepressant users 43.7% | Linear regression | Exposures: age, gender and randomisation group (data not reported), negative symptoms, global assessment of functioning, cognition, duration of illness (years), any employment, antipsychotics (daily dosage), positive symptoms and friendship.  
Participants lost to follow-up were accounted for in analyses. |
| Nyboe et al. (262) | Prospective, outpatients, Denmark | The Physical Activity scale (PAS) over the last 7- days (Self-report administered by trained assessor) | - 12 months | • Response rate 64% (n=101/158)  
• Baseline n=101, Follow-up n= 75  
• All first episode schizophrenia  
• 67% male.  
• 3.8% on wages, 61.9% social security  
18.5% educational grants, 13.4% sickness benefit, 4.1% unemployment grant, 1% no income.  
• Mean age (years) 24.9 SD 7.1.  
• BMI mean 24.9 SD 4.3  
• Positive symptoms (SAPS) mean 2.09 SD1.34  
• Negative symptoms (SANS) mean 2.06 SD1.12  
• Linear regression  
• Exposures: negative symptoms and gender. Age, anomalous body experiences and antipsychotic medication not extracted  
• No differences were reported between completers and those lost to follow-up regarding global assessment of functioning, negative symptoms, positive symptoms, PA, PA fitness, age and gender at baseline. |

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*a* Obtained from author.  
*b* No significant intervention effects. Correlation analysis combined treatment arms.  
*c* See section 3.5.4 for justification.  
*d* Original article states that the intention to treat principle was used and linear mixed models and unstructured covariance matrix was used to calculate estimated outcomes (265).  
BRPS Brief Psychiatric Rating Scale  
SANS Scale for Assessment of Negative symptoms  
SAPS Scale for Assessment of Positive symptoms  

Source: This table is based on Table 1 published in the journal Psychiatry Research (248)
3.5.3 Methodological quality of the studies included

Table 3-2 reports the methodological quality rating for each of the included studies according to the NOS for cohort studies (266). None of the studies were deemed to be the highest standard of methodological quality and scored below the maximum of nine stars. Jakobsen et al. and Nyboe et al. were scored 8 and 7 which were the highest scores (259, 262). Other studies scored 6, 5 and 4 and were deemed to be of a lower standard of methodological quality (258, 263, 264). The following section describes how ratings were derived according to each item of the NOS and the impact on overall study quality.

3.5.3.1 Selection

From the available evidence, the samples were representative of their target populations including people with first episode psychosis, schizophrenia, delusional disorder, schizoaffective disorder and first episode schizophrenia. Therefore, there is some confidence that the findings are generalisable to these populations. Participants within the studies were recruited from the same population. Jakobsen et al. and Nyboe et al. (259, 262) mostly used structured interviews with trained assessors when measuring exposure variables. However, the other studies (258, 263, 264) mostly relied on written self-report. Self-reported items can be subject to recall bias and it is possible that the chances of measurement error may have increased. Only Arbour-Nicitopoulos et al. (258) adjusted for self-reported baseline PA in analysis, but the measure used to determine follow-up PA was different to the one used to determine baseline PA.

3.5.3.2 Comparability

Arbour-Nicitopoulos et al., Jakobsen et al., and Nyboe et al. (258, 259, 262) included age and gender in analyses as well as other additional variables. However, the two other studies (263, 264) did not adjust for sample characteristics in the analysis.

3.5.3.3 Assessment of outcome

Three studies (258, 259, 264) employed objective measures when measuring aspects of PA which were considered to be independent assessments. Gardner-Sood. and Nyboe et al. (262, 263) however, relied on self-report which are subject to recall error as previously described. Therefore, outcomes should be interpreted some degree of
caution in these studies. All studies but Arbour-Nicitopoulos et al. (258) were considered suitable in terms of the duration that PA was assessed. Therefore, there was confidence that long-term PA was measured in most studies. All studies apart from Arbour-Nicitopoulos et al. (258) either achieved a follow-up rate of more than 80%, employed multiple imputation to account for attrition or reported no differences between those lost to follow-up and those who completed studies. Therefore, there are unlikely to be differences related to PA between those that took part and dropped out in most studies.
Table 3-2 Methodological quality of PA related studies using the NOS

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Representativeness of exposed cohort</th>
<th>Selection of non-exposed cohort</th>
<th>Ascertainment of exposure</th>
<th>Demonstration that outcome was not present at the start of study</th>
<th>Comparability of cohorts</th>
<th>Assessment of outcome</th>
<th>Was the follow-up long enough for the outcomes to occur</th>
<th>Adequacy of follow-up of cohorts</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbour-Nicitopoulou et al. (258)</td>
<td>★ ★ -</td>
<td>★ ★</td>
<td>★ ★</td>
<td>★</td>
<td>★</td>
<td>-</td>
<td>-</td>
<td>★★★★★★★</td>
<td>(6/9)</td>
</tr>
<tr>
<td>Beebe et al. (264)</td>
<td>★ ★ -</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>★ ★</td>
<td>★</td>
<td>★</td>
<td>★★★★★</td>
<td>(5/9)</td>
</tr>
<tr>
<td>Gardner-Sood. (263)</td>
<td>★ ★ -</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>★</td>
<td>★★★★★</td>
<td>(4/9)</td>
</tr>
<tr>
<td>Jakobsen et al. (259)</td>
<td>★ ★ ★ -</td>
<td>★ ★ ★</td>
<td>-</td>
<td>★ ★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★★★★★★★</td>
<td>(8/9)</td>
</tr>
<tr>
<td>Nyboe et al. (262)</td>
<td>★ ★ ★</td>
<td>Unclear</td>
<td>★ ★</td>
<td>-</td>
<td>-</td>
<td>★</td>
<td>★</td>
<td>★★★★★★★</td>
<td>(7/9)</td>
</tr>
</tbody>
</table>

Source: A version of this table was published in the journal Psychiatry Research (248)
3.5.4 Findings

This section synthesises the data across studies grouped according to the assessment of factors prospectively associated with PA related outcomes. This section also explores consistencies and differences within the data and attempts to explain these. This is divided into sociodemographic, mental health, social, levels of functioning, health behaviour, anthropometric characteristics, and psychological constructs within behavioural theories with corresponding subheadings. A summary of consistencies and inconsistencies in factors prospectively associated/correlated or not associated/correlated with PA related outcomes can be found in Table 3-3.

One study explored the association between age, anomalous body experiences and antipsychotic medication and PA (262). However, following correspondence with the author, these data comprised of both baseline and follow-up data which were pooled together. As this provided less clarity on the sequencing of events between the exposure and outcome, these data were not extracted. Only negative symptoms collected at baseline and gender were extracted for this study.
Table 3-3 Comparison of statistically significant and not significant associations across the PA related studies grouped by exposures

<table>
<thead>
<tr>
<th>Exposure Variable</th>
<th>Statistically significant association/ correlation with PA related outcome</th>
<th>No statistically significant association/ correlation with PA related outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Study</td>
<td>Direction of association</td>
</tr>
<tr>
<td>Negative symptoms (higher)</td>
<td>Jakobsen et al (2018)</td>
<td>-</td>
</tr>
<tr>
<td>Action planning</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Coping planning</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Maintenance self-efficacy</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Manageability of threat</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Perceived personal vulnerability</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Self-efficacy (diet)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Self-efficacy (PA)</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: This table was published in the journal Psychiatry Research (248)
3.5.4.1 Sociodemographic factors

Most of the studies included (n=4) measured whether at least one sociodemographic characteristic may be associated with PA related outcomes but only considered either age, gender or employment. Therefore, studies did not consider a broad range of sociodemographic characteristics.

Age

Arbour-Nicitopolous et al. study reported that meeting Canadian guidelines of moderate-vigorous PA was associated with older age at baseline (OR=0.92, 95% CI=0.87 to 0.96, p=0.001, n=99) (258). Beebe et al. also found that a higher number of minutes walked was weakly correlated with older age (r=0.26, p=0.01, n=78). Though both studies did not compare the same aspects of PA, both employed objective measures of PA including accelerometers to measure activity levels pedometers to measure walking behaviour. The samples from both samples were similar in that they contained a similar average ages (41.5 and 46.9 years) which may also explain the consistency between findings.

It is also important to note that when extracting the data I noticed that it was not entirely clear whether the outcome data in Arbour-Nicitopolous et al. was coded as "0= not reaching guidelines and 1= reaching guidelines". However, the findings were written in a way to imply the reverse, which is counter intuitive and inconsistent with a later finding related to BMI. I therefore contacted the authors on numerous occasions to determine whether their findings related to older age and PA had been reported incorrectly. However, the authors did not return a response. I therefore extracted these data given that these findings had been reported in a peer-reviewed article, however I was inclined to treat it with caution.

Gender

Arbour-Nicitopolous et al. reported that meeting guidelines for moderate-vigorous PA was not associated with gender (OR=0.38, 95%CI=0.13 to 1.09, p=0.07, n=99). Similarly, Nyboe et al. found that gender was not associated with of low PA (262). However, the data output was not reported in this study and despite several attempts to contact authors for these data, the authors did not respond.
Employment

Only Jakobsen et al. explored whether employment was associated with CRF/PA related outcomes, even though there was a high proportion unemployed or on social security benefits in most studies (259). Any form of employment was associated with higher CRF ($\beta=2.00$, 95% CI=0.24 to 3.78, $p=0.02$, $n=428$). As this is the only study which addressed the association between employment and PA related outcomes, it is difficult to draw any conclusions regarding the relationship between employment and PA.

3.5.4.2 Mental health related factors

Two studies (Jakobsen et al. and Nyboe et al.) considered whether mental health related factors were associated with PA related outcomes.

Medication

Jakobsen et al. reported that dosage of antipsychotic medications including Olanzapine, Clozapine and Quetiapine was not associated with CRF ($\beta=-0.70$, 95% CI=-1.60 to 0.20, $p=0.13$, $n=428$). Information related to medication history was obtained via self-report and therefore may be subject to recall error. Therefore, the accuracy of reported data is unclear. It is also unclear how change of type of medication and dosages over the follow-up period may have affected the findings. Further, this study reported baseline descriptive data on the proportion of those using antidepressants (187/428, 44%) but was not included in the analysis of factors associated with CRF.

Duration of illness

Jakobsen et al. explored whether duration of illness (in years) was associated with CRF. Longer duration of illness was associated with lower levels of CRF ($\beta=-0.11$, 95% CI= -0.22 to <0.01, $p=0.04$, $n=428$). However, the association was weak. It is also unclear as to how duration of illness was ascertained, therefore the level of accuracy is unknown.
Negative and positive symptoms

Two studies explored whether negative symptoms were associated with PA related outcomes. Jakobsen et al. reported that an increase in negative symptoms was associated with a decrease in levels of CRF (β= -1.23, 95% CI= -1.98 to -0.47, p<0.01, n=428). Similarly, Nyboe et al. reported that an increase in negative symptoms was associated with a decrease in PA (β= -0.88, 95% CI= -1.48 to -0.29, p<0.001, n=99). Though studies differ in the outcomes measured and settings where participants were recruited, both studies employed the same measure in the assessment of negative symptoms (Scale for Assessment of Negative Symptoms, SANS) and were conducted over a duration of 1 and 2 years.

Jakobsen et al. also reported no significant association between CRF and positive symptoms (β= -0.41, 95% CI= -0.95 to 0.12, p=0.13, n=428).

3.5.4.3 Social factors

The association between social factors (friendship and social support) and PA related outcomes were considered across two studies (Arbour-Nicitopoulos et al. and Jakobsen et al.).

Arbour-Nicitopoulos et al. reported that perceived social support was not associated with meeting guidelines for moderate-vigorous PA (OR=0.74, 95% CI=0.47 to 1.16, p=0.18, n=99). Jakobsen et al reported that friendship (either having friends or not/ spending time with friends in the last week) was not associated with CRF (β=1.50, 95% CI= -1.00 to 3.99, p=0.24, n=428). However, Jakobsen et al.’s study addressed structural support (including the existence and quantity of social support) rather than functional support (including emotional support, instrumental support, information guidance or feedback, appraisal support and social companionship) and functional support may provide a more accurate reflection of social support (267). For example, participants may have many friends or family, but participants may perceive that these relationships do not serve functions of support.

3.5.4.4 Clinical and health behavioural factors

Two studies explored the association between PA related outcomes and levels of daily functioning, cognition, previous PA and BMI. As the exposures were measured
independently and not across all studies, it is not possible to draw any comparisons between studies.

*Global assessment of functioning and cognition*

Jakobsen et al. reported that higher functioning ($\beta=0.24$, 95% CI=0.11 to 0.37, $p<0.01$, n=428) and cognition ($\beta=0.14$, 95% CI=0.06 to 0.21, $p<0.01$, n=428) was associated with higher CRF.

*BMI*

Arbour-Nicitopoulos et al. found that higher BMI was associated with a reduced odds of moderate-vigorous PA (OR=0.90, 95% CI= 0.84 to 0.98, $p=0.01$, n=99).

*Previous PA behaviour*

Arbour-Nicitopolous et al. reported that previous self-reported moderate-vigorous PA was not associated with moderate-vigorous PA at follow-up (OR=1.00, 95% CI=1.00 to 1.00, $p=0.94$, n=99).

### 3.5.4.5 Psychological constructs and components of behavioural theories

Gardner-Sood and Arbour-Nicitopolous et al. primarily aimed to explore whether aspects of behavioural theories were associated with PA outcomes. Arbour-Nicitopolous et al. explored whether the Health Action Process model was associated with meeting guidelines for moderate-vigorous PA. Gardner-Sood explored whether health risk perceptions using constructs of the Protection Motivation theory was correlated with PA outcomes. As a part of this, both explored whether PA intentions were associated and correlated with PA outcomes.

*PA intentions*

Moderate-vigorous PA intentions and PA intentions were not associated with either later meeting guidelines for PA in Arbour-Nicitopoulos et al. (OR=1.39, 95% CI=0.95 to 2.04, $p=0.09$, n=99). nor correlated with later PA outcomes in Gardner-Sood ($r=0.19$, $p>0.05$, n=70). Gardner-Sood also reported that diet intentions were not correlated with later PA ($r=0.11$, $p>0.05$, n=70).
Health Action Model constructs (Arbour-Nicitopoulos et al.)

Meeting guidelines for moderate-vigorous PA at follow-up was not associated with action planning (OR=1.12, 95% CI=0.69 to 1.83, p=0.64, n=99), coping planning (OR=0.88, 95% CI=0.54 to 1.43, p=0.61, n=99) or maintenance self-efficacy (OR=1.60, 95% CI=0.90 to 2.82, p=0.11, n=99) at baseline.

Protection Motivation Theory constructs (Gardner-Sood.)

PA outcomes at follow-up were not correlated with manageability of threat (r=0.20, p>0.05, n=70), perceived personal vulnerability (r=-0.11, p>0.05, n=70), self-efficacy perceptions regarding diet (r=0.12, p>0.05, n=70), self-efficacy perceptions regarding exercise (r=0.17, p>0.05, n=70) at baseline.

3.6 Results: Factors prospectively associated with dietary related outcomes

3.6.1 Selection process

The total number of unique articles retrieved from bibliographic database and grey literature searches for diet are presented in Appendix G. A flow diagram representing the process of identifying articles for diet searches can be found in Figure 3-2. Two articles were identified for inclusion for dietary related outcomes.
Figure 3-2 PRISMA flow diagram for the process of identifying articles for dietary related outcomes

Source: This figure is based on Figure 2 published in the journal Psychiatry Research (248)
3.6.1 Study characteristics

The two articles (Gardner-Sood; Jakobsen et al.) meeting eligibility criteria within diet searches were also identified in the previous PA searches (259, 263). The study characteristics can be found in Table 3-1. The mean age of Gardner–Sood’s sample was younger than Jakobsen et al. (a mean of 29.7 versus 38.6), which reflected the nature of the sample being first episode psychosis. Gardner-Sood’s sample contained a greater percentage of males (65%) than Jakobsen et al. (45%). Further, Jakobsen et al. contained a larger sample size (N=428) compared to Gardner–Sood. (N=169). In Gardner-Sood’s study, there was a high dropout rate of 58% (n=70 completers at follow-up), but there were no differences between completers and non-completers in terms of demographic characteristics or physical health problems.

The method of ascertaining study outcomes also differed. Gardner-Sood measured dietary related behaviour using the Dietary Instrument for Nutrition Education (DINE) to determine the quantity of fat and fibre intake and type of unsaturated fat consumed. Jakobsen et al. measured dietary habits using the Dietary Quality Score (DQS) measuring fish, fruit, vegetable and fat intake and produced an overall score.

The aims also differed between studies, therefore the consideration of factors associated or correlated with diet differed. Jakobsen et al. explored the association between global assessment of functioning, negative symptoms, positive symptoms, cognition, antipsychotic medication dosage, duration of illness, employment and friendship and CRF at two years. However, Gardner-Sood measured the association between health risk appraisal and the Protection Motivation theoretical constructs including manageability of threat, perceived personal vulnerability, self-efficacy (diet and PA) and intention (diet and PA) and dietary outcomes at 12 months.

3.6.2 Methodological quality of the studies included

The methodological quality of the studies have previously been reported in Table 3-2 and described further in Section 3.5.3. Dietary related outcomes were measured in both studies using recall of weekly and daily food intake. Jakobsen et al. scored one star lower than for the assessment of PA related outcomes due to this. Though there are no objective measures of dietary outcomes, there are alternative options which are considered further in the “strengths and limitations” section of Chapter 4. Overall, Jakobsen et al. (7 stars) was of higher quality than Gardner-Sood. (4 stars).
3.6.3 Findings

As the study aims differed between the two studies, descriptions of the study findings are reported separately below, however the findings were largely statistically not significant.

3.6.3.1 Gardner-Sood.

Unsaturated fat

There were no significant correlations between unsaturated fat at 12 months and: manageability of threat \( (r=0.04, \ p>0.05, \ n=70) \), perceived personal vulnerability \( (r=-0.02, \ p>0.05, \ n=70) \), self-efficacy for diet \( (r=0.02, \ p>0.05, \ n=70) \), self-efficacy for PA \( (r=0.07, \ p>0.05, \ n=70) \), intention for diet \( (r=0.20, \ p>0.05, \ n=70) \) and intention for exercise \( (r=0.17, \ p>0.05, \ n=70) \).

Saturated fat

There were no significant correlations between saturated fat intake at 12 months and: manageability of threat \( (r=-0.04, \ p>0.05, \ n=70) \), perceived personal vulnerability \( (r=0.11, \ p>0.05, \ n=70) \), self-efficacy for diet \( (r=0.03, \ p>0.05, \ n=70) \), self-efficacy for physical activity \( (r=-0.11, \ p>0.05, \ n=70) \), intention for diet \( (r=0.02, \ p>0.05, \ n=70) \) and intention for exercise \( r=-0.05, \ p>0.05, \ n=70) \).

Fibre

There were no significant correlations between fibre intake at 12 months and: manageability of threat \( (r=0.12, \ p>0.05, \ n=70) \), perceived personal vulnerability \( (r=-0.06, \ p>0.05, \ n=70) \), self-efficacy for diet \( (r=0.12, \ p>0.05, \ n=70) \), self-efficacy for physical activity \( (r=0.07, \ p>0.05, \ n=70) \), intention for diet \( (r=0.09, \ p>0.05, \ n=70) \) and intention for exercise \( r=0.11, \ p>0.05, \ n=70) \).

3.6.3.2 Jakobsen et al (2018)

There was a positive association between dietary quality scores and global assessment of functioning. Higher scores on global assessment of functioning was associated with higher scores on the DQS \( (\beta=0.03, \ 95\% \ CI=0.004 \ to \ 0.05, \ p=0.02, \)
N=428). However, cognition ($\beta=0.11$, 95% CI=$-0.03$ to $0.26$, $p=0.13$, N=428) was not associated with dietary quality scores.

It was also reported that negative symptoms ($\beta=-0.12$, 95% CI=$-0.27$ to $0.04$, $p=0.14$, N=428) positive symptoms ($\beta=0.04$, 95% CI=$-0.07$ to $0.15$, $p=0.47$, N=428), antipsychotic medication dosage ($\beta=0.02$, 95% CI=$-0.17$ to $0.2$, $p=0.87$, N=428) and duration of illness ($\beta=-0.01$, 95% CI=$-0.04$ to $0.01$, $p=0.23$, N=428) were not associated with dietary quality scores.

Employment ($\beta=0.19$, 95% CI=$-0.21$ to $0.54$, $p=0.28$, N=428) and friendship ($\beta=0.28$, 95% CI=$-0.23$ to $0.78$, $p=0.28$, N=428) were also not associated with dietary quality scores.

3.7 Discussion

3.7.1 Summary of key findings

There was a paucity of longitudinal studies identifying factors prospectively associated with PA related outcomes (n=5) and fewer studies on dietary related outcomes (n=2). A limited range of exposures were also explored. Additionally, there were no studies identified in people with bipolar disorder and studies which measured PA or diet related changes from baseline to follow-up. Although one study adjusted for self-reported previous PA, the measurement used for PA at follow-up (i.e. accelerometer) differed to the one used to determine previous PA.

Although PA was measured differently across the studies, some patterns were apparent across the findings. The most consistent prospective factors significantly associated with PA related outcomes were older age and negative symptoms. Being older in age was associated with meeting guidelines for moderate-vigorous PA and more minutes walked (Arbour-Nicitopolous et al.; Beebe et al.). Higher negative symptoms were associated with lower CRF and lower PA levels (Jakobsen et al.; Nyboe et al.). It was also found that gender and intention of carrying out PA was consistently not associated with PA related outcomes (Arbour-Nicitopolous et al., 2017; Nyboe et al., 2016; Gardner–Sood, 2015).

Several exposures were explored within individual studies but not across studies. Being employed, higher cognition and higher levels of functioning was related to higher CRF (Jakobsen et al.). Longer duration of illness was associated with lower...
CRF (Jakobsen et al.). Lower BMI was also associated with meeting guidelines for moderate-vigorous PA (Arbour-Nicitopolous et al.). Antipsychotic medication, positive symptoms, social support, having friends and spending time with them in the last week, previous self-reported PA, dietary intentions, health action process model and health risk perceptions based on the protection motivation theory constructs were unrelated to PA related outcomes (Jakobsen et al.; Arbour-Nicitopolous et al.; Gardner-Sood.).

Studies exploring factors associated with dietary related outcomes were mostly not statistically significant. Only higher levels of global functioning were associated with higher dietary quality scores at two-year follow-up (Jakobsen et al.). All other factors were not associated with PA related outcomes (Jakobsen et al.; Gardner-Sood.).

The quality of the studies varied, but none of them were deemed to be the highest standard of methodological quality. However, two studies scored higher scores (Jakobsen et al. 8/9 for PA, 7/9 for diet; Nyboe et al. 7/9 for PA) whilst others were of a lower standard.

3.7.2 Comparison of findings to other literature

3.7.2.1 Physical activity related outcomes

Age

Prior cross-sectional systematic reviews and primary studies suggest that older people with SMI are more likely to engage in less vigorous forms of PA or sedentary behaviour (74, 75, 87, 205). Similarly, research in the general population also suggests that older people spend on average 9.4 hours per day sedentary (268). This is inconsistent with the findings of Arbour-Nicitopoulos et al., where older age was associated with meeting guidelines for moderate-vigorous PA. However, the findings were consistent with Beebe et al., where older age was associated with more walking; a form of lower intensity PA. There is some uncertainty about the accuracy of the findings of Arbour-Nicitopoulos et al. as discussed previously. Further, the mean age of participants in this study was 46.7 years (SD 2.0). Therefore it is possible that most of the participants were middle-aged and the same findings may not apply in an older population. Furthermore, this study was conducted over a four-week duration with a small sample size. A longer follow-up with a larger sample and a wider age-range (including older adults >64 years old) would be required in future prospective studies.
assessing the association between age and type of PA outcomes. It is also important to note that Beebe et al.’s study was concerned with improving walking behaviour and not any other form of PA. Therefore, it is unknown as to whether similar findings may have emerged if other more vigorous forms of PA were addressed.

When considering the findings of Arbour-Nicitopoulos et al. and Beebe et al. together, though activity types differed, these findings may suggest that those who were middle aged with schizophrenia spectrum disorders were more likely than younger populations to engage in some form of PA. It is possible that those in their 40-50s may be more aware of their physical health status, have more knowledge or awareness of their own CVD risk and the benefits of engaging in PA to reduce and/or prevent this and therefore may be motivated to exercise. This knowledge may have arisen from more frequent advice from HCPs with increasing age. Research in the general population among individuals with acute myocardial infarction, angina pectoris or stroke supported the association between health literacy, engagement with HCPs, healthy behaviours and health status (269). Health literacy and engagement with HCPs was associated with lower odds of being physically inactive and improved mental and physical health status. This may suggest that health literacy or the importance placed on health with increasing age may be important, particularly in people with SMI where involvement from HCPs is increasingly encouraged and being addressed. One cross-sectional study in people with SMI also supported that perceptions that maintaining a healthy lifestyle was either moderately or not important was associated with less PA (76). However, it may be possible that this may change with age, greater health literacy and engagement with HCPs.

**Gender**

Two prior cross-sectional reviews reported that being male was associated with light or low levels of moderate-vigorous PA in people with SMI (75, 205). This is inconsistent with the findings of Nyboe et al. and Arbour-Nicitopoulos et al., where there was no association between gender and PA. The difference in findings may be due to the lack of statistical power and reduced sample sizes. There is some evidence to suggest that the experience of mental health symptoms may differ between men and women, with men experiencing more negative symptoms and women experiencing affective symptoms (270). The association between being male and lower or light levels of PA may be explained by another cross-sectional review reporting that negative symptoms may reduce PA levels (86). Therefore, the role of
negative symptoms as a potential mediator in explaining the differences in PA levels between men and women should be explored in further longitudinal studies.

**Negative symptoms**

One cross-sectional review reported no association between negative symptoms and PA outcomes (75). This contrasts with the findings of Nyboe et al. and Jakobsen et al. This may be due to the method of measuring negative symptoms, as studies identified in this review adopted the same approach (Scale for the Assessment of Negative Symptoms (SANS)) (271). However, in Stubbs et al., a different approach was adopted (Positive and Negative Symptoms Scale) (272). Another cross-sectional study using SANS reported an association between higher negative symptoms and lower moderate-vigorous PA (193). This may suggest further studies are required before any conclusions can be drawn.

**PA intentions**

One cross-sectional review reported that intention for PA was associated with PA behaviour (197), however it is problematic to measure intentions at the same time as behaviours. In contrast, intentions were unrelated to PA outcomes in Gardner-Sood. 2015 and Arbour-Nicitopoulos et al. It is not possible to determine whether intentions are associated with longer term PA in cross-sectional studies. A meta-analysis of prospective studies conducted in the general population suggests that the intention-PA behaviour gap was 46%, suggesting that those intending to be physically active do not necessarily become active (273). Therefore, it is possible that intent is not associated with sustained PA but with short term and/or current PA.

These findings may also be explained by the “PRIME” theory of motivation which states that intentions or logical thought processes (i.e. reflective motivation) can only influence actions if they create enough strong wants and needs (i.e. automatic motivation) to carry out the desired behaviour (241, 274). It is possible that the reasons for PA intentions among participants in Gardner-Sood. and Arbour-Nicitopoulos et al. were not enough to generate strong enough wants and needs to carry out sustained PA. This suggests that behaviour is complex and that an understanding behind intentions for PA and how they may or may not relate to automatic forms of motivation (i.e. wants and needs) over time are required to explain behavioural factors associated with PA.
Findings within individual studies of PA

It is important to highlight that although few consistencies were found across studies, it is still possible to make inferences on the strength of an association within an individual study depending on the power and quality of a study. Factors including duration of illness, cognition, functioning, employment, BMI, antipsychotic medication dosage, social support, friendship, previous PA, Health Action Process and Protection Motivation theory constructs require more consideration (Jakobsen et al.; Arbour-Nicitopoulos et al.). However, to account for such variety of exposures, large sample sizes are required. These observations are based on one study identified containing the most significant findings due to the highest sample size (Jakobsen et al.). However, chance findings may have also occurred in this study due the analysis of multiple outcomes. Therefore, the quantity of variables included in models should also be considered to avoid compromising statistical power.

3.7.2.2 Dietary related outcomes

It was also difficult to infer the strength of associations identified in diet related studies as these were limited and not possible to compare across the two studies identified (Gardner-Sood.; Jakobsen et al.). The lack of associations identified may be due the self-reported nature of diet and reliance on memory potentially increasing measurement error. Additionally, Gardner-Sood contained a small sample size (n=70 at follow-up) and high attrition rate (58%).

The finding that higher global functioning was associated with higher dietary quality scores may suggest that those with better functioning were more clinically stable, able to understand health risks and therefore perhaps more likely to make better decisions regarding dietary choices (Jakobsen et al.). However, this had not been considered in prior research and therefore requires replication in other studies before recommendations may be made.

3.7.3 Strengths and limitations of studies included in the present review

3.7.3.1 Representativeness

From the available evidence, the participants included in studies represented the target populations regarding demographics factors (i.e. gender, unemployment), health related factors (e.g. BMI) and setting (i.e. inpatients and/or outpatients) thereby
increasing the generalisability of findings to these target populations. However, the findings cannot be extended to the broader population of people with SMI including those with bipolar disorder as the studies did not aim to include these participants. It was also unclear in Nyboe et al., and Jakobsen et al., whether the findings are representative of people with ethnic minority status as this was not reported.

Beebe et al. and Jakobsen et al. were based on RCT data aiming to improve health behaviours including PA and/or diet and although the interventions had no effect on PA and/or diet related outcomes, it is possible that participants in these studies were more motivated to improve their health behaviours as they volunteered participation in health participation trials and may not represent those that are less motivated. This is a form of self-selection bias; however this was not possible to determine.

There was a high response rate among the four studies reporting this information, varying from 60-100%. Therefore, there is a good chance that the participants were representative of the target populations. However, reasons for declining participation among the few were not reported. There may still be some chance that those who declined were in greater need of health improvement or differed in terms of demographic characteristics. Similarly, this could be a form of self-selection bias, however this was not possible to determine.

The studies were also conducted within several countries increasing the generalisability of findings to these countries, but few studies were conducted, and all were carried out within higher income countries. It is possible that findings may differ in lower income countries where access to health services may be further restricted and financial status poorer. These factors may play a role in dietary and PA related changes and/or outcomes. Higher quality research conducted in both higher and lower income countries is needed to determine the replicability of findings and increase generalisability internationally.

### 3.7.3.2 Selection bias

Participants were all drawn from the same communities within the studies, thereby increasing the comparability of participants and minimising selection bias. However, in Arbour et al. and Jakobsen et al., participants were identified through nurses, psychiatrists and usual care givers. Therefore, it is possible that nurses, psychiatrists or usual care givers only selected those who they believed would be more interested
to partake and improve their health behaviours, increasing the likelihood of selection bias, but it was not possible to determine.

The follow-up rates varied between 47-81%. Only Beebe et al. achieved greater than 80% follow-up and there is less of a chance that those lost to follow-up were in some way different to those that remained. For example, greater psychiatric symptoms, physical health problems or inability to exercise. Arbour et al., however, did not explore reasons for attrition. The remaining studies either reported no differences in terms of demographic characteristics, mental health medication, symptoms and/or physical health problems between completers and non-completers (Nyboe et al.; Gardner-Sood) or accounted for attrition in analyses (Jakobsen et al., 2018). Therefore, the chances of the findings being distorted due to selection bias because of attrition were less likely in these studies.

3.7.3.3 Information bias

Information bias could arise from assessors who unintentionally or intentionally distort the way data are collected to increase the chances of identifying an association. As all the studies were prospective, exposure status were collected prior to the outcome was known, which minimised the possibility that exposures were collected unfairly. Further, Arbour et al., Jakobsen et al., and Beebe et al. used objective measures to ascertain PA related outcomes. This reduced the chances of distorting the way the data were collected since data collection did not require researcher involvement. Nyboe et al. used a trained assessor who administered a PA based measure to determine PA outcomes. It was unclear whether assessors were blinded as to the exposure statuses of participants and outcome data may have been affected by information bias, thereby distorting the findings. Recall bias may have also occurred in Gardner-Sood., Nyboe et al. and Jakobsen et al. where they employed self-reported PA and/or diet measures. It is possible that participants were likely to recall aspects of their diet and PA if they were healthier and more engaged with their PA and diet. In these studies, responses may have also been influenced by social desirability, whereby participants distorted their responses to conform to what they perceived as socially acceptable.
3.7.3.4 Measurement error

Outcome measures

Studies that measured PA related outcomes using objective measures (including accelerometers, pedometers and VO\textsubscript{2}) reported a greater number of statistically significant findings (Arbour-Nicitopoulous et al.; Beebe et al.; Jakobsen et al.). It has however been reported that pedometers provide less accurate information when speeds which are slower (including shuffling) or faster (including running) are measured (275). Further, pedometers are limited to measuring ambulatory activity and do not provide reliable estimates of energy expenditure.

Both Gardner-Sood and Nyboe et al utilised self-reported measures of PA. However, the use of self-reported measures in people with SMI have been questioned (255). Subjective measures can be unreliable as they rely heavily on participant responses, which can be influenced by cognitive capacity, mental health status and the degree of honesty which may be affected by social desirability. Systematic review findings report that subjective measures are associated with higher levels of PA and lower levels of sedentary behaviour compared to objective measures (74, 75). In fact, one study reported that when comparing controls and people with schizophrenia in terms of self-reported PA no differences were found (276). However, when comparing accelerometer data, people with schizophrenia showed lower levels of PA. This may suggest that PA levels may be overestimated by people with schizophrenia and self-reported measures may therefore be unreliable in this population. Similarly, both the dietary outcomes were based on self-reported measures requiring recall of food intake over the last week and may be liable to error (Jakobsen et al.; Gardner–Sood.). However, objective measures of dietary behaviour are scarce and discussed in greater detail in Chapter 4 (section 4.6.3.5).

Extreme scores or outliers may be more common in studies which use self-reported outcome measures. However, there was no indication in studies that used subjective measures whether any extreme scores or outliers may have influenced the findings in any way.
Exposure variables

Two of the studies (Jakobsen et al. and Nyboe et al.) used trained assessors to administer measures on exposure factors which may have decreased the chances of measurement error. As stated previously, cognitive capacity and mental health status may affect participant recall and written understanding of questions. Therefore, assessors were able to read assessments and clarify any uncertainties and medical records are more accurate than verbal recall. The other studies mostly used self-administered measures, which can lead to measurement error. Further, it is possible that participants may have distorted their responses due to social desirability in all studies.

3.7.3.5 Confounding

Only three of the studies included both age and gender within their analysis (Arbour-Nicitopoulous et al.; Nyboe et al.; Jackobsen et al.). However, two studies (Gardner-Sood; Beebe et al.) did not adjust for sample characteristics due to the analysis methods employed. Other demographic characteristics such as socioeconomic status may have been important to consider but unemployment was only considered in one study (Jakobsen et al.). Therefore, there is the possibility of unmeasured confounding.

The studies explored a limited range of other exposure variables compared to cross-sectional studies on PA in this area. However, some studies were possibly limited by the availability of exposure data as these were secondary analyses (Beebe et al.; Jakobsen et al.). There is a lack of understanding as to how other factors included in other cross-sectional work may be related to long-term PA outcomes and/or changes and may be important to consider as potential confounders. To my knowledge, the studies included in the present review based on dietary outcomes explored factors not previously explored in cross-sectional data. However, sociodemographic characteristics and other health behaviours were considered in cross-sectional studies and not the studies included.

3.7.3.6 Chance findings

The samples included in the studies were small increasing the chances of type II error (i.e. accepting the null hypothesis when it is false). Larger sample sizes are likely to increase the precision of effect estimates and the assumption that the findings are not
due to chance. The study containing the largest sample detected the greatest number of statistically significant findings (Jakobsen et al.). However, this study assessed multiple outcomes (VO₂, dietary quality score, waist circumference, BMI, systolic blood pressure, HDL, HbA1c) and it is possible that multiple outcome testing may have increased the chances of detecting a statistically significant finding (type I error; rejecting the null hypothesis when it is true) (277). Further, the number of variables in Arbour-Nicitopolous et al.'s study were greater than the statistical power available based on the “one in ten” observations rule of thumb (Outcome dichotomous- meeting PA guidelines = 22, not meeting PA guidelines=77) (see Chapter 4, section 4.4.5.1 and section 4.4.5.2). This may have contributed toward the reason why few associations were reported.

3.7.4 Strengths and limitations of the review

The inclusion and exclusion criteria were pre-specified, and the protocol was published on PROSPERO for transparency. The protocol was adhered to and there were no changes since the protocol was published on PROSPERO.

Further, I adopted a comprehensive and robust approach to identifying literature in this area without language or data restrictions to avoid missing relevant articles. I searched four bibliographic and four grey literature databases. I used several relevant search terms which had not been done in prior cross-sectional reviews. These were identified through scoping searches and consulting the multidisciplinary expertise of my supervisors. I also constructed the search strategy under the guidance of an information scientist. I have provided an example of the searches for the purposes of replicability. I further checked the sensitivity of my searches by identifying whether the searches located a few relevant articles I had found during the scoping stages of my review. I also conducted both backward and forward citation searches. Consequently, more studies were identified that had not previously been included in other reviews. The reasons for excluding all studies were clearly specified and reported. I also provided a list of non-English language articles that I was unable to screen due to limited resources for translation for transparency.

Two reviewers independently screened papers identified for full-text screening and assessed the inclusion of papers and achieved full agreement on the articles to be included in the review, thereby limiting the risk that articles had been missed. Two reviewers also extracted the same data from a portion of eligible studies and achieved
full agreement. Further, despite contacting authors on numerous occasions, some of the queries related to certain data could not be clarified and some of the data required was not provided.

The studies included in this review were heterogeneous in terms of the way outcomes and exposures were measured. It was not possible to meta-analyse the data and it was therefore difficult to draw any strong conclusions. However, consistencies and inconsistencies were explored using a data-driven approach for PA related outcomes. Exposure variables that were both significantly and not significantly associated with PA related outcomes were grouped and discussed. Despite the differences between studies in terms of the measurement of PA and exposures, there were some emerging consistencies in associations across the studies. However, given the inconsistencies regarding study aims between studies based on dietary outcomes, it was not possible to explore patterns between the findings in these studies.

Very few studies were identified overall with few findings, and it is therefore difficult to draw any strong conclusions in the studies. Measurement error, small sample sizes, reduced statistical power and unmeasured confounding may have contributed to the lack of associations observed. Nevertheless, the studies were limited to prospective study designs only which allows the ability to identify the temporal sequencing of events since exposures were collected prior to outcomes and reduced information bias as the exposure is collected before the outcome is known.

I assessed the ROB of included studies and clearly reported how ROB was assessed and rated. However, it is important to note that none of the studies scored as meeting the highest standard of methodological quality. Despite this, the studies were still included in the present review. The quality of the studies affects the extent to which strong conclusions can be drawn regarding associations.

3.7.5 Conclusions and implications for further study

There were few studies exploring baseline factors associated with PA and/or dietary related outcomes. None explored factors associated with changes from baseline to follow-up or were conducted in people with bipolar disorder. However, some consistencies emerged in the evidence including the association between negative symptoms and poorer PA related outcomes, older age and better PA related outcomes. PA Intentions and gender were also unrelated to PA related outcomes.
However, much more methodologically robust longitudinal research is required before any strong conclusions can be drawn regarding factors associated with dietary and PA related outcomes and changes.

To improve the physical health status of people with SMI, it is imperative to understand long-term PA and dietary related changes and outcomes in more detail to aid the development of interventions. Prospective study designs should be taken forward in future studies, but these require resource. Therefore, alternatives such as the use of RCT data could also be explored. There is a need to consider in particular: a) those with bipolar disorder to improve the generalisability of findings to all people with SMI, b) ways of measuring change from baseline to follow-up, use of stronger methods of ascertaining exposure status (i.e. medical records/structured assessments), c) a range of exposure variables, d) statistical power and sample size to reduce the chances of type II error. I considered each of these factors to inform my next study; study 2.
Chapter 4  Study 2: Factors prospectively associated with physical activity and dietary related changes in people with severe mental illness: secondary analyses of PRIMROSE trial data

4.1 Chapter overview

In this chapter, I present the findings of secondary analyses of PRIMROSE data which aimed to explore self-reported PA and dietary changes from baseline to 12-months. This chapter includes a brief rationale for this study, followed by the methodology, findings, discussion of the findings and the strengths and limitations. I had no role or involvement in designing or collecting data for the PRIMROSE trial. However, I conceived the present study which was separate to the PRIMROSE trial analysis. I created new variables and conducted all analyses for the purposes of the present study. This study has been written as a paper and submitted to a journal for publication.

4.2 Introduction and rationale

In Chapter 3, I systematically reviewed longitudinal studies which identified associations between baseline factors and dietary and/or PA related outcomes over time. These reviews highlighted the paucity of longitudinal research on factors associated with PA and dietary related outcomes and changes in people with SMI. Five articles were identified for PA and two for diet outcomes, none of which explored change from baseline to follow-up.

A longitudinal approach may be valuable to better understand dietary and PA changes over time in this population, as well as draw stronger conclusions on the temporal relationships between exposure and outcome variables. This work is needed to inform future health behaviour interventions and given the gaps and limitations I identified in my systematic review, there is a need for further research.

4.3 Aims, objectives and research questions

The overall aim of the present study was to explore self-reported PA and dietary related changes in a sample of people with SMI and identify factors that may be associated with dietary and PA related changes over a 12-month period. More specifically, the objective was to conduct secondary exploratory analysis of data collected from the PRIMROSE trial to explore the following research question:
1. Are there identifiable factors at baseline that are associated with any change (i.e. an increase and/or decrease) in self-reported: I) PA (Total metabolic equivalent of task (MET) minutes and time spent sitting) and II) dietary behaviours (fruit and vegetable intake per day, total fat and fibre intake per day/week) from baseline to 12-month follow-up?

To explore behaviour change in those in higher risk groups, as further supplementary analysis, I also explored the following questions related to primary outcomes only:

2. Of those meeting the lowest category of total PA at baseline, how many people increased by ≥10% at follow-up?

3. Of those consuming less than five fruit and vegetables per day at baseline, how many people increased by ≥10% at follow-up?

4. Are there identifiable factors at baseline that are associated with: I) a ≥10% increase in total PA at follow-up in those meeting the lowest category of total PA at baseline and II) a ≥10% increase in fruit and vegetable intake at follow-up in those consuming less than five portions of fruit and vegetables per day at baseline?

4.4 Methods

4.4.1 Context and justification for use of this dataset

There is a very limited range of data sources that have measured behaviour change and PA and diet using validated instruments in people with SMI over time. To my knowledge, there is currently only one ongoing primary longitudinal study involving behavioural measures and people with SMI led by Professor Simon Gilbody at York University (“The Closing the Gap: Health and Wellbeing Cohort”), however follow-up data have not yet been collected (76, 278). Other datasets which are regularly used for secondary analyses, such as primary care electronic routinely collected data does not contain accurately or consistently reported information related to diet and PA. I therefore decided that secondary analyses of data collected for PRIMROSE trial was a unique opportunity to explore longitudinal PA and dietary related changes in people with SMI across England with diverse clinical, anthropometric, medical, health and wellbeing explanatory/ exposure and descriptive variables and behavioural measures. The PRIMROSE study is described in greater detail in Chapter 2, section 2.5.
4.4.2 Study design

The present study was exploratory secondary analyses employing a longitudinal cohort design. There was no effect of the intervention on health behaviour outcomes including diet and PA (174). I therefore combined data from the intervention and treatment as usual arms from the trial in analyses. I analysed the association between carefully selected baseline explanatory variables and dietary and PA change scores over a 12-month period to identify temporal relationships between exposure and outcome variables and conducted further supplementary analysis. The supplementary analysis was conducted to explore factors predictive of an uptake of positive health behaviour change in higher risk groups (i.e. those with lowest total PA and consuming less than five fruit and vegetables per day at baseline improving by ≥10% at follow-up). I focused on these groups as they would normally be targeted in terms of improving their health behaviours in behaviour change interventions.

4.4.3 Outcome data

4.4.3.1 Primary and secondary outcomes

PA was measured using The International Physical Activity Questionnaire (IPAQ) with separate scores for metabolic equivalent of task (MET) minutes for overall total PA and time spent sitting as an indicator of sedentary behaviour (SB) (279). Diet was measured by daily fruit and vegetable intake and total fat and fibre scores on the Dietary Instrument for Nutrition Education (DINE) (256).

I decided to explore multiple outcomes as these were exploratory analyses, and there were PA and dietary measures that represented different aspects of these domains. This decision was also based on clinical guidelines that recommend targeting all these factors (e.g. both sedentary time and levels of physical activity, and fruit and vegetable intake, fat and fibre intake) to reduce CVD risk in the general population (131). Further, I considered the literature in Chapter 1 which reported that people with SMI showed evidence of unhealthy diet, PA, SB and these were linked to early mortality, metabolic syndrome and/or CVD risk.

I chose overall MET minutes as the primary outcome for PA as research in the general population and people with SMI has shown that being more physically active can reverse or improve the effects of being sedentary (82, 84, 85). I chose fruit and vegetable intake as a primary outcome for dietary behaviour as fruit and vegetable
intake is widely measured in the general population in relation to health risk and in some large health surveys (e.g. UK Time Use Survey, 2014-2015, Health Survey for England 1991-2018) is used as the single indicator of dietary habits (280-282). Therefore, this measure has external validity. The amount of time spent sitting (as an indicator of sedentary time), total fat and fibre intake were selected as secondary outcomes.

### 4.4.3.2 Operationalisation of outcome data

I used outcome measures collected at baseline and 12-months because I was interested in long-term PA and diet, which is important for understanding change and temporal relationships. I made the decision a priori that all outcomes would be treated as continuous when exploring factors associated with 12-month changes to address my main research question. This was based on reasoning that categorical and binary outcomes reduce statistical power as opposed to continuous outcomes (283). Maximising statistical power was important given the sample size in the present study.

I conducted further supplementary analysis with the primary outcomes categorised as binary variables to facilitate the interpretation of the findings for high risk sub-populations, but I was aware dichotomising outcomes would reduce statistical power. This was to address my exploratory research questions regarding what proportion of those: I) meeting the ‘low’ PA category on the IPAQ at baseline and II) consuming less than five fruit and vegetables per day at baseline change by a margin of ≥10% and III) what baseline factors were associated with these changes.

### 4.4.3.3 Outcome measures

**International Physical Activity Questionnaire (IPAQ) short form**

IPAQ was self-administered and is frequently used in studies with people with psychosis (74, 75, 205). It was also validated in participants with schizophrenia and an international sample of participants in the general population (279, 284, 285).

*Metabolic equivalent of task (MET) minutes/ per week – continuous score*

IPAQ measured walking, moderate and vigorous PA. Participants were asked how many days per week they spent performing each type of activity with examples (e.g. heavy lifting, digging, aerobics for vigorous activity and cycling at a regular pace or
double tennis for moderate PA) for at least 10 minutes at a time. Participants were also asked the amount of time (in hours and minutes) spent carrying out activities. Hours were converted to minutes and each domain was calculated separately accounting for the number of metabolic equivalent of task (MET) minutes; the amount of energy consumed when performing PA as compared to the resting metabolic rate (the amount of energy consumed at resting state). For example, 1 MET is approximately equivalent to the energy consumed when sitting quietly. The standard MET values used in the measure includes walking = 3.3, moderate physical activity = 4.0 and vigorous = 8.0 (286). The total MET minutes per week for each domain is calculated by the following:

\[
\begin{align*}
\text{Walking MET minutes per week} &= 3.3 \times \text{minutes per day} \times \text{total days per week} \\
\text{Moderate MET minutes per week} &= 4.0 \times \text{minutes per day} \times \text{total days per week} \\
\text{Vigorous MET minutes per week} &= 8.0 \times \text{minutes per day} \times \text{today days per week}
\end{align*}
\]

A total score of MET minutes per week was calculated by summing the results from each domain indicating overall total PA (286).

**MET minutes – categorical data**

Baseline IPAQ scores were further categorised to represent different activity levels (286):

a) High: Vigorous-intensity activity for 3 days with a minimum total of at least 1500 MET-minutes per week or any combination of walking, moderate-intensity or vigorous-intensity activities for 7 or more days with a minimum total of at least 3000 MET-minutes per week.

b) Moderate: Vigorous-intensity activity for 3 or more days occurring for at least 20 minutes per day or moderate-intensity activity and/or walking for 5 or more days occurring for at least 30 minutes per day or any combination of walking, moderate-intensity or vigorous-intensity activities for 5 or more days with a minimum total of at least 600 MET-minutes per week.

c) Low: Participants not meeting the criteria for moderate or high PA were classified as having low PA.
Sitting time – continuous scores

An additional domain in IPAQ included time spent sitting as an indicator of sedentary time. Participants were asked in the last seven days, how much time in hours and minutes they spent sitting. The total hours reported were converted into minutes and were multiplied by seven to produce the number of minutes spent sitting per week. This domain was calculated separately and therefore not combined with total MET minutes or activity categories. There are no established thresholds in IPAQ for categorising sitting time (286).

Fruit and vegetable intake per day – continuous data

An additional question was added separately to measure daily fruit and vegetable intake as this was not specifically included in DINE. Participants were asked by research nurses how many pieces of fruit they ate per day, with examples including “an apple or banana, a small bowl of strawberries, three tablespoons of tinned fruit, at least one glass of fresh fruit juice”. Participants were asked how many portions of vegetables they ate on a typical day excluding potatoes, with examples including “four heaped teaspoons of green vegetables such as spinach, three heaped spoons of fresh, tinned or frozen vegetables (such as carrots), one medium tomato, three heaped teaspoons of beans or chickpeas”. This measure was derived by the trial team using previous NHS guidance on fruit and vegetable portions. I added together fruit and vegetable portions and created a continuous overall fruit and vegetable portion intake total per day variable.

Fruit and vegetable intake per day – binary data

Baseline total daily fruit and vegetable portions were further categorised to represent the following categories: consuming five or more portions of fruit and vegetables per day versus consuming less than five per day. This was based on clinical guidelines recommending consuming at least five portions of fruit and vegetable per day to reduce CVD risk (131).
**Dietary Instrument for Nutrition Education (DINE)**

DINE was researcher administered and had previously been used extensively in research containing participants with SMI (21, 164, 256, 287, 288). It was also validated in a primary care-based population (256).

*Total fat and fibre intake – continuous scores*

DINE measured: fibre, fat (total fat) and unsaturated fat (256). Fibre and fat domains contained 19 specific foods or food groups relative to the domain (e.g. fibre includes breads and rolls and fat includes milk items etc.). These corresponded with pre-assigned scores which measured the relative amount of fat and fibre within specific foods. The scores corresponded to daily or weekly frequency of intake. Scores were added together separately within fibre and fat domains and represented overall total fat or fibre intake. The higher the score, the greater the amount of fat or fibre consumed.

The domain related to unsaturated fat aimed to establish the balance of saturated and unsaturated fat. I did not include this as a study outcome because this domain related to the types of cooking and spreading fats consumed and not the amounts or intake. This did not therefore provide any information about the quantity of various saturated versus unsaturated fats consumed.

*Fat and fibre intake DINE categories*

Baseline fat and fibre scores were categorised for descriptive purposes using the following recommended and validated categories (256):

**Fat:**

- a) Low: total score of less than 30 (83g or less per day)
- b) Medium: total score of 30 to 40 (84-122g per day)
- c) High: total score of more than 40 (greater than 122g per day)

**Fibre:**

- a) Low: total score of less than 30 (20g or less per day)
- b) Medium: total score of 30 to 40 (21-30g per day)
c) High: total score of more than 40 (greater than 30g per day)

The aim of DINE was originally to educate people regarding food choices whilst encouraging change to low fat and high fibre categories.

4.4.3.4 Measuring change in PA and diet

Continuous change scores

I computed a change score for each of the primary (MET minutes per week score and fruit and vegetable servings) and secondary outcomes (sitting time per week score, fat and fibre intake score) using continuous scores derived from each of the measures described above using the following calculation:

\[
\text{12 month total score or serving} - \text{Baseline total score or serving}
\]

The change scores provided information on how much the participant had worsened, improved, or remained the same from baseline to 12-months. A positive (+) score indicated any increase, a negative score (-) indicated any decrease and a score of ‘0’ implied no change from baseline to 12-months. An increase in MET minutes, fruit and vegetable and fibre intake suggests an improvement. However, an increase in total fat and sitting time suggests these outcomes had worsened.

Percentage changes and binary conversion

For the supplementary analysis, the following calculation was applied to identify the percentage change from baseline to follow-up for the primary outcomes (MET minutes’ scores and the total fruit and vegetables):

\[
\frac{\text{12 month score or total serving} - \text{Baseline total score or serving}}{\text{Baseline total score or serving}} \times 100
\]

Using this information, I then created a binary outcome variable for those meeting ‘low’ category in total MET minutes and those consuming less than five fruit and vegetables at baseline. The categories included those achieving ≥10% change versus those showing no change, any decrease and <10% change. I avoided the use of more than two categories to retain as much statistical power as possible and differentiate
those increasing in way that may benefit health outcomes versus changes or no changes that have potentially little positive or negative impact on health.

As IPAQ is liable to measurement error, any minimal increases in reported PA at follow-up could be random error and wrongly identified as improvements in PA. However, evidence suggests that even small increases in PA in those considered inactive could contain health benefits (289). Therefore, the threshold of 10% may differentiate those reporting minimal increases due to random error and those with smaller ‘true’ increases which may benefit health outcomes. Similarly, research suggests that the more fruit and vegetable consumed, the greater the health benefits (290).

4.4.3.5 Rationale for the use of change scores

When reviewing statistical literature, I noted that there were two main approaches that were commonly used to measure change in outcome and the factors associated with this change including:

1) Adjusting statistical models for baseline outcome values and reporting change in follow-up outcome scores and
2) Computing “change scores” or “difference scores” by deducting baseline from follow-up scores.

Research on the statistical value of using baseline adjustment as opposed to change scores is mixed and commonly debated. It is therefore argued that the decision to use either approach should be based on the research question, as they address slightly different questions (291, 292). Analyses adjusting for baseline measures in multivariable models explore factors which may be associated with the change in follow-up outcome after holding baseline measures constant. Holding baseline measures constant whilst exploring the effects of other variables on change in follow-up outcome does not address my research questions adequately. It is likely that there will be differences between participants in terms of their baseline scores. Holding baseline measures constant whilst exploring the association between other variables and the follow-up outcome would therefore not provide a true reflection of factors associated with change from baseline to follow-up. Change scores, however, consider individual differences within the sample within baseline and follow-up outcome measures and are therefore more suited to my research questions.
4.4.4 Exposure data

Exposures collected at baseline were used to analyse associations with primary and secondary outcomes. These were selected from the evidence base including existing cross-sectional literature on the topics, my systematic review, discussions with my supervisory team regarding the factors that may be plausibly biologically related and were available in the PRIMROSE dataset.

4.4.4.1 Exposure measures

Demographics

Researchers verified participants’ date of birth, gender, self-assigned ethnicity, and marital status by checking with participants. Date of birth was used to calculate age and gender was binary (male and females). Self-assigned ethnicity was categorised using Office for National Statistics (ONS) categories (293). Marital status included: single, married/cohabiting/in a civil partnership, separated/divorced/civil partnership dissolved and widowed.

Employment status was determined by a self-administered measure of pre-specified categories. Responses were dichotomised into paid (part-time paid, full-time paid, paid with paid support, employed but paid up to allowed limit without affecting benefits) and not in paid employment (none, voluntary work, in education, homemaker and retired from paid work).

Medical history

Mental, physical health diagnoses and medication prescribed in the last 12-months were collected from GP records by research nurses.

Mental health diagnosis

Mental health diagnoses were categorised into schizophrenia/schizoaffective disorder, bipolar disorder, and other psychosis (depression with psychosis/psychotic symptoms, paranoid psychosis, psychotic depression, reactive depressive psychosis, unspecified affective psychoses, severe depressive episode with psychotic symptoms).
Physical health diagnosis

Long-term conditions in the last five years including: hypertension, diabetes, raised cholesterol (5 mmol/l or more) were each dichotomised into diagnosed/ not diagnosed.

Antipsychotics and antidepressants

Antipsychotic and antidepressant medication data were checked against British National Formulary (BNF) categories and antipsychotics were organised by first (FGAs) and second-generation (SGAs) antipsychotics. Dichotomous variables indicated whether/not participants were prescribed first and/or second-generation antipsychotics and antidepressants. Medications in the same class, likely to have been prescribed for the same mental health problems were only counted once.

Polypharmacy

I created a variable for the total number of medications prescribed without including antipsychotics or antidepressants to avoid double counting medications. It was not possible to count medications in the same class with different names only once, as the dataset did not contain information on BNF categories. This variable was used as a proxy for polypharmacy, which is commonly used as an indicator of overall health and health outcomes (294, 295).

Anthropometrics

Body Mass Index (BMI)

Height was measured in metres (m) to the nearest centimetre (cm) using practice equipment. Weight was measured in kilograms (kg) to the nearest 0.1kg using weighing scales provided by the PRIMROSE research programme. Research nurses entered this information into Sealed Envelope, which then populated BMI. The calculation was:

\[
\frac{\text{Weight (kg)}}{[\text{Height (m)}]^2}
\]
Cardiovascular disease risk

**QRISK®-2 2016**

QRISK®-2 2016 measured the risk of developing CVD in the next 10 years and was validated in two large UK based primary care databases (296, 297). The algorithm was based on:

a) Age, gender, ethnicity, postcode to determine Townsend score  
b) Smoking (non-smoker, ex-smoker, light smoker less than 10, moderate or 10-19 and heavy smoker 20 or over) and diabetes status (none, type 1, or type 2)  
c) History of angina or heart attack in a 1st degree relative aged <60  
d) Stage 4 or 5 chronic kidney disease  
e) Atrial fibrillation  
f) On blood pressure treatment  
g) Rheumatoid arthritis  
h) Cholesterol/HDL ratio  
i) Systolic blood pressure (mmHg)  
j) BMI (based on height in cm and weight in kg)

Each corresponded with different weights in the algorithm depending on the contribution to CVD risk. The total score represented a percentage, with a higher percentage indicating greater risk. Scores were calculated using the QRISK calculator (298). The calculator permitted leaving some responses blank if the data were not available and were substituted for average responses.

**Other health behavioural measures**

**Cigarette use**

Smoking status was determined by a researcher-administered questionnaire. Participants were asked if they were non-smokers, ex-smokers, light smokers (9 cigarettes or less a day), moderate smokers (between 10-19 cigarettes a day) or heavy smokers (20 or more cigarettes a day). The number of cigarettes smoked per

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2 QRISK® is a registered trademark of the University of Nottingham and EMIS.
day was also determined. For this continuous measure, I replaced figures that were missing with a value of ‘0’ if participants reported being non-smokers or ex-smokers.

**Alcohol Use Disorders Identification Test Consumption (AUDIT)**

AUDIT was developed by the World Health Organization (WHO) as a screening tool to identify self-reported excessive alcohol consumption (299). It was validated among people with schizophrenia, had demonstrated internal reliability and was validated internationally (299, 300). It was employed in primary care settings, drug users, the unemployed and people with low socioeconomic status (301). This was researcher administered and contained 10 questions regarding:

1) Alcohol consumption (frequency of drinking, typical quantity and frequency of heavy drinking),
2) Dependence symptoms (impaired control over drinking, increased salience of drinking, morning drinking)
3) Alcohol-related consequences (guilt after drinking, blackouts, alcohol-related injuries, others concerned about drinking)

The first section (‘AUDIT-C’) of AUDIT relates to alcohol consumption. Each question is scored on a scale of 0-4, which corresponds with units of alcohol, frequency by year, month, weeks and days or yes/no. Participants who scored five or more in the first section were then asked the remainder of the questions in the second section (dependence symptoms and alcohol-related consequences). The overall scores (ranging from 0-40) were derived by adding the scores for each section. Scores from the first section were classed as the overall score if less than five. The higher the overall score, the greater the risk of dependence and harmful drinking.

**Social support, mental wellbeing, and quality of life**

*The Medical Outcomes Study - Social Support Survey (MOS-SSS)*

The MOS-SSS was self-administered and measured the perceived availability of functional support (267). It demonstrated reliability and validity in a population of prisoners and participants with hypertension, diabetes, coronary heart disease and depression and was used in people with SMI (267, 302-304).
It measured how often various forms of support were available if necessary, including emotional, informational, tangible, affectionate support, and positive social interaction. Responses ranged from 1 (none of the time) to 5 (all of the time) and scores were then converted to represent a scale ranging from 0-100 using the following calculation where the observed score represented the average from all questions and the minimum possible score was 1 and the maximum 5:

$$100 \times \frac{\text{observed score} - \text{minimum possible score}}{\text{maximum possible score} - \text{minimum possible score}}$$

**The Warwick Edinburgh Mental Well Being Scale (WEMWBS)**

This was a self-administered measure and was validated in a primary care population, people with schizophrenia and students (305-307). It contained 14 questions covering positive affect (feelings of optimism, cheerfulness, relaxation), satisfying interpersonal relationships and positive functioning (energy, clear thinking, self-acceptance, personal development, competence and autonomy) (305). Scores ranged from 1 (none of the time) to 5 (all the time) and participants were asked to reflect on experiences over the past two weeks and select one option for each statement. The total was calculated, ranging from 14-70. The higher the score, the higher the level of mental wellbeing.

**Health-related quality of life: EQ-5D-5L**

EQ-5D-5L has been validated in six countries with people with CVD, respiratory disease, depression, diabetes, liver disease, personality disorders, arthritis and stroke (308). It comprises of 5 items measuring: mobility, self-care, usual activities, pain/discomfort and anxiety/depression (309). Each item has response options from 1-5 where 1 refers to not experiencing the problem to 5 unable/extreme. Participants were required to select one response for each item to represent how they felt at the time of completion. The responses (no problem to unable/extreme) corresponded with values that were derived and validated in a sample of participants in England reflecting the importance placed on specific aspects of health (309).

Participant responses were mapped to these values and used to calculate a single score for each participant which represented how good or bad each health state was on a scale anchored at 1 and 0. A score of 1 represents full health and 0 is equivalent
to mortality. Any score less than 0 represents a health state worse than mortality (309). The value of health state were calculated by adding the results from each domain using the following formula where 1 equalled full health:

\[ 1 - (\text{Mobility} + \text{Self care} + \text{Usual activities} + \text{Pain or discomfort} + \text{Anxiety or depression}) = \text{Total value of health state} \]

The possible total scores ranged from -0.285 to 1 and a greater score indicated a greater quality of life experienced.

4.4.5 Statistical analyses

All data were stored and analysed using Stata Version 16. I carried out descriptive analysis to summarise the characteristics of the sample. Following visual analysis of histograms, continuous data were summarised using the mean and standard deviation (SD) or median and interquartile range as applicable. Categorical/ binary data were summarised using frequencies (n) and percentages (%). I used univariable regression analyses followed by multivariable regression analyses to explore baseline exposures associated with outcome variables in both the main and supplementary analysis.

4.4.5.1 Main analysis

Univariable analysis

Histograms were used to assess the normality of primary and secondary outcomes and scatter plots to examine the linearity between continuous exposures and outcomes. Random effects univariable linear regression analysis was conducted, accounting for GP practice clustering as a random effect. Residual plots were created following modelling.

Missing data

Though there is no consensus for acceptable levels of missing data, it is also argued the proportion of missing data is less important than the reasoning (310, 311). For example, if higher CVD risk scores on the QRISK were associated with missing outcome data, it is likely that people who were more likely to be unwell were less likely
to take part or complete assessments. If this were unaccounted for in analysis, this could lead to distorted associations between QRISK and outcomes in the findings.

I accounted for missing data in the main analysis by including any factors associated with increased or reduced odds of missing outcomes in multivariable models that tested the association between baseline factors and change scores. The inclusion of these variables is thought to reduce the level of bias due to missing data in the sample and increase precision in the findings (312). Missingness of outcome data were explored using random effects logistic regression analysis testing the association between baseline characteristics and each of the missing outcomes (missing was coded 1, and not missing 0). Complete case analysis including participants with complete data from baseline to follow-up was conducted adjusting for factors associated with missingness of outcomes.

**Multivariable analysis**

I selected variables with a p-value of ≤0.25 in univariable models which were identified from a list of variables of potential interest based on literature on cross-sectional findings and rationale that factors could be plausibly related to the outcomes of interest. I entered these into random effects linear regression multivariable models accounting for GP practice as a random effect. This was based on evidence that the use of lower p-values such as 0.05 to inform variable selection may not succeed at detecting clinically important factors associated with outcomes in multivariable models (313).

Age and gender were entered into all multivariable models a priori regardless of p-values in univariable analysis and whether they were associated with missingness of outcomes. This was because multiple studies in this area had adjusted for these factors and research suggested these may be important (21, 73-76, 80, 87, 205). Following statistical modelling, residual plots were analysed.

The final multivariable regression models therefore included: age and gender, exposures meeting the p-value 0.25 threshold in univariable analyses and exposures associated with missingness of primary and secondary outcomes.

I further estimated multicollinearity in the models using variance inflation factor (VIF) analysis. Consensus regarding high VIF thresholds are mixed. However, it is
generally accepted that VIFs above 5 or 10 are problematic and variables should be removed to reduce the possibility of multicollinearity (314).

Sample size and power calculation

To avoid compromising statistical power, I applied the "one in ten rule" of thumb when entering variables into models. This is based on the notion that for every ten observations, one continuous/ binary variable could be entered into models (315). Categorical measures with three levels account for 2 degrees of freedom. There was a sample size of 280 for MET minutes, 281 for sitting scores, 285 for fruit and vegetable intake and 287 for all DINE outcomes at 12-month follow-up. Therefore, a maximum of 28 continuous/ binary variables could be included.

Sensitivity analysis

Following multivariable analysis, I conducted sensitivity analyses for each outcome to test the stability of the findings. I noticed a few change scores that appeared to be extreme scores/ outliers in histograms. Outliers may be true scores or due to measurement error, thereby distorting findings and leading to unreliable conclusions.

In a normal distribution 99.7% of values are expected to fall within 3 SDs of the mean (316). Scores above or below 3 SDs from the mean may be classified as outliers or extreme scores and I therefore identified outcome scores where this was the case.

I repeated the analyses detailed above, using random effects multivariable regression models to test the association between baseline exposures (using the same exposures identified previously) and all outcomes removing all potential extreme scores in each of the outcomes, to test the sensitivity of the findings. I analysed the distribution of the residuals to determine whether there were any differences between the original multivariable models and those without potential outliers.

4.4.5.2 Supplementary analysis

I explored baseline factors associated with dichotomous percentage change scores for primary outcomes (MET minutes and fruit and vegetable intake) using random effects univariable logistic regression analysis, accounting for GP practice clustering as a random effect. The number of variables to include in the models were calculated
using the lowest number of observations in the categories \((n=92\) for fruit and vegetable portions and \(n=44\) for IPAQ MET minutes). Using the one in ten rule, 9 continuous/binary variables could be included for fruit and vegetable intake and 4 for IPAQ MET minutes (315).

I conducted univariable logistic regression analysis with baseline variables, followed by random effects logistic regression multivariable analysis accounting for GP practice clustering. I included age and gender in all multivariable models based on the rationale described above. I selected further variables with a \(p\)-value of \(\leq 0.25\) in univariable models for inclusion in multivariable models. As there was limited statistical power, I prioritised the inclusion of variables with the lowest \(p\)-values in univariable analysis. Where variables were considered similar, I included the variable with the lowest \(p\)-value to avoid collinearity.

### 4.5 Results

#### 4.5.1 Sample follow-up and baseline characteristics

A total of 326 participants were recruited from 76 GP practices in England at baseline and 293 (89.8\%) were followed up at 12-months. Baseline participant characteristics are presented in Table 4-1. Participants had a mean age of 50 years old and around half were female (53\%). Participants were mostly from White (89\%) backgrounds, not in paid employment (72\%) and many were single (41\%).

The median BMI (31.1) fell within the 'obese' threshold category (30-39.9 kg/m\(^2\)) and the median QRISK score (7.5) was below the 10\% threshold recommended for the initiation of statins (131, 317). The most common physical health problem was a diagnosis of raised cholesterol (75\%) and approximately half of the participants were diagnosed with bipolar disorder (49\%). Most participants were either prescribed SGAs (59\%) and/or antidepressants (56\%). Participants were prescribed a median total of 4 medications.

Participants had a mean WEMWBS score of 42 (out of a possible 70) (SD 10.8), lower than the estimated national average of 49.9 (318). The mean MOS-SSS score was 56 (SD 25), approximately halfway between no support (minimum score of 0) and maximum support (maximum score of 100). EQ-5D-5L was approximately left skewed and the median was 0.81 (IQR 0.65–0.92), suggesting that participants mostly scored toward the higher end of the scale (maximum score of 1) rather than the lower end of
the scale (minimum score of -0.285), mostly indicating perceptions of higher rated health quality of life.\(^3\)

PA, diet, alcohol and smoking related continuous scores were approximately right skewed. Many participants (44%) were within the low PA category and spent a median time of 360 minutes per week sitting. Many participants also met the low fat (48%) and fibre (48%) categories and most consumed less than five fruit and vegetables per day (69%). The median AUDIT score was 2, suggesting a lower risk of hazardous alcohol use/dependency but almost half classed themselves as smokers (49%).

### Table 4-1 Baseline sample characteristics

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age mean (SD)</strong></td>
<td>50 (10)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>154/326 (47%)</td>
</tr>
<tr>
<td>Female</td>
<td>172/326 (53%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>289/325 (89%)</td>
</tr>
<tr>
<td>Black</td>
<td>16/325 (5%)</td>
</tr>
<tr>
<td>Asian</td>
<td>10/325 (3%)</td>
</tr>
<tr>
<td>Other</td>
<td>10/325 (3%)</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
</tr>
<tr>
<td>Not in paid employment</td>
<td>218/302 (72%)</td>
</tr>
<tr>
<td>In paid employment</td>
<td>84/302 (28%)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>133/324 (41%)</td>
</tr>
<tr>
<td>Married/cohabiting/civil partners</td>
<td>123/324 (38%)</td>
</tr>
<tr>
<td>Separated/ divorced</td>
<td>59/324 (18%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>9/324 (3%)</td>
</tr>
<tr>
<td><strong>BMI (kg/m²) median (IQR)</strong></td>
<td>31.1 (28.4 – 35.1)</td>
</tr>
<tr>
<td><strong>CVD risk (%) median (IQR)</strong> QRISK 2-2016</td>
<td>7.5 (3.6 – 14.4)</td>
</tr>
<tr>
<td><strong>Physical Health Diagnoses (in the last 5 years)</strong></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>32/326 (10%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>76/326 (23%)</td>
</tr>
<tr>
<td>Raised cholesterol</td>
<td>243/326 (75%)</td>
</tr>
<tr>
<td><strong>Mental health diagnosis</strong></td>
<td></td>
</tr>
<tr>
<td>Schizophrenia or schizoaffective disorder</td>
<td>105/326 (32%)</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>159/326 (49%)</td>
</tr>
<tr>
<td>Other psychoses</td>
<td>62/326 (19%)</td>
</tr>
</tbody>
</table>

\(^3\) The data reported in this paragraph are not displayed in Table 4-1 to reduce repetition.
## Medication Prescriptions

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mental Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-generation antipsychotic</td>
<td>43/326</td>
<td>13%</td>
</tr>
<tr>
<td>Second-generation antipsychotic</td>
<td>192/326</td>
<td>59%</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>182/326</td>
<td>56%</td>
</tr>
</tbody>
</table>

| **Physical Health**           |       |            |
| Antihypertensive              | 93/326| 29%        |
| Statins                       | 63/326| 19%        |
| Diabetes drug                 | 33/326| 10%        |

| **Total (n=326)**             |       |            |
| Median (IQR)                  | 4     | (2–7)      |

## Physical Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPAQ Score</strong></td>
<td></td>
</tr>
<tr>
<td>Total MET (min) (n=320) median (IQR)</td>
<td>1344 (371 – 3465)</td>
</tr>
<tr>
<td>Sitting (min) (n=322) median (IQR)</td>
<td>360 (240 – 480)</td>
</tr>
</tbody>
</table>

**IPAQ MET mins categories**
- Low: 140/320 (44%)
- Moderate: 92/320 (29%)
- High: 88/320 (27%)

## Diet

<table>
<thead>
<tr>
<th>Category</th>
<th>Median (IQR)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total fruit and vegetable portions (per day) (n=326) median (IQR)</td>
<td>3 (2 – 5)</td>
<td></td>
</tr>
<tr>
<td>Less than five portions/day</td>
<td>225/326 (69%)</td>
<td></td>
</tr>
<tr>
<td>Five or more portions/day</td>
<td>101/326 (31%)</td>
<td></td>
</tr>
</tbody>
</table>

**DINE Score (n=326)**
- Total Fat median (IQR): 30 (22 – 38)
- Fibre median (IQR): 30 (22 – 39)

**DINE Categories**
- **Total Fat**
  - Low: 155/326 (48%)
  - Moderate: 102/326 (31%)
  - High: 69/326 (21%)
- **Fibre**
  - Low: 156/326 (48%)
  - Moderate: 100/326 (30%)
  - High: 70/326 (22%)

## Alcohol

<table>
<thead>
<tr>
<th>Category</th>
<th>Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIT score (n=326) median (IQR)</td>
<td>2 (0 – 7)</td>
</tr>
</tbody>
</table>
4.5.2 Main analysis

4.5.2.1 PA and diet continuous change score outcomes: descriptive statistics

Change scores for all outcomes were approximately normally distributed. Total MET minutes, fruit and vegetable portions and sitting time on average increased from baseline to follow-up (see Table 4-2). On average, total fat and fibre decreased. However, SDs were large suggesting a large degree of individual variation.

Table 4-2 Descriptive statistics for PA and diet change score outcomes

<table>
<thead>
<tr>
<th>Outcome change scores</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Total MET (mins) (n=280)</td>
<td>422.8 (5463)</td>
</tr>
<tr>
<td>Total fruit and vegetable portions (n=285)</td>
<td>0.45 (2.6)</td>
</tr>
<tr>
<td><strong>Secondary Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Total time spent sitting (mins) (n=281)</td>
<td>5.8 (973.2)</td>
</tr>
<tr>
<td>Total fat (n=287)</td>
<td>-0.89 (10.1)</td>
</tr>
<tr>
<td>Fibre (n=287)</td>
<td>-0.34 (11.8)</td>
</tr>
</tbody>
</table>

4.5.2.2 Baseline factors associated with PA and diet continuous change score outcomes: random effects univariable linear regression analyses

Regression coefficients, 95% CI intervals and p-values from univariable linear regression analyses are reported in Table 4-3. Few baseline factors were significantly associated with any of the change scores at the <0.05 p-value threshold.
Primary outcomes: MET minutes and fruit and vegetable change scores

Being separated, divorced or in a civil relationship (vs. being single: $\beta = -2280.82$) and QRISK scores (per one-unit increase: $\beta = -74.05$) were significantly associated with decreases in MET minutes change scores. A diagnosis of other psychosis (vs. schizophrenia/schizoaffective disorder: $\beta = 2136.12$) was significantly associated with an increase in MET minutes change scores. Increases in age, total number of medications prescribed, fruit and vegetable intake, AUDIT scores and a diagnosis of diabetes were associated with decreases in MET minutes change scores at the >0.05 to 0.25 $p$-value threshold. Being in paid employment and increases in EQ-5D-5L were associated with increases in MET minutes at the >0.05 to 0.25 $p$-value threshold.

The total number of medications prescribed (per one-unit increase: $\beta = -0.07$) was significantly associated with a decrease in fruit and vegetable change scores. MOS-SSS scores (per one-unit increase: $\beta = 0.01$) were significantly associated with an increase in fruit and vegetable change scores. Increases in EQ-5D-5L scores was associated with increases in fruit and vegetable change scores at the >0.05 to 0.25 $p$-value threshold.

Secondary outcomes: Sitting minutes, total fat and fibre change scores

There were no significant associations with sitting time change scores at $p<0.05$. Antidepressant prescriptions and having a diagnosis of raised cholesterol were associated with decreases in sitting time change scores at the >0.05 to 0.25 $p$-value threshold. Diagnoses of diabetes, increases in QRISK, WEMWBS and EQ-5D-5L scores were associated increases in sitting time change scores at the >0.05 to 0.25 $p$-value threshold.

Being prescribed first generation antipsychotics (vs. not prescribed: $\beta = -3.86$) and a diagnosis of diabetes (vs. not diagnosed: $\beta = -3.80$) were significantly associated with decreases in fat change scores. Increases in: MOS-SSS, QRISK scores and BMI were associated with decreases in fat change scores at the >0.05 to 0.25 $p$-value threshold. Increases in AUDIT scores and cigarette use were associated with increases in fat change scores at the >0.05 to 0.25 $p$-value threshold.

There were no significant associations with fibre change scores at $p<0.05$. Being in paid employment, being diagnosed with hypertension and an increase in IPAQ MET
minutes was associated with a decrease in fibre change scores at the >0.05 to 0.25 \(p\)-value threshold.

**Table 4-3** Associations between baseline factors and continuous change score outcomes using random effects univariable linear regression analyses

<table>
<thead>
<tr>
<th>Possible explanatory variables</th>
<th>Primary Outcomes</th>
<th>Secondary Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MET minutes change score</td>
<td>Fruit and vegetable portions change score</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>-61.28 (-126.38 to 0.065*)</td>
<td>-0.00 (-0.03 to 0.02)</td>
</tr>
<tr>
<td><strong>Sex (ref. male)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-581.03 (-1861.67 to 699.59)</td>
<td>-0.26 (-0.86 to 0.34)</td>
</tr>
<tr>
<td><strong>Employment (ref. unpaid employment)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid employment</td>
<td>1143.65 (-266.70 to 2554.00)</td>
<td>0.35 (-0.32 to 1.03)</td>
</tr>
<tr>
<td><strong>Marital status (ref. single)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabiting/in civil partnership</td>
<td>-386.15 (-1790.60 to 1018.30)</td>
<td>0.46 (-0.20 to 1.17)</td>
</tr>
<tr>
<td>Separated/divorced/civil partnership dissolved</td>
<td>-2280.82 (-4098.90 to -462.75)</td>
<td>0.42 (-0.43 to 1.29)</td>
</tr>
<tr>
<td>Widowed</td>
<td>-1794.37 (-5447.62 to 1858.87)</td>
<td>-0.42 (-2.18 to 1.32)</td>
</tr>
<tr>
<td>Overall (p=0.080^*)</td>
<td>Overall (p=0.446)</td>
<td>Overall (p=0.649)</td>
</tr>
<tr>
<td>Mental health diagnosis</td>
<td>Overall</td>
<td>Overall $p=0.039^*$</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>---------</td>
<td>---------------------</td>
</tr>
<tr>
<td>(ref. schizophrenia/schizoaffective disorder)</td>
<td></td>
<td>0.534</td>
</tr>
<tr>
<td><strong>Bipolar disorder</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>76.46</td>
<td>-0.37</td>
</tr>
<tr>
<td></td>
<td>(-1352.26 to -1.05 to 0.30; to -348.22 to 0.281 to 163.74; to 0.916 to 0.480)</td>
<td></td>
</tr>
<tr>
<td><strong>Other psychosis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2136.12</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(312.27 to -0.97 to 0.77; to -221.81 to 0.820 to 433.09; to 3959.96 to 0.527)</td>
<td></td>
</tr>
<tr>
<td><strong>First-generation antipsychotic prescription</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribed</td>
<td>-560.94</td>
<td>-0.09</td>
</tr>
<tr>
<td></td>
<td>(-2411.48 to -0.95 to 0.77; to -157.54 to 0.835 to 496.75; to 1289.59 to 0.310)</td>
<td></td>
</tr>
<tr>
<td><strong>Second-generation antipsychotic prescription</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribed</td>
<td>112.72</td>
<td>-0.31</td>
</tr>
<tr>
<td></td>
<td>(-1187.48 to -0.92 to 0.29; to -141.09 to 0.315 to 317.40; to 1412.93 to 0.451)</td>
<td></td>
</tr>
<tr>
<td><strong>Antidepressant prescription</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribed</td>
<td>-206.14</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(-1485.33 to -0.50 to 0.69; to -391.24 to 0.752 to 59.62; to 1073.03 to 0.451)</td>
<td></td>
</tr>
<tr>
<td><strong>Medication total</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-121.84</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(-252.18 to -0.13 to 0.01; to -22.07 to 8.49; to -0.18 to 23.90; to 0.005 to 0.29;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.067*</td>
</tr>
<tr>
<td><strong>Diagnosis of hypertension in last 5 years (ref. not diagnosed)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosed</td>
<td>104.89</td>
<td>-0.14</td>
</tr>
<tr>
<td></td>
<td>(-1366.25 to -0.84 to 0.55; to -208.94 to 0.686 to 315.65; to 1576.04 to 0.690)</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnosis of diabetes in last 5 years (ref. not diagnosed)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosed</td>
<td>-2028.17</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>(-4072.57 to -0.75 to 1.20; to -59.53 to 0.052 to -59.53; to 16.23 to 0.649)</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the 0.05 level.
<table>
<thead>
<tr>
<th><strong>Diagnosis raised cholesterol in last 5 years (ref. not diagnosed)</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosed</td>
<td>337.72</td>
<td>0.05</td>
<td>-189.58</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>(-1179.28 to 1854.73)</td>
<td>(-0.65 to 0.874)</td>
<td>(-461.03 to 0.171*)</td>
<td>(1.20 to 0.274)</td>
</tr>
<tr>
<td></td>
<td>0.11</td>
<td>0.099*</td>
<td>0.663</td>
<td>0.944</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Diet</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DINE Fat score</strong></td>
<td>-17.71</td>
<td>-</td>
<td>4.60</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-75.33 to 39.89)</td>
<td>(-5.55 to 0.374)</td>
<td>(14.76; to 0.00)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td><strong>DINE Fibre score</strong></td>
<td>-21.25</td>
<td>-</td>
<td>0.08</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-71.30 to 28.78)</td>
<td>(-8.79 to 0.984)</td>
<td>(8.97; to 0.00)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td><strong>Fruit and vegetable intake (portions per day)</strong></td>
<td>-153.71</td>
<td>-</td>
<td>9.52</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-396.23 to 88.81)</td>
<td>(-33.43 to 0.214*)</td>
<td>(to 52.48; 0.664)</td>
<td>(to 0.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Physical activity</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPAQ MET minutes</strong></td>
<td>-</td>
<td>0.00</td>
<td>-0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td></td>
<td>(-0.00 to 0.00)</td>
<td>(-0.00 to 0.00)</td>
<td>(0.00; to 0.847)</td>
<td>(to 0.438)</td>
</tr>
<tr>
<td><strong>IPAQ Sitting time</strong></td>
<td>-</td>
<td>0.00</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(-0.00 to 0.00)</td>
<td>(-0.00 to 0.00)</td>
<td>(0.00; to 0.00)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>0.249</strong>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.547</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.421</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Alcohol</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUDIT score</strong></td>
<td>-58.36</td>
<td>0.00</td>
<td>-5.54</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(-152.16 to 35.42)</td>
<td>(-0.03 to 0.04)</td>
<td>(-22.17 to 11.08)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td></td>
<td>0.13</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Smoking</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cigarette use</strong></td>
<td>-14.81</td>
<td>-0.00</td>
<td>-1.42</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(-73.34 to 43.70)</td>
<td>(-0.03 to 0.02)</td>
<td>(-11.60 to 8.76)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CVD risk</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QRISK-2-2016 score</strong></td>
<td>-74.05</td>
<td>0.01</td>
<td>8.48</td>
<td>-0.06</td>
</tr>
<tr>
<td></td>
<td>(-134.48 to 64.41)</td>
<td>(-0.01 to 0.05)</td>
<td>(-2.34 to 26.83)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td></td>
<td>-0.06</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>BMI</strong></th>
<th>-39.73</th>
<th>0.00</th>
<th>8.28</th>
<th>-0.13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-143.89 to 64.41)</td>
<td>(-0.03 to 0.05)</td>
<td>(-10.26 to 26.83)</td>
<td>(to 0.00)</td>
</tr>
<tr>
<td></td>
<td>-0.13</td>
<td>-0.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

135
### Psychological wellbeing

<table>
<thead>
<tr>
<th>Psychological wellbeing</th>
<th>WEMWBS score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-8.04</td>
<td>8.52</td>
</tr>
<tr>
<td></td>
<td>(-67.69 to -0.02)</td>
<td>-2.02 to</td>
</tr>
<tr>
<td></td>
<td>51.59; 0.02; 19.08; 0.05;</td>
<td>to 0.09;</td>
</tr>
</tbody>
</table>

### Social support

<table>
<thead>
<tr>
<th>Social support</th>
<th>MOS-SSS score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-10.84</td>
<td>-0.25</td>
</tr>
<tr>
<td></td>
<td>(-36.25 to 0.00)</td>
<td>(-4.74 to</td>
</tr>
<tr>
<td></td>
<td>14.36; 0.02; 4.23; 0.00;</td>
<td>to 0.05;</td>
</tr>
</tbody>
</table>

### Health-related quality of life

<table>
<thead>
<tr>
<th>Health-related quality of life</th>
<th>EQ-5D-5L score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2235.66</td>
<td>1.17</td>
</tr>
<tr>
<td></td>
<td>(-563.70 to -0.12)</td>
<td>(-112.36 to</td>
</tr>
<tr>
<td></td>
<td>to 2.48; to 3.15; to 6.91;</td>
<td>5035.03; <strong>0.077</strong>; 880.00; 0.453;</td>
</tr>
<tr>
<td></td>
<td><strong>0.118</strong>;</td>
<td><strong>0.129</strong></td>
</tr>
</tbody>
</table>

- association not explored.
* p-values in **bold** indicate ≤0.25 threshold.

### 4.5.2.3 Missing data

The proportion of missing data for the change score outcomes was below 15% (MET minutes=14.1% (47/326), fruit and vegetable= 12.8% (41/326), sitting minutes=13.8% (45/326), total fat=11.9% (39/326) and fibre=11.9% (39/326)). The data from univariable logistic regression analysis exploring baseline factors associated with missing outcome data for each of the outcomes can be found in Appendix H.

A diagnosis of hypertension (vs. not diagnosed: OR=0.35, 95% CI=0.13 to 0.95, \( p=0.039 \)), second-generation antipsychotic prescriptions (vs. not prescribed: OR=0.48, 95% CI=0.25 to 0.90, \( p=0.024 \)), WEMWBS scores (per-unit increase: OR=0.96, 95% CI=0.93 to 0.99, \( p=0.021 \)) and EQ-5D-5DL scores (per 0.14 unit increase: OR=0.03, 95% CI= 0.00 to 0.09, \( p=0.050 \)) were associated with lower odds of missing MET minute change scores. A diagnosis of hypertension (vs. not diagnosed: OR=0.36, 95% CI=0.13 to 0.97, \( p=0.044 \)) was also associated with lower odds of missing sitting minutes change scores. These variables were therefore included in relevant multivariable models reported below. None of the other factors were associated with missing outcomes.

---

\(^4\) The coefficient and confidence intervals were divided by 10 to transform this into a 0.1 unit change as EQ-5D-5L is one unit long with scores ranging from -0.285 to 1.
4.5.2.4 Baseline factors associated with PA and diet continuous change score outcomes: random effects multivariable linear regression analyses

Following univariable analyses, 14 variables were identified for inclusion in the multivariable model for MET minutes change score outcome, 6 for fruit and vegetable, 9 for sitting time, 9 for total fat and 5 for fibre. The VIF values for all models were below three suggesting a low risk of multicollinearity between the variables in the models. The findings of the associations between baseline factors included in models and primary and secondary outcomes using multivariable analysis can be found in Table 4-4.

Primary outcomes: MET minutes and fruit and vegetable change scores

After adjusting for all relevant variables, being separated, divorced or in a civil partnership that had dissolved (vs. being single: $\beta$ = -1903.13), fruit and vegetable portions per day (per one-portion increase: $\beta$ = -278.26) and AUDIT scores (per point-increase: -141.05) were significantly associated with decreases in MET minutes change scores.

None of the variables were significantly associated with fruit and vegetable change scores following adjustment of relevant variables.

Secondary outcomes: Sitting minutes, total fat and fibre change scores

After adjusting for all variables, none of the variables were associated with sitting time, total fat or fibre change scores.
Table 4-4 Associations between baseline factors and PA and diet continuous change score outcomes using random effects multivariable linear regression analyses

<table>
<thead>
<tr>
<th>Possible explanatory variables</th>
<th>Outcomes</th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MET minutes change score</td>
<td>Fruit and vegetable portions change score</td>
<td>Sitting minutes change score</td>
</tr>
<tr>
<td>Age</td>
<td>14.49 (-72.65 to 101.65; 0.744)</td>
<td>-0.01 (-0.04 to 0.01; 0.430)</td>
<td>1.23 (-14.19 to 16.67; 0.875)</td>
</tr>
<tr>
<td>Sex (ref. male)</td>
<td>14.49 (-72.65 to 101.65; 0.744)</td>
<td>-0.01 (-0.04 to 0.01; 0.430)</td>
<td>1.23 (-14.19 to 16.67; 0.875)</td>
</tr>
<tr>
<td>Female</td>
<td>-362.77 (-1800.62 to 1075.08; 0.621)</td>
<td>-0.28 (-0.86 to 0.29; 0.340)</td>
<td>104.07 (-149.38 to 357.53; 0.421)</td>
</tr>
<tr>
<td>Employment (ref. unpaid employment)</td>
<td>810.19 (-726.45 to 2346.84; 0.301)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Married/cohabiting/in civil partnership</td>
<td>-344.22 (-1902.11 to 1213.65; 0.665)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Separated/divorced/civil partnership dissolved</td>
<td>-1903.13 (-3797.45 to -8.80; 0.049*)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Widowed</td>
<td>-2375.11 (-6294.36 to 1544.13; 0.235)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mental health diagnosis (ref. schizophrenia/schizoaffective disorder)</td>
<td>Bipolar disorder</td>
<td>501.24 (-1124.72 to 2127.21; 0.546)</td>
<td>-</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Prescribed</td>
<td>95% CI (90%)</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td><strong>Other psychosis</strong></td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>First-generation antipsychotic prescription</strong></td>
<td>-3.12</td>
<td>(-6.48 to 0.22; 0.068)</td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Second-generation antipsychotic prescription</strong></td>
<td>-308.74†</td>
<td>(-1645.57 to 1028.09; 0.651)</td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Antidepressant prescription</strong></td>
<td>-124.15</td>
<td>(-355.52 to 107.22; 0.293)</td>
<td></td>
</tr>
<tr>
<td>(ref. not prescribed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Medication total</strong></td>
<td>-50.77</td>
<td>(-199.57 to 98.03; 0.504)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.06</td>
<td>(-0.12 to 0.00; 0.059)</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnosis of hypertension in last 5 years (ref. not diagnosed)</strong></td>
<td>-1.93</td>
<td>(-5.30 to 1.44; 0.263)</td>
<td></td>
</tr>
<tr>
<td>(Diagnosed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1279.20†</td>
<td>(-372.23 to 2930.63; 0.129)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-54.72†</td>
<td>(-351.88 to 242.42; 0.718)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnosis of diabetes in last 5 years (ref. not diagnosed)</strong></td>
<td>-3.33</td>
<td>(-7.86 to 1.19; 0.149)</td>
<td></td>
</tr>
<tr>
<td>(Diagnosed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2201.01</td>
<td>(-4695.79 to 293.75; 0.084)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180.99</td>
<td>(-276.88 to 638.88; 0.438)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Diagnosis raised cholesterol in last 5 years (ref. not diagnosed)</strong></td>
<td>-212.24</td>
<td>(-489.14 to 64.66; 0.133)</td>
<td></td>
</tr>
<tr>
<td>(Diagnosed)</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>DINE Fat score</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DINE Fibre score</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fruit and vegetable intake</td>
<td>-278.26</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(portions per day)</td>
<td>(-554.04 to -2.48; 0.048*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical activity</th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IPAQ MET minutes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.00 (-0.00 to 0.00; 0.009*)</td>
</tr>
<tr>
<td>IPAAQ Sitting time</td>
<td>-0.00</td>
<td>-</td>
<td>-</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>(-0.00 to 0.00; 0.212)</td>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIT score</td>
<td>-141.05</td>
<td>-</td>
<td>0.07</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-247.23 to -34.86; 0.009*)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking</th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette use</td>
<td>-</td>
<td>-</td>
<td>0.07</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-0.04 to 0.18; 0.214)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CVD risk</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>QRISK-2016 score</td>
<td>-30.59</td>
<td>-</td>
<td>0.04</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-131.95 to 70.77; 0.554)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BMI</th>
<th></th>
<th>-</th>
<th>-0.12</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-0.32 to 0.07; 0.233)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychological wellbeing</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WEMWBS score</td>
<td>-32.55‡</td>
<td>-</td>
<td>2.56</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-102.04 to 36.92; 0.358)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social support</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MOS-SSS score</td>
<td>-0.02</td>
<td>-</td>
<td>-0.02</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-0.00 to 0.02; 0.057)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health-related quality of life</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ-5D-5L score</td>
<td>2355.21</td>
<td>0.55</td>
<td>306.66</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-858.07 to 5568.49; 0.151)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- variable not entered into model.
‡ Corresponding explanatory variable associated with corresponding missing outcome data and therefore included in model.
*p-values in bold <0.05
4.5.2.5 Sensitivity analysis: removal of outliers

The results of the sensitivity analysis for each of the outcomes are reported in Appendix I. Random effects multivariable analyses were repeated for each of the outcomes using the same baseline factors omitting change score outliers.

Primary outcomes: MET minutes and fruit and vegetable change scores

Following removal of seven outlier MET minutes change scores, being separated, divorced or in a civil partnership ($\beta=-1425.21$, 95% CI=-2933.95 to 83.52, $p=0.064$) and fruit and vegetable intake ($\beta=-218.80$, 95% CI=-438.85 to 1.23, $p=0.051$) were no longer significantly associated with MET minutes change scores. The association between AUDIT score and MET minutes change scores was attenuated but remained statistically significant ($\beta=-97.51$, 95% CI=-182.43 to -12.60, $p=0.024$). After removing eight outlier fruit and vegetable change scores, each additional point increase in MOS-SSS scores was associated with a 0.01 increase in fruit and vegetable change scores (95% CI=0.00 to 0.02, $p=0.017$), and became statistically significant.

Secondary outcomes: Sitting minutes, total fat and fibre change scores

After removing eight outlier sitting minutes change scores, all the variables remained not significantly associated with sitting time change scores. Following the removal of two outlier change scores for total fat, being female (vs. being male) was now significantly associated with a 2.52 point increase in total fat score (95% CI=0.06 to 4.97, $p=0.044$) and being prescribed FGAs was now significantly associated with a 3.52 point decrease in total fat change scores (95% CI=-6.75 to -0.28, $p=0.033$). When I removed two outlier fibre change scores, there remained no statistically significant associations between any of the variables and fibre change scores.

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5 Change scores three SDs above and/or below the mean were removed. See section 4.4.5.1 "Sensitivity analysis" for further details.
4.5.3 Supplementary analysis

4.5.3.1 MET minutes (PA) and fruit and vegetable binary primary outcomes\(^6\): descriptive statistics

Out of 124 participants meeting the ‘low’ MET minutes category at baseline, 65% (n=80) showed a ≥10% increase in MET minutes from baseline to follow-up. From 197 participants consuming less than five fruit and vegetables per day at baseline, 53% (n=105) showed a ≥10% increase in consumption of fruit and vegetable portions per day.

4.5.3.2 Baseline factors associated with MET minutes (PA) and fruit and vegetable binary primary outcomes\(^6\): random effects univariable logistic regression analyses

The results of the univariable analysis for each of the outcomes are reported in Appendix J. Being in paid employment (vs. unpaid employment: OR=5.68, 95% CI=1.24 to 25.97, \(p=0.025\)) was significantly associated with an increased odds of a ≥10% increase in MET minutes, whilst fibre scores (per one-unit increase: OR=0.96, 95% CI=0.93 to 0.99, \(p=0.014\)) were significantly associated with a reduced odds of ≥10% increase in MET minutes from baseline to follow-up. Increases in: fruit and vegetable portions, BMI, total number of medications prescribed, being widowed and a diagnosis of other psychosis were also associated with a reduced odds of a ≥10% increase in MET minutes at the >0.05 to 0.25 \(p\)-value level. Increases in EQ-5D-5L scores were associated with an increased odds of ≥10% increase in MET minutes at the >0.05 to 0.25 \(p\)-value threshold.

None of the variables were associated with fruit and vegetable binary outcomes at \(p<0.05\). Increases in WEMWBS scores, MET minutes, antidepressant prescription and being female were associated with increased odds of a ≥10% increase in fruit and vegetable portions at the >0.05 to 0.25 \(p\)-value threshold. Increases in sitting time were associated with reduced odds of a ≥10% increase in fruit and vegetable portions at the >0.05 to 0.25 \(p\)-value threshold.

\(^6\) People with low activity or consuming less than five fruit and vegetables at baseline who changed (increased) by 10% or more compared with those who changed <10% over 12 months
4.5.3.3 Baseline factors associated with MET minutes (PA) and fruit and vegetable binary primary outcomes: random effects multivariable logistic regression analyses

The results of the multivariable analysis for each of the outcomes are reported in Appendix K. Following univariable analysis only four variables were included in the multivariable model for the outcome MET minutes due to limited statistical power. Being in paid employment (vs. unpaid employment: OR=7.72, 95% CI=1.59 to 37.35, p=0.011) was significantly associated with increased odds of a ≥10% increase in MET minutes from baseline to follow-up and this association became stronger in the multivariable model. Fibre scores (per one-unit increase: OR=0.95, 95% CI=0.92 to 0.99, p=0.018) were significantly associated with a reduced odds of a ≥10% increase in MET minutes from baseline.

Following univariable analyses, seven variables were included in the multivariable model for the outcome fruit and vegetable intake. I included sitting time in the model but not MET minutes as these two variables were related and sitting time was more strongly associated with the outcome in univariable analyses. None of the variables were however statistically associated with the fruit and vegetable binary outcomes.

4.6 Discussion

4.6.1 Summary of key findings

At baseline the sample had several CVD risk factors including raised cholesterol (75%), hypertension (23%) diabetes (10%) and a median BMI (31.1) classed as ‘obese’ (317). Participants almost reached CVD risk (median QRISK=7.5%) thresholds (10%) requiring statin medications (131). Many participants demonstrated poor diet and low PA, meeting ‘low’ PA thresholds on the IPAQ (44%), consuming less than five fruit and vegetables per day (69%) and meeting ‘low’ fibre intake thresholds on the DINE (48%). Almost half (49%) were also smokers.

Between baseline and follow-up, PA levels on average improved by 422.8 MET minutes (per week) and fruit and vegetable intake improved by a small amount (0.45 more portions per day). The time spent sitting increased on average by 5.8 minutes per week. Fat intake improved on average by a small amount (decreased by 0.89) whilst fibre intake worsened on average by a small amount (decreased by 0.34) per day/week. However, there was a large degree of individual variation, with some
participants improving and others worsening in all outcomes. There was little evidence that baseline factors were consistently associated with changes in diet and PA. The only consistent finding from multivariable analysis was that higher scores on the AUDIT (indicating hazardous or harmful drinking patterns) predicted decreasing activity level from baseline to follow-up.

The supplementary analysis suggested that most participants who had low levels of PA at baseline (65%) improved their total activity by ≥10% and around half who were consuming less than five fruit and vegetables per day at baseline (53%) improved their fruit and vegetable intake by ≥10%. The multivariable analysis suggested that being in employment was associated with ≥10% increases in total PA and conversely increases in fibre scores were associated with a reduced odds of a ≥10% increase in total PA from baseline to follow-up. None of the factors were associated with ≥10% increases in fruit and vegetable consumption.

### 4.6.2 Comparison of findings to other literature

There are a range of potential explanations for these findings. In a cross-sectional study of participants with SMI, 61% wanted to do more PA (76). In the overall sample, MET minutes on average increased by 422.8, fruit and vegetable consumption increased and total fat intake reduced by small amounts. In the supplementary analysis, the majority (65%) of participants meeting low PA thresholds at baseline increased their activity by ≥10% and in those consuming less than five fruit and vegetable portions per day at baseline, around half increased their intake by ≥10% (53%). These findings support that overall people with SMI are capable and willing to change their PA levels and aspects of their diet even if the changes are small. Research in the general population suggests that even small increases PA in inactive individuals could benefit health and the more fruit and vegetables consumed, the greater the health benefits (289, 290). This also challenges the basis of some negative HCP attitudes toward people with SMI and their capability to address physical health related issues (35, 57, 93, 100, 107).

I found that harmful/hazardous drinking at baseline was associated with reduced PA 12-months later in the main analysis. Harmful alcohol use over time can have long-term psychological and physical effects including brain damage, cognitive impairment, mobility impairment due to weakened bones and other organ damage (319). Experiences of these factors may have in turn reduced the amount of PA participants
were able to take over time in the present study, suggesting that targeting harmful alcohol use early may be important particularly given its addictive nature. This finding was inconsistent with cross-sectional research which showed no association between alcohol and PA (76, 87). The differences between findings may be explained by the use of different measures. The present study measured alcohol dependence risk/hazardous and harmful use rather than whether participants consumed alcohol, or the amount consumed. Alcohol dependence risk/hazardous and harmful drinking was assessed through frequency of intake, dependence symptoms and alcohol-related consequences and therefore covered more factors.

The finding that being separated, divorced or in a civil partnership was associated with a worsening activity level (a decrease in MET minutes change) from baseline to follow-up disappeared in the main analysis when outliers were removed. Other cross-sectional work similarly showed no association between marital status and PA in people with SMI and it is possible that the original findings in the present study may have been explained by outliers (87). Alternatively, removing outliers may have reduced the statistical power to find a significant effect. This was exploratory analysis and further investigation in studies with larger samples is needed. It is possible that the operationalisation of marital status (dichotomised into married/cohabiting or other) in other studies may have explained the lack of findings. This lacks distinction between being separated and single; the experience of detaching from a spouse may play a role in PA participation. Research conducted in the general population showed lower life satisfaction among those who were divorced or separated which was associated with lower PA levels two years later (320). This may be particularly important in people with SMI who may be more vulnerable, less resilient and may be more affected by the experience of separating from a spouse (10).

Participants consuming less than five and two or less fruit or fruit and vegetables in two cross-sectional studies were likely to do less regular or low PA (76, 87). In contrast, higher fruit and vegetable consumption at baseline was associated with worsening (a decrease in MET minutes scores) PA levels from baseline to follow-up in the main analysis. However, this finding may have been driven by extreme values as this effect disappeared in the sensitivity analysis after removing outliers. Similarly, supplementary analysis also suggested that in participants meeting low PA levels at baseline, higher fibre intake at baseline was associated with a 5% reduction in the odds of increasing PA by ≥10% from baseline to follow-up. These findings may have occurred by chance and should be interpreted with caution. Further investigation
would be required in a larger sample with robust measures to determine the replicability of the findings.

Cross-sectional work has mostly demonstrated that older age, being female, unemployed, higher BMI, in some cases antipsychotic and antidepressant medications were associated with less vigorous or less PA (73, 75, 76, 87, 205). There was no association between these factors and change in PA levels over time in my main analysis. However, there was an association between increases in PA (≥10% increases in MET minutes) from baseline to follow-up and being in paid employment in those meeting low PA thresholds at baseline in the supplementary analysis, but the confidence intervals were large. Possible explanations for this finding may include greater financial stability and therefore access to PA related resources. However, as this was supplementary analysis with a small sample and the finding contained large confidence intervals, further investigation is needed.

Systematic reviews have shown no cross-sectional associations between age, BMI, smoking and antipsychotic medications and sedentary behaviours (SBs) in people with SMI, which is consistent with the present study findings (73, 205). Only one systematic review reported that older age was associated with higher levels of SB (74). It is possible that the present study lacked enough statistical power to detect such effects. Sitting time was also used as a proxy for SB which is limited. Other studies use broader definitions of SB including ≤1.5 METs whilst sitting or reclining during the waking hours. It is therefore possible that this did not provide an accurate reflection of SB.

Previous cross-sectional work reports conflicting findings regarding the association between demographic, health behavioural factors and fruit and vegetable, fat and fibre intake (21, 192). Similarly, there was no association between any of these variables and fruit and vegetable, fibre or total fat change scores in the main analysis or the binary fruit and vegetable outcome in the supplementary analysis. The finding of higher social support and fruit and vegetable increase in the main analysis following sensitivity analysis was very weak and unlikely to be clinically significant. It is unclear why FGAs were associated with a decrease in total fat intake in the main analysis following sensitivity analysis. It may be that FGAs are less likely to affect appetite as research suggests that some SGAs rather than FGAs were associated with increased weight gain and metabolic syndrome (18, 20). However, stronger evidence is needed to support the present study findings.
4.6.3  Strengths and limitations

4.6.3.1  Research value

To my knowledge, this is one of the first studies to explore PA and dietary related changes and the factors associated in people with SMI using a longitudinal cohort study design. There was a lack of work on people with bipolar, sedentary behaviours specific aspects of diet and change over time and this study addressed important gaps and limitations identified in prior work. However, few associations were identified and below I consider possibilities why this might have been.

4.6.3.2  Representativeness

Primary care context

Participants registered with GP practices on the SMI register in England were recruited into PRIMROSE. A small proportion of the population may not be registered with a GP such as those who are homeless, in the UK illegally or that lack engagement with healthcare services. In England there is a high prevalence of SMI among those who are homeless who would have not been included in the sample and would have had physical health needs (321). It may also be that the participants who took part in the study were more likely to improve their health behaviours if engaging with primary care services. This is a form of self-selection bias.

Response rate

The proportion of participants willing to take part and received physical health checks was 22% (891/ 3982) (174). There may have been differences between those that expressed interest to take part and received physical health checks versus those who did not such as placing more importance on their health, increased motivation to improve health behaviours or being more engaged with physical health services and therefore healthier. It may be that those who declined participation and/or physical health checks were in greater need of health improvement than those that participated and/or received physical health checks to determine eligibility.
Inclusion criteria

The inclusion criteria in PRIMROSE were specific to people who were at increased risk of CVD to understand ways to change behaviours in a population where CVD may be preventable. However, all participants were required to have raised cholesterol and one or more of the other CVD risk factors to be eligible and it is likely that participants with SMI do not necessarily all have raised cholesterol but other CVD risk factors. Therefore, the definition of CVD risk as defined by raised cholesterol and one or more of other CVD risk factors was restrictive and may not have represented the entire SMI population. However, the threshold of cholesterol was low (5.0 mmol) and previous research has showed that the average cholesterol levels in people with SMI was higher than this threshold (5.51 mmol) (67). Further, the inclusion criteria were specific to those from 30–75 years, to identify those at risk of CVD outcomes and where these may be modifiable by health behaviour change and physical health medications. However, this may have not captured participants with a first episode of psychosis, presenting at around the age of 18 and form part of the SMI population. The sample was also not representative of people with SMI >75 years old.

Diversity

The sample was comparable with the demographics of another SMI population recruited in primary care in England in terms of age, gender, diagnosis of schizophrenia, smoking and alcohol use (67). However, there was an underrepresentation of participants from ethnic minority groups and people from Black African and Caribbean ethnic minority groups who are at greater risk psychosis (322). The sample was however recruited from 76 urban and rural GP practices all over England and therefore represented participants from different parts of England. The sample also contained a similar proportion of participants with bipolar and schizophrenia/ schizoaffective disorder but underrepresented those with a diagnosis of other psychosis. My systematic review highlighted the lack of studies on PA and dietary behaviours people with bipolar disorder, the present study therefore addresses one of the limitations of prior work.

4.6.3.3 Selection bias

Selection bias may have occurred during recruitment where GPs were required to screen lists of potential participants to establish ineligibility. It is possible that GPs
excluded participants that they thought would be less willing to take part, change their health behaviours or improve their health. Therefore, the findings may not provide a fair comparison between participants that were also unwilling/ willing to change their health.

A further strength is that a low proportion of participants (14%, 33/326) were lost to follow-up. However, it may be that those who were lost to follow up had greater physical health problems than those that remained in the study.

There also may be a difference between those that have more complete outcome data versus others without. One of the strengths of my main analysis is that I analysed factors associated with missing outcome data to identify potential sources of selection bias. I accounted for these factors in my main multivariable analysis to reduce the possibility of bias related to attrition or missing data.

4.6.3.4 Information bias

The way that the outcome/ exposure statuses were collected may have been intentionally or subconsciously distorted by researchers to demonstrate some association. As the study was prospective in nature, exposure status was collected before the outcome status was known which therefore minimised the possibility of observer bias. Those that collected outcome data were also blinded in terms of treatment allocation. It is a possibility that people who were more active or consumed a healthier diet were more aware of their health behaviours than those who were unhealthier. This may have led to recall bias, where healthier participants were more likely to accurately recall aspects of their diet and PA as they were more engaged with healthier behaviours.

4.6.3.5 Measurement error

Outcomes

Both PA and aspects of diet were self-reported. Questions were related to behaviours over the course of a week/ or typical day. This can be problematic since it requires crude calculations/ estimations of behaviour and can therefore be subjective. In people with SMI, self-reported measures can lead to inaccuracies as discussed in Chapter 3 (section 3.7.3.4) and therefore over or underestimations of behaviours. This may be one reason why few associations were identified. It is important to note
however, that participants were only included if they were able to provide informed consent. Therefore, it is reasonable to assume that participants had a reasonable level of cognitive capacity, but the degree of cognitive capability may have varied. IPAQ was additionally designed for those in the general population. Given the unique challenges people with SMI face, measuring PA using an instrument not specifically designed for people with SMI may result in inaccuracies (323). Difficulties in fluctuating mood, psychotic symptoms and depression may impact self-reported PA. A new measure (Simple Physical Activity Questionnaire – “SIMPAQ”), was designed with a multidisciplinary international team to assess PA in people living with mental illness (323). This has shown good test-retest reliability and validity when compared with accelerometer data. This holds important implications in terms of the need to use measures specific to SMI when measuring PA related behaviours.

As discussed in Chapter 3 (section 3.7.3.4), objective measures of PA may prove more reliable than subjective measures. In terms of diet, dietary biomarkers may provide one way of measuring selected nutrients or diet intake objectively and removing potential recall/ social desirability bias (324). However, dietary biomarkers can lead to inaccuracies regarding dietary intake as biomarkers are influenced by disease and homeostatic regulation. Therefore, there are no objective measures for diet as there are for PA. Other measures such as 24-hour dietary recall, food consumption records collected by assessors and dietary records/ prospective food diaries may provide alternative approaches (324). The 24-hour recall process may reduce the amount of recall that is required by participants but this method relies on participants’ memory and has been criticised for use in people with SMI (325). Trained assessors obtaining information on food consumption by observation at home may reduce reliance on participant recall but assumes that all food is prepared/ consumed in the home environment. Dietary records/ prospective food diaries may reduce reliance on participant memory since this is completed when food is consumed. However, this relies on participants disclosing all they consume which can be affected by social desirability. Further, it requires literacy skills as well as motivation to remember to complete records/diaries.

Further, it is important to note that although IPAQ was a self-administered measure, trained research nurses were on hand to explain and answer questions participants may have had. DINE and fruit and vegetable intake were administered by trained research nurses which may have reduced the amount of error caused by lack of understanding. However, the presence of research nurses may have impacted
participant responses where participants gave responses they thought to be more desirable, leading to an overestimation/underestimation of fat, fibre, fruit and vegetable, MET minutes and sitting time scores.

One of the strengths of the study is that I attempted to address the impact of potential measurement error by removing any potential outliers (any outcome scores above/below three SDs from the mean) in the sample and comparing them to models with potentially extreme scores to assess the sensitivity of findings in the main analysis. However, removing potential outliers only considers potential reporting errors in those with extreme values.

A limitation of DINE is that it is a brief tool, which means not all aspects of diet are covered in detail. It was not possible to calculate total energy intake (calories) which differs by sex, age, body size and activity level (256). Total energy intake is an important aspect of diet as these are needed to function, however exceeding the recommended amounts may lead to weight gain. It was therefore not possible to interpret this in relation to fat scores. In addition, DINE does not measure energy sources such as sugar and soft drinks. Further, it was not possible to estimate the amount of relative unsaturated versus saturated fat consumed since the measure did not cover this. Therefore, it is likely that aspects of diet and therefore dietary change scores were somewhat underestimated. It has also not been validated in people with SMI.

IPAQ measured the amount of sitting time only which was used as a proxy for sedentary behaviour. However, other studies use broader definitions of sedentary behaviour including ≤1.5 METs whilst sitting or reclining during the waking hours. Therefore, it is likely that sedentary behaviour and therefore sitting time change scores were underestimated.

One of the limitations of the study may be that the main analysis considered any change in PA and dietary related outcomes. It may be argued that this may not represent meaningful change. However, as part of supplementary analysis I limited the analysis to those who would normally be targeted in practice to improve their health behaviours to add further meaning. I was able to identify the proportion of those reporting poor PA and/or diet at baseline that made potentially clinically meaningful changes in this and characteristics associated with this change. The disadvantage of this approach was that it reduced statistical power and I was unable
to assess the association between a wider range of baseline characteristics and the outcome. Therefore, I was unable to include other potentially confounding variables, and there may be unmeasured confounding leading to an over or under estimation of effect. Further, I was unable to account for factors associated with missing outcome variables and account for extreme increases in scores. However, I was able to distinguish between those making minimal increases which may have been due to reporting error, decreases and no changes versus increases that could have a clinically beneficial effect by dichotomising the outcome.

**Baseline exposures**

Another strength of the study was that some of the baseline exposures (physical, mental health conditions and prescribed medications) were established using medical records which are stronger measures than self-reported data due to less reliance on participant recall. Although date of birth, gender and marital status were also obtained from medical records, these were checked with participants to ensure the information reflected current circumstances. Similarly, BMI was calculated based on clinical assessments conducted by trained research nurses. CVD risk scores were calculated using information from medical records, clinical assessments and some self-reported information (smoking status).

Measures related to overall wellbeing, social support, quality of life and employment status were self-administered and self-reported and it therefore is possible that scores were over or underestimated. Although alcohol dependence/hazardous use (AUDIT) and smoking behaviours were self-reported, these assessments were administered by trained research nurses, which minimised error caused by lack of participant understanding. However, presence of research nurses may have influenced responses to alcohol risk dependence, smoking behaviours, overall wellbeing and quality of life. It is possible the stigma associated with alcohol and smoking behaviours as well as the notion that research nurses had a duty of care to report risk related wellbeing or quality of life, may have influenced participant responses.

CVD risk may have been over or underestimated as QRISK-2 was originally designed for the purposes of the general population and did not specifically consider people with SMI (326). Updated versions such as QRISK-3 now consider SMI, but these were unavailable when these data were collected (326).
The wellbeing measure (WEMWBS) was specific to positive mental health. Though validated in people with schizophrenia, this tool was not specific to the symptoms experienced by people with SMI and I was unable to assess the impact of SMI specific symptoms on health behaviours (307). Further, social support (MOS-SSS) and health related quality of life (EQ-5D-5L) has not yet been validated in people with SMI and these measures may not measure what they intended to with consistency in this sample of people with SMI. Further, quality of life scores were calculated using an indirect measure of health state values that were derived from the general population, meaning that this reflected the general populations perceptions on the importance they placed on certain aspects of their health. This was not specific to people with SMI and it is possible that they placed different emphasis on these aspects of health compared to those sampled in the general population. Therefore, quality of life scores may have been over or underestimated.

Employment categories were dichotomised into in paid employment (part-time paid, full-time paid, paid with paid support, employed but paid up to allowed limit without affecting benefits) and not in paid employment (none, voluntary work, in education, homemaker and retired from paid work) which may be considered as arbitrary. Unemployment due to illness was also not considered as these data were not collected. Further, those retired from paid work were included in the not in paid employment category but may have been receiving private pensions and this categorisation may not reflect their financial status. It was not possible to determine this as the data were not collected, but it is possible that financial status due to employment was underestimated.

Medication count was also used as a proxy for polypharmacy. However, it was not possible to account medications with different names prescribed for the same illness only once since BNF categories were not included in the data. Medications may therefore have been double counted in the overall medication count and it is possible that this was overestimated in the sample. Nevertheless, it was important to include some form of measure that accounted for overall health, as opposed to not accounting for overall health at all. It was also not possible to determine whether participants were adhering to any of the medications prescribed.

Further, it is possible that some of the exposures selected for analysis were time-varying and therefore may have changed over the course of the 12-months such as BMI, cigarette use, alcohol, antipsychotic/antidepressant medications and
medications generally. Therefore, the findings may not provide a true picture of the impact of time-varying exposures on outcome measures.

4.6.3.6 Confounding

Age and gender were included in all multivariable models regardless of univariable findings and all variables included in univariable analysis were based on clinical plausibility and previous literature. In the main analysis, rigorous efforts were made to include variables that could be related to the outcome of interest. Any variables (other than age and gender and factors associated with missing outcomes) that showed signs (p-value ≤0.25) of being associated with the outcomes in univariable analyses were entered into multivariable models and remained (313). The inclusion of these variables may have been important in terms of providing adjustment for any of the associations observed, given their association with the outcome of interest in univariable analyses.

Some researchers criticise univariable screening processes and argue that although variables may not be related to the outcome in univariable analysis, they may serve as important confounders in multivariable analysis (327). Consequently, in the main analysis I increased the p-value threshold normally applied in univariable screening processes from ≤0.05 to ≤0.25 to maximise the chances of identifying factors that were important (313). Further, given the sample size, the number of variables included in analysis were minimised to maximise statistical power. Univariable screening therefore provided a way of reducing the number of variables into multivariable models and prevented the use of multiple baseline variables highly related to one another to avoid multicollinearity. Nevertheless, it is important to acknowledge that there is a possibility that important confounders may have been eliminated from the analysis.

As this was a secondary analysis of data, I was somewhat limited by the variables that were collected. Mental health factors including symptoms, duration of illness, antipsychotic and antidepressant medication side-effects were not collected. However, these are both clinically important and studied in previous literature. Psychological variables such as motivation, intention, perceptions, knowledge were also important but unmeasured. Therefore, there was the potential of unmeasured confounding.
4.6.3.7 Chance findings

Chance refers to the probability of making true inferences in a given population and is affected by the size of the sample and therefore representativeness of the sample (328). Prior to my analysis, I took into consideration the size of the PRIMROSE sample. Outcome variables were treated as continuous and the number of variables entered into statistical models were small and well-defined in order to maximise statistical power using the “one in ten” rule of thumb when entering variables into models to avoid compromising statistical power (315). However, the sample size was fixed, and the sample required was not calculated based on the present study as this was a secondary exploratory analysis. Therefore, it is possible that a larger sample may have been required to identify factors specifically associated with dietary and PA related outcomes and may have contributed toward the reason behind why few associations were found and potentially type II error. As the sample may not have been representative of all people with SMI, it is possible that some of the findings may have been either over or underestimated (328).

The present study assessed multiple outcomes and the chances of finding a statistically significant result may have been increased by multiple outcome testing (277). However, this was exploratory analysis and outcomes were selected based on clinical relevance, importance and the gaps identified in previous work. It is also important to note that few statistically significant associations were found but there were some observations which could have been due to chance (i.e. a type I error) and may have been a result of multiple testing.

4.6.4 Conclusions

The findings from this study demonstrated that some people with SMI were able to improve on PA and dietary behaviours which supports the need to continue health promotion in this area. However, only higher alcohol related scores were consistently associated with worsening PA from baseline to follow-up. Further work is needed before any stronger conclusions can be drawn and the implications of this chapter are discussed further in Chapter 7.

Although it is important to identify what individual characteristics may help or inhibit behaviour change in this population, it is also valuable to understand how interventions or services provided may or may not bring about change. In the next
chapter, I consider this in greater detail and explore how health behaviours were changed and supported in PRIMROSE.
Chapter 5  Study 3: Exploring how health behaviours are supported and changed in people with severe mental illness: A secondary qualitative analysis of staff and patient experiences and perceptions of the PRIMROSE intervention

5.1 Chapter overview

In this chapter, I present the findings of a secondary analysis of qualitative data exploring how health behaviours were supported and changed in PRIMROSE. I discuss the rationale for the study, methods, findings, and relation of the findings to other theory and previous work as well as limitations and strengths. I had no role or involvement in designing the original qualitative study or collecting the data. However, I led on the analysis of the original qualitative study regarding the implementation of PRIMROSE into primary care contexts (the original process evaluation) and published a paper on this. Some of the themes identified regarding the implementation of PRIMROSE were also identified as contributors to supporting and/or changing health behaviours. I published these themes in a paper in the BioMed Central (BMC) Health Services Research journal (246). I conceived the present study and re-analysed transcripts to address the present study aims. These findings have also been published in the British Journal of Health Psychology (329). I also presented the findings of the present study at the Public Health Science Conference London as a poster on 29th November 2019 and the conference abstract was also published in the Lancet (330).

5.2 Introduction and rationale

Although Chapter 3 demonstrated the importance of understanding how participants personal characteristics may be associated with dietary and PA changes, the findings provided no understanding of the value of the PRIMROSE intervention components and how patients and staff may have interacted with them; one of the important parts of a process evaluation, to explore the ‘active’ components within an intervention and the mechanisms which may have produced change (237).

As discussed in Chapter 1, there is some qualitative evidence regarding the barriers and facilitators to health behaviour change in people with SMI both before and after interventions, but these studies contained limitations including a lack of: comparison between staff and patient perspectives, staff and patient descriptions regarding the
use of behaviour change techniques (BCTs), how patients and staff interacted with them, and use of behavioural science theory to explain in greater detail how interventions are perceived to ‘work’ or not. Further, to my knowledge none of the studies were conducted within a primary care context, despite the recommendations made in clinical guidelines regarding the involvement of primary HCPs in supporting people with SMI with health behaviour change. Therefore, there was a lack of knowledge regarding the use of BCTs to support health behaviour change in people with SMI, the way they may be perceived to ‘work’ and how health behaviours could be supported effectively in primary care for people with SMI.

I aimed to address these limitations and gaps in the present study to better inform clinical practice and guidelines. I conducted a secondary qualitative analysis of data PRIMROSE qualitative data as an addition to the original qualitative process evaluation which explored the implementation of the intervention into primary care. I explored one part of the intervention which involved health promotion in relation to diet, PA, smoking and alcohol use as this is the topic area of my PhD. I explored how health behaviours were changed and supported from staff and patient perspectives.

5.3 Aims and objectives

The aims of the current study were to explore and compare how health behaviours were supported and/ or changed from the perspectives and experiences of primary care staff delivering BCTs to improve patient health behaviours in a primary care-led intervention (The PRIMROSE trial) and patients receiving the intervention.

The specific objectives were to explore perspectives and experiences on:

1. How BCTs were applied to encourage health behaviour changes using the Behaviour Change Techniques Taxonomy (BCTT) (245).
2. Barriers and facilitators of making and supporting health behaviour changes, interpreting these using the COM-B model of behaviour for greater explanation (241, 242).
3. The processes behind how the barriers and facilitators of supporting and changing health behaviours occurred, referring to interlinking components of the COM-B model where possible for explanation.
5.4 Methods

5.4.1 Study design

This was a secondary analysis of qualitative data collected from patients and staff regarding their experiences of the implementation of the PRIMROSE intervention into primary care. The primary aim of the original qualitative study was to explore the experiences of those delivering and receiving the PRIMROSE intervention to assess implementation into primary care contexts, addressing one part of a process evaluation (237). The PRIMROSE intervention and logic model are covered in Chapter 2, section 2.5.1. The methods used in the original process evaluation are described in Chapter 2, section 2.5.2.

5.4.2 Context and justification for use of this dataset

It is argued that secondary analysis of qualitative data by an independent researcher may add additional insights into the original primary data (331). However, it is advised that researchers should consider the following before embarking upon secondary qualitative analysis (331):

- Ethical issues concerning whether participants have provided informed consent for the aims of the secondary analysis
- Whether there is enough data to answer the research questions
- Whether the original methods are suitable to address the research questions of the secondary analysis adequately
- Whether the study addresses a sensitive area of research where the population may be difficult to recruit thereby adding value to the research area
- Whether the questions are different enough to warrant secondary investigation

Prior to conducting secondary analysis of the qualitative data, I considered each of these factors in depth:

Ethical approval for the original qualitative study was granted as discussed in Chapter 2 (section 2.5.2). Informed consent was obtained by both staff and patients to take part in semi-structured interviews regarding their experience of the PRIMROSE intervention. Details regarding supporting and changing health behaviours were also discussed in interview responses. However, the focus of the main analysis was about the context of implementing the intervention into primary care. Although health
behaviour changes were discussed by participants as part of the study, they were not considered in the original analysis (246). Therefore, the data that were used in the present study were used for purposes that participants originally consented to and the additional analysis adds further insight.

As I analysed the qualitative data to identify factors that influenced implementation, I noted that health behaviour change was frequently discussed. I liaised with my supervision team (K.W, D.O and J.R), who were familiar with the data and in agreement that the data contained sufficient information relevant to my own research aims. Therefore, I concluded that the data were adequate to answer my research questions. As there was enough data to support my research aims, it was clear that the methods applied to answer the original research question were adequate to answer my research questions. Furthermore, if I had the opportunity of conducting the study afresh, I would employ qualitative methods and semi-structured interviews to explore my research aim and objectives.

Moreover, using these data for the purposes of my PhD provides an opportunity to delve into the experiences of those either taking part or delivering a primary care-led intervention, which would otherwise be problematic to obtain afresh. Re-sampling and interviewing this population would not be pragmatic as it is highly likely that many people would have forgotten the intervention since the time they received or delivered it (in 2014 to 2016, 2 to 4.5 years ago respectively at the time this was written). It would also be difficult to locate a new sample including primary care staff trained in delivering BCTs to people with SMI, as well as patients receiving this. Therefore, the secondary analysis was warranted, well-justified and added a new perspective to the data and therefore significance to this research area.

5.4.3 Analysis

5.4.3.1 Overview of analysis process

Transcribed data were stored electronically, labelled with unique identification codes and uploaded on to NVivo (version 11) which was used to organise data. I referred to the original transcripts, independently reading and listening to the audio recordings to familiarise and immerse myself in the data. I listened to the way in which things were discussed and/or probed. Although misinterpretation of data through this method was not entirely avoidable as I was one-step removed from the data, this facilitated my
understanding of the data more than reading transcripts alone. I noted initial areas related to my research questions.

I coded the data, moving back and forth between interviews comparing all interviews and staff and patient data to identify consistencies or discordant codes. The coding process was inductive and therefore driven by the data. The process involved reading interviews repeatedly and deriving codes which I felt represented the data and my own research aims.

I compared my codes against the codes derived by previous researchers who coded the data in terms of the implementation of PRIMROSE. This step was taken to identify whether similar codes related to my own aims were identified in the original analysis and explore the consistency of the interpretation of the data. These were in most cases similar, demonstrating the consistency in terms of interpretation. However, there were some differences. I identified some new codes which were specific to my own research objectives and some codes that required modification.

I used the original NVivo file containing the original primary analysis and placed my own new code-set in a new folder. I also revised some of the original codes by both:

1. Removing extracts of data that had been linked to the codes, as I felt that some data extracts did not adequately represent the codes reported.
2. Adding new data extracts to pre-existing codes, as it appeared that these had been missed in the original analysis.

I also discussed both my new codes and revised codes with my supervision team (J.R, K.W and D.O) and one of the original researchers who was involved in the original data collection and coding (A.B). The coding process was iterative which involved moving back and forth between transcripts and emerging codes, discussing codes with the research team and revising codes until I was satisfied that the codes represented the data and my research objectives.

After I coded the data, I applied two different analysis approaches according to the different research objectives.
5.4.3.2 Objective 1 analysis approach

Exploring how behaviour change techniques (BCTs) were applied to encourage health behaviour changes using the BCTT.

During the coding stages described in the analysis section above, I coded both the staff and patient data regarding how staff and patients perceived that health behaviours changes were supported such as ‘providing advice and guidance’ or ‘being persistent’. These codes were data-driven and therefore derived inductively. In a second step, I deductively mapped the descriptive codes to BCT descriptions/headers using the BCTT to identify specific use of BCTs and considered all 93 techniques (245). I used the definitions reported in the BCTT and compared them to the codes and quotes I identified. The mapping process was iterative, I continuously referred to the codes and BCTT labels and descriptions until I was satisfied that the codes represented BCTs. The codes and corresponding BCTs were further discussed with J.R and K.W until I was satisfied that the codes had been mapped correctly to BCTT.

Alternative approaches to addressing this objective included content analysis. The BCTT may be applied to the data to identify instances or counts that BCTs were applied. I decided against this approach as I was interested in how BCTs were applied rather than the frequency at which they were applied which is suited to a research question related to fidelity. Applying the BCTT as a framework and coding the raw data using this framework may have been an alternative approach. However, this would have been predominantly deductive. The disadvantage would have been that the codes would have been driven by the framework and not the data, potentially introducing some bias. Ethnographic approaches such as observing how BCTs were applied in appointments could have been an alternative approach. However, the data were collected prior to my PhD and after the intervention had taken place. Coding audio-recordings of the intervention appointments may have also been another way of exploring how BCTs were applied. However, many of the audio-recordings were short in duration, some were not returned and did not provide much detail on the barriers and facilitators of supporting or changing health behaviours or patient perspectives on how BCTs were applied.
5.4.3.3 Objective 2 and 3 analysis approach

Exploring the barriers and facilitators of making (patients) and supporting (staff) health behaviour changes and the processes behind the barriers and facilitators using the COM-B model.

I used thematic analysis to address these objectives because it is useful for identifying similarities and differences across the data as well and underlying meanings behind the data, aligning well with the objectives (332).

Data-driven, descriptive codes related to the barriers and facilitators of encouraging and/or making health behavioural changes were derived as described in section 5.4.3.1. The codes were then grouped inductively into broad themes and sub-themes, including both common and discordant themes. This involved moving back and forth between descriptive codes and data extracts to identify patterns and underlying meanings and connections behind the data and comparing staff and patient perspectives. Emergent themes were discussed with K.W., J.R., D.O. and A.B. This process was iterative, and themes were revised continuously up to the written presentation of findings until I was satisfied they reflected the data.

In a second step, the themes were explored further by deductively interpreting them using the COM-B model of behaviour (241, 242). I compared the themes and quotes to constructs and interlinking components within the COM-B model where possible, using definitions of the components and the theory behind how the constructs linked together as a system of behaviour change. This provided a way of further explaining how health behaviour change may have been influenced based on staff and patient perspectives and the underlying processes and meanings behind the themes. Therefore, rather than simply categorising the themes using COM-B as an organisational framework with separate components, COM-B was used in an interpretative way to explain the themes. I considered how the different components of COM-B linked as a system of behaviour, what the individual components meant and how the data related to this. The interpretation of the themes using the COM-B model were further discussed with K.W and J.R and revised where necessary until I was satisfied the themes and links identified related to aspects and interlinking components within the COM-B model.
5.5 Results

5.5.1 Sample characteristics

There was a lack of variation between staff in terms of gender and ethnic origin, with all being female and White British. There was a variation in professional roles; staff were either practice nurses (n=7/15), HCA (n=6/15), or research nurses (n=2/15). Staff had varying lengths of employment, ranging from 1.5 to 26 years and therefore varying degrees of experience. The sample had a wide age range from 30 to 60 years. Only 6/15 staff stated that they were involved in other studies, perhaps indicating a lack of time, opportunity, or willingness to partake in research. The sample interviewed were similar in demographic characteristics to the overall sample of staff delivering PRIMROSE but none delivered less than two PRIMROSE intervention appointments (see Appendix L).

Patients attended between 3 to 13 intervention appointments, and the majority (n=12/15) attended 6 or more appointments. There was a lack of diversity in the sample in terms of ethnicity as patients were mostly White British (n=13/15). There were also slightly more males (n=9/15) than females in the sample. However, the age range was broad, from 36 to 73 years old. There was a balance of people diagnosed with bipolar disorder (n=7/15) or schizophrenia (n=6/15) and those who classed themselves as ‘single’ (n=8/15) or ‘married or cohabiting’ (n=7/15). The sample interviewed were similar to the overall PRIMROSE trial sample in terms of age, gender and mental health diagnosis (see Appendix L). However, the perspectives of those who were divorced, separated/widowed, ‘black’ or ‘other’ ethnicities and attended less than 2 appointments were not captured.

5.5.2 Objective 1 findings

_Exploring how behaviour change techniques (BCTs) were applied to encourage health behaviour changes using the BCTT._

A total of 18 descriptive codes were identified in the staff and patient raw data. These were mapped to a total of 20 BCT labels within the BCTT (v1) (245). A table displaying the process of mapping codes to the BCTT can be found in Appendix M, Table 1. There were many codes that related to a different range of techniques in the BCTT taxonomy and the process of mapping data to the BCTT was useful in distinguishing the different techniques reported. The BCTs were grouped into broader BCTT
categories for brevity to summarise the findings. Briefly, I summarise below how techniques were applied within 9 broader BCTT groupings using some of the illustrative quotes to demonstrate the techniques used as reported by staff and patients. Specific details of individual techniques with illustrative quotes can be found in Appendix M, Table 2.

### 5.5.2.1 Goals and planning

Patients reported that staff discussed their health and health behaviours and facilitated goal setting to address unhealthy behaviours. Staff reported that they helped patients formulate manageable action plans to facilitate achievement with health goals and discussed ways to overcome problems related to achieving health goals as they occurred. It was also suggested that staff reviewed health behaviours and goals within consultations.

…how easy did you find that goal, was it challenging, do you want to continue with that or try something else… then we’d carry on about how that was going to have an impact on his week, not just, okay, so we’re swapping it, but how he was, because he only had one arm, as well, so he had to think about the goals that were easy for him to be doing with one arm… changing to cereal because porridge was an idea but that’s really hard to make with one hand, apparently. (Staff 2, HCA, 50’s)

We’d go through the booklet to see what I’d filled in, to see how I’d sort of kept up with the goals, and then we may amend them or we may just do the same thing for the following week. So we might adapt them slightly if something hadn’t worked. We’d adapt it, or we’d add something else in. (Patient 82, Female, 40’s, Bipolar Affective Disorder)

### 5.5.2.2 Feedback and monitoring

It was sometimes suggested by both patients and staff that staff would encourage the use of health plans to self-monitor their behaviour and provide feedback in terms of progress when measuring health markers. Both staff and patients suggested that staff would provide feedback on progress with health behaviours and monitor progress in consultations.

We’d discuss what they’d eaten, what exercise they’d done, how they could do more exercise, how they could improve their diet. (Staff 3, Research Nurse, 20’s)
...they take your blood and weigh you and different things like that, you know. And we just have a talk... (Patient 83, Male, 50’s, Schizophrenia)

5.5.2.3 Social support

Staff and patients reported that staff provided emotional social support by listening to and encouraging patients with health goals. Practical social support in the form of encouraging involvement from supportive others was less often reported, however there is further evidence in the thematic analysis reported later to suggest that supportive others were in some cases involved in health behaviour changes.

...we had a good relationship. We had a good dialogue, it was...she supported me, but once...It's very good when somebody actually understands why things are happening. And then doesn’t think well...you know you go to some people and they think you're lazy, you're not doing anything about your weight but <practice nurse> understood it. (Patient 12, Female, 70’s, Bipolar).

She did raise that I think that was obviously part of the project, to make sure that, you know, family and friends were brought into the equation if possible. And she did ask that, you know, does your wife help you, does she support you? (Patient 81, Male, 60’s, Bipolar).

5.5.2.4 Shaping knowledge

Both staff and patients frequently reported that staff gave them instructions on how achieve health behaviour changes. A minority of staff and patients reported that staff encouraged patients to record their emotions when health behaviours occurred to identify triggers.

I wanted to lose a bit of weight and she discussed various ways I could do that. (Patient 16, Male, 60’s, Schizophrenia)

And so I broke it down and said, just put key words in there [health plan diary]: sad, fed up, fat, heavy, anything. Just a word to sum up how they felt, even just one word a day: good, energetic. And then they could look back on that, and perhaps they might see a pattern, or they might see a barrier that perhaps they hadn't identified themselves. (Staff 4, HCA, 50’s).
5.5.2.5 Natural consequences

A minority of staff and patients commented that staff provided them with information regarding the impact of health behaviours on their health.

_I just said to him, you need to stop but we need to help you to do that because you are going to kill yourself... You’re drinking three or four bottle of wine a day; you are going to give yourself a heart attack. If you want some help I can help you now._ (Staff 5, Practice Nurse, 40’s)

5.5.2.6 Repetition and substitution

Patients more frequently reported that they were encouraged to reverse their habits by replacing unwanted behaviours with alternative healthier behaviours.

_...there was things I was taking out, I took snacks out, for example. Because she said, look, you had a KitKat, you’ve had this, why don’t you just stop them? So, and also eating late at night. I don’t eat late at night, now. I have a meal, I might go and have a drink, but I don’t eat late at night..._ (Patient 81, Male, 60’s, Bipolar)

5.5.2.7 Reward and threats

Staff more frequently described praising patients when they had achieved their goals.

_I’d praise him on the stuff that went really, really well..._(Staff 2, HCA, 50’s)

5.5.2.8 Antecedents

A minority of staff and patients expressed that staff suggested engaging in healthier physical and social environments to reduce access to environments promoting unhealthy behaviours.

_I think we, we looked at it as a whole, so we were looking at where he was eating, obviously with one arm, convenience food a lot, so instead of always going to KFC let's try something else, and then he found a friend that went to this other café, so then he had someone to go and socialise, so it wasn’t just about going to get food anymore..._ (Staff 2, HCA, 50’s)
5.5.2.9 Self-belief

Staff reported that they attempted to increase self-belief by encouraging patients even when they had not achieved their goals.

...just by saying, don't set yourself targets that are too hard to achieve; just even the smallest of changes can make a difference, and don't be afraid of coming back and saying, I haven't been able to do it, for whatever reason. There's always a next time, as long as you don't give up, and I think that's the main thing, and just giving them that encouragement to feel that you're not being judged by the fact that you haven't been successful in what you're trying to do. (Staff 10, Practice Nurse, 40's)

5.5.3 Objective 2 and 3 findings

Exploring the barriers and facilitators of making (patients) and supporting (staff) health behaviour changes and the processes behind the barriers and facilitators using the COM-B model.

Six main themes and fourteen sub-themes were identified. Some themes were identified as both barriers and facilitators and there were similarities between staff and patients. Staff and patient views were combined and compared within the themes for triangulation.

The main themes that were identified from the data overall related to:

- Factors influencing patient proactivity to change health behaviours
- Patient health knowledge and perceptions
- Perceptions of patient capability
- Staff proficiency in mental health and behaviour change
- Social roles and influences
- Environmental-level influences

The themes resonated strongly with components of the COM-B model and I discuss these within the written presentation of findings. I also explore underlying meanings and processes behind the themes by applying interlinking components of the COM-B model where possible.
5.5.3.1 Factors influencing patient proactivity to change health behaviours

Patient motivation was reported to influence patient proactivity both positively and negatively towards taking the appropriate actions to achieve health goals. Further, a positive reward cycle was identified: where patients were able to see visible health benefits of enacting healthy behaviours, this appeared to influence motivation to continue achieving health goals such as eating healthily.

The impact of motivation on proactivity

Staff commonly suggested that patient proactivity was underpinned by motivation levels. Staff suggested that patients that were more motivated realised the need to take control of their goals and take a proactive role in terms of engaging with the advice that was recommended.

Some people were more invested than others, and that really showed, in terms of their attendance, their ease of being able to get hold of them, and the amount of work that they did themselves in order to reach the various goals that we'd set up. (Staff 6, HCA, 50's)

Similarly, patients who were more motivated to change reported taking ownership and responsibility of changing their health behaviours. Decisions of being committing to achieve health goals appeared to be self-conscious and based on the idea that this was the right thing to do. This appeared to be related to reflective motivation; whereby patients’ commitment to achieve healthy behaviour change related to their personal belief about whether the behaviour was ‘right’.

I just felt it was the right thing to do really yeah. If I commit myself to something, I do like to follow it through. (Patient 16, Male, 60’s, schizophrenia)

According to staff, a lack of patient motivation also prevented patient proactivity toward achieving health goals. Staff often suggested that some patients had an expectation that they could achieve goals without realising that success was dependent on themselves to enact the appropriate behaviours to achieve goals.

...had a mixed half and half, of people that were very, very invested and people who were hoping that they’re miraculously lose some weight just by turning up every so often. (Staff 6, HCA, 50's)
Despite being provided with health plans to self-monitor their behaviour, some staff reported that patients would often not complete these. However, those that were proactive in monitoring their own behaviour had more motivation and greater success.

...the people that tracked definitely were the most successful. However, not everybody tracks. Some people, I didn’t see that book again, after the very first time I gave it to them, or I saw it once or twice throughout the process...with those people, there was no particular evidence that they’d been thinking about their goals in the meantime. (Staff 6, HCA, 50's)

Similarly, some patients suggested that despite having the tools, advice and an action plan to achieve healthy behavioural goals, they were not motivated to apply or action this advice or make use of the tools. However, it was clear that patients took responsibility for their lack of proactivity, often placing blame on themselves and recognising they lacked desire to change (i.e. automatic motivation) rather than blaming staff for their lack of perceived success. Therefore, patients recognised the necessity of being proactive, conflicting with staff perceptions that patients had no recognition that success was dependent on themselves.

Other people can just give you advice, but at the end of the day, if you are not going to do anything about it, then it’s not going to get anywhere... but that was nothing to do with [Anonymous] or [Anonymous, nurse 2]...I was supposed to do exercises and things... It’s just the way I was feeling... I just couldn’t be bothered. (Patient 112, Female, 50's, Other Psychosis)

The impact of visible benefits on motivation

Staff commonly reported that patients who were able to visibly see the positive impact of changing their health behaviours were more motivated to continue taking proactive steps to engaging in healthy behaviours such as attending intervention appointments. This included positive changes to physical appearance including smaller body size and healthier cholesterol levels. It was however unclear whether specifically automatic and/or reflective processes underpinned motivation in these cases.

I think what, what I would definitely say is, is the couple that were motivated to come back was because, one, they were losing weight; one, their cholesterol level was going down, they were more active, they could see the improvements in their bodies because they were saying about their clothes, you know, were, um, a bit baggy and things... so with all these, this was encouraging them to come back. (Staff 1, HCA, 40's)
The positive impact of healthier behaviours were commonly supported in patient accounts. Patients reported experiencing improved physical health and mobility and some expressed improvement in their mental wellbeing. However, it was unclear whether this subsequently affected motivation levels.

...losing the weight helped me a bit because when I was doing the walking I was feeling a bit fitter... it does help your movement. You know, you feel a lot better. (Patient 9, Female, 50's, Bipolar)

Conversely, a few staff reported that when some patients perceived a lack of health benefits this negatively influenced motivation levels and therefore the continuation of health behaviours. However, this was not reflected in patient interviews. It was also unclear whether automatic or reflective motivation played a role.

Particularly with X, it was a weight loss thing, and she lost interest when she realised she wasn't actually losing any weight. Do you know what I mean? She disengaged a bit there. (Staff 14, Practice Nurse, 50's)

5.5.3.2 Patient health knowledge and perceptions

It was commonly reported that patients’ health knowledge (i.e. their understanding/knowledge of what it means to be healthy) and their perceptions of their health (i.e. whether they perceive and/or understand the need to change or want to change) (i.e. psychological capability) affected the extent to which healthy changes were made. In some cases, it was suggested that psychological capability influenced reflective motivation. This demonstrated the link between capability and motivation in the COM-B model. There were however a few exceptions to this rule, where psychological ability/capability did not appear to influence motivation and behaviour change was more affected by automatic habitual processes.

The impact of knowledge

A few staff reported that patients lack psychological capability, whereby a lack of understanding regarding how to achieve healthy behaviours appeared to impede patients’ capability of enacting healthy behaviours. This created difficulties when attempting to provide patients with information about healthy behaviours.

...everyone would be, like, oh, yes, so I had a healthy day today, and then go through what their healthy day was, and it was so unhealthy it was
unbelievable, and then you’d kind of realise you have to take, stepped right back and you’d start from the very beginning, baby steps, and that everyone’s understanding of health and health needs and what it is and what it will mean is so varied… Let’s just introduce a piece of fruit a day, like, he was getting so far back, and then even then it would be a challenge because what do I mean about a piece of fruit? What I mean and what you might mean is very different to what he meant, and, yes, that was challenging. It was challenging, but… a lack of knowledge and education of what we were doing. (Staff 2, HCA, 40’s)

This view was often refuted in patient accounts. It was clear that most patients commonly valued the knowledge they gained from staff and demonstrated a good understanding of how to achieve healthy behaviours. Patients frequently commented that they developed an understanding of the foods that negatively impacted their weight as well as identified patterns within their behaviour. It was apparent that this understanding subsequently equipped patients with the capability to make healthy changes (i.e. psychological capability). Psychological capability also appeared to affect reflective motivation whereby patients reported reflecting on and evaluating their own behaviour through monitoring and discussion with staff. Patients discussed behaviours including what they considered as “wrong” based on the knowledge they had gained which subsequently informed their decision to change their behaviour.

Without hesitation. Because it made me sit with another person and identify links between food groups that were obviously causing me to gain weight. I was keeping a diary of when did I feel good and when did I not. And so what was I eating and what was happening. It made me actually look at the whole thing of… So, almost like a mood diary and a food diary. And look at the big… at the holistic picture. And what that allowed me to do, was to change my pattern of eating, which I’ve pretty much done 99% of the time since. (Patient 17, Male, 40’s, Schizophrenia)

Difficulties changing perceptions

A few staff further explained that a challenge to supporting healthy behaviour changes and patients’ willingness to engage in healthy behaviours was conveying the need to change existing behaviours. It appeared that some patients did not perceive this information as applicable to them given that they thought their existing behaviour was “fine”. However, this was not reported among patients. Nevertheless, this reflected further a link between psychological capability and reflective motivation. Staff expressed that difficulties foreseeing the problems associated to unhealthy behaviours (i.e. reflective motivation) due to a lack of understanding (i.e. psychological capability) influenced a lack of behaviour change. Staff also suggested
that unhealthy behaviours may have potentially evoked enjoyment and therefore a lack of motivation to want to change (i.e. automatic motivation).

When they think they’re fine and they don’t understand why on earth you want to change anything, that’s was always a toughie…In hindsight he didn’t see a problem with what was going on, or he enjoyed what we perceive as a bad lifestyle choice too much to want to give it up, and he couldn’t see the benefits outweighing any risks. (Staff 2, HCA, 50's)

There were however a few cases where the connection between psychological capability and motivation was not apparent. Despite having previous awareness of a healthy diet and experience on how to achieve this (i.e. psychological capability) as well as forming beliefs about the positive effects of diet modification (i.e. reflective motivation) it appeared that one patient was still unwilling to adopt healthy eating. It was clear that change was prevented from a persistent, innate, lack of desire to do so despite having psychological capability and reflective motivation. A possible cause behind a lack of patient proactivity was automatic motivation; which in part, refers to habitual processes that prevent or facilitate health behaviours. A patient expressed that their lack of engagement towards achieving their goals resulted from the perception that they had always been reluctant to change and were therefore “stubborn”.

…if I’m perfectly honest, it’s a goal I shouldn’t have set because I know myself well enough to know that… I’ve been on different diets… I’ve been to [weight reduction group] and had some success with it, but at the end of the day I’m a bit reluctant to change that sort of lifestyle… I’m fairly conscious of a healthy lifestyle… and how I do or don’t fit into that… I’m also bloody stubborn… I don’t think I really identified anything I wanted to change, if that makes sense…(Patient 18, Female, 60's, Bipolar Affective disorder)

5.5.3.3 Perceptions of patient capability

Patient psychological and physical capability were perceived mostly by staff as barriers to patients adopting healthy behaviour changes.

Mental health status

A common perception among staff was that patients’ mental health status in some cases affected their ability to adopt healthy behaviour changes. Staff suggested that mental health problems resulted in some patients becoming focused on their personal problems and caused patients’ stress. In some cases, it was suggested that
psychological problems affected patients’ concentration levels (i.e. psychological capability) within intervention appointments and consequently motivation, representing the link between psychological capability and motivation.

*Mental health patients… it’s so difficult to get them to come off that and sort of engage and concentrate…people with mental health illness do have a tendency to be demotivated. Don’t necessarily want to engage on things other than what’s occupying their minds and their thought processes at that time. They become quite focused on their problems, understandably.* (Staff 14, Practice Nurse, 50’s)

This was not however reported within patient interviews. In fact, only one patient expressed that their psychological wellbeing affected their cognitive capacity to adopt healthy behaviour change.

*Probably not, no, because it’s the way I feel at the time, you know, and then I find it hard to actually concentrate and be able to be, sort of, useful in what I’m supposed to be doing, if you see what I mean. I get a bit anxious and all the rest of it, so. Yes. It’s difficult, really, isn’t it?* (Patient 9, Female, 50’s, Bipolar Affective Disorder)

*Physical health status*

A small minority of patients and staff suggested behaviour change was negatively affected by physical health problems (i.e. physical capability). It was suggested that physical pain often affected patients’ ability to engage with exercises.

*With one particular patient… She had numerous health problems. So I think, from the start, it was going to be an uphill struggle to achieve her goal of losing weight, which we did actually adapt to. sort of, maintaining weight… And one particular patient, who had not only a problem with obesity, but she had pain, arthritis, and she couldn’t really exercise…* (Staff 4 HCA, 50’s)

**5.5.3.4 Staff proficiency in mental health and behaviour change**

It was apparent that staff had mixed perceptions of their own skills and knowledge (i.e. psychological capability) in terms of supporting people with mental health problems adopt healthy behaviour changes. Staff reported that their communication, interpersonal skills knowledge and confidence influenced their ability to support people with mental health with their health behaviours.
**Skills to engage with mental health**

Staff commonly reported that their previous experience with people with mental health problems equipped them with skills required to adequately support patients achieve their health goals (i.e. psychological capability). Relevant skills included being able to communicate with and approach patients.

> I’ve dealt with people with it as well, so with mental health issues, so I do know how to sort of approach them and speak to them, and I think just being in general practice, seeing all different types of people and doing all different types of aspects of my job. (Staff 15, Practice Nurse, 60’s)

A few staff reported their lack of previous experience with mental health patients subsequently affected the extent to which they were able to support them. Some suggested that they lacked motivational skills and were in some cases consequently less able to motivate patients to achieve health goals.

> I did begin to think as they weren’t engaging so well towards the end of it, I thought perhaps if I had more skills, like a counsellor or somebody who’s been working in mental health, would I have been able to maintain their motivation a bit better? Because I’m not skilled in that area, so I don’t know if there was anything that I possibly could have done in order to do that. (Staff 7, HCA, 40’s)

**Health behaviour change knowledge**

There appeared to be varying levels of knowledge in terms of how to support healthy behaviour changes. It appeared that most staff, who were in most cases qualified nurses, commonly reported that they had previous experience supporting patients from the general population achieve healthy behaviours. This prior experience facilitated their knowledge and understanding (i.e. psychological capability) which helped them to support patients with their health behaviours.

> Well it’s something I do day in day. You know, day out, isn’t it? You’re aware of what a healthy cholesterol is, you’re aware of a good diet, you’re aware of what exercise helps physically. So I think just my job itself, I’ve got the tools. (Staff 14, Practice Nurse, 50’s)

In contrast, a small minority of staff who were HCAs expressed that they had no specialist expertise regarding specific health behaviours such as diet modification. In such cases, a lack of previous knowledge meant that staff lacked knowledge in these areas and therefore the psychological capability of supporting patients. This was
supported in some cases by their inability to answer patient questions in relation to such topics. It is possible that the differences between HCAs and nurses may be explained by the notion that nurses may have had more experience and therefore prior knowledge in how to support healthy behaviour changes as compared to HCAs.

...there were a thousand questions I didn’t know the answer to...I’m not a nutritionist or a dietician, I don’t really know the ins and outs. (Staff 2, HCA, 50’s)

The need for reassurance

It was evident that some staff needed reassurance in their skills in supporting patients, perhaps suggesting a lack of confidence in some cases. Staff who suggested that they lacked skills in supporting patients also suggested that they were unsure whether they were supporting patients correctly and required further assurance from others delivering PRIMROSE. It was suggested that this may have been done through peer-support (i.e. social opportunity) and discussion of cases with others delivering PRIMROSE may have benefited their psychological ability to support patients. However, lack of access to peer-support may have prevented their ability to support patients adequately.

...perhaps having a meeting in the middle just so perhaps as nurse practitioners we can say, well, actually I came across that or I feel I’ve been saying the same thing for the last ten weeks or ten appointments, is this right? (Staff 12, HCA, 30’s)

5.5.3.5 Social roles and influences

It was commonly reported that social opportunity in terms of the social interactions between patients and people within their social environment influenced health behaviour change. The role of staff was perceived as highly important in terms of patients’ motivation to change their health behaviours. Patients were more motivated if they were supported and monitored by staff. The link between social opportunity and motivation was therefore identified in some cases. The role of informal support networks were also perceived as pertinent to health behaviour change. It was suggested that the type of health behaviours displayed by family and friends influenced the type of health behaviours that patients displayed.
The role of staff

Patients commonly reported that one of the factors that helped them achieve healthy behaviour changes was the supportiveness of staff including listening to their problems and finding ways to overcome them. There also appeared to be an element of social desirability to be successful in achieving goals, whereby a sense of needing to achieve goals arose from being monitored by staff and increased patient motivation.

...did feel generally it had helped because it was continuity, it was someone just keeping an eye, was there to listen and support in what she was choosing to do. (Staff 12, HCA, 30’s)

And it felt a little bit like I was... I had somebody to answer to, which did, it began, at the beginning of the period of time I was coming in that did motivate me. (Patient 82 Female, 40’s, Bipolar Affective Disorder)

In a few cases, staff reported that patients were motivated to change their behaviour to please staff which further reinforced the link between social opportunity and motivation in the COM-B model. It appeared that this related to automatic motivation; whereby patients may have felt pleasure because of pleasing staff when achieving their goals and therefore achieving social acceptance.

... I think that person consciously wanted to do well for me. And if that was a motivating factor, then it worked. (Staff 4 HCA, 50’s)

Staff acknowledged that in some cases they were unable to support patients as much as they should have, particularly in cases where patients did not appear to be engaging or motivated. They reported that they could have been more persuasive to encourage behaviour change as well as keep in contact to monitor patients more frequently. According to staff, the lack of social support (i.e. social opportunity) they provided to patients acted as a barrier to engaging with healthy behaviours.

I think the whole way through seeing that one patient I could have kept trying to encourage her to stop smoking fully. A little bit more than I did. I mean, I did try and encourage her, but she said no a couple of times. But I think I could have tried to persuade her a little bit more. (Staff 15, Practice Nurse, 60’s)

The lack of support reported by staff was not commonly reported among patients. In fact, only one patient expressed that the lack of staff support was a barrier to
behaviour change. Patients suggested that they may have been more motivated to adopt healthy behaviours if they had more contact with staff.

_Maybe if she... if [Anonymous] phoned up, follow-up calls after a couple of weeks... I think I was ill one time, but she’s a busy lady, so I understand._

(Patient 11, Male, 30's, Schizophrenia)

**The role of the informal support network**

It was commonly reported that patients’ informal support network appeared to have both a negative and positive impact in terms of engaging with healthy behaviour change. Patients reported that friends and/or family supported them by also adopting healthy behaviours. In these situations, members of their informal network would show them encouragement and patients would in turn encourage their supportive others to engage in healthy behaviours (i.e. social opportunity). It appeared that patients were creating positive social norms by involving family and/or friends to adopt healthy behaviours alongside them. This was supported by most staff who commonly suggested that the involvement of family and/or friends facilitated healthy behaviour change.

_My partner also has been eating healthier and exercising more. She was quite overweight, and she’s lost 2 stone as well by just supporting me and kind of changing the food that we buy. She’s not... She’s not vegan or anything like that though, but she’s changed. We don’t ask for any takeaways._ (Patient 6, Female, 30’s, Bipolar Affective Disorder)

_Every day she and her husband were walking. He sort of went on board with it._ (Staff 3, Practice Nurse, 50’s)

Some staff reported that unhealthy social norms acted as a barrier to engaging with healthy behaviours. However, this perception was not apparent among patients. It appeared that patients were more likely to engage in unhealthy behaviours when members of their internal social network were also engaging in unhealthy behaviours; patients therefore mirrored the unhealthy behaviours they observed.

_One lady, suddenly her friends had come round, and she’d had a couple glasses of wine at lunch time, so there were things like that, so she would quite often, oh sorry, or she had friends round to stay..._ (Staff 7, HCA, 40’s)

As detailed in section 2.5.1.2, staff were encouraged to facilitate the participation of supportive others as part of one of the eight of the components of the intervention.
However, it appeared this was overlooked in a small minority of cases. Some patients reported feeling socially isolated with very limited access to internal social support networks. These patients were less likely to report making healthy changes.

'I don’t go out much, I don’t socialise much, so I haven’t had much support. I’ve been mostly on my own. My sister has been quite busy as well. She’s got a full-time job and everything. She’s tried to provide some support, but the majority of the time, I feel I’ve been on my own.' (Patient 112, Female, 50’s, Other Psychosis)

5.5.3.6 Environmental-level influences

Staff commonly suggested that their ability to support patients was affected by elements within the primary care environment (i.e. physical opportunity). Time and resource were perceived as assets and the availability of time and resource affected the extent to which staff could support patients. Patients also reported that factors within their environment were also important for behaviour change. Those that reported using existing physical opportunities to exercise within their daily environments maintained and normalised such behaviours (i.e. automatic motivation).

Access to time

Staff commonly reported that appointments related to targeting health behaviour change required substantial time. Staff acknowledged that working within a general practice context often meant that this was limited. Subsequently staff were unable to monitor patients and offer them as much support as required. This offered one explanation behind why some staff were unable to provide patients with the social opportunity to facilitate health behaviour change as much as they hoped as apparent in the ‘social roles and influences’ theme.

'We do weigh management programmes and things like that anyway, but time-wise I think it would be a little bit difficult... The length of the appointment times probably, because it's quite a long thing.' (Staff 9, Practice Nurse, 30’s)

'Following up, probably if I had more time to follow-up it probably would have been more successful here. But it is like running a race when you are here.' (Staff 10, Practice Nurse, 40’s)

Despite limited access to time, staff acknowledged its importance regarding the extent to which they were able to support patients. Those that had more time suggested that
this enabled them to explore health behaviour change topics in more depth in sessions, support and mentor patients and offer instructions more adequately.

*I think the most positive thing about it was it was almost... I felt like I had the time to coach people. You see patients every day, who come in, who are, maybe, clearly overweight, smoking, they report that they make the incorrect food choices and eat the wrong diet. But you’ve got 15 minutes, as a practice nurse, generally, outside of the research nurse role, to see patients. Whereas, as a research nurse, with a study like this, you have got time to coach patients, and I really love that.* (Staff 4, HCA, 50’s)

**Access to resource**

Signposting patients to specialist services was also one of core aspects of the intervention as detailed in section 2.5.1.2. Staff suggested that health behaviour change were better supported when staff had access to such resources. However, there was a variation between staff regarding the extent to which they were able to access specialist services to support patients with specific health behaviour goals. This may be explained by differences between area-level factors such as deprivation and the availability of services across different areas of England. The importance of environmental context (i.e. physical opportunity) and having access to specialist services in the role of supporting behaviour change was therefore further reinforced.

*Well, that lady joined a weight loss group and gave up smoking. She was seeing her GP regularly, so I think that clinical care and guidance helped. Another person was referred to a dietician. As I said, that was in regard to his cholesterol, and he was referred to a specialist...* (Staff 4, HCA, 50’s)

**Making use of existing ‘tools’**

Patients reported normalising their healthy behaviours using aspects of their physical environment (i.e. physical opportunity) which were readily accessible on a daily basis. This included increasing exercise levels by walking more using stairs rather than lifts, limiting the use of buses, using shopping as a way of exercising and bicycles for cycling. By using existing aspects of their environment and making them a part of their normal routine (i.e. automatic motivation), patients suggested that this facilitated their ability to maintain positive changes.

*I think the main goals were kind of like exercising, it was just kind of like getting off the bus a couple of stops early before uni and walking the rest of the way in… Because I’d been doing it for such a long time, I kind of managed to maintain it.* (Patient 6, Female, 40’s, Bipolar)
5.6 Discussion

5.6.1 Summary of key findings

A range of BCTs were reported as being used to promote healthy behaviour changes in people with SMI within the PRIMROSE intervention. This included goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, repetition and substitution, reward and threat, antecedents, and self-belief. While there was no evidence of explicit use of habit formation as a BCT, thematic analysis revealed that patients reported new habits were being formed due to embedding behaviours into daily routines.

The process of supporting and changing health behaviours were reported to be influenced by several elements. The proactivity to engage in changing behaviours was driven by motivation, which was varied across patients. However, being able to experience the visible benefits of engaging in healthy behaviours facilitated motivation and taking proactive actions to achieve health goals. Patient health knowledge in some cases facilitated motivation, but in some cases health perceptions were difficult to change and negatively driven by automatic and/or reflective motivation. Staff suggested mental health problems negatively impacted patients’ psychological capability to engage in intervention appointments and their motivation, however this was not evident in patient’s own accounts. Social opportunity including the support provided by staff facilitated patient motivation and informal social networks both facilitated and prevented healthy changes. Staff reported that their level of proficiency in mental health and behaviour change impacted on their ability to support patients. Physical opportunity in the general practice environment including time and resource were perceived as important to support patients. Patients who reported building healthy behaviours into their routine and normalising their behaviours (i.e. automatic motivation) also reported using existing opportunities in their physical environment (i.e. physical opportunity) to achieve this.

5.6.2 Comparison of findings to other literature and theory

5.6.2.1 Health knowledge and perceptions

The finding that patients who developed health knowledge as part of PRIMROSE suggested this facilitated healthy behaviour changes is consistent with other research (210, 226, 229, 231, 234). It was suggested by patients that the reasoning for this in
the present study was that their psychological capability in terms of understanding how their behaviours affected their health, in some cases affected their beliefs and evaluations about healthy and unhealthy behaviours (i.e. reflective motivation). However, a key feature of the Plans, Responses, Impulses, Motives and Evaluations (PRIME) theory (a theory from which motivational constructs of COM-B model were based) states that evaluations and/or beliefs only influence behaviour if strong enough desires and impulses (i.e. automatic motivation) are generated from them to overpower existing desires and impulses (241, 274). This explains the finding that health perceptions were in some cases difficult to change, although some patients reported having health knowledge and awareness, this was not enough to generate strong enough feelings related to the perception of needing and/or wanting to change. Similarly, quantitative work has reported that self-reported health behaviours was not associated with health knowledge in a sample of people with SMI sampled from secondary healthcare services (333). This suggests that although some patients may have perceived that health knowledge facilitated their behaviour change, for others, imparting health knowledge may not always be an effective strategy. Further, nurses reported better health behaviour change knowledge than HCAs which may suggest that it is possible that more care could be given to the way or by whom health information is delivered to ensure that people with SMI can identify more strongly with it.

5.6.2.2 Informal social networks

Another common finding across research studies has been that accessibility to emotional and practical social support from informal social networks including peers, staff, family and friends both prevents and facilitates health behaviour change (79, 100, 210, 211, 213, 215-217, 220, 223, 225-229, 231-236). Similarly, in the present study patients and staff reported that patients were likely to display similar healthy and/or unhealthy behaviours as peers. The social identity approach suggests that individuals’ personal identity are influenced by social groups and The PRIME theory supports that personal identity is a strong determinant of motivation (274, 334). It possible that patients’ sense of personal identity in terms of how they perceived themselves regarding their health were influenced by social comparison, either facilitating or hindering motivation to engage in behaviours. This may therefore support the value of peer-support interventions in this area, particularly in cases where health perceptions and automatic motivation were difficult to change. It is possible that if patients are better able to identify with peers rather than staff, this may result in
them being more motivated to want to change and engage with advice. There is some support for peer-led behavioural interventions for people with SMI; mental and physical health scores improved in a peer-led intervention to increase chronic disease self-management in people with SMI (335).

5.6.2.3 Staff support

Other research commonly reports that staff holding patients accountable for their actions, monitoring their behaviour and providing feedback facilitated behaviour change (219, 226, 229, 230, 234). Similarly, in the present study, the role of staff was perceived as an important contributor to health behaviour change. Staff and patients suggested that social opportunity in the form of nurses monitoring patients was linked to automatic motivation, whereby patients wanted to achieve health goals because of the anticipated pleasure of gaining staff approval (i.e. automatic motivation). This supports one of the assumptions of the PRIME theory that automatic motivation is one of the most important drivers of behaviour. The desire to please staff may have arisen from the positive and trusting relationships that most staff and patients formed as identified in the primary qualitative analysis (246).

5.6.2.4 Staff mental health and behaviour change knowledge

It has previously been suggested that the knowledge and personal attributes of staff impacts health behaviour change in people with SMI (79, 100, 210, 223, 225, 227, 229, 231-234). Similarly, staff reported varying levels of self-proficiency to engage with patients with SMI, which they suggested affected their ability to support patients engage in healthy behaviours. Nurses commonly reported better health knowledge and therefore better psychological capability than HCAs. This difference may be attributed to differences in levels of experience caused by different levels of responsibility and may suggest that nurses may be better placed to support patients with health behaviour change or that HCAs may require more training. However, there were differences between staff regarding their previous experience with people with SMI regardless of roles and this affected the extent to which they were able to communicate and motivate patients. This suggests that people with SMI may be better supported to engage in healthy behaviours by people with a background and/or experience in mental health as well as those with a background in behavioural science and knowledge in different motivational techniques. One study supported the involvement of mental health staff when supporting behavioural changes due to their
compassionate and collaborative style and their knowledge of mental health to support patients adequately (221).

5.6.2.5  Visible impact of behaviour change

Consistent with the present study findings, previous literature has reported that health behaviour change was facilitated by positive reinforcement in terms of observable results including physical appearance or health indicators and hindered by not being able to observe progress (79, 213, 223, 226, 229, 231, 234). One possible reasoning behind this was that motivation was increased through evaluating the effect of good and bad behaviours and/ or gaining pleasure from achieving goals. However, although feedback on behaviours, biofeedback and progress can be valuable tools in behaviour change, the present study supports that negative feedback cycles can occur negatively impacting healthy behavioural changes if care is not taken regarding how these methods are applied.

5.6.2.6  Environment and habitual behaviour

Consistent with other literature, patients also reported that building small changes into their routine and using physical opportunities such as taking the stairs rather than lifts for walking, helped normalise their behaviour whereby PA became habitual and part of normal behaviour (i.e. automatic motivation) (229, 231). This suggested that healthy behaviours were easier to carry out and maintain if they were achievable and engrained into daily routines. However, physical opportunities to normalise behaviour may differ between people with SMI, particularly between individuals living in deprived areas or experiencing financial strain. Factors such as restricted access to green space, the safety of neighbourhoods, the affordability of eating healthily and available fast food are known to impact health behaviour change in people with SMI (79, 224-226, 228, 231, 336). However, the findings did not reflect how socio-economic factors may have influenced the findings. One possibility for this was that given this was not the main purpose of the original qualitative study, this area was not covered sufficiently in interviews. However, there was some indication that area-level factors may have played a role where staff reported some differences in the availability of specialist resources to support behaviour change.

Although the findings reflected that some patients made use of their environment such as walking greater distances between bus stops to build behaviour into routine, there was no indication that staff encouraged repetition or rehearsal in such contexts. This
is formally identified as habit formation in the BCTT (V1) and was originally one of the eight PRIMROSE intervention components (100, 245). There were no reports from staff or patients that this technique was being applied in this way. As there was some suggestion by patients that habits were formed, it is possible that staff thought they were applying this method but perhaps not using the terminology as defined by the BCTT. Alternatively, it could be that staff adapted techniques to facilitate delivery. Another possible reason may be that this is a limitation of this data and was not covered enough in interviews.

5.6.3 Differences in opinion between staff and patients

Nurses reported that patients’ lack of knowledge, lack of awareness of the need to be proactive, mental health status and unhealthy social environments negatively affected engagement with healthy behaviours. However, some patients demonstrated an understanding of the effects of health behaviours, an awareness for the need to be proactive, did not commonly report that mental health symptoms and unhealthy social environments prevented behaviour change. One possible reason for the differences was that patients who took part in the study were perhaps more well, motivated, and willing to change their behaviours compared to those that declined participation. Alternatively, some patients may have distorted their responses due to social desirability. There is stigma associated to negative health behaviours and mental health and it is possible that patients were more likely to distort their responses for the purposes of gaining approval from interviewers. However, if this were the case, there would be inconsistencies throughout the data, yet there are similarities between both staff and patients across other themes. Alternatively, another possible explanation is that staff had negative pre-conceptions of people with mental illness and/or people who were not self-managing their health conditions well. In fact, the primary qualitative analysis supports that in some cases staff stigmatised patients for their mental health prior to delivering the intervention and this is consistent with other literature (100, 210, 211, 246). Although patients did not explicitly state that mental health symptoms affected their engagement with health behaviours, it may be possible that some people with SMI did not always prioritise their health behaviours as opposed to their mental health and that this came through indirectly when patients reported a lack of proactivity to action staff advice and the difficulties both staff and patients reported difficulties changing health perceptions.
5.6.4 Strengths and limitations

5.6.4.1 Research value

To my knowledge, this is one of the first studies to explore how a primary care-led intervention may have worked/ not worked to change health behaviours in people with SMI. No other studies have compared and explored the perspectives of primary care staff who delivered an intervention to promote health behaviours and patients who received it. Further, no other studies offer detail on staff and patient perspectives on how BCTs were used and/or worked in a primary care setting to support behaviour change. In addition, there is limited work that explores staff and patient perspectives on how the barriers and facilitators to supporting and changing health behaviours occur in a primary care setting through applying theoretical reasoning. That is, not simply mapping themes to components of theories using them as organisational frameworks, rather considering all aspects of a theory as a ‘working system’ where possible to interpret and explain possible findings.

5.6.4.2 Methodological rigour

According to Lincoln and Guba (1985), four criteria can be applied to establish the trustworthiness of findings arising from qualitative studies (337). This includes credibility, transferability, dependability, and confirmability. Credibility refers to the degree of assurance that the findings represent the participants ‘truth’, transferability refers to the applicability of findings to other similar contexts and participants, dependability refers to the extent to which the findings show consistency and are replicable and confirmability refers to whether the findings are representative of participants perspectives and to what extent they have been influenced by the researcher’s biases, motivations and/or interests. I next consider each in turn and their relation to the present study.

Credibility

Prolonged engagement and persistent observation

The data were collected by previous researchers through face-to-face interviews, which subsequently enabled them to engage with and observe participant responses and therefore pose follow-up questions. As the aim of the study was different to the original study, it is possible that researchers did not specifically pose questions related
to the current study aims. Further, as the data were collected some time before the start of my PhD, I was unable to personally collect the data and therefore engage with and observe participants. However, I attempted to address this limitation by listening to audio-recordings of the interviews to contextualise the data which allowed me to avoid as much as possible misinterpreting information. I further sought advice from one of the original researchers (A.B) involved in personally collecting the data. We discussed the codes derived from the data for the present study to ensure as much as possible that the codes reflected participant accounts. The data analysis process was also iterative and the codes and themes were revised until I felt satisfied that the themes added sufficient insight into the topics discussed.

**Triangulation**

Once the themes were derived, I compared both staff and patient perspectives to one another iteratively. This involved searching for both commonalities as well as discordant views to understand the range of perspectives. I also discussed the codes and themes derived from the data with J.R, K.W, A.B and D.O who all have a mixture of academic backgrounds ranging from medicine (General Practice), implementation science, psychiatry and health psychology. This was done iteratively to understand different ways of interpreting the data. Consulting different sources and analysts therefore enabled a comprehensive exploration of the research topic.

**Member checking**

It was not possible to cross-check the analysis with participants in the present study due to ethical restrictions and problems related to contacting participants without consent. Further, it is probable that this would not have added value to the analysis given the time between participants being interviewed and the present analysis and problems related to recall. The process is also controversial, and many argue that this may lead to greater confusion as participants may change their responses. Participants may distort their original responses and be influenced by social desirability or may regret expressing certain views.

**Transferability of findings**

The transferability of findings to similar contexts and those with similar experiences is commonly judged by the reader as opposed to the analyst as it is thought the reader
will have greater understanding of the context they intend to transfer the findings to (337). It is suggested that the analyst should provide a “thick description” of the sample, context, data collection methods and findings to facilitate this judgement. Throughout the present chapter and Chapter 2, I report in detail the factors required to judge the transferability of findings. The present study findings are not transferable to all, but they are somewhat transferable to people with/from similar backgrounds, contexts, perspectives, and experiences. However, the differences between different health behaviours in terms of the barriers, facilitators and BCTs for different health could not always be explored. This is specifically the case when staff were reflecting on their experience of supporting several patients overall and patients were reflecting on several goals they set. Therefore, the transferability of the findings to specific health behaviours are somewhat limited as there may have been variances for different health behaviours. However, the same BCTs were discussed in most cases across all health behaviours and this may be explained by the fact that HCPs were provided with a manual containing eight broad key components which could be applied to all health related behaviours.

**Dependability and confirmability**

**External audit**

As detailed previously, I was not originally involved in the research process and I assessed the credibility of the original codes that were derived in the primary analysis that I also used for the present analysis. After independently analysing the data, I cross-checked the original codes that were derived in the primary analysis against my own. In most cases, the codes were very similar and therefore demonstrated that the codes in most cases represented the data. There were a few cases where I identified new codes. However, these were related to my own research aims and were not the focus of the primary study. In addition to discussing the codes with those originally involved in the primary qualitative study, I also discussed them with J.R who was not involved in this process and we agreed that the codes reflected the data.

**Reflexivity**

Given that I was not involved in the data collection process, I can only retrospectively reflect on how researchers’ beliefs, values, perceptions, position, and characteristics may have affected data collection and analysis processes.
It is important to note that researchers originally involved in the data collection process were also involved in the management of the PRIMROSE trial. Although there was no prior contact with patients, researchers worked closely with some of the staff in terms of answering and dealing with administrative and PRIMROSE related queries. It is possible that the type of relationship that researchers shared with staff may have affected the way they collected the data. Social desirability may have affected both staff and patient responses in interviews. It is possible that staff distorted their responses depending on the relationship they shared with researchers and the knowledge of the researchers position in the PRIMROSE trial.

There is also stigma associated to certain health behaviours and mental health and it is possible that patients may have distorted their responses on this basis and awareness that researchers were involved in PRIMROSE. However, both researchers clarified at the beginning of the interview process that they were seeking both negative and positive views to prevent this as much as possible.

Both researchers (A.B and S.He) had a combination of mental health and psychology related academic backgrounds. Their prior academic knowledge and understanding of the PRIMROSE intervention may have influenced the way they collected the data. For example, they may have inadvertently prompted responses to certain questions more frequently if they believed this was an important element of PRIMROSE or prior literature showed that this impacted behaviour in this population.

When considering my own influence on the data, I had no prior relationship with staff or patients. Therefore, I approached the data afresh without any preconceptions or knowledge of these participants. Given that I have a personal interest in both mental and physical health as well as health psychology and knowledge of the literature in this area, I acknowledge that it is possible that this may have influenced the way I analysed the data. For example, I had prior knowledge of the COM-B model and this may have driven the analysis process. However, as detailed previously I discussed the codes and themes that I identified in the data with a multi-disciplinary team with different expertise to ensure that a broad range of perspectives were considered. I also compared the codes I identified to previous codes in the original primary analysis, which showed similarity.
Other methodological considerations

Consideration of different groups and perspectives

Rather than seeking statistically representative samples, the purpose of qualitative research is to sample participants to explore phenomena in depth and detail. Therefore, seeking variation based on participant characteristics may increase insights into different issues and therefore the credibility of findings.

In the current study, the sample recruited mostly captured the characteristics of those who took part in the trial, but black groups and those who were separated/divorced or widowed were not recruited. It is possible that these participants had different views to those recruited in the sample and this was not captured in the data.

The sampling technique involved recruiting a random 20% (8/38) of participating GP practices. Therefore, purposive sampling was not conducted, and it is possible that the views of participants beyond the 8 GP practices may have differed. Further, there may be differences between those that declined participation versus those that participated. For example, patients and staff may have greater interest in behaviour change and health promotion. In fact, most patients (n=12/15) attended 6 or more intervention appointments. It is possible that those with less interest in health promotion and behaviour change had different perspectives. However, some patients did report difficulties associated to changing their health behaviours, indicating that the sample included some patients that were less motivated to change their behaviours. In terms of the broader trial context, there was a lack of diversity in ethnicity in both staff and patients as well as staff gender, therefore it was not possible to capture the diversity of views that may be expressed by participants with greater ethnic diversity or male HCPs.

Participant recall

Staff were mostly (n=10) interviewed 11 to 18 months from delivering the intervention to the most recent patient. The remaining staff (n=5) were recruited 6 to 9 months after. This may appear a long duration between delivering an intervention and being interviewed about it, however the delay in being interviewed did not appear to affect staff recall in most cases.
Patients were mostly (n=11) recruited and interviewed between 6 to 9 months from the end of the intervention, which lasted 6 months. However, some patients (n=4) were interviewed between 10 to 12 months after the end of the intervention. The delay between receiving the intervention and taking part in the present study did appear to have some negative impact on the interview process. Some patients struggled with recalling prior events related to PRIMROSE.

**Inductive and deductive approaches**

As discussed in Chapter 2 (section 2.5.1.2), staff topic guides were based on the TDF and patient topic guides were based on the COM-B model. This would have inevitably biased the data toward this framework and model, potentially limiting the scope of the data and any deviation from the model and framework. This may explain why there was a strong resonance between the themes and the COM-B model. It may be considered a limitation that I also used the COM-B model after I had identified themes inductively to deductively explain the data, however this is an approach commonly applied in this area (338-342). Further, the decision to use COM-B was based on reasoning that it was specifically designed to address the limitations of other models. It provided a comprehensive account of behaviour and streamlined other constructs in other models to four simple constructs. This deductive approach enabled me to explore and explain the processes underling behaviour change according to staff and patient perceptions. This process therefore moved the analysis from description to interpretation thereby addressing the limitations of previous work.

It may be considered a strength that I initially took an inductive approach to identifying how BCTs were applied by coding the data and allowing divergence. However, I then mapped these codes deductively to the BCTT. It may be considered a limitation that I categorised data according to terminology used in the BCTT as it may have limited divergence. However, I was able to categorise all the codes identified under the BCTT given the quantity (n=93) of techniques covered. Therefore, there no instances where the codes did not relate to any of the techniques. This method also provided greater clarity of the techniques that staff and patients perceived and provides guidance for clinicians using standardised definitions and shared language. It may additionally be considered a limitation that I used interview data as opposed to observational methods to explore how BCTs were applied. However, as detailed in section 5.4.3.2, ethnographic approaches were not possible and audio-recorded appointments would
have provided less clarity on how patients perceived the techniques as well as the barriers and facilitators to applying them.

5.6.5 Conclusions

Overall, both patients and staff reported variability in the extent to which patients were able to adopt healthy behaviours and staff were able to support patients. Some reported that monitoring and reviewing health plans, providing information about health consequences, biofeedback, involvement from staff and supportive others, normalising behaviours facilitated capability, opportunity and/ or motivation to adopt healthy behaviours. However, others reported the reverse. This may hold some promise for the involvement of primary HCPs who are trained in delivering BCTs to this population to support health behaviour change. However, it was clear that in some cases primary HCPs required more knowledge and/or skills to change behaviour in people with SMI and given the variability in terms of the extent to which patients were able to adopt healthy behaviours, more work is required before health behaviour change interventions are employed in primary care settings for people with SMI. The implications of this chapter are discussed further in Chapter 7 (discussion).
Chapter 6  Study 4: Exploring how health behaviours are supported and changed within a real world integrated mental and physical healthcare context for people with severe mental illness: a qualitative study of staff and patient perspectives and experiences.

6.1 Chapter overview

In this chapter, I present the findings of a primary qualitative study designed to explore staff and patient perspectives regarding how health behaviours are supported and changed in an integrated healthcare context. I discuss the rationale for the study, methods, and findings in relation to theory and frameworks and previous work as well as the strengths and limitations. I independently designed the study, sought research ethics committee (REC) and health research authority (HRA) approvals, collected, and analysed the data. The findings are being prepared for dissemination to the healthcare setting that participated in the present study, will be used to inform the development of their service and are currently being prepared for publication.

6.2 Introduction and rationale

As discussed in Chapter 1, it is important to understand how health behaviours can be supported in people with SMI across different health contexts. Integrated mental and physical health services are more commonly advocated and guidance suggests health promotion should be offered within these services. However, very few qualitative studies explore how health behaviours are supported effectively in such settings for people with SMI.

The previous chapter explored supporting health behaviour change in a primary care setting within the PRIMROSE trial. This chapter now moves on to explore how it can be supported in a healthcare setting in a local area of London which has been deploying an integrated system for people with psychosis. This involves mental primary and secondary care services which aim to work together to support people with SMI with their physical health. Briefly, this integrated service is aiming to reduce the mortality rate of people with psychosis by identifying physical health issues while their mental health is being addressed. Integrated care takes on many forms in this service. Patients are screened yearly for physical health problems in wellbeing clinics in the mental health trust or within general practice. The intention is that when physical health problems are identified, these are communicated to senior doctors.
and nurses and a care plan is agreed and communicated with the GP. Care plans may involve ways of targeting patients’ health risk behaviours and the possibility of starting physical health medication such as statins for high cholesterol. In some cases, staff within mental health services may work closely with diabetes management services to gain their input on diet management approaches, in other cases mental health teams are set up in such a way to enable collaborative working (including a psychologist, nurse, psychiatrist etc.). In other cases, dual trained nurses (trained in both mental and physical health) from secondary care services may attend GP practices to screen patients for physical health problems (see Chapter 2, section 2.5.3 for more description on the context of this setting).

Chapter 7 (discussion) will then reflect on how these settings compare and what can be learnt from each setting in terms of support for health behaviour change in people with SMI.

6.3 Aims and objectives

The aims of the current study were to explore and compare how health behaviours were supported and/ or changed from the perspectives of staff working within in an integrated mental and physical healthcare setting and patients experiencing care within this setting.

The specific objectives were the same as those described in Chapter 5 (section 5.3). This was to enable comparability between the findings identified in the studies. This included exploring staff and patient perspectives and experiences on:

1. How BCTs were applied to encourage health behaviour changes using the BCTT (266).
2. Barriers and facilitators of making and supporting health behaviour changes, interpreting these using the COM-B model of behaviour for greater explanation (262, 263).
3. The processes behind how the barriers and facilitators of supporting and changing health behaviours occurred, referring to interlinking components of the COM-B model where possible for explanation.
6.4 Methods

6.4.1 Design

A qualitative study design was employed to address the aim of exploring how health behaviours are supported and changed within an integrated mental and physical healthcare context being deployed in a local region of London. The context of this setting is described in Chapter 2 section 2.5.3 and the justification for a qualitative approach is explained in Chapter 2 section 2.3.

6.4.2 Patient and public involvement (PPI)

I presented the protocol for this study to two patient and public involvement (PPI) members from the McPin Foundation, a charity that involves people with lived experiences of mental health problems in research to improve it using their experiences (343). Both members had previous difficulties with health behaviour change and accessing appropriate services. The feedback from PPI members was that this was a valuable project and a research study needed. Though they were not aware of or had experienced integrated healthcare settings, they thought this was valuable. They made no additional suggestions to the design of the study and thought the qualitative nature of the study would be helpful to enable patients the chance to openly express their opinions without being confined to pre-categorised responses. The PPI members also provided suggestions to help inform the questions in the topic guide which is covered more in section 6.4.5.3.

6.4.3 Eligibility criteria

6.4.3.1 Staff

Staff with the following criteria were included:

I) part of/affiliated with the service,
II) involved in the care of people with SMI in the service,
III) part of senior organisational management involved in the implementation/design of the service/monitoring progression of the service or
IV) a combination of the above.

Those not involved in providing patient care within the service or were involved in the service in terms of implementation, design or monitoring were subsequently excluded.
6.4.3.2 Patients

Patients meeting the following criteria were included:

I) diagnosis of SMI including psychosis, schizophrenia spectrum disorder, bipolar disorder,
II) aged 18+,
III) community-dwelling,
IV) received care as part of the service for health problems or currently receiving care as part of the service in the last 6-12 months,
V) capacity to consent (determined by HCPs) and
VI) English speaking.

The following patients were excluded:

I) mentally acutely unwell (determined by HCPs),
II) diagnosed with an organic mental health problem and/or severe cognitive impairment,
III) a life expectancy <6 months including being physically acutely unwell with terminal illness, under palliative care or undergoing chemotherapy,
IV) experiencing a recent bereavement (≤6 months ago),
V) diagnosis of personality disorder or depression/anxiety without any psychotic features,
VI) no capacity to consent (determined by HCPs) and/or
VII) non-English speaking were excluded.

6.4.4 Sample recruitment

6.4.4.1 Overview of recruitment procedures

The sample were obtained using both purposive and snowballing sampling techniques. Purposive techniques were used to identify participants from a range of age groups, gender, ethnic groups, experience levels (staff), roles and grades (staff), settings (i.e. primary and secondary care, within both boroughs), mental health diagnosis (patients) and CVD risk factors in patients (including: cholesterol problems, hypertension, being overweight, smoking and/or a diagnosis of diabetes) to gain a range of perspectives and facilitate a greater understanding of the service from different viewpoints. I planned to capture the perspectives of patients that did not
engage with services to explore any differing perspectives but was unable to access clinical records. Staff within the Trust would have to search records to identify potential patients and I decided against this to reduce the burden on staff.

I approached patients meeting the eligibility criteria in person/ on the telephone if given permission. I approached staff meeting eligibility criteria via email using a standardised email template and in person. I explained the purpose and procedures of the study and provided participants with a study information pack (see Appendix N). I continued to recruit participants to achieve diversity in the sample to ensure that sufficient people from a range of backgrounds were recruited who may have offered different perspectives.

6.4.4.2 Recruitment methods within mental health services

I recruited patients from mental health services in the Trust by attending outpatient clinics (i.e. psychiatrist appointments, early intervention services, depot, clozapine, and wellbeing clinics). The clinics were located within six locations across the two boroughs. I was informed of the clinics by senior members of the steering group. I approached key members of staff within the clinics to identify which patients would be eligible for recruitment. I specified the list of characteristics required for purposive selection and selected patients based on this. Clinicians introduced me to patients to enable them to feel comfortable being approached for recruitment.

I was provided with a list of staff employed within the service from the business manager. I purposively selected, approached and recruited participants from this list. However, these comprised of senior members and I intended to capture the perspectives and experiences of staff from a range of experience levels. When I recruited and interviewed senior members of staff, I used snowballing methods and asked them to provide me with details of staff who they managed and worked within the services using their knowledge to identify other members of staff in the service. I also recruited staff that were mentioned as ‘key’ members within interviews with other staff or informally discussed. This allowed me to approach and recruit staff whose key roles were otherwise ‘hidden’ within staff lists or clinics that I attended. I also approached administrators who provided lists of staff working within services, which allowed me to identify and purposively select and recruit a range of staff. I made use of my time within clinics recruiting patients to locate pre-selected staff working within services and approach them for recruitment in person. I recruited staff from six
locations across the two boroughs, including assertive outreach, early intervention, and outpatient services.

**6.4.4.3 Recruitment methods within primary care**

I planned to recruit participants directly from primary care and purposively select staff and patients from pre-filtered lists. Therefore, I worked with four dual-trained nurses to identify practices they worked within to approach practices for capability and capacity approvals for each of the practices. However, this process took longer than anticipated and would not be possible in the time required to complete this study. I therefore re-approached dual-trained nurses employed by the Trust working across primary and secondary care and asked them to identify patients they screened in primary care that would be willing to be contacted by myself about the research. Dual-trained nurses were responsible for 23 primary care practices between them. I specified the eligibility criteria and purposive selection characteristics. I was able to contact these patients specifically in primary care, send them information about the study and recruit them for participation.

**6.4.5 Data collection**

**6.4.5.1 Type of data collection method**

Semi-structured interviews were considered more appropriate for the purposes of the present study as compared to structured or in-depth/unstructured interviews. Structured interviews contain pre-determined closed-ended questions, which are therefore inflexible, preventing participants from openly discussing their experiences and perspectives and the discovery of new topics not originally considered by researchers. In contrast, in-depth/unstructured interviews are considered flexible in nature but these types of interviews are difficult to compare across an interview sample due to the exploratory nature of the interview. In the present study, perspectives on the same topics were intended to be sought and compared.

I decided against the use of focus groups for patients following consultation with one of the senior steering group committee members, given that patients may have felt uneasy expressing their opinions with other patients present. I aimed to conduct face-to-face rather than telephone interviews as the length and depth of information obtained can be affected where it is not possible to observe and/or display visual cues to prompt patients (344). However, I maintained a flexible approach and
acknowledged that some participants may have perceived telephone interviews as more acceptable (344). Only one patient expressed that they preferred a telephone interview and though I was unable to observe and display visual cues, I felt the quality of the interview was not compromised. I avoided meeting patients within their homes as it was stipulated by the Research Ethics Committee (REC) that interviews should not be conducted alone in participants homes and another colleague should accompany interviews. I recognised the inclusion of a third person may have affected the dynamics of the interview and the extent to which patients discussed specific topics. I therefore coordinated face-to-face interviews alongside patients existing appointments within mental health services or conducted them at UCL in pre-booked meeting rooms.

I intended to conduct focus groups with staff and further supplement focus groups with semi-structured individual interviews to explore views in-depth. However, several staff expressed concerns regarding the logistics of organising time for all staff to meet and were uncomfortable expressing their views among other staff members which they suggested would prevent them from participating. Having anticipated that these issues might arise, my REC approval covered the possibility of conducting semi-structured interviews alone. Face-to-face interviews were conducted within primary or secondary care settings as well as private spaces in local coffee shops as preferred by staff.

6.4.5.2 Background characteristics and demographics

I collected data to describe participant characteristics to facilitate the data analysis and purposive recruitment processes (see Appendix O). Patients were asked about their: age, gender, ethnicity, marital status, employment status, health service engagement in terms of the number of appointments they attended with their GP, practice nurse and mental health key worker, CVD risk factors including diagnoses of hypertension, raised cholesterol, diabetes, pre-diabetes, alcohol use using the AUDIT-C (see Chapter 4, section 4.4.4.1), smoking status, whether it had been suggested that they lose weight by a HCP and mental health diagnosis. Staff were asked about their: age, gender, ethnicity, borough, job title, length of employment, type of involvement in the service, length of involvement in the service, whether they had experience with people with SMI, physical health conditions, implementing and/or delivering health behaviour change interventions in the general population and people with SMI.
6.4.5.3 Topic guide design, content, and format

Two complementary topic guides for service users and staff respectively were used to facilitate discussion (see Appendix P). The PPI members suggested that topic guides for the patients could cover questions on the availability of resources (such as classes to facilitate healthy diet habits), the experience of symptoms and effects of medication, financial circumstances, social and peer support, stress and the impact on behaviour change and knowledge of CVD risk. Given the variation of topics that were discussed between the PPI members, I decided to keep the topic guides open in nature and not restricted to specific barriers/facilitators related to behaviour change. I also consulted a psychiatrist that previously worked within the service, to inform the development and then check the topic guides and background questionnaires. I asked questions about the background of the integrated context to help develop my topic guides, such as the extent to which patients were aware they were receiving integrated care. I was informed that patients were unaware of this and saw the service as part of their care. Therefore, questions were framed around whether they perceived their care as integrated rather than based on the notion that they were receiving integrated care. Further, I amended information sheets and summary leaflets to reflect this and used terminology involving a study seeking to explore patient views on the healthcare.

I kept the questions open-ended with prompts that aimed to explore, amplify, explain, and clarify responses given to questions. The format of the topic guides initially started broadly to facilitate rapport and then gradually progressed to specifics regarding the research aims. The topic guides were developed from the aims of the study and in consultation with the multidisciplinary supervisors. I decided against basing the topic guides on prior literature and/or theoretical models to allow for potential divergence.

The topic guides were piloted on the first few patients and staff (which were included in the analysis) to assess the relevance, format, flow, and openness of questions and prompts and I noted the interview questions worked well. However, I made some changes to the structure of interviews with patients. I initially conducted patient interviews followed by questions on background demographic characteristics as I thought that asking these questions before the interview could affect the depth of the responses provided in interviews due to the closed-ended of the questions. However, having conducted interviews with two patients in this way, I found that knowledge of background health information would have facilitated my ability to prompt patients
more. For example, the first patient denied drinking much alcohol, yet in the background questionnaire scored highly on the AUDIT-C. Another patient suggested HCPs did not discuss their physical health yet mentioned being diagnosed with hypertension and high cholesterol in the questionnaire.

6.4.5.4 Field notes and reflexivity

I kept field notes in a diary to reflect in the analysis on how my personal characteristics, participant characteristics and the setting may have impacted data collection after interviews (these reflections are described further in section 6.6.4.2 ‘reflexivity’). I reflected on the impact of the following characteristics on data collection: ethnicity, gender, education, culture, class, ability, age, religion, physical surroundings (345). I also kept field notes and listened to interview recordings after each interview to reflect upon the recruitment process, ways I could improve my interviewing style to increase rapport and initial thoughts on common and discordant views. I also kept notes on my observations of clinics to explore any consistencies or differences between my observations and patient and staff accounts (discussed in section 6.5.4).

6.4.5.5 Interview procedures

Prior to the start of interviews, I reiterated the purpose and procedures of the study and gave participants the opportunity to ask questions related to the study. All participants provided their written informed consent (see Appendix Q). As one of the patient interviews was conducted on the telephone, I ensured that the participant had a copy of the consent form, so she was able to follow each point that I verbally read out aloud. I then proceeded to ask her whether she agreed or not and sought permission to place her initials in the boxes, taking consent on her behalf.

At the start of patient interviews, I explained my role to patients as an external PhD researcher and was clear that I was not involved in their healthcare and that any questions related to this should be directed toward HCPs. I also explained to staff and patients that I was in no way affiliated with the service. There is research to suggest that the professional background of interviewers can affect the interview process and I aimed to minimise this as much as possible by explaining my role (346). To reduce the impact of social desirability, I encouraged both staff and patients to express both positive and negative views and experiences and reiterated that there were no ‘right’ or ‘wrong’ answers, reassuring them that all the information they provided me would be anonymised, confidential and stored securely.
Participants were given the opportunity to discuss any further thoughts at the end of each interview. Patients were given a £10 high-street voucher at the end of the interview to reimburse them for their time. All interviews were audio-recorded using an encrypted Dictaphone and then transcribed verbatim using an external transcribing company. Transcribed interviews were checked against audio-recordings for accuracy and amended where necessary. I anonymised transcripts by removing names and locations prior to the analysis and replaced names with unique participant identification codes.

6.4.6 Ethical considerations

The present study was ethically approved by the London - Westminster REC and Health Research Authority (HRA) (REC reference: 19/LO/1233, IRAS: 246924, 6th and 17th September 2019) (see Appendix R). I wrote and submitted the application and independently attended the ethics committee meeting to discuss the application with committee members which was later approved. I also obtained capability and capacity agreements with the mental health trust as well as a letter of access to conduct research activities. All consent forms and demographic questionnaires were stored and locked in a secure room in UCL. Electronic copies of transcripts, audio recordings and recruitment details were stored in UCL’s Data Safe Haven, a secure system for storing identifiable data.

6.4.7 Analysis

6.4.7.1 Overview of the analysis approach

Transcribed interviews were uploaded on to NVivo Pro (Version 12) software to assist in the organisation of data. I began the analysis process by reading transcripts repeatedly as well as listening to audio-recordings. I noted initial codes and areas of interest and used my field notes to facilitate this process. These steps were taken to familiarise myself with and immerse myself in the data. I proceeded to code the data by moving between interviews and identifying consistent and inconsistent codes by comparing staff and patient responses. I iteratively revised the codes by repeatedly reading the transcripts until I felt satisfied they represented the data. The codes were applied consistently across the transcripts. The codes were inductive and therefore driven by the data.
I provided another researcher (A.B) with two of the patient transcripts and two of the staff transcripts to independently code. We discussed the codes together and in another meeting with a member of the supervision team (K.W) who also read both staff and patient transcripts. The researchers have a multidisciplinary background in mental health research, health psychology and primary care research with mixed-methods expertise. This process allowed me to refine codes and identify further potential codes of interest.

Further analyses were conducted following the identification of codes to address each the different objectives of the study and are briefly summarised next. The analysis approach followed the same approach as study 3, Chapter 5 (section 5.4.3.2 and 5.4.3.3) where justifications and more detail on these analysis approaches can be found. The analysis followed an iterative approach whereby themes, the mapping of data to the BCTT and interpretation of themes using COM-B was continuously revised until I was satisfied that these reflected the data.

6.4.7.2 **Objective 1 analysis approach**

*Exploring how behaviour change techniques (BCTs) were applied to encourage health behaviour changes using the BCTT.*

In the first level of analysis previously described above, descriptive codes were derived regarding staff and patient perceptions on how behaviour change was being supported both by staff in the integrated setting. These codes were therefore derived inductively and were data driven. In the second stage of analysis, I mapped these codes deductively to BCT labels in the BCTT (245). I discussed the mapping of these codes with A.B and K.W and revised the labelling of BCTs, as necessary.

6.4.7.3 **Objective 2 and 3 analysis approach**

*Exploring the barriers and facilitators of making (patients) and supporting (staff) health behaviour changes and the processes behind the barriers and facilitators using the COM-B model.*

Following identification of descriptive codes related to the barriers and facilitators to supporting and changing health behaviours, I grouped the codes into broad and sub-themes. This process was iterative, which involved repeatedly reading the codes and data extracts to identify patterns and underlying meanings through to the written
presentation of findings. I compared staff and patient experiences and perceptions throughout and identified discordant as well as consistent views. I also discussed the themes with K.W and A.B which helped to both refine themes and identify potential other themes of interest.

To further explain the underlying processes and meanings behind the barriers and facilitators of supporting behaviour change, I used the COM-B model to deductively interpret the themes (241, 242). I applied the definition of COM-B constructs and theory regarding how the components in the COM-B linked to one another to interpret the themes and quotes. I also consulted K.W and A.B and discussed different ways the themes could be interpreted and revised my interpretations where necessary.

### 6.5 Results

#### 6.5.1 Sample characteristics

A total of 34 participants took part. Out of 32 staff approached, 20 participated. Reasons for staff non-participation included: not contactable (n=6), on long-term sick leave (n=3), had other competing demands (n=2) and newly appointed to the role (n=1). From 22 patients approached, 14 participated. Reasons for patient non-participation included: not interested (n=6) and had other competing demands (n=2).

Staff characteristics are displayed in Table 6-1. Staff ranged from 24-54 years of age and more were female (12/20) and worked within mental health services (14/20). A range of ethnic groups were captured, as well as those working in primary care and both secondary care mental health services and primary care. A range of professional roles were captured. Staff had between 2 months to 16 years’ experience working in their current roles. The length of involvement in the integrated aspect of the service ranged from 2 months to 5 years. Most staff had previous experience working with people with SMI (19/20), people with physical health problems (15/20) and implementing/delivering health behaviour change to people with SMI (17/20). However, most staff had no experience of implementing/delivering health behaviour change interventions to other people in the general population without SMI (14/20).
### Table 6-1 Staff characteristics

<table>
<thead>
<tr>
<th>Staff Characteristics</th>
<th>N =20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>1</td>
</tr>
<tr>
<td>25-35</td>
<td>5</td>
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<td>36-45</td>
<td>6</td>
</tr>
<tr>
<td>46-55</td>
<td>8</td>
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<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>White British</td>
<td>9</td>
</tr>
<tr>
<td>White Irish</td>
<td>2</td>
</tr>
<tr>
<td>Black African</td>
<td>1</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>2</td>
</tr>
<tr>
<td>White/ Black Caribbean</td>
<td>1</td>
</tr>
<tr>
<td>Mixed other</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td><strong>Service type</strong></td>
<td></td>
</tr>
<tr>
<td>Secondary care mental health services</td>
<td>14</td>
</tr>
<tr>
<td>Primary care</td>
<td>2</td>
</tr>
<tr>
<td>Both</td>
<td>4</td>
</tr>
<tr>
<td><strong>Name of borough working within</strong></td>
<td></td>
</tr>
<tr>
<td>Borough 1</td>
<td>11</td>
</tr>
<tr>
<td>Borough 2</td>
<td>6</td>
</tr>
<tr>
<td>Both</td>
<td>3</td>
</tr>
<tr>
<td><strong>Professional role</strong></td>
<td></td>
</tr>
<tr>
<td>Doctors</td>
<td></td>
</tr>
<tr>
<td>General practitioner</td>
<td>1</td>
</tr>
<tr>
<td>Psychiatrist</td>
<td>1</td>
</tr>
<tr>
<td>Registrar</td>
<td>1</td>
</tr>
<tr>
<td>Nurses</td>
<td></td>
</tr>
<tr>
<td>Specialist mental health nurse (&quot;SMI&quot; nurse)</td>
<td>3</td>
</tr>
<tr>
<td>Clinical nurse specialist*</td>
<td>1</td>
</tr>
<tr>
<td>Community psychiatric nurse*</td>
<td>1</td>
</tr>
<tr>
<td>Community matron</td>
<td>2</td>
</tr>
<tr>
<td><strong>Allied health professionals &amp; other team roles</strong></td>
<td></td>
</tr>
<tr>
<td>Clinical Psychologist</td>
<td>1</td>
</tr>
<tr>
<td>Occupational Therapist*</td>
<td>3</td>
</tr>
<tr>
<td>Social worker*</td>
<td>3</td>
</tr>
<tr>
<td>Peer coach</td>
<td>2</td>
</tr>
<tr>
<td>Sports practitioner*</td>
<td>1</td>
</tr>
<tr>
<td><strong>Length of employment in professional role</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>3</td>
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<tr>
<td>1-2 years</td>
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<td>3-5 years</td>
<td>3</td>
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<tr>
<td>6-10 years</td>
<td>3</td>
</tr>
<tr>
<td>16 years</td>
<td>1</td>
</tr>
</tbody>
</table>
Patient characteristics are displayed in Table 6-2. Participants ranged from 22-64 years of age and half were 46-55. The sample was very ethnically diverse with only 2/14 designating themselves as White British. Half lived alone, around half were females (8/14), and resided in borough 1 (8/14). Patients were mostly unemployed and on benefits (10/14) and recruited within mental health services (10/14). Half had attended >3 appointments with their GP in the last year (7/14) compared with only 1/14 attending >3 appointments with their psychiatrist or practice nurse. A range of CVD risk characteristics were captured. Half of the participants reported that they had been advised to lose weight by a HCP, around half were smokers (8/14) and scored ≥5 on the AUDIT-C (8/14) and classified as at risk of potential dependence/hazardous use. More than half reported being diagnosed with schizophrenia/schizoaffective disorder (8/14), with 5/14 reporting bipolar disorder and one other psychosis.
Table 6-2 Patient characteristics

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>N =14</th>
</tr>
</thead>
<tbody>
<tr>
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<td>&lt;25</td>
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</tr>
<tr>
<td>25-32</td>
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</tr>
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<tr>
<td>46-55</td>
<td>7</td>
</tr>
<tr>
<td>56-65</td>
<td>4</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>White British</td>
<td>2</td>
</tr>
<tr>
<td>White Other</td>
<td>2</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>4</td>
</tr>
<tr>
<td>Black African</td>
<td>1</td>
</tr>
<tr>
<td>Asian Other</td>
<td>1</td>
</tr>
<tr>
<td>White/ Black Caribbean</td>
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</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td><strong>Location of recruitment</strong></td>
<td></td>
</tr>
<tr>
<td>Mental health services</td>
<td>10</td>
</tr>
<tr>
<td>Primary care</td>
<td>4</td>
</tr>
<tr>
<td><strong>Borough of residence</strong></td>
<td></td>
</tr>
<tr>
<td>Borough 1</td>
<td>8</td>
</tr>
<tr>
<td>Borough 2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Living arrangements</strong></td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>7</td>
</tr>
<tr>
<td>With others</td>
<td>7</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>2</td>
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<tr>
<td>Employed part-time</td>
<td>1</td>
</tr>
<tr>
<td>Unemployed, on benefits</td>
<td>10</td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
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<tr>
<td><strong>Health services engagement (appointments attended)</strong></td>
<td></td>
</tr>
<tr>
<td>GP*</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>6</td>
</tr>
<tr>
<td>&gt;3</td>
<td>7</td>
</tr>
<tr>
<td>Practice Nurse</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>13</td>
</tr>
<tr>
<td>&gt;3</td>
<td>1</td>
</tr>
<tr>
<td>Psychiatrist</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>13</td>
</tr>
<tr>
<td>&gt;3</td>
<td>1</td>
</tr>
<tr>
<td>Mental health key worker*</td>
<td></td>
</tr>
<tr>
<td>N/A**</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Physical health diagnoses</strong></td>
<td></td>
</tr>
<tr>
<td>Raised cholesterol</td>
<td>5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>4</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3</td>
</tr>
<tr>
<td>Prediabetes</td>
<td>1</td>
</tr>
</tbody>
</table>

**Mental health diagnoses**
- Schizophrenia/schizoaffective disorder | 8 |
- Bipolar disorder | 5 |
- Other psychosis | 1 |

**Advised by HCP to lose weight**
- Yes | 7 |
- No  | 7 |

**Smoking status**
- Smoker | 8 |
- Non-smoker | 6 |

**Alcohol**
- AUDIT-C score
  - <5 | 6 |
  - ≥5 | 8 |

*n=1 unknown.*
**No longer assigned key worker.**

### 6.5.2 Objective 1 findings

Exploring how behaviour change techniques (BCTs) were applied to encourage health behaviour changes using the BCTT.

There were 15 descriptive codes which were mapped to a total of 30 BCTs in the BCTT. A table displaying the process of mapping the data to the BCTT can be found in Appendix S (see Table 1). The BCTs identified were grouped by the broader BCTT groupings for brevity to summarise the findings. The BCTs were categorised within 11 broader BCTT categories and briefly I summarise below how techniques were applied within these broader categories. Details regarding the individual techniques can be found in Appendix S (see Table 2) with illustrative quotes.

#### 6.5.2.1 Goals and planning

Staff commonly reported that they helped patients identify a health behaviour to address and help them set goals. It was rarely reported that staff were prompting patients to identify factors preventing them from forming healthy behaviours and how to overcome any difficulties. This was only reported by one staff member trained in behaviour change. In some cases, staff and patients suggested an action plan was formulated with guidance on how to achieve goals but that was not common. It was
also less often reported that staff would review goals to identify whether they had been achieved.

...you can do... short-term, medium-term and long-term goals... in terms of physical health you can kinda' look at their long-term goal, for instance, being able to do a bit more exercise and being able to go out and walk if you’ve got chest problems or anything like that or wanting to give up anything. And then working back, this can be the medium-term, and this can... short-term we’ll... Do these things, and we'll, keep coming back to those... (S11 Female, 20's, Allied health professionals & other team roles)

....we drew up, a care plan... things that I will do to help myself...we talked about doing yoga, some of the safety nets, and support network I utilise… so we just put a care plan together with some action plans... Of...things to keep me maintaining my health. (P13 Female, 30's, Bipolar)

### 6.5.2.2 Feedback and monitoring

A minority of staff reported that they would monitor patients in terms of keeping track of whether the patient was achieving their desired goal and/or outcome. It was not reported among staff that this information would be communicated to the patient and was only suggested by one member of staff with a health behaviour change specialism. Similarly, only one staff member suggested that they encouraged patients to self-monitor behaviour through keeping food diaries. Staff and patients commonly reported that patients’ health markers would be monitored by staff including measuring weight and blood pressure.

It's also helpful to use the... ‘smokerlyzer’ in which they breathe into the machine. Um, and you can see your tar levels, your carbon dioxide levels. (S3 Female, 40's, Nurse)

...the other day when I was here, and they said...my blood pressure... Is a little bit high... I was weighed, she weighed me ... I've always weighed 15 stone, but all of a sudden, I've grown to 16 and a half stone. (P1 Male, 40's, Bipolar)

### 6.5.2.3 Social support

Both staff and patients commonly reported on both the emotional and practical support provided to patients by staff. Staff and patients reported that in some cases, staff would signpost patients to specialist behaviour change services for further practical support such as guidance on planning meals. Staff suggested that they
would attend PA groups with patients or signpost patients to peer support services and/or peer activity groups to further facilitate peer emotional support.

...if it's more about kind of support with, planning a healthy diet and actually buying the foods. In the past I've... I've referred for floating support through local resource... Which is a community centre but they also offer one-to-one support. (S15 Male, 30's, Allied health professionals & other team roles)

I go to [location anonymised] for Zumba exercise... they referred to the... service, and she came and, she, arranged it for me to do... Nurse, I think. Nurse or social worker. (P9 Female, 50's, Schizophrenia)

6.5.2.4 Shaping knowledge

Staff and patients commonly reported that staff provided patients with information on how to carry out healthy behaviours. It was only reported by a member of staff with specialism in behaviour change that patients would be encouraged to perform behavioural experiments to develop an understanding of the positive and negative consequences of unwanted and wanted behaviours.

... advising them about food groups... I’ll always ask them about... your diet, five a day, and you ask them, tell me exactly what I mean by five a day... I’ll always tell people about what we have available, smoking cessation... And I’ll tell them a little bit about how they take it. (S5 Female, 50’s, Nurse)

...she said, this Doctor, don’t eat too much cheese, don’t eat too much butter... It’s like... you should eat... healthy salads, vegetables... You know, brown bread, not a lot... (P12 Female, 40’s, Bipolar).

6.5.2.5 Natural consequences

Staff and patients commonly reported that staff would provide patients with information about the consequences of unhealthy and healthy behaviours regarding health outcomes. A minority of staff expressed that they would also provide information about the social and environmental, and emotional consequences of unhealthy/healthy behaviours.

I’d start educating them... I talk to them about their insulin and what happens when they eat... what happens when they eat late at night. What happens if they’re unable to burn off some of those calories. How it’s getting stored. What are the risks... being able to have a discussion about
alcohol, to think about the calories. The empty calories in alcohol... And thinking about how alcohol impacts on the body.... It’s supposed to be [visual tool depicting effects of smoking], one’s supposed to be an artery... The other one is, how smoking impacts, affects your lungs...and this is the tar of um, what does it say, a twenty a day smoker. So, it takes up to 400mg of tar a day, that’s a thick, brown, cancer causing tar inhaled into the lungs each year. (S3 Female, 40’s, Nurse)

... they [GP and SMI nurse] said, you know what’s gonna’ happen, you can have stroke, you can have heart attack, you can have brain bleeding, you can, you know... You have to be careful what you’re eating.. (P12, Female, 40’s, Bipolar)

6.5.2.6 Comparison of behaviour

Staff commented that in some cases HCPs would demonstrate behaviours to patients such as cooking healthily.

The OT could do cooking sessions with them. (S16 Female, 30’s, Doctor)

6.5.2.7 Associations

Staff in some cases expressed that they would encourage associative learning by identifying healthy activities that patients associated with pleasure and enjoyment to encourage behaviour change.

...you can link alleviation of the distress to something that they can enjoy doing or which they’ve always wanted to do, whether it’s a short-term or long-term goal, it’s those two things hand in hand that.. A goal that feels to them meaningful that really makes them excited in some way and at the same time alleviates something which they are currently really, really suffering with. If you can get those two things in place at the same time then you’re onto a winner. (S18 Male, 50’s, Allied health professionals & other team roles)

6.5.2.8 Repetition and substitution

In some cases, staff also suggested that they would provide suggestions on alternative behaviours to replace unwanted behaviours. Few staff explicitly reported that they encouraged habit formation by repeating behaviours in the same context continuously. However, there was some suggestion that patients were encouraged to build changes into their daily routine. A minority of staff also expressed that they would gradually build on their approach by encouraging small changes and progressing this slowly.

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...clinic rooms... the walls are littered with just ideas...swap this with this. ...rather than having lemonade, have fizzy water. If you want a bit of flavour put a little bit of orange juice in it... it's just those simple little swaps... chicken and chips... When you go into that shop, ask for a little bit of salad with it. (S7 Female, 50's, Nurse)

...why not try and walk down one flight of stairs, take the lift the next one, and then gradually build up, and training people to see they can take little baby steps in getting a bit more active. (S5, Female, 50's, Nurse)

6.5.2.9 Comparison of outcomes

Staff commonly reported encouraging patients to talk about the advantages and disadvantage of their unhealthy behaviours.

... making someone, like, explicitly say what the pros and cons are... (S11 Female, 20's, Allied health professionals & other team roles)

6.5.2.10 Reward and threat

A minority of staff with access to PA groups implemented in the community would promote the incentives of being involved in these groups. Staff and patients commonly reported on the social reward displayed by staff when they achieved their behavioural goals.

...praising them for what they've achieved... celebrating success... well done, you've done very well... (S5 Female, 50’s, Nurse)

The psychiatrist also said, you are doing good, and whatever you are doing, you carry on with that. (P9 Female, 50’s, Schizophrenia)

6.5.2.11 Self-belief

A minority of staff reported emphasising to patients their strengths to develop their confidence. Few staff also reported identifying activities patients were good at in the past and focusing on how this past success was achieved.

...looking at strengths that people have...everybody has strengths...They just don't know it... it's about breaking all those down and looking with them. (S13 Male, 40's, Allied health professionals & other team roles)
6.5.3 Objective 2 and 3 findings

Exploring the barriers and facilitators of making (patients) and supporting (staff) health behaviour changes and the processes behind the barriers and facilitators using the COM-B model.

Rich data were collected and a total of 9 main themes and 24 sub-themes were identified that related to the barriers, facilitators and underlying processes supporting and changing health behaviours in the integrated setting. As in Chapter 5, staff and patient views were combined and compared within the themes for triangulation.

The main themes identified in the data included:

- The importance of the self in behaviour change
- Health knowledge, skills, and perceptions
- Emotional, psychological and physical experiences associated with health behaviours and motivation to change
- The impact of socioeconomic and environmental factors
- Normalisation of health behaviours
- Social, cultural norms, modelling and support
- The use and availability of behaviour change services
- Staff knowledge, professional identity and responsibilities
- Integrated working between mental and physical health services

As in Chapter 5, I use both the individual and interlinking components of the COM-B model to interpret the themes and explain the underlying processes where possible in the written presentation of findings. Below I provide a table summarising the themes, sub-themes and description of the findings.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
<th>Brief description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The importance of the self in behaviour change</td>
<td>• The role of proactivity and self-responsibility</td>
<td>Patients’ role was instrumental in facilitating change regardless of staff involvement</td>
</tr>
<tr>
<td></td>
<td>• Readiness and willingness to change</td>
<td>The perception of being proactive, ready and capable of change affected change</td>
</tr>
<tr>
<td></td>
<td>• Patients’ role was instrumental in facilitating change regardless of staff involvement</td>
<td>Medication side-effects could negatively impact behaviour change</td>
</tr>
<tr>
<td>Health knowledge, skills and perceptions</td>
<td>• The impact of knowledge</td>
<td>Health knowledge had a variable impact</td>
</tr>
<tr>
<td></td>
<td>• Difficulties changing perceptions</td>
<td>Awareness of risks and fear evoked from information positively influenced change</td>
</tr>
<tr>
<td></td>
<td>• Health knowledge had a variable impact</td>
<td>Health perceptions were difficult to change</td>
</tr>
<tr>
<td>Emotional, psychological and physical experiences associated with health behaviours and motivation to change</td>
<td>• Emotional and psychological impact</td>
<td>Emotional, psychological and physical experiences with health behaviours influenced motivation positively and negatively</td>
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<td></td>
<td>• Physical impact</td>
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<tr>
<td>The impact of socioeconomic and environmental factors</td>
<td>• Financial circumstances</td>
<td>The affordability of cheaper unhealthy foods negatively affected change</td>
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<td></td>
<td>• Access to outdoor space</td>
<td>Access to outdoor spaces were helpful for PA but unavailable in some areas</td>
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<td>Normalisation of health behaviours</td>
<td>• Fitting behaviours into lifestyle</td>
<td>There was difficulty making healthy behaviours habitual and long-term habits were difficult to break</td>
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<td>• Routine and long-term behaviours</td>
<td>Some healthy behaviours like walking, were easy to incorporate and became habitual</td>
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<tr>
<td>Social, cultural norms, modelling and support</td>
<td>• Cultural norms</td>
<td>Interacting with similar cultures and informal social networks influenced beliefs about health behaviours and behaviours</td>
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<td>• Informal social network</td>
<td>External peer support in PA groups helped increase patient motivation</td>
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<td>• The value of external peer support</td>
<td>HCPs were a source of emotional and practical support and facilitated motivation and change</td>
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<td>• Healthcare provider (HCP)</td>
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<td>The use and availability of behaviour change services</td>
<td>• Accessibility and funding of services</td>
<td>Staff increased patient access to behaviour change services</td>
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<td></td>
<td>• Accountability and monitoring</td>
<td>Resource was scarce and patient engagement with services varied</td>
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<td>• The need for staff time and follow-up</td>
<td>A lack of monitoring, the questionability of the suitability of services and patients lack of confidence in their abilities negatively impacted engagement</td>
</tr>
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<td>• Suitability of services</td>
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<tr>
<td>Confident in abilities</td>
<td>Staff had limited time to follow-up on patient progress when signposted but follow-up was considered important</td>
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**Staff knowledge, professional identity and responsibilities**
- Awareness and understanding of behaviour change
- Understanding of process and resources
- Staff awareness of the need to target health risk behaviours was enhanced due to the integrated service
- Staff understanding of how to target such behaviours was variable
- All staff requested training on BCTs
- There was a lack of standardised processes and information sharing on how to support health risk behaviours
- Staff professional identity affected the extent to which they helped to change patients’ health risk behaviours

**Integrated working between mental and physical health services**
- Using skills and knowledge within primary and secondary care
- Utilising knowledge on patient relationships within services
- Primary and secondary care had complementary skills and consulted these where possible
- Integrated working was negatively impacted by communication issues caused by a lack of access to an information sharing system
- Patients viewed mental and physical health care as disjointed.
6.5.3.1 The importance of the self in behaviour change

A common occurring theme among staff and patients was the importance of the patients’ role in facilitating their own behaviour change regardless of the involvement of staff. Beliefs regarding the need for self-responsibility and the perception of being proactive, ready, and capable to change behaviour were described as affecting behaviour change. It was suggested that these were commonly underpinned by reflective and automatic motivation. However, factors beyond patients’ control including medication side-effects were also negatively affecting their willingness to change.

The role of proactivity and self-responsibility

Patients commonly reported that although they received advice (i.e. psychological capability) from HCPs regarding health behaviour change, their involvement did not necessarily facilitate behaviour change. Patients believed that they were responsible for initiating their own behaviour change and this would not occur unless they initiated change or engaged with advice (i.e. reflective motivation).

…it’s up to me… the advice is fine given to me, but I have to stick with it… I think the thing is, it’s me sticking to it… I just haven’t done my part to look into it, to be honest. (P4, Female, 30’s, Schizophrenia)

Similarly, staff suggested that although they were able to discuss and recommend ways of facilitating health behaviour change in patients, it was ultimately up to the patient to make their own decisions (i.e. reflective motivation).

I think the reality is… often in the end the decisions are with the individual patient… So I think you can recommend…and try and direct them, but in the end it’s their decision. (S16, Female, 30’s, Doctor)

In other cases, patients that believed that they were proactive and therefore taking responsibility for their actions (i.e. reflective motivation), were more likely to independently seek and identify ways of changing their health behaviours. This perception along with the belief that certain foods were ‘good’ or ‘bad’ (i.e. reflective motivation) appeared to influence their behaviour change. Those that were more proactive in their behaviour change were recruited from primary care services, diagnosed with bipolar and were potentially more stable and on oral antipsychotics.
It’s hard to say because I’m pretty proactive myself… I’m trying to cut out things that are not good for me… Like snacks, cookies, crisps, or something like that. So I have gone to more yoga… before I signed up for the exercise class, but… I’ve emailed another… teacher locally. (P13, Female, 30’s, Bipolar)

Well I don’t need that [Advice] because I got it by myself… (P11, Female, 50’s, Bipolar)

…A lot of the individuals using the Service started to change their own, um, lifestyle choices… Subjectively as opposed to objectively. Um, we’re not telling them to stop smoking… Or telling them to eat less fatty foods… it just becomes natural. (S13, Male, 40’s, Allied health professionals & other team roles).

Readiness and willingness to change

A common theme related to the impact of patients’ beliefs regarding their readiness to make changes on smoking and alcohol behaviours. Patients who smoked or were drinking alcohol often commonly reported that they were not ready to change their behaviour and any tools to change this behaviour would not work unless they were in the mind-set of being ready to change.

… I’m not ready to stop smoking… mentally, you got to finish in your mind first… Otherwise, whatever you try… try the patches… try the hypnos, you try this and that and that, it doesn’t help. Or chewing gum, or whatever, doesn’t help. You got to finish in your mind. (P12, Female, 40’s, Bipolar)

This was also supported in staff accounts. Most staff demonstrated an awareness (i.e. psychological capability) of the importance of being in the right stage of the cycle of change (see Chapter 7, section 7.2.3.1 Figure 7-1) for behaviour change to occur and be targeted. Staff suggested that although they could advise patients, patients had to believe that they were ready to make changes to their smoking and alcohol behaviours to facilitate behaviour change. Further, it was suggested that the readiness to quit smoking was due patients lacking belief regarding their capabilities because of lacking confidence (i.e. reflective motivation).

… I think a lot of the clients that we work with… There’s never really a right time… I don’t think very many people I work with have the confidence to stop smoking. (S15, Male, 30’s, Allied health professionals & other team roles)
Staff reported that patients were on some occasions lacking an innate desire to quite or reduce smoking and drinking (i.e. automatic motivation) and that they were unable to facilitate patients in terms of getting them to want to change.

... I think it's very hard because... I think certain people have that sort of spirit, like they're just outgoing or they're very motivated... I mean like when they're not as willing, you can see whatever you want to say, they're just going to look at you and say okay and nothing gets done. (S12, Female, 20's, Nurse)

This was supported in patient accounts. Patients with unhealthy smoking and drinking habits reported that they lacked the desire to change (i.e. automatic motivation) and this prevented them from changing their behaviours.

Nothing’s stopping me. I just don’t want to stop. (P5, Male, 50’s, Schizophrenia)

In other cases however, factors beyond the patients’ control were influencing their willingness to change their PA levels. Medication prescribed to patients for mental health difficulties could have negative psychological side-effects including drowsiness (i.e. psychological capability) which subsequently affected patient motivation to carry out PA. This was also supported by patients who suggested that they felt “dozy” and “tired” (i.e. psychological capability) due to medication and unmotivated and not wanting to move consequently (i.e. automatic motivation). Therefore, patients suggested that their lack of psychological capability was negatively influencing their motivation.

... I speak to a lot of individuals who are on that medication and say it makes them very sleepy. (S10, Male, 40’s, Allied health professionals & other team roles)

I am concerned about the side-effects of medication... it does make you dozy as well... So then it’s gonna’ affect your motivation... I was on Olanzapine before... And I put on loads of weight. I wasn’t eating great either... But it just... It made me feel dozy all the time. So these things are affecting your motivation... To do physical exercise... (P13, Female, 30’s, Bipolar)
6.5.3.2 Health knowledge, skills, and perceptions

Health knowledge (i.e. psychological capability regarding patient understanding of health risks and how to be healthy) was perceived as an important contributor to both patient beliefs about the consequences of being unhealthy (i.e. reflective motivation) and the fear they experienced from realisation of the negative impact of their behaviours (i.e. automatic motivation) which was facilitated by staff. However, despite having knowledge (i.e. psychological capability), some patients still lacked desire (i.e. automatic motivation) to change their health behaviours. Further, staff experienced difficulties changing patients’ perceptions of their health behaviours, where they were minimising and/or not willing to recognise the negative impact of being unhealthy (i.e. reflective motivation). Having the appropriate skills and knowledge to cook nutritionally (i.e. psychological capability) was also perceived as important but affected by mental health difficulties and physical opportunities to learn to cook.

The impact of knowledge

Patients commonly reported an awareness (i.e. psychological capability) of the health issues that could affect them such as stroke and heart attacks. Based on this understanding, patients reflected that engaging in healthy behaviours such as exercising and eating well could prevent health problems and keeping well (i.e. reflective motivation). This represented a link between psychological capability and reflective motivation whereby patients understanding of health risks informed their decision to exercise and/or eat well as they reflected that these could prevent health problems (i.e. reflective motivation).

I will have... in ten years' time...heart attack, or... stroke.... it helps me to prevent...illness... Doing exercise and watching diet. (P4, Female, 60’s, Schizophrenia)

This contrasted with staff experiences of patients. Staff commonly suggested that some patients lacked awareness of the importance of a healthy diet and the link between mental health and physical illnesses (i.e. psychological capability) and this lack of understanding prevented behaviour change.

...think people might not, they might not fully understand the importance of a healthy diet. (S16, Female, 30’s, Doctor)
…my understanding of patients with mental problems are not used to learning about how patients with SMI, severe mental illness, die from 30 years younger. They’ve not heard that. (S6, Male, 30’s, Doctor)

In other cases, staff suggested it was difficult to identify alcohol related behaviours when patients did not understand the concept of alcohol units or food groups (i.e. psychological capability). It was suggested that lacking psychological capability prevented behaviour change and that therefore education was used to facilitate behaviour change. However, some staff suggested that it was difficult for patients to retain the information they conveyed due to the nature of their mental illness which can sometimes cause cognitive impairment (i.e. psychological capability).

…if you’ve got to get a weekly measure of how many units, people don’t understand… the concept of units and what that means. They know that drinking’s bad… and then talking to people about food groups… knowledge is very varied… people don’t really understand why we say five a day, so I always ask them, why do we say five a day? And sometimes, people find it impossible to answer. (S5, Female, 50’s, Nurse)

….the mental health I think… the lack of insight…cognitive impairment and understanding. Some people are not able to retain information or understand information that way…. (S14, Female, 40’s, Nurse)

In contrast, patients commonly reported their understanding of food groups, the quality of food and the importance of quantities (i.e. psychological capability) which they gained from social networks (i.e. social opportunity). Generally, those that gained information from their social networks were also more proactive regarding their health behaviours and recruited from primary care. They suggested the knowledge they gained facilitated their ability to consume a healthy diet. This also supported staff perceptions that knowledge was in some cases an important tool for instigating healthy changes.

I’ve got a nutritionist which is a friend of mine… She gives advice…It’s like yeah you eating healthy but you been eating too much. She said to me… so the problem is when you eat large quantity, but whatever good food they are…They transform into sugars in the end. Because your body can’t assimilate all of them….that’s when I cut…The quantities. (P11, Female, 50’s, Bipolar)

Patients recruited in mental health services also commented on the knowledge (i.e. psychological capability) they had gained from HCPs. This was commonly perceived as a powerful tool by both staff and patients in facilitating behaviour change as this
had created fear in patients (i.e. automatic motivation). However, it was clear that patients reported becoming “scared” (i.e. automatic motivation) due to the information (i.e. psychological capability) that staff had shared about the effects of their unhealthy behaviours such as strokes and heart attacks which subsequently motivated them to change their behaviour.

... this Doctor... she made me scared, which is good she did...Because she said to me, you know what’s gonna’ happen to you...you can have stroke, you can have heart attack, you can have brain bleeding... they really scared me... You have to be careful what you’re eating... So, they give me advice, that’s why. (P12, Female, 40’s, Bipolar)

...the health thing was clearly massive and she could die, she was only in her early 40’s but she could die through... really uncontrolled diabetes, she knew that and she said that really motivated her (S18, Male, 50’s, Allied health professionals & other team roles)

It was also apparent that patients who reported fear from the health knowledge they had gained from HCPs also reported that they received similar health information from different professionals including SMI nurses, GPs and wellbeing nurses/ practitioners (i.e. psychological capability), reflecting a coherent approach from different HCPs to target health behaviours. It is possible that being given such information from multiple sources in a consistent manner meant that information was further reinforced and enhanced the fear they experienced (i.e. automatic motivation).

... The psychiatrist also said, you are doing good, and whatever you are doing, you carry on with that. She asks me about exercise, what are the activities I am doing...Even when the...person here [wellbeing clinic], he said, even carrot, beet root are also sweet... If I avoid, it’s better. Like fruits and vegetables, the sugary. (P9, Female, 50’s, Schizophrenia)

However, it was evident that the link between psychological capability and automatic motivation did not always apply. Both staff and patients suggested that sometimes the knowledge (i.e. psychological capability) they had gained by HCPs about how and why to change their diet was not always enough to motivate patients to want to change their behaviour. In these cases it appeared that although patients understood how to change their behaviour as well as evaluated what they should be doing (i.e. reflective motivation), automatic drives such as not wanting to change or wanting to eat unhealthily (i.e. automatic motivation) superseded any of their understanding (i.e. psychological capability) and beliefs about what they should be doing (i.e. reflective motivation).
… usual patter is about, you know, less sugar, less this, less that, more... You know, five-a-day, blah, blah, blah [laughs]... It’s... nothing earth-shatteringly new... it wouldn’t make me do anything about it... I think it’s one of those things that like everything knows some sensibly you should be doing it... It’s obviously not landing... I don’t feel like it lands with me either. (P10, Female, 40’s, Bipolar)

… my impression talking to people about... I’ll ask them are you eating five a day, how much exercise do you do all that, is everybody knows what they’re supposed to do... but people just... levels of motivation to do it just vary. (S4, Male, 40’s, Nurse)

Patients who reported consuming healthy foods also reported that they had that they had skills and knowledge in cooking which had facilitated their ability to cook healthy meals (i.e. psychological capability). It was also suggested that they had developed skills because of the physical opportunity of attending services they were referred to by staff. Similarly, staff suggested that patients who developed skills in such services were able (i.e. psychological capability) to cook healthy meals.

I do cook roast meals. Roast chicken. A whole roast chicken with roast potatoes and veggies. Always have vegetables. Onions, carrots. I enjoy eating and like, if you enjoy eating and you know what you’re capable of doing... There was a place called [service] in [location anonymised] that was one of the places where I learned to cook. (P5, Male, 50’s, Schizophrenia)

…someone else that I’ve worked with who’s been referred to [service]... They have volunteers doing... Preparing meals... And they’ve done that and then they’ve used the skills that they’ve learnt there to cook healthy meals for themselves. (S15, Male, 30’s, Allied health professionals & other team roles)

In contrast, some patients who were younger in age lacked knowledge of healthy recipes and suggested that seeking this knowledge for recipes was a task and prevented them from cooking. Therefore, a lack of immediate knowledge (i.e. psychological capability) prevented cooking healthy meals.

I don’t know many recipes... I only know a few, and sort of going out of your way to, like, search out recipes and stuff like that... That’s quite a hinderance to me. (P14, Female, 20’s, Other Psychosis)

Staff also commonly suggested that psychological capability in terms of a lack of knowledge how to cook as well as negative physiological impact of taking medication such as tiredness and reduced energy negatively impacted patient’s physical
capability to cook or buy food to cook with. This did not come across in patient interviews.

Some of them don’t know how.... Some people, it’s because of the medication, they feel so tired and groggy and they don’t have the energy to actually cook up a long meal. Some people do, erm but I know a lot of people struggle because they’re like I’m too tired to go out to do some shopping. (S12, Female, 20’s, Nurse)

Difficulties changing perceptions

Staff suggested that they found it difficult to change patient perceptions regarding their health behaviours. They suggested that patients were unable to automatically identify any of the negative effects or long-term effects of their health behaviours but rather the beneficial effects. This may suggest that instant gratifications because of unhealthy behaviours (i.e. automatic motivation) outweighed any reflection on the negative effects of unhealthy behaviours (i.e. reflective motivation). However, by providing patients with the knowledge (i.e. psychological capability) in a repetitive manner over time, staff suggested that this helped change perceptions, however, did not report that this changed patient behaviour.

...you make the patient think of the adverse effects because it doesn’t come automatically. so maybe when you do it three or four times they kind of, it kind of sinks in that there are more adverse effects than beneficial effects. What they see as beneficial effects for themselves. (S6, Male, 30’s, Doctor)

Other staff commonly suggested that some patients do not attribute the health information they have been given (i.e. psychological capability) about effects of unhealthy behaviours by staff as applicable to themselves as they do not believe and/or accept that their unhealthy behaviours may be problematic (i.e. reflective motivation).

I would probably say most people minimise their drinking.... or they don’t really see it as a problem as the way we might see it, or they don’t really believe that it causes the health problems that, you know, we might tell them. (S5, Female, 50’s, Nurse)

This was not commonly reported among patients, however there were a few instances where patients did not believe and/or accept that their behaviours were problematic and were “minimis(ing)” their unhealthy behaviours (i.e. reflective motivation).
was mostly concerned with alcohol and cigarette related behaviours and more common among those recruited in mental health services. Patients were reflecting on the idea that roll-up cigarettes were not as bad as normal cigarettes or suggesting they do not crave for nicotine despite the amount they smoke. It may be possible that this belief and lack of acceptance (i.e. reflective motivation) informed their decision to continue to smoke and drink excessive amounts of alcohol.

If I do drink, then I, like, 15 bottles, in a night. I start at about three, four, five, always once a week... If I'm not drinking, I mean, it'll [smoking] be about five, six a day, a bit less than that. If I'm drinking, it'll be 20, 25. Maybe a bit more. I'm not a heavy, not a heavy smoker, and not a heavy drinker... I don't crave for nicotine, I just like to smoke. (P1, Male, 40's, Bipolar)

...roll up is smaller than cigarettes...You know, two puffs, three puffs, they've gone already...They're small, very small... (P12, Female, 40's, Bipolar)

6.5.3.3 Emotional, psychological and physical experiences associated with health behaviours and motivation to change

Staff and patients reported that the emotional, psychological, and physical experiences associated with behaviours were powerful contributors to motivation levels. This impacted behaviour in both negative and positive ways, whereby unhealthy behaviours were associated with feeling pleasure, relaxation (i.e. automatic motivation) and physical side-effects such as breathing difficulties (i.e. physical capability). In some cases, the negative physical impact of behaviours heightened patients' awareness of their health and helped them reach the realisation that behaviour change was important (i.e. reflective motivation). Further, engaging in PA was sometimes associated with tangible physical benefits (i.e. reflective motivation).

Emotional and psychological impact

Both patients and staff commonly reported that patients suggested they enjoyed smoking cigarettes and drinking alcohol and they associated these behaviours with feelings of pleasure (i.e. automatic motivation) which subsequently prevented them from changing these unhealthy behaviours.

...they enjoy their... cigarettes, they enjoy their drink (S4, Male, 40's, Nurse)
I like it too much, I like to have a drink, and smoke. (P1 Male, 40’s, Bipolar)

Similarly, patients also suggested that if they enjoyed carrying out physical activities, they were more likely to continue with doing PA (i.e. automatic motivation). Most staff commonly acknowledged the value of identifying healthy activities that patients enjoyed, cared about and alleviated stress as this facilitated behaviour change.

…I was telling [nurse] it’s quite difficult because I don’t particularly enjoy going to the gym… It’s just cos’ it’s boring to be on the same machine… sometimes I’ll just put on [music] and…dance in the apartment, or something; stuff that I enjoy more. (P10, Female, 40’s, Bipolar)

…it’s really important for people to be aware that the sports that we’re using are carrots to attract people in… Football is not, we’re not getting people to come down just because we want to make a team and win a game of football…That’s not the point…You know? The point is it attracts people… (S13, Male, 40’s, Allied health professionals & other team roles)

In other cases, staff suggested that patients were using the pleasure they gained from unhealthy behaviours as a way of dealing and coping with their mental health difficulties and being happy (i.e. automatic motivation). It was suggested that the pleasure that patients gained from unhealthy behaviours such as eating unhealthily, drinking alcohol and/or smoking are sometimes the only pleasures that patients had. Similarly, it was suggested that smoking was associated with comfort and regaining calmness (i.e. automatic motivation). It was also suggested that unhealthy behaviours produced these pleasurable feelings quickly and this is what patients desired (i.e. automatic motivation). In other cases, it was suggested that smoking cessation was not prioritised due to the further potential stress (i.e. automatic motivation) caused as result of quitting.

…you’re enjoying something at least… and if it’s the taste of…Of foods that are… not so healthy…Or if it’s cigarettes or drugs…people give up. And when they give up, they turn to instant gratifications… They are the only way they can be happy… (S13, Male, 40’s, Allied health professionals & other team roles)

…if they’ve got other stresses or other things going on they might not be… they might not prioritise that necessarily. But it’s just trying to quit is just seen as an added stress I think if they’ve got other things happening (S4, Male, Nurse)
Similarly, it was commonly reported among patients that smoking and drinking alcohol helped them deal with the stress (i.e. automatic motivation) that they experienced because of mental health difficulties.

…it is the stress thing cos sometimes like a trigger will happen… And I’ll be like, right, have a cigarette, yeah? (P13, Female, 30’s, Bipolar)

That’s [smoking] the only thing that keeps me calm. (P5, Male, 50’s, Schizophrenia)

However, patients also suggested that healthy behaviours such as PA operated in a similar way in that this helped patients cope with their mental health difficulties as well as maintain feelings of calmness. They suggested that PA was associated with feeling good (i.e. automatic motivation), helpful for their mental wellbeing and dealing with challenges they faced.

…it in the mornings, it's difficult to get up and go… With my activities, it's a bit difficult… But I know after I'd be… I will feel better when I… come back home… I have sort of bad dreams and… Sort of suicidal thoughts and things like that. So the negativity feel depressing and sort of… And scary about the suicidal thoughts…After I go there and go in [PA class], I can sweat and it feel good. (P9, Female, 50’s, Schizophrenia)

The beneficial mental health effects of taking up PA among patients was not commonly reported among staff, however a few staff members with more regular contact with patients (including nurses and allied health professionals) acknowledged that the adrenaline released due to partaking in PA that patients had previously enjoyed and the pleasure experienced from doing certain sports (i.e. automatic motivation).

…there’s adrenalin…That are, that are released, as well. And there’s hormones... (S13, Male, 40’s, Allied health professionals & other team roles)

Physical impact

In other cases, staff with PA and behaviour change knowledge reported that patients became more aware of the negative impact of smoking, eating unhealthily and sedentary behaviour had on their ability to play sport as well as the impact this may have been having on their health (i.e. reflective motivation). It was suggested that
patients experienced breathlessness (i.e. physical capability) because of being unhealthy and attempting to engage with sports activities. Staff reported that this created a belief among patients that they needed to change other health behaviours such as smoking to be able to play sports more effectively (i.e. reflective motivation). Staff therefore suggested that patients lack of physical capability positively influenced their motivation and some health behaviours such as exercising had a positive knock-on effect on changing other unhealthy behaviours.

...we've had lots of people...stop smoking...if you live a very sedentary lifestyle...And you're not pushing your body in way, shape or form, and you're smoking away and drinking away and eating what you want to eat, and putting on weight...And doing whatever's happening, and you're not really moving that much, you don't notice it... But if you're coming out and you're playing football...Or you're playing tennis...You're realising... it's a subjective realisation...That, I'm not all that well...It's a moment when it clicks. (S13, Male, 40's, Allied health professionals & other team roles)

Similarly, it was suggested by a few patients that when they could see the physical effects on their unhealthy behaviours that this motivated them to want to change. It was suggested that when staff provided this knowledge (i.e. psychological capability) by weighing patients and checking their blood pressure and/or cholesterol, these subsequently motivated patients to change their behaviour.

*Its only the other day when I was here, and they said, my blood pressure...is a little bit high...I was weighed, she weighed me ...I definitely would like to do something about that...* (P1, Male, 40’s, Bipolar)

Further, some patients associated the physical impact of cigarettes such as the physical taste and smell of cigarettes and alcohol with being “disgusting”, “vile”, “repuls(ive)” and therefore automatic dislike of smoking and/or alcohol (i.e. automatic motivation). It was suggested that this in some cases helped prevent or stop patients from smoking and drinking. In one case it was suggested that these factors had contributed to patients’ willingness to stop smoking.

*I find it really, really vile...What probably really stopped me... Because I did actually try it a few times when I was like young and my friends smoked in high school and stuff... Like, second-hand smoke...Was the most vile, disgusting thing. (P10, Female, 40’s, Bipolar)*

*I am starting to, sort of, get, like, a bit repulsed by smoking... Because of the, sort of, taste... it's sort of the taste... It tastes quite ethanol-y...*
It was also suggested among patients that eating healthily made them feel pleasure (i.e. automatic motivation). In one case, a patient who decided to buy some freshly prepared juice reported feeling physically energised after consuming the juice. It was suggested that this subsequently reminded her to continue making juice because due to the belief that it was a good thing to do (i.e. reflective motivation) and the positive feeling that this created as a result (i.e. automatic motivation).

... I just thought, ooh juice, that sounds really good. And I went in there and I get completely... Like my energy went up in a really, really good way, so it kind of reminded me because I had drunk cold-pressed juice before, but we just got out of the habit of it because... You know, it's a hassle to clean the, all the filters, and stuff like that.... (P10, Female, 40's, Bipolar)

It was also reported among staff that where patients were able to physically see the benefits of engaging in PA in terms of their appearance and their fitness (i.e. reflective motivation), this reinforced their behaviour and subsequently motivated them to continue being healthy (i.e. automatic motivation).

... once someone starts seeing positive change in themselves, then it's, like, there's a tangible benefit, so they want to keep going. (S11 Female, 20's, Allied health professionals & other team roles)

However, patients reported that when they were unable to see the visible benefits of exercising, they were subsequently less motivated to continue exercising. The amount of work it required was not perceived as proportional to the amount of benefit that was achieved (i.e. reflective motivation).

It just felt like a lot of effort for not very much benefit at the end of the day (P10 Female, 40’s, Bipolar)

6.5.3.4 The impact of socioeconomic and environmental factors

Physical opportunity in terms of socioeconomic factors including financial difficulties and environmental circumstances including accessibility to outdoor green spaces were perceived as impacting behaviour change. Financial difficulties prevented patients from purchasing healthy foods, yet reduced smoking and alcohol behaviour in some cases due to reflecting on the amount it costed (i.e. reflective motivation).
Patients associated walking in outdoor environments as pleasurable (i.e. automatic motivation), yet it was evident that outdoor space was not always available and hindered behaviour change. Therefore, physical opportunity was in some cases linked to both reflective and automatic motivation.

**Financial circumstances**

Staff suggested that if healthy food were both readily accessible within the patients’ environment and financially affordable (i.e. physical opportunity), this would facilitate healthy eating. However, it was commonly reported that patients lacked physical opportunity to eat healthily due to financial difficulties and easier access to unhealthy foods which consequently prevented behaviour change.

...money, to be able to afford to buy the right healthy food...So cheap-quality food is often very filling...so for some of the people we see, it’s about… It’s about what they can afford (S5, Female, 50’s, Nurse)

This was supported in patient accounts where it was evident that in some cases, patients expressed that they often consumed foods that were more affordable such as ready-made meals.

I’ve been having…ready-made meals…mutton stew, rice and peas. I’m just saving money at the moment. (P6, Male, 40’s, Schizophrenia)

In other cases, it was suggested that poorer financial circumstances (i.e. physical opportunity) facilitated behaviour change in terms of alcohol, drugs, and cigarette use.

Staff reported that patients were more likely to want to quit or reduce these behaviours after they had reflected with them the amount it was costing them (i.e. reflective motivation) to sustain these behaviours. Therefore, it was suggested that a lack of physical opportunity was positively influencing reflective motivation to change behaviour. However, this was not reported in patient interviews.

...we worked out, in the course of a month, he spent, like, £800 between cigarettes, alcohol, cannabis, and coke... And I think when it was quantified, they thought, blimey, you know, look at all this money, where it’s going. (S5, Female, 50’s, Nurse)
Access to outdoor space

Staff suggested that physical opportunity in terms of the type of outdoor environment that patients had access to either prevented or facilitated patients’ PA. In one staff account, it was suggested that walking in the countryside would perhaps be more enticing as opposed to walking in an urban area and therefore some patients lacked physical opportunity for PA. Similarly, another member of staff suggested that the location of the mental health centre she worked within provided access to parks and hills and therefore physical opportunities for walking which patients enjoyed (i.e. automatic motivation) which facilitated patient behaviour of walking. Therefore, it was suggested physical opportunity was related to automatic motivation. It was also suggested that staff provided access to OTs who would use the park to enable patients to walk more during their appointments whilst some staff who were directly involved care coordinating the patients care would often walk with patients outdoors (i.e. social opportunity) and acknowledged the beneficial effects of being in outdoor space.

...walking around [location], walk for pleasure, like, where do you walk, up and down [road] [laughter]? if you’re in the countryside or if you’re beside the sea… Those kind of lures can be a bit different. (S5, Female, 50’s, Nurse)

[MH centre] is in the middle of an enormously large hill… you can walk up the hill, and that in itself is quite a nice bit of exercise….They love it. There’s a park next door... And so we’ve had OTs getting people from the clinic going for a walk in the park in the middle of their appointment schedule. (S7, Female, 50’s, Nurse)

Similarly, patients reported that they enjoyed walking (i.e. automatic motivation) in outdoor environments that would enable them to get “fresh air” and in some cases mental health centres had access to gardens to allow this (i.e. physical opportunity). In one case, a patient reported that they walked more often when they had greater physical opportunity in terms of access to more parks and open spaces. However, moving from a rural area to an urban area had reduced his walking.

I don’t have any exercise apart from walking, but I still enjoy walking in fresh air…. And it’s actually nice even just taking the bus up here [MH centre] and sitting in the garden. (P6, Male, 40’s, Schizophrenia)
…there’s [previous residence]… the common and the village and stuff and there’s a lot of parks and stuff When I’m over here I just go to the shop and do shopping and stuff. I don’t really do as much walking anymore. (P7, Male, 40’s, Schizoaffective)

6.5.3.5 Normalisation of health behaviours

Making behaviours normal and therefore habitual (i.e. automatic motivation) was considered by staff and patient as both a barrier and facilitator to behaviour change. In some cases, patients suggested that due to problems related to physical and social opportunity, behaviours could not be incorporated into their lifestyle. Yet, other behaviours such as walking were perceived as easier to incorporate. In other cases, staff and patients suggested that long-term behaviours including smoking and alcohol became a part of routine and difficult to break.

Fitting behaviours into lifestyle

Some patients suggested that they found it difficult to normalise healthy behaviours and therefore make healthy behaviours such as attending PA groups or the gym due to competing demands such as childcare and relationships.

…it’s just trying to…find it where it fits in as well because I have the children up here and I don’t really have any babysitters during the week…a lot of sessions I’ve wanted to go to are evenings, weekdays…I’m normally travelling down to my boyfriend, or he’s up with me at on the weekend. (P13 Female, 30’s, Bipolar)

In other cases however, patients commonly reported that walking was something they found easy to incorporate into their lifestyle. In some cases, it was suggested that this was because it is something they used as means of visiting places or people.

I don’t really do much exercise… other than walking…Because… my brother lives, like, 15 minutes away, and my Mum lives, like, 10 minutes away, and my Step-Dad lives like 10 minutes away as well…So, I’ll just do walking, or if I’m walking to the bus stop. (P14 Female, 20’s, Other Psychosis)

It was commonly reported among staff who had regular contact with patients including nurses and allied HCPs that they suggested realistic ways of engraining behaviour into their lifestyle to make the behaviours habitual (i.e. automatic motivation). This was not reported among doctors. Walking is something that staff reported they often
suggested to patients and although patients did not report that staff had facilitated this behaviour, it was commonly evident in patient accounts that they were often carrying out this form of PA as evidenced above.

...that’s the thing, some people don’t want to be in the gym, but I say to people, you can go out for walks… I said, if you walked up that hill and that got the bus back, that’s one way of doing it… And that’s what we try and do is work with them and say, you know, what is going to feasible for you? (S10 Male, 40’s, Allied health professionals & other team roles)

Routine and long-term behaviours

Patients who identified themselves as smokers and drinkers suggested that they had been smoking and drinking alcohol from a young age. Patients explained that these long-term habits had become engrained, automatic, and part of daily routine (i.e. automatic motivation). It was suggested that this created problems in breaking these unhealthy habits often resulting in relapse. Long-term behavioural habits also had beneficial effects. A few patients expressed that eating healthily was habitual due to being this way inclined throughout their lives (i.e. automatic motivation).

I’ve always smoked since I was little… I’ve always been a drinker since I was really small… It’s just like a normal daily routine sort of thing… part of my routine, it’s become the norm…. (P7 Male, 40’s, Schizoaffective)

I always been very fussy with my food… All my life. (P11 Female, 50’s, Bipolar)

Similarly, staff reported that one of the factors preventing reducing and/or quitting smoking and/or alcohol was the fact that patients had made the behaviour habitual and part of their routine (i.e. automatic motivation). In some cases, it was suggested the behaviour had occurred over many years and that this created difficulties in terms of fluctuating between states of relapse and recovery. Staff in some cases suggested that addiction related behaviours were consequently difficult to break and other behaviours such as PA may be easier to address. This may provide reasoning why previously (“Fitting behaviour into lifestyles”) staff commonly reported encouraging walking behaviour. It may be that they found PA an easier intervention to suggest rather than smoking cessation.

… it’s a total routine… get up in the morning and have that fag and have a cup of tea, or buy the rollies… I think smoking is a tough nut to crack, to
be absolutely honest, because then I think it’s so varied, that someone will have quit today and they’ll be off for a couple of weeks and then they’re back on the smokes again… I think you’re, you’re probably more likely to be… Potentially get someone to be active, to be honest. (S5, Female, 50’s, Nurse)

In other cases, staff demonstrated an awareness for the notion that smoking were difficult to change if patients had been long-term smokers. They suggested that being realistic by targeting this behaviour slowly in terms of encouraging patients to reduce their cigarette intake or seek alternatives could help patients change.

I think you have to be realistic… not just going to, say, stop smoking. It’s not going to work. You start off slowly, like you know, have you tried to maybe cut down or looking at alternatives? But then you have to be, if someone’s been smoking every day for like 15 years, like 60 cigarettes a day… It’s going to take time, so even just maybe cutting down three a day, it might seem small but it’s something. (S12, Female, 20’s, Nurse)

6.5.3.6 Social, cultural norms, modelling and support

Patient engagement with members from informal social networks and similar cultures (i.e. social opportunity) were perceived by both staff and patients as influencing patient beliefs regarding the consequences of health behaviours (i.e. reflective motivation) and consequently behaviour change. In some cases, it was suggested patients mimicked the behaviours they observed in their social environments. External peer support in PA groups motivated patients to engage in healthy behaviours. Staff were perceived as valuable for providing both practical and emotional forms of support (i.e. social and physical opportunity) which facilitated behaviour change.

Cultural norms

Patients commonly reported that cultural factors commonly influenced behaviours. Those with ethnically diverse backgrounds suggested that in some communities, serving small quantities of food was offensive and meagre (i.e. reflective motivation). Therefore, in some cases social opportunity in the form of interacting with members of similar cultures had influenced patient beliefs about what was ‘good’ and ‘bad’ in terms of being culturally accepted or not (i.e. reflective motivation). This in turn affected behaviours in both positive and negative ways and patients imitated behaviours that they believed as culturally acceptable.
Because I’m coming from the culture… We eat in a big quantity. And also it’s not comfort eating, it’s just the way we are. We like to see a big table. We don’t like lacking… If you give someone in a small plate… They will throw it at your face… they wouldn’t have it. It’s like, um, what you giving me? Come on… this is for the bird, you know… Like, maybe for one of my tooth, but come on… Generosity is our way of doing things. (P11 Female, 50’s, Bipolar)

These perceptions were also supported among staff. Staff commonly reported that cultural factors both prevented and facilitated health behaviours. Similarly, social opportunity in terms of interacting with similar cultures influenced patients’ beliefs as accepted behaviours (i.e. reflective motivation) and therefore in turn their behaviour.

…we work in London, we have a culturally diverse population. So there are, patients of mine who I do think would be reluctant to go into a mixed swimming pool, for example… So finding and being aware of culturally appropriate options around exercise is something that I think you get better at once you’ve been sort of working somewhere for a while… (S20 Male, 30’s, Doctor).

**Informal social networks**

Patients and staff both reported that members of patients’ informal social networks including partners, family and friends were important contributors to their health behaviours. In a few cases patients were comparing themselves to their partners in terms of appearance and body size (i.e. social opportunity). As a result, patients reflected that that they were overweight and believed that their behaviours were unhealthy in comparison (i.e. reflective motivation). It was also suggested that the opportunity to spend more time together in some cases facilitated healthy eating. It was commonly reported among patients and staff that patients ate the same foods that their partners and/or family had prepared, modelling the same behaviours and impacting behaviour in negative and positive ways.

… I’ve put a lot more weight on. And my boyfriend’s really petite and he’s gone vegan and he’s lost a load of weight… And I’m just like going the other way, so yeah…Erm, he’s quite healthy as well…I’m with him most weekends, so I’m eating like him most weekends as well which is helpful. (P13 Female, 30’s, Bipolar)

… some of our clients have partners who would often do a lot of cooking… Some of our patients are like health freaks and it’s like, yes, my wife’s very balanced, she makes sure… Some people are just like my partner will just cook whatever we want to eat. (S12 Female, 20’s, Nurse)
Further support of social modelling was evidenced in some cases where it was suggested that patients had not cooked for themselves in a while and it was often explained that family would eat out together or order takeaways, which was perceived as the norm. This was supported in staff accounts where it was suggested that patients who were not brought up in an environment where unhealthy eating was the norm often ate unhealthily.

*I haven’t cooked for myself in a while… just sort of like go to my Step-Dad’s house or my Mum’s house… Or my brother’s house, and we will go, like, out to eat, or we will order something in.* (P14 Female, 20’s, Other Psychosis)

*I think sometimes some of the patient group, they’ve not maybe been brought up in an environment where they’ve been brought up with a healthy diet. So it’s not something that’s a norm to them.* (S16, Female, 30’s, Doctor)

In some cases, although patients suggested that having social opportunity in terms of being amongst others who ate healthily also facilitated patients healthy eating, it was also reported by both patients and staff that being isolated in terms of living alone often meant that patients were less motivated to cook healthily.

...*my friend she’s got me onto... the healthier stuff... she eats like seeds and pumpkin seeds and sunflower seeds... flax seeds and stuff like that to put in the drinks and stuff. And we have grapes... Cos, when I used to live on my own...I rarely cooked for myself and I wouldn’t eat healthy... I’d rarely eat fruit and veg and stuff like that. But in the last, say, five years my diet’s become a lot better, it’s more stable... cos I was sectioned and then once I come out she said I could stay with her so I wasn’t on my own… Before that I was on my own... And it was more like drink and partying all the time rather than looking after myself.* (P7 Male, 40’s, Schizoaffective)

...*it’s more difficult to be motivated to cook when you’re by yourself. So a lot of people we’ll see will be by themselves.* (S5 Female, 50’s, Nurse)

In a minority of cases, it was suggested that staff increased social opportunity by encouraging the involvement of family members to facilitate healthy eating and provide practical support on providing patients healthy meals.

*She’s overweight, she does little exercise. She eats a really stodgy diet... So, we got…her daughter involved… in thinking about the types of food and looking after mum a bit more and having a bit of variety. A little bit*
more walking was happening. But essentially she was very unwell. She needed looking after...(S7 Female, 50’s, Nurse)

Patients and staff commonly reported that patients would use alcohol and smoking as a way of maintaining social contact with friends. In some cases, a change of social circumstances such as a new relationship often acted as the catalyst for changing this behaviour. Patients would reflect with their partners (i.e. social opportunity) that this behaviour was not the ’right’ thing to do (i.e. reflective motivation) and this would in turn facilitate change. In other cases, patients who attempted to stop drinking alcohol would often reflect on and observe how much pleasure their friends (i.e. social opportunity) were experiencing due to drinking alcohol and felt they were missing out and disliked this (i.e. automatic motivation).

... my friends and most of the times I meet my friends it’s around drink… It’s hard to go to the pub and have an orange juice. I did do it for a while but then I was sober and everyone else was drunk and it’s like totally different. When you see everyone else is drunk and merry and you’re sober... it’s not really a nice thing sort of thing. (P7 Male, 40’s, Schizoaffective)

...drinking five or six pints a night… many cases wouldn’t be classed as a terrible problem, that’s just enjoying going out in the pub and it’s part of what you do socially… (S5 Female, 50’s, Nurse)

The value of external peer support

It was evident that social opportunity to engage in healthy behaviours was facilitated by the PA groups that staff referred patients to. It was suggested by both patients and staff who had regular contact with patients that peer support for PA occurred frequently in these groups. It was reported that patients felt supported emotionally through difficulties and felt encouraged to do PA by their peers. Patients suggested that peer support facilitated their attendance of the gym and their motivation. However, it is unclear whether social opportunity affected reflective and/or automatic motivation in this case. It is possible that witnessing peers engage in PA subsequently informed the belief that this was the ‘right’ thing to do (i.e. reflective motivation) or the emotional support gained and pleasure and/or pressure associated with the encouragement and support they received by peers facilitated their behaviour (i.e. automatic motivation).
… what’s really social, is the walking… And jogging, because people talk to each other while they’re doing it. But when you’re playing a sport… You don’t really talk to each other… but you get to know each other… There’s no verbal communication as such, or verbal socialising, but there’s physical socialising… you get to respect each other… And it levels playing fields, so to speak… there’s a lot of emotional… Socialising… Because people will understand and support each other… on the pitch or on the court. And they’ll provide whatever’s necessary for individuals who might be struggling… (S13 Male, 40’s, Allied health professionals & other team roles)

… you get pushed… I don’t push myself as much… But if I’m in a class… It encourages you… it’s also just nice… I don’t know many people in [location anonymised], so when I did go to those classes I did end up having a chat with people at the end. (P13 Female, 30’s, Bipolar)

In some cases, however, it was suggested by staff that exposure to peers in PA groups may not be helpful for other patients who were experiencing mental health symptoms such as paranoia and difficulty engaging with others. Staff suggested that the social opportunity in terms of interacting with peers in PA groups in some cases negatively impacted patients in terms of feeling intimidated and created fear (i.e. automatic motivation) and consequently resulted in avoidance of PA groups. However, this was not evident in patient responses.

… quite often people will just disengage and never want to do it again because… they were threatened by the social environment. (S1 Male, 50’s, Allied health professionals & other team roles)

… think by the nature of the health problems that we’re talking about, if somebody, has a degree of, paranoid ideation, or is suspicious, or is deeply, anxious or self-conscious, then... So group-based or gym-based or service-type... or even with meeting somebody new for an assessment, can be an issue. (S20 Male, 30’s, Doctor)

Healthcare provider

Patients in some cases perceived the role of HCPs as important to facilitating behaviour change. They suggested that when social interactions (i.e. social opportunity) with HCPs resulted in praise and positive reinforcement from losing weight and becoming more active, this appeared to positively impact their motivation to continue making healthy changes to their health behaviours.
I told [psychiatrist]...how much it was that I weighed... at that time when I went, and he was quite pleased with me..., that I have lost some weight...it helps, yes. (P2 Male, 50's, Schizophrenia)

Similarly, staff suggested that when patients had a good relationship with HCPs, received positive reinforcement and emotional support (i.e. social opportunity) from them, they were motivated to eat healthily. It was suggested this was because patients wanted to be liked by HCPs due to neglected emotional needs and therefore the pleasure associated with being liked (i.e. automatic motivation). This was supported in one of the patient accounts where it was suggested that they considered primary care services as family members due to the relationship they had built over time and commented on the emotional support that was provided. It is possible that this support facilitated her motivation of changing her unhealthy diet.

...She had a very good relationship with her Care Co-ordinator particularly who really liked her, and I think lots of positive feedback from us that she was doing well and that we cared really helped her to sort of... To actually care for herself. She was just one of those patients where she hadn't had... She hadn't had an awful lot of care in her family and was quite neglected really emotionally during her development and so she responded really well to a nurturing Care Co-ordinator relationship and that motivated her to change... I think to make us happy with her. (S18 Male, 50's, Allied health professionals & other team roles)

She's [SMI nurse] very nice... I'm quite happy with her. She's really good... I would like to see the [SMI nurse anonymised] again... Because she, she giving advice and she listening you.....like my Doctor... My Nurse, you know, they're a bit, like family, they're not just, uh... I go to Surgery years and years. (P12 Female, 40's, Bipolar)

Allied health professionals commonly reported that when they attended PA sessions alongside patients and carried out PA with them (i.e. social opportunity), patients were more likely to attend PA sessions and be active. However, this was not reported among patient accounts. This may be related to patients' lack of belief and confidence in their abilities (i.e. reflective motivation) to partake in sessions alone without support and that perhaps the support received from staff increased their confidence (i.e. reflective motivation). Alternatively, it is possible patients associated doing the activity with someone as enjoyable (i.e. automatic motivation) or patients may have formed the belief that this is a ‘good’ thing to do if observing that HCPs are also doing the same (i.e. reflective motivation).
Another one is willing to go swimming… but only goes if I go… I’ll go but actually, I have to wing it in my lunch hour because it’s not really the best use of my time. We’ve got an OT that’s willing to go with her and stuff like that.. We’ve got assistant practitioners that… take people swimming and things like that. (S8, Female, 50’s, Allied health professionals & other team roles)

It was also commonly suggested by both patients and staff that patients signposted to specialist behaviour change services (i.e. physical opportunity) for practical support (i.e. social opportunity) such as help on how to plan a healthy diet or smoking cessation (i.e. psychological capability). However, it was not commonly reported that this facilitated behaviour change. In fact, there were only a few instances where patients reported that practical support in the form of cooking sessions facilitated their knowledge (i.e. psychological capability) and behaviour of cooking healthily as discussed in “Health knowledge, skills and perceptions”.

…if it’s more about kind of support with, planning a healthy diet and actually buying the foods. In the past… I’ve referred for floating support through local resource.. Which is a community centre but they also offer one-to-one support. (S15 Male, 30’s, Social Worker)

6.5.3.7 The use and availability of behaviour change services

Although patients and staff reported that staff would increase patients’ physical opportunity to access a range of behaviour change services, these were perceived as short-term and time-consuming to access. Specialist behaviour change services included services that specifically targeted aspects of health risk behaviours such as smoking cessation groups, physical activity groups (football, walking groups), diabetes management, exercise on referral to access gym facilities, cooking nutritional food tutorials and nutrition services. The services were not specifically designed for people with SMI and were also open to the general population. Staff and patients also suggested that physical opportunity in terms of funds to support services were restricted and staff sought ways of increasing funds. Despite having the physical opportunity to access specialist behaviour change services, patients did not always engage with these due to limited accountability and monitoring by HCPs. Yet this could increase awareness of progress (i.e. psychological capability) and therefore facilitate motivation. However, this was related to the lack of HCP time (i.e. physical opportunity) to intervene, monitor and follow-up patients. Some suggested that those in certain roles had greater physical opportunity. In other cases, it was suggested that services were not suitable to meet individual patient needs including both mental and
physical health factors. In some cases patients lacked confidence (i.e. reflective motivation) in their abilities which prevented further engagement.

Accessibility and funding of services

In some cases a lack of physical opportunity in terms of access to specialist OT staff within mental health services prevented staff from supporting patients PA.

\[\text{We had, um, an OT that would come up there. We don’t have an OT that comes up there now so it does affect. (S7, Female, 50’s, Nurse)}\]

A few staff and patients also commented that some of the targeted interventions offered to patients were short-term (i.e. physical opportunity) and long-term support was needed and the lack of access to this prevented behaviour change in some cases.

\[\ldots\text{obviously we only ever offer interventions for a certain amount of time and there’s quite a lot of people I think who want… Need ongoing support. (S18, Female, 50’s, Allied health professionals & other team roles)}\]

\[\ldots\text{they don’t really last long…More diet things, and more motivational things. (P3, Male, 50’s, Schizophrenia)}\]

Staff who were responsible for setting up PA groups commonly reported a shortage of funds to support specialist behaviour change services (i.e. physical opportunity). It was suggested that OT staff would facilitate some of the PA groups, but ultimately there was a lack of resource in terms of access to staff (i.e. physical opportunity). However, staff within mental health services themselves often spent time developing relationships with charities and external companies with access to equipment and grounds to increase physical opportunity. There was no indication that the mental health services had helped facilitate these relationships, rather staff took it upon themselves to source ways of funding services based on their belief that was without this source of funding, they would be unable to facilitate access to these groups and therefore support patients PA (i.e. reflective motivation).

\[\ldots\text{having a whole programme of healthy eating, exercise, healthy living, you know, how you’re managing your health…That’s where we need to actually probably put all of the work, but… they are massively overstretched and under-resourced…the physical activity, there’s so much money…that we could bid for to do programmes, from sporting} \]
groups...we could so much more with so many more staff, but... There's not. (S2, Female, 40's, Allied health professionals & other team roles)

...to be honest...we would be nothing without the partners... because they've come and done a huge amount... services are not coming to us and saying, here's the service for people to access...We're developing the relationships and starting up the things. Having the resource is really important... Our tennis programme has been going on ... Well, five years now, we got funding for the first three years. And then the funding ran out. We had two courts and a coach indoors, through that...then we developed a good relationship with the Centre. The Centre then said, fine... we'll absorb the cost... if the NHS or if the Trust had to foot the bill for everything...I don't believe they would have done for this long. (S13, Male, 40's, Allied health professionals & other team roles)

The lack of resource of specialist services regarding staff and funding had not gone unnoticed by patients. A few patients commented that there was a lack of physical opportunity in terms of resource to support their PA and this was important to facilitate their access to such services. In some cases, patients took it upon themselves to fight against the closure of PA groups due to a lack of funding.

...my Zumba class or yoga exercise or... And they were going to shut down the [service] and then we... We fought and they... Then they didn’t close down, but they... The, the building is... They're paying, uh, something, 30,000 or something every year or so... then they sacked the two staffs... They have so many meetings and letters and signing and, petition signings. (P9, Female, 50's, Schizophrenia)

Accountability and monitoring

Most patients reported that HCPs actively provided patients with the physical and social opportunity of attending specialist behaviour change services. However, there was no indication that patients were monitored following this and patients suggested that they were not engaging with services. Patients suggested that there was no accountability in terms of reviewing progress. It was suggested HCPs monitoring patients would have facilitated their behaviour and this may have helped to identify progress (i.e. psychological capability) which may have in turn facilitated their motivation to change. It was unclear whether this related to reflective motivation including, forming positive beliefs about the consequences of exercise because of seeing progress and/or automatic motivation including feeling pleasure from seeing progress.
…so she [HCA] said...that you just follow through with it… But there's not checks or anything… you can do as much, or as little as you want…. I haven’t been...we did weigh me… she did mention, like, if you weigh yourself again...I think the healthcare assistant said...she is supposed to... review it... we haven’t yet, but, again, maybe someone to be accountable to… if you feel...like you’re going to have to tell somebody what you’ve done… You don’t feel guilty… I suppose… And you’ll be able to see your progress more as well… you’ll be able to see the change as it goes… And that could be encouraging in itself and motivating… (P13 Female, 30’s, Bipolar)

Similarly, staff acknowledged that it was often the service themselves that would help patients identify goals, provide a schedule to work toward and prompt behaviour. There were also mixed reports regarding the extent to which staff themselves would actively monitor patients once referred to services. In some cases, patients who were on staff caseloads would be informally monitored, alternatively staff may have worked directly with patients to teach cooking skills but would then refer patients to the care coordinator to follow-up. In other cases when physical health checks were conducted as a one-off intervention, patients were only signposted to services.

…work with that person actively through, one to one work in their home to facilitate their improved diet, their improved cooking skills. That’s a very specific piece of work, and then that ends, and then I hand it back to the care coordinator… that care coordinator then should ideally be monitoring and encouraging, that process to continue (S1 Male, 50’s, Allied health professionals & other team roles)

…I wouldn’t follow that person up. Unless that person comes back to me again and needs… if it was follow-up, that would be my caseload... The only thing I could do is offer if that person is interested in the swimming group. The person is, okay, give her the flyer, send an email to the person who works on this and say could you phone this person on this number, she’s interested in the group. (S14, Female, 40’s, Allied health professionals & other team roles)

Staff acknowledged that patients would also not be monitored in terms of physiological measures once referred to PA programmes and that there was no way of tracking patient progress. It was suggested that this was due to a lack of patient willingness. However, this contrasted with the patients’ earlier view that monitoring would help the patient identify their progress.

…that’s something we’ve talked about so much, and we don’t use any outcome measures, and we’ve talked about using, sort of, specific outcome measures. But the reality is that people haven’t really wanted to do them because if it’s a barrier, this idea that you’re going to get someone
weighed and all that, for the groups, people just haven’t wanted to engage with that. And so we haven’t done it. (S2, Female, 40’s, Allied health professionals & other team roles)

In one case, it was unclear whether patients were actively monitored once they were referred to smoking cessation services even though the information could be tracked. It seemed this staff member was reflecting on an ideal model for monitoring rather than actuality. Further support of this was evident in her belief that the service was universally not good and/or capable at intervening with patients’ health behaviours.

We’re not very good at interventions which I’ve been saying for a very long time… we should monitor… So anybody… We should be collating that data, even if you’re accessing it through [smoking cessation services]… We should know who on our case studies are non-smoker now… (S9 Female, 30’s, Nurse)

The need for staff time and follow-up

It was commonly suggested that mental health services are often overstretched and that it could be difficult to encourage health behaviour change alongside their other responsibilities. It was suggested that responsibilities were prioritised in order of importance due to a lack of physical opportunity and factors that could put patients at greater immediate risk (i.e. reflective motivation) were prioritised.

… There’s not enough time in the day. Do you know what I mean, if I’ve got someone who’s on the verge of committing suicide or breaking down, thinking about what someone’s eating tomorrow is not really… I know that sounds horrible, but if I’ve got like ten people who are in crisis or on the verge of crisis, maybe someone going to the gym today is not going to be…(S12, Female, 20’s, Nurse)

Both staff and patients commonly suggested that their appointments with GPs were often limited. However, patients were commonly understanding about the lack of physical opportunity that doctors had with their patients. In other cases, it was suggested that staff other than doctors may have greater access to time and therefore may be better placed to support behaviour change.

… in a limited appointment it’s always quite tempting to focus on the things that the patient themselves mentions and asks about, rather than the whole list of other things I think are important…. And time is a very precious commodity within…medical practice… so I think that’s why many
GPs would probably say that these things are often done better by other colleagues who have a bit more time to do it. (S20, Male, 30's, Doctor)

I know in the back of my mind that my GP only has like ten minutes of an appointment... so we need to talk about whatever’s the priority... Usually that’s about the medication and how am I feeling... There’s no time left over to talk about possible things that might help me... It’s not ideal, but I don’t blame people either.... (P10, Female, 40’s, Bipolar)

It was commonly reported among SMI nurses that they lacked the physical opportunity in terms of being able to follow-up on patients they had screened for physical health problems and assess whether they had managed to achieve any behavioural changes. It was suggested that this could facilitate patient motivation and therefore increase behaviour change but may not be realistic to implement due to the lack of physical opportunity. Nurses often only reviewed patients yearly and this was considered as unhelpful for monitoring patient progress. In one case, it was suggested that some doctors working within the mental health trust may not always assess the same patients and therefore a lack of physical opportunity prevented monitoring patient progress.

...if you’re trying to support somebody with their diet, again, it’s about how you look at it over a certain period of time. And that’s if you have the ability, and the opportunity to look at it over a certain period of time. So, if I’m seeing somebody and won’t be able to see them again for another year, or another six months, how am I supporting those changes? It’s about being able to follow things up, it’s about being able to say, what did you think to that and asking them? ... We don’t always have that opportunity. (S3, Female, 40’s, Nurse)

Further, it was commonly reported among those with regular contact with patients (Nurses, Allied health professionals & other team roles) that health behavioural changes often occurred slowly over a period. This reinforced the necessity for physical opportunity and dedicated time to monitor patients.

I’ve been working as well for nearly two years trying to change his behaviour around, multiple physical health problems. COPD, overweight, diabetic, hypertension... I suppose [I need] dedicated time to do it... (S9, Female, 30’s, Nurse)

Suitability of services
In a minority of cases it was suggested by patients that due to a lack of physical capability such as chronic back problems and arthritis, they were unable to engage with services such as physiotherapy or could not be referred to services and were often prescribed medication. There was no suggestion in patient accounts that HCPs had attempted to identify more suitable alternative methods of PA for people with such problems. However, one staff member with knowledge in PA, suggested that patients who were unable to perform certain exercises due to physical health problems and therefore lack of physical capability were often referred to other forms of exercise such as walking.

…they referred me to physio years ago, it didn’t help me, and then they’ve been trying injection didn’t help me…the consultant said to me, so you’re gonna’ have to continue the tablets, we can’t do anything for you, because your problem is chronic… I’ve got my walking frame indoor… So, you know, I’ll just try to moving myself, just a little bit with walking frame…(P12, Female, 40’s, Bipolar)

…there’s two main… exclusion criteria, which is high blood pressure and BMI… I’m guessing they’re worried about… adverse effects…what we do, and what works really well, because there is no, there’s no interim, service…To, to get up to the Exercise on Referral…. But we can offer people, for example, a walking group…Which works. I mean, so it is initiated as a jogging group…But we… split the group into two, and the idea is the individuals who are not necessarily ready for jogging will walk… with the intention of building up the abilities to jog. (S13, Male, 40’s, Allied health professionals & other team roles).

Staff commonly reported that some of the services such as dieticians were not suitable for people with SMI. It was suggested that patients required more time (i.e. physical opportunity) and less detailed information as well as practical guidance on how to implement changes (i.e. psychological capability). In other cases, it was suggested that some of the population lacked psychological capability in terms of being able to concentrate and speak English given the ethnic diversity of this area of London, and would prevent people from engaging in services. It was suggested that access to services could be facilitated by considering challenges that SMI patients face to make it more suitable for this population.

….often the dietetics will often just give you a sheet and say, here…a diet plan, which no one’s going to stick to, with no behavioural change conversation… I’ve not felt they’ve been geared up for our population… I just think…it is too detailed, and I’d say people… Don’t engage particularly well…a lot of people that I’ve worked with have known what a healthy diet is, that actually the difficulty is, working out how to implement that in their
day-to-day life and how to make good choices throughout the day rather than just trying to follow a sheet, because that's generally not [laughs] the only thing needed… (S2, Female, 40's, Allied health professionals & other team roles)

… so with respiratory, if you're diagnosed with COPD, the first thing you do is you should be… Attending in a smoking group where your peer, people who go through the smoking and you hear people's stories… Doesn't happen. Pulmonary rehab so again, exercises for your lungs… That's what the general population have but… Our patients don't get that… they're already tick boxed as not appropriate because they wouldn't engage. Diabetes DESMOND programme… that's not suitable for somebody because one maybe your English isn't your first language. Two, you’re not going to go there, you can't actually concentrate for seven hours, but again you’re not getting what you really should get because you have a mental disorder… These groups are not fit for purpose… Why don’t we make it a little bit more useful… What can we tailor… to make it more easier… (S9, Female, 30's, Nurse)

Confidence in abilities

Staff who had regular contact with patients (Allied health professionals & other team roles) reported that one of the factors that affected patients’ engagement with particularly PA services was their lack of beliefs regarding their capability (i.e. reflective motivation). It was suggested that patients lacked confidence and this affected the extent to which they were ready to engage with services.

… it comes back to confidence in abilities… everybody who’s sort of started and not come, has done so because… they don’t feel capable… it tends not to be about the people there, or the…Service provided, it’s just about the individuals not feeling ready to…Make that change. (S13, Male, 40’s, Allied health professionals & other team roles)

Similar accounts regarding the impact of patient beliefs about their capability were reported among patients. Patients suggested that they found the PA services that they were referred to as physically challenging (i.e. physical capability). In some cases, patients reflected on the notion that other people within the PA classes seemed to be more capable than themselves and that they were unable to meet the same levels of PA (i.e. reflective motivation). In some cases, this evoked a negative emotional response (i.e. automatic motivation) and therefore dislike of the service. In other cases, the lack of belief regarding capability was associated with the belief that the activity was not a ‘good’ thing to do (i.e. reflective motivation).
... There was one thing that I did mention to [SMI nurse anonymised] was that at the gym they did have a dance class, but it’s like the Zumba dance thing… I was quite dismayed by the fact that it wasn’t… There was no real entry level to that… it felt like everyone knew what they were doing… Except for me, and it’s like I’m there for the first time going what? It was just they were just doing the movements, and I just felt like this is the worst thing ever... (P10, Female, 40's, Bipolar)

6.5.3.8 Staff knowledge, professional identity and responsibilities

The knowledge of staff played an important role in their ability to support patients with health behaviours. Though it was suggested this integrated context increased staff psychological capability regarding the need to discuss health behaviours in people with SMI, psychological capability regarding specifically how this was done were variable. Staff commonly reported that further training in BCTs were needed to increase understanding. There were mixed perceptions regarding the ability of primary care versus secondary care professionals in supporting behaviour change. Both patients and staff suggested that the way staff perceived their professional training and background (i.e. reflective motivation) influenced the extent to which they incorporated health behaviour change into their practice. Access to knowledge on standardised processes and resources (i.e. physical opportunity) in terms of supporting behaviour changes affected staff psychological capability and, in some cases, reflective motivation regarding whether this was part of staff roles.

Awareness and understanding of health behaviour change

It was commonly suggested among staff that one of the benefits of the integrated service was that it had increased staff psychological capability in terms of their knowledge about physical health and wellbeing and therefore their reflective motivation regarding their beliefs about the importance of addressing health behaviours. As a result, it was suggested that staff were more likely to intervene in unhealthy behaviours and signpost patients to services involving PA and diet.

I think what the [integrated service] has done is it’s really brought to everyone’s attention the importance of routinely talking about exercise, diet, smoking and other physical health elements with all patients... I think there’s more focus on the routine questioning about it now... there’s more availability of information leaflets about food and diet for people. There’s more likelihood that the Care Co-ordinators will give people information and will be more well informed about diet than they used to be...I would expect there to be an increase in referrals to Dieticians than there used to be. (S18, Male, 50's, Allied health professionals & other team roles)
Staff across different roles however commonly suggested that they often signposted patients to services due to their lack of knowledge about health behaviours. Staff reported that due to changing information regarding diet advice, they lacked knowledge and therefore psychological capability regarding dietary behaviours. It was suggested that this impacted staff ability to support patients in terms of providing advice around diet. This contrasted with the previous staff members’ perception that staff had more knowledge around dietary advice because of the integrated setting but supported the view that referrals to dieticians had potentially increased. In primary care, it was suggested that psychological capability in terms of the ability and remembering to provide dietary advice could be variable and problematic and therefore there was greater reliance on dietary services.

*I might just refer it to the dietician and they can explore this a bit further. We’re not specialised services…We’re not even that knowledgeable in diet.* (S14, Female, 40’s, Nurse)

*I’d like to think that we all could give helpful, brief, and supportive dietary advice. I’m not actually convinced that that’s the case, or that we’re all particularly good at remembering to do it…So more of the time we rely on, involving, a service. So, there is in the borough, a weight management service, or we’re usually talking about this if somebody’s overweight…if somebody also happens to have diabetes, because there is then the opportunity for them to have an educational session with some specific dietician-type input.* (S20 Male, 30’s, Doctor)

In one case, the least experienced member of staff suggested that a lack of psychological capability in terms of how to support behaviour change and lack of knowledge of the patients’ backgrounds affected her ability to support patients. It is possible that this lack of psychological capability caused a lack of confidence in her ability to support health behaviour changes (i.e. reflective motivation) as evidenced in her belief that other staff with more knowledge of the patient could be better supported.

… I guess it’s, like, knowing how’s it’s best to go about it… and also, I guess, if I screen someone that I don’t know so well… Not knowing their exact… Their story and what’s…What would help them particularly. Whereas I think… Sometimes it’s more suitable for their care coordinator who actually know… A lot more about them. (S11, Female, 20’s, Allied health professionals & other team roles)

Staff within the mental health teams also commonly suggested that they relied on training of applying BCTs to support patients’ health behaviours they had received
many years ago or knowledge they developed as part of practice. In some cases, staff suggested that they were unable to recall the training (i.e. psychological capability) and therefore unable to use the techniques. It was commonly reported that there was no formal training on BCTs but others suggested that the training available was not enough to increase staff psychological capability.

…we used to in the Trust… a number of people trained in motivational interviewing, and we don’t anymore, I mean, I’m talking ten years ago, when myself and [psychologist]…would say even a five-day course is only a beginner’s, but we don’t even have access to that. So when we start to set up the, sort of one-day self-management training, we can offer people three hours on MI, and I’m not convinced that’s enough. (S2, Female, 40’s, Allied health professionals & other team roles)

…a lot of the behavioural change techniques we learned through clinical practice, for example, motivational training – you can do some specific training for that. I’ve kind of picked up on a training when I was a trainee and then I could have used it in my practice. But there’s no specific training that I’ve attended. And if there is one I’d be interested. Which can supplement my clinical skills. (S6, Male, 30’s, Doctor)

All staff reported that they would like to receive further training in applying BCTs. Among less experienced staff, it was suggested that this knowledge (i.e. psychological capability) could facilitate their confidence in their abilities (i.e. reflective motivation) in terms of knowing whether they were applying the correct approaches. It was suggested that the training had previously been provided by psychologists and training all members of the team would ensure all staff had a similar knowledge base.

I think a bit more, awareness of those… nuances, how to create behaviour change itself…So understanding what is the best technique and having some, evidence base to know that you’re doing the right thing… I guess it could be added on to the clinical meeting…or even having, like, an away day and everyone get trained, and everyone be at the same level. (S11, Female, 20’s, Allied health professionals & other team roles)

In other cases, it was suggested that mental health staff were best placed to encourage health behaviour changes due to greater psychological capability in terms of interpersonal and communication skills to interact appropriately with mental health service users and understanding the barriers they face to changing health behaviours. However, this contrasted with a view from primary care which suggested that practice nurses were better placed to deal with health behaviour changes in people with SMI due to greater understanding on how to intervene. There were however no patterns
among patients regarding their preferences on who should support them with their health behaviours.

*I'm very much a believer that we do the clinical work, we know about the people who walk in the door, we know what the barriers are, we know what the levers are going to be, we know about what the challenges are for them in managing their physical health as well as we want them.* (S5, Female, 50's, Nurse)

*I find sometimes a lot of people that don't work with mental health patients don't know how to talk… To them. I know it's the basics and not lack of ignorance, it's just the skill… I think we're in the best position to… helping with some of the interventions in terms of reducing mortality and long-term conditions.* (S9, Female, 30's, Nurse)

*The interesting thing that we found then was… the [SMI] nurse was very good at identifying issues, was not as aware… or, skilled at actually intervening… what we found has actually worked better is that the nurse who's doing the, our practice nurse did the physical health check, would actually also be the person who then might be seeing patients for their diabetes check, or would also be referring them to nicotine replacement therapy.* (S20 Male, 30's, Doctor)

Although patients reported that physical health screening and general health reviews covered physical health, it was suggested by patients that mental health was discussed more within these reviews. Patients recruited in both mental health services and primary care commonly reported that these sessions could cover physical health more as they acknowledged that this could help their mental wellbeing but were lacking this physical opportunity when being screened and/or reviewed. It was suggested that the professional medical background of staff influenced their focus on mental health and created lesser awareness of alternative ways of managing mental health through health behaviour change. Like patients, some staff from mental health backgrounds agreed that mental health would sometimes dominate their 'holistic' reviews.

*…It sounded like it was a general health review… So I thought it was not necessarily to do with the bipolar, I just thought it was just generally she was gonna’ check everything… but then when I went there it seemed to be very much, kinda’ the other way round… Once we started talking about the bipolar it seemed to be… It was mostly to do with that, and then she would do other things as well like she did take my weight… And talk about, a little bit about that, but the balance was definitely not like mind and body 50-50… With the psychiatrist… it said something like, come and talk about your general health and wellbeing… but then when I got there it was like… it’s very much talking about the mental part, and it just it just seems to be
I like my GP and he’s… He listens really well and he’s quite sympathetic, but, again, he’s coming from the medical model… So I think that’s pretty much their first thing that they do… (P10, Female, 40’s, Bipolar)

I also had to keep in mind that I had this holistic review to do. For some patients, it would be like the mental health completely dominated that review… And, it was a bit, more or less, it was about, more about physical health as well… (S3, Female, 40’s, Nurse)

Staff in both boroughs agreed that staff professional identity impacted their practice. Staff with specialisms in occupational therapy and psychology commonly reported that they were trained in a holistic and broad way covering both mental and physical health as well as the social environment and therefore had a greater awareness of this (i.e. psychological capability). Therefore, staff reflected that it was their belief that incorporating a holistic approach by supporting health behavioural changes would be of greater benefit than just focusing on mental health alone due to their professional background and training (i.e. reflective motivation).

… because of my professional training and my identity, as a developing identity, as an [role removed]… It’s just created in me that holistic view of my training… So, I look at the environment, physical health, mental health, social environment, you know, it’s ingrained in me. And in the [role removed] assessment, everyone just thinks physical, but it’s much more than that… That’s what we believe in… your health and wellbeing is strongly associated with your social, physical, your environments and all those things together. (S1, Male, 50’s, Allied health professionals & other team roles)

Understanding of processes and resources

It was commonly reported among staff that they lacked knowledge (i.e. psychological capability) regarding the availability of specialist behaviour change services that were operating in the two boroughs. Some staff suggested that it was unclear as to whether some services were still operating.

… I don’t know what they [specialist services] are, so I can’t answer that. (S11, Female, 20’s, Allied health professionals & other team roles)

It was explained that this lack of knowledge was a result of poor communication between staff. It was suggested that access to a shared drive (i.e. physical opportunity) with details regarding services that were currently operating would be
important in facilitating their understanding of the availability of services in different boroughs. It was suggested that this would facilitate their ability to provide patients with the physical opportunity of engaging with specialist services.

... one thing that I struggle with the [integrated service] is that the communication of changes is quite hit and miss... for example, what’s the latest updates on the Diabetes Service... or in [borough], can you still refer to the Football Group, can you refer to like the Tennis and Badminton Group or has that now finished or... I kind of hear about if I know the OT or I have a channel with them, but I think lots of the practitioners don’t unless we actually send out emails to our practitioners... I think what there needs to be is a sort of [integrated setting] shared drive that is actually regularly updated that everyone can access in the R&R Division... things differ in [borough] to in [borough]... (S18, Male, 50’s, Allied health professionals & other team roles)

In other cases, it was suggested that a lack of shared standardised processes regarding procedures (i.e. physical opportunity) for referring patients to behaviour change services impacted staff understanding of the processes for supporting behaviour change (i.e. psychological capability) negatively therefore creating variability in the way it is supported. It was also suggested that a lack of formalised procedures also affected reflective motivation and staff beliefs that promoting health behaviour change was not an essential part of patient care.

I think we still do need a protocol... if, for example, someone is actually flagging up exercise as an issue, then it could be a sort of checklist, have you considered this... Have you gone to the activity folder on the shared drive to make sure that you know the activities options are? Have you referred for Psychology, if so, has your referral made clear that the kind of person wants to increase activity?... so that it’s just much more... standardised. (S18, Male, 50’s, Allied health professionals & other team roles)

...unfortunately, when you don’t formalise it [physical activity] in such a way, is that certain people referring in, or certain, professionals within the Service don’t see it as therapy. They see it as add-ons to things. So you know, the feeling is, I believe from some people... it’s a leisure activity, that is a bit of an add-on from their support. And it needs to be, through the CPA process, considered part of the process therapy. (S13 Male, 40’s, Allied health professionals & other team roles)

The lack of standardisation regarding the processes and procedures for referring to behaviour change services was evident among staff accounts. It was apparent that different mental health services had different processes for referring patients to
services, with some having access to ‘wellbeing’ folders and others in the process of implementing this.

We got an… Part of [integrated service] wellbeing folder directly that is a referral, referral to somebody. [management] matron, gave me, sent me all these leaflets. So I print them out. And these referrals. Someone extremely overweight there’s exercise referrals so that’s what I do. Listen, they’re interested, it’s football, tennis and all of that. And then they do their referral as well… (S14, Female, 40’s, Nurse)

In other cases, nurses commonly suggested that the physical opportunity of having access to the physical health screening tool facilitated staff psychological capability in terms of what and how to discuss health behaviour change. It was also evident this affected their reflective motivation as they saw it as part of their role to take anthropometric measures and ask questions on health behaviours given the formalised process in the screening tool.

…seeing what they’re actually eating at the moment and their blood sugars, their weight, their BMI…Explain to them the risks. That can help, which they do actually because part of the…The screening tool. Yes. There’s this whole section on it…if I was doing a screening, I would go through it. (S12, Female, 20’s, Nurse)

6.5.3.9 Integrated working between mental and physical health services

Staff and patients reported that staff within primary and secondary care made use of the knowledge primary and secondary care services offered and therefore their physical opportunity in terms of access to such links and skills. They additionally used their knowledge on who shared better relationships with patients to intervene in health behaviours appropriately. However, in some cases, a lack of physical opportunity to integrate primary and secondary care systems affected communication and joint working. Further, staff suggested that their organisation of mental health services enabled physical opportunity to work in an integrated way and therefore better meet patient needs using the different expertise of staff members (i.e. psychological capability). Staff also reported access to specialist services within secondary care trusts and therefore the physical opportunity to attend MDTs and increase their psychological capability of physical health to better meet patient needs. Yet, joint working with such services was not always possible.

Using skills and knowledge within primary and secondary care
The psychological capability of GPs in terms of their knowledge on physical health and health related behaviour change was perceived as valuable by mental health staff and their involvement was commonly sought. One patient reported that their mental health service was attempting to arrange an appointment with the GP so that their physical health needs could be addressed.

…I’m waiting to see the... my next doctor. [CPN in mental healthcare setting] the guy that gave me the injection he’s going to arrange to see another, just a doctor for a check-up. (P7, Male, 40’s, Schizoaffective)

…we could monitor...we could try and devise some of the behaviour changes with the patient...but ideally it still needs closely monitoring with the GP. (S3, Female, 40’s, Nurse)

However, the ability to make use of different skills in primary and secondary care was affected by communication barriers caused by a lack of physical opportunity to integrate information sharing systems. Staff and patients often suggested that services were disconnected which consequently affected the extent to which physical health needs were met. It was suggested that having access to a shared system would increase psychological capability regarding health needs and inform physical health interventions offered.

My impression is it’s not very well integrated at all… It’s like there’s [SMI nurse]… She comes into my GP clinic. There’s my GP. Does he talk to [SMI nurse]? I don’t know. Maybe… They share my… My medical records transfer between them somehow… Then there’s still that psychiatrist over here in a different bubble; it does not feel very integrated… and I do feel like I’ve got to say the same things to my GP that I say to my psychiatrist, and then back and forth… And whatnot. (P10, Female, 40’s, Bipolar)

I think we’ve just been in our silos, each of our services, for a very, very long time, and I don’t think we’ve had the forums whereby we can be together to think about how we best serve the needs of our patients and service users together… I can see you today, do all your checks, but you might have been in the surgery two weeks ago and I’m just duplicating. Or you might tell me, I’ve had those done, in fact you haven’t had anything done in ten years, because you just don’t really want me to bother you. So in order...to… Offer the correct interventions at the right time, we needed to have access to things like [IT system]…That will go some way in bringing that, that we have a better understanding about the needs of our individual patients... (S5, Female, 50’s, Nurse)

Patients commonly reported that GPs were also using the psychological capability of mental health staff regarding their expertise in mental health.
Utilising knowledge on patient relationships with services

Mental health staff acknowledged that some patients had better relationships with GPs and patients in some cases preferred to be seen by their GPs for physical health problems rather than their mental health teams. It evident that staff were utilising their knowledge (i.e. psychological capability) on the relationships patients shared with specific providers and/or the extent to which they engaged with specific services flexibly to either intervene or allow other providers to intervene. This consequently increased patients’ physical opportunity to access physical health related interventions.

...some of our patients have very good relationships with their GPs, they prefer to go to their GPs... like family GPs that they’ve had for like years so that one GP they know... (S12, Female, 20’s, Nurse)

I’m confident that GPs are also offering interventions. One of the things we are trying do is obviously replicate that in patients who are hard to engage, who don’t regularly see the GPs, probably attend Clozapine Clinics or depot Clinics more regularly than GP appointments... So it’s a two-pronged approach. (S6, Male, 30’s, Doctor)

Team working and interprofessional learning

Staff in some cases reported creating links with specialist services with greater knowledge in specific areas of physical health and health behaviour change. However, this was not commonly reported across both boroughs. It was suggested that this physical opportunity facilitated staff psychological capability in terms of understanding how to better support patients by attending multidisciplinary team (MDT) meetings. Similarly, these services utilised this physical opportunity to attend meetings with staff with mental health expertise to increase their own psychological capability of how to support patients from a mental health perspective by consulting staff with mental health expertise. Therefore, this physical opportunity enabled information exchange in MDTs between mental and physical health services in secondary care (i.e. psychological capability) and facilitated patient access to mental and physical healthcare with specialised guidance on health behaviour change.
I also linked in with the diabetes MDTs and I linked in with the respiratory MDT, and then latterly have made links with, palliative care teams... So we’re a resource for them, they can ask us questions about people, any sort of broad mental health issues or do we know specifically patients, so we can link them back into the care coordinators so they can do some work together. And similarly, it was for us also an opportunity to learn… a lot more about what we needed to know in terms of adequately managing people, say, with diabetes, what is a realistic goal that we can set, how can we help people ensure they’re, complying with their medication or they’re following the right diet or they’re having their blood tests in a timely fashion... (S5, Female, 50’s, Nurse)

In other cases, however, staff commonly reported difficulties in terms of working jointly with physical health services in secondary care. It was suggested that staff within these services lacked psychological capability in terms of understanding the needs and challenges of patients with mental health difficulties and were disconnected from mental health services. It was suggested that this lack of psychological capability meant that services would discharge patients without being seen which therefore restricted patients’ physical opportunity to access the appropriate specialist physical healthcare. Therefore, it was suggested that physical opportunity for better working relationships were needed between mental health staff and specialist services to increase the psychological capability of both mental and physical health staff within these services. This view was supported by patients who suggested that there was fragmentation between mental and physical health services, and that disjointed working affected how well health needs were being met.

…it’s not been universal…There’s little pockets of it, but that’s how I feel it should be across the board…I’ve worked with people with quite profound physically disabilities then aren’t getting the service that they need because they don’t relate to services in the same way perhaps your general population might… I’d really like a good working relationship with them where they’re willing to do joint work with us… ‘Cos we could learn from them and they could learn from us… (S2, Female, 40’s, Allied health professionals & other team roles)

Mental health and physical is together; it’s the same body… I don’t feel they working in partnership… I think they work in units; they have compartments and that’s why it doesn’t work… you need to work as small [multi] disciplinary team. Team work… No little compartments because that’s what we got here. (P11, Female, 50’s, Bipolar)

6.5.4 Field observations

My field observations within mental health clinics were consistent with staff and patient accounts. It was clear that signposting patients to various services including PA
groups, smoking cessation etc. was commonly advocated. Clinics often contained various leaflets and advertisements advocating these groups. There were also various posters providing patients with information on how to consume healthier foods and information on stopping smoking which is consistent with staff reports.

The location of several mental health clinics were also ideal for PA as supported by patient and staff accounts. Various mental health clinics were situated near or amongst green space and one was located on the top of a steep hill, which I found physically challenging to reach.

Staff within mental health services had very limited time for additional tasks other than caring for the mental health needs of patients. I noticed several occasions where understandably mental health risk was often prioritised and took up most staff time. There were occasions where staff who I interviewed had been placed on-call for urgent cases/ risk assessments sometimes on short notice. In fact some of the interviews I conducted had to be paused due to staff receiving urgent risk assessment calls, but this did not disrupt the quality of the interviews. In some cases I witnessed staff not taking their entitled breaks due to their volume of work. One staff member showed me her weekly diary which was completely full.

I also noticed that mental health staff had excellent interpersonal and communication skills as they themselves reported. This was evident in their ability to maintain rapport with patients and share positive relationships with them. Patients valued the relationships they shared with HCPs and the dynamics between staff and patients were often informal, where they were known to each other on a first-name basis. However, I noticed several occasions were staff found it difficult to tackle addiction related behaviours such as smoking and staff informally discussed with me that they struggled to motivate patients to want to change.

I also attended several steering group committee meetings (see Chapter 2, section 2.5.3.1). Primary care services did not attend any of the meetings I observed and this reinforced the communication issues that staff and patients reported between services.
6.6 Discussion

6.6.1 Summary of key findings

A range of BCTs were identified as being used to support health behaviour changes in people with SMI in the integrated healthcare context, but their use was reported variably by staff. These broadly fell within goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, comparison of behaviour, associations, repetition and substitution, comparison of outcomes and self-belief. Staff and patients more commonly reported on the use of techniques related to social support, shaping knowledge, natural consequences and feedback and monitoring (in terms of biofeedback).

Several factors affected supporting and changing health behaviours in the integrated context. The patients’ role in facilitating their own health behaviour change was perceived as important irrespective of the involvement of staff, and proactivity, readiness and willingness to change were affected by reflective and/or automatic motivation. However, factors beyond patients control including medication side-effects negatively impacted motivation. It was suggested that patient’s health knowledge (i.e. psychological capability) had a variable impact and awareness of risks (i.e. reflective motivation) and fear (i.e. automatic motivation) evoked from information provided by HCPs positively influenced behaviour, particularly in those provided information by both mental and physical healthcare providers. However, health perceptions were difficult to change. Emotional, psychological, and physical experiences associated with health behaviours both positively and negatively affected motivation to change. Physical opportunity regarding financial circumstances and environmental structure such as affordability of cheaper unhealthy foods and outdoor spaces were important. Making behaviours habitual (i.e. automatic motivation) was difficult due to limited physical and social opportunities and long-term unhealthy habits were difficult to break, but some healthy behaviours perceived as easy to incorporate became habitual. Social opportunity arising from interacting with similar cultural communities and informal social networks influenced beliefs (i.e. reflective motivation) about health behaviours and in turn behaviours. External peer support in PA groups was perceived by patients to enhance patient motivation.

HCPs were an important source of practical and emotional support, influenced patient reflective and/or automatic motivation and facilitated behaviour change. Staff increased patients physical and social opportunity to access specialist services.
targeting different health behaviours, but resource was scarce and patient engagement with services were variable. A lack of monitoring and accountability, the suitability of services and a lack of confidence in abilities affected motivation affected patient engagement. Staff expressed a lack of physical opportunity in terms of time to support patients’ health behaviour change, yet follow-up was perceived as important. Mental healthcare was believed to pose a greater immediate risk (i.e. reflective motivation) and was in some cases prioritised by staff due to limited time.

Staff psychological capability in terms of the knowledge about health and wellbeing was enhanced due to the integrated context and influenced beliefs regarding importance of addressing behaviours (i.e. reflective motivation). However, an understanding of how to support and awareness of health behaviour change was variable, affected by profession and professional identity. All staff requested additional training on BCTs. A lack of physical opportunity in terms of standardised processes to support behaviour change and information sharing on the services available in different boroughs negatively affected staff psychological capability and reflective motivation regarding their roles. Physical opportunity regarding access to a health screening tool with questions on behaviour change positively influenced staff beliefs about the purpose of their role but patients still felt reviews could be more holistic and were being guided by mental healthcare or medication due to staff profession.

Primary and secondary care made use of the psychological capability that different services had but the integration between the two services was affected by difficulties in communication and physical opportunity regarding access to a shared system. Mental health services also integrated with secondary physical health specialists and shared knowledge on supporting patients. However, joint working was not always possible due to a lack of psychological capability of understanding patients and patients viewed services as disjointed.

6.6.2 Comparison of findings to other literature and theory

6.6.2.1 Health knowledge and perceptions

Previous research supports that a lack of health knowledge prevented health behaviour change whilst having health knowledge facilitated behaviour change in people with SMI (210-212, 226, 229, 231, 234). The findings in the present study somewhat support this finding as health knowledge facilitated behaviour among some patients. One factor that differentiated these patients from others not reporting this
was that they reported being provided information from both mental and physical healthcare providers and experiencing fear as a result. In contrast, others reported that an understanding of the health consequences of unhealthy behaviours affected patients' evaluations about what they should be doing, but this did not motivate them to change. This supports quantitative work demonstrating no association between self-reported health behaviours and health knowledge (333). It is possible that being provided consistent information from multiple HCPs had created greater emotive responses (i.e. fear= automatic motivation) in those who reported that this facilitated behaviour change and therefore automatic motivation may have been a stronger driver of behaviour as opposed to reflective motivation in these cases. This is in line with the Plans, Responses, Impulses, Motives and Evaluations (“PRIME”) theory, which suggests that evaluations can only influence behaviour if strong enough desires and impulses (i.e. automatic motivation) are generated from them (274). However, staff suggested that in some cases a lack of acceptance that behaviours were unhealthy (i.e. reflective motivation) was a barrier to supporting behaviour change.

6.6.2.2 Emotional, psychological, and physical experiences associated with health behaviours and motivation to change

Consistent with prior research, the pleasures gained (i.e. automatic motivation) from smoking and drinking alcohol prevented behaviour change but helped patients deal with the stresses associated with having mental health difficulties (118, 212, 215-219). Similarly, the pleasure gained (i.e. automatic motivation) from PA facilitated behaviour change and helped alleviate the stress patients experienced which also aligned with other research findings (79, 223, 225, 228, 229, 232, 233). This is consistent with the PRIME theory which suggests that actions occur as a result pursuing the strongest wants (i.e. pleasure/ satisfaction) or needs (i.e. anticipated relief) in line with automatic motivation (274).

Other research supports that positive changes in physical health appearance motivated patients whilst the inability to observe progress with goals hindered progress (79, 213, 223, 226, 229, 231, 234). Breathing problems related to smoking were also suggested to positively impact behaviour change (215, 217). Similarly, patients' subjective realisations regarding the positive and negative impact of unhealthy behaviours including breathlessness during exercise due to smoking habits and observations that they were overweight/ losing weight (when weighed by HCPs), were facilitators to behaviour change. One possible reason behind this is that patients
may have stronger awareness regarding the consequences of healthy/ unhealthy behaviours if they can relate to these through their own personal circumstances creating stronger beliefs. In fact, a research study suggested that brain regions associated with self-related processing became activated when messages specifically tailored to individual smokers were provided which then later predicted smoking cessation at 4-months (347).

### 6.6.2.3 Financial circumstances and environment

Consistent with other research, staff and patients reported that access to outdoor green spaces facilitated PA but limited access prevented PA (336). It is suggested that the reasoning for this is that being exposed to nature may be soothing and beneficial for mental health symptoms.

The availability of affordable healthy foods was important, as reported across other studies where financial strain caused difficulties purchasing healthier foods (226, 231). Reflecting the costs of smoking (reflective motivation) facilitated the reduction of smoking and alcohol behaviours as reported by staff in the present study and research elsewhere (215, 217, 218), yet this was not reported among the patients in the present study. This may be because the patients in the present study who smoked expressed that they did not want to stop due to the pleasure and relaxation they reported experiencing, and this automatic motivation may have been a stronger drive of behaviour. Reflective evaluations (including the cost to support these behaviours) may have not been enough to overpower this need and desire as supported by the PRIME theory (274). Therefore the perceived benefits may have outweighed the costs as in other research (215).

### 6.6.2.4 Habitual behaviour

It is commonly reported in other research that patients with SMI show preference for walking as opposed to other PA (348, 349). Similarly, patients in the present study found it easier incorporate into their lifestyle. However, other research reported that habits formed around smoking prevented behaviour change which was also supported in the present study regarding long-term smoking and alcohol behaviours (215, 217). Research in the general population suggested that smoking and alcohol behaviours occurring from a young age and continue into adulthood were associated with later smoking and alcohol dependency, suggesting that these behaviours are harder to break the longer they occur (350, 351).
6.6.2.5 Cultural norms and informal social networks

Unhealthy diets among people with SMI were previously reported to be influenced by cultural factors and associated unhealthy foods, which was also supported by the present study where serving small portions was offensive among ethnically diverse participants (231). Other research supported that patients with SMI exhibit similar behaviours to people within their social networks which can hinder or facilitate healthy changes (211, 226). Similarly, participants reported that patients mimicked the behaviours they observed and formed beliefs on their appearance by comparing body size to members of their informal networks. Prior research also suggested that smoking related behaviours are often used as a way of maintaining social contact, and this was also reported across both staff and patients in the present study (215, 217).

It is possible that reasons for modelling such behaviours within cultural and informal environments may be affected by the relatability of one’s own experiences to people with similar backgrounds and circumstances. As discussed previously, individually adapted messages designed to target individual health needs may generate stronger beliefs regarding the need to change behaviour (347). It is possible that patients can resonate more strongly with informal networks or patients from similar cultures with similar experiences which may in turn influence their beliefs regarding health behaviours more strongly. Other patients that experienced peer support through attending PA services reported they enjoyed socialising and were more motivated to continue. This was supported by the association between a peer-led intervention for people with SMI and improved mental and physical health scores and other research supporting the value of peer involvement in facilitating behaviour change (232-234, 238, 241-243) (335). However, external peer support services may not be suitable for all patients. Research suggests that patients may find new social environments intimidating and fear being stigmatised for their mental health problems (352). Similarly, staff in the present study suggested that peer group services may not be valuable for all people with SMI experiencing mental health symptoms such as paranoia and difficulty engaging with others.

6.6.2.6 Staff support

In the present study both patients and staff reported that staff provided patients with practical support by referring patients to behaviour change services which is consistent with other examples of integrated care models for people with SMI (42,
This is further supported by a review that suggested that better referral pathways to access such services are needed for people with SMI to target individual health goals (35). However, staff and patients in the present study suggested that patient engagement with such external services was in some cases poor due to the suitability of services, patients’ lack of confidence in their abilities and lack of accountability and monitoring. However, when staff attended PA sessions with patients, they were reported as more likely to continue.

It is possible that attendance of sessions with patients increased patients’ confidence and fostered a sense of accountability. Further, patients and staff reported positive relationships and receiving positive reinforcement for achieving health behaviour change also motivated patients. Other research has also supported that accountability in terms of monitoring and tracking progress, providing feedback and positive relationships with staff is a source of motivation for health behaviour change in people with SMI (100, 210, 219, 226, 229-231, 234). However, there was little evidence that patient progress was being monitored and tracked by staff when they were referred to services. Other research suggests that supporting behaviour change takes time and time can be limited amongst HCPs as supported in the current study and the lack of opportunity to follow-up and monitor patient progress (211).

### 6.6.2.7 Staff behaviour change knowledge

Prior research showed that both primary and secondary care staff had a lack of knowledge about the increased risk of CVD in people with SMI, consequently preventing them from offering interventions to reduce this (100). As a result of the integrated nature of the healthcare context in the present study, patients and staff reported that they had greater knowledge regarding the importance of addressing health behaviour change which positively informed their beliefs about the need to address this (i.e. reflective motivation).

Previous research has reported that staff knowledge regarding how to support behaviour change is also important. Consistent knowledge in smoking cessation techniques was required and a lack of knowledge negatively impacted the extent to which staff intervened (215, 217). Similarly, mental HCPs suggested that due to their lack of knowledge regarding specific techniques about how to support changes in diet, alcohol, and smoking, they often referred patients to specialist services to support this. This was further supported by their perceptions that they required more skills and
training in applying BCTs given that there was no specific training available in the Trust and they relied on knowledge they gained many years ago. This may explain why staff and patients reported that some BCTs around shaping knowledge, health consequences and support were more often used than others. It may be that approaches such as providing information about health consequences or how to eat healthier and providing practical and emotional support may be easier to use as opposed to techniques related to behavioural experiments, which only a staff member with specialism in behaviour change reported using.

In other cases, staff reported that they lacked psychological capability regarding the knowledge on the availability of health behaviour change services in different boroughs and a lack of shared processes in some cases prevented supporting behaviour change. The lack of standardised agreements may support the reasoning behind why a variation of BCTs were reported between staff. Other research on the implementation of integrated models supports the need for shared agreements and protocols to facilitate implementation (107, 146).

6.6.2.8 Staff roles and perceptions

Previous research suggested that understanding roles and responsibilities and holistic training could facilitate the integration of mental and physical health into staff practice which was also supported in the present study (107, 146). However, patients reported that their wellbeing reviews could involve greater focus on health behaviour change as this could reduce mental health symptoms, but the mental health background of staff meant that the dominant focus was on mental health within reviews. This may provide some reasoning why other research has found that physical health needs should be addressed by primary care HCPs (100, 353). It may be that staff from predominantly mental health backgrounds with limited holistic training find it challenging to address physical health needs, as implied by the GP in this study.

However, research supports the value of mental health staff with knowledge of the challenges people with SMI face regarding health behaviour challenges (221). In fact, mental health staff suggested they had good interpersonal and communication skills to support patients. This was also supported across the themes where it was evident staff understood the challenges patients faced and my observations of staff. There was also generally consistency between staff and patient perspectives. Some
research suggests that people with SMI may not engage with primary care HCPs and in some cases they lack understanding or experience of people with SMI (100). It was in some cases suggested by mental health staff that primary care practitioners lacked an understanding of people with SMI in the present study, but this was variable. There was also no preference among patients regarding who could support them with their health behaviours. In fact, staff capitalised on the knowledge about whether patients shared better relationships with staff in primary or secondary care to determine whether to intervene in health behaviours.

A review suggested that it was primarily the responsibility of staff rather than organisations or structures to ensure successful implementation of integrated care (107). While the present study findings somewhat support this in terms of addressing health behaviour change, it was also evident that organisational structures were important in terms of influencing staff perceptions of their roles to support behaviour change. Physical opportunity in terms of physical health screening tools provided by the Trust including questions on health behaviour change provided to staff to identify physical health issues, facilitated staff beliefs regarding the need to incorporate this as part of their role. Further, a lack of standardised processes and shared knowledge from the organisation on supporting behaviour change influenced some staff beliefs that this was not part of their role.

6.6.2.9 Integrated working practices

There was some suggestion that primary and secondary care services were beginning to work together to support patients with health behaviours, which is a common recommendation among reviews identifying ways to integrate physical and mental healthcare (35, 42, 107, 146, 147). It was evident that mental HCPs valued primary care input in terms of monitoring health and behaviour change and primary care used the expertise of mental health staff when mental health concerns were raised. However, communication issues between primary and secondary care have been reported to negatively affect supporting smoking cessation in people with SMI (221). Other research also supports that lack of information sharing prevented the integration of mental and physical healthcare and was also supported in the present study (42, 107, 146). In the present study however, it was also suggested this affected the extent to which staff could support behaviour changes as they had no way of tracking whether interventions had been offered to patients.
Research on integrated models for people with SMI also advocates the involvement of other secondary care physical health services such as secondary care services specialising in physical health problems (42). There was some suggestion that staff in the present study were integrating with physical health services and seeking advice on ways to support patients with behaviours such as diet if diagnosed with diabetes which they suggested facilitated their ability to support behaviours. However, this was not widespread, and patients and staff reported a lack of integration with secondary physical health services due to poor understanding of service users and different locations of services. Research supports that the co-location of services is important to facilitate integration between services (42, 107, 146).

6.6.3 Differences in opinion between staff and patients

There were some differences in opinion between staff and patients mainly concerned with health knowledge. Whilst the patients interviewed demonstrated health literacy, staff suggested some patients lacked health knowledge and the capacity to understand. This might be due to staff underestimating patient’s knowledge and capability. Alternatively, patients that participated in the present study potentially had greater interest in health promotion than those who declined participation. However, based on my observations in clinics, this is unlikely as the sample recruited was diverse. The sample did not purely contain participants that were engaged in health promotion, in fact, some were less engaged and potentially less stable recruited from antipsychotic depot and clozapine clinics.

A further discrepancy was that patients desired being monitored by HCPs once they had been referred to behaviour change services but in some cases, staff suggested that patients were unwilling to be monitored. This may be due to misconceptions of staff on patient’s views or again due to differences between some of the patients that staff care for compared to those who were recruited to the present study, but this is unlikely given the diversity in the sample.

Some factors were also reported in staff interviews but not patient interviews. Staff believed that reflecting the financial consequences of smoking cigarettes and approaching smoking cessation in a graded way by advising reduction rather than quitting were facilitators. However, this was not reported in patient interviews. One possible reason for this finding is that those who classed themselves as current smokers all expressed that they would never quit and refused any help. Therefore,
these patients experienced help for smoking cessation that staff reported. However, ex-smokers did not report that this technique was used and/or motivated them to quit. In fact, fear related to the health consequences of smoking appeared to be a greater motivator.

It was also suggested by staff that peer PA groups were unhelpful to those experiencing mental health symptoms including paranoia and difficulty engaging with peers, but this was not supported in patient interviews. In fact, those that attended PA groups enjoyed this. In some cases, a few patients suggested they attended PA groups for the general population but disengaged due to lack of confidence in their physical abilities rather than difficulties engaging with others.

Further, staff reported using several BCTs whilst patients reported less techniques used by staff. It may be the case that staff were reflecting on an ideal model of care rather than what was used in practice. Alternatively, it is possible that patients were less able to recall these.

6.6.4 Strengths and limitations

6.6.4.1 Research value

To my knowledge, this is the first qualitative study exploring how health behaviours may be supported in an integrated mental and physical healthcare context for people with SMI. Therefore, there are no studies in integrated settings comparing both staff and patient perspectives on this issue including how BCTs may be used, work in practice or use theoretical reasoning to interpret themes and explain underlying processes. Therefore, this work is original and offered new insights into supporting health behaviour change in integrated settings for people with SMI.

6.6.4.2 Methodological rigour

In this section, I refer to the four criteria (credibility, transferability, dependability and confirmability. See Chapter 5, section 5.6.4.2) established by Lincoln and Guba (1985) to explain the trustworthiness of the findings (337).

Credibility

**Prolonged engagement and persistent observation**
I attended clinics to recruit patients and staff and therefore spent a considerable amount of time with staff and patients. I was kindly given desk space in clinics and so I was able to observe my environment and the context in which I was collecting the data. I also independently conducted the interviews mostly face to face (only one was conducted on the telephone) and I was able to observe participants non-verbal cues and pose follow-up questions or prompt them as appropriate. I also kept field notes throughout the entire process to reflect on my observations in clinics and the consistency between these and patient and staff accounts.

Initially it was difficult to engage with staff in clinics as I felt they were wary of my position as a researcher, but after developing relationships with them and rapport, I felt they better understood my position and trusted me. I spoke with various staff from administrators to higher management and I felt this really enabled me to ‘blend’ in so that the process of interviewing staff felt natural and comfortable. This is supported in the rich data that was captured when I interviewed staff. Similarly, staff would introduce me to potential eligible patients to enable them to feel more comfortable with being approached for research participation and being interviewed. Through the process of engaging with staff informally in clinics, I was also able to identify other members of staff who were important in terms of their involvement in the integrated context.

The process of data coding and grouping the codes into themes was also iterative, whereby I repeatedly listened to interviews, read transcripts, revised codes and themes until I was satisfied that they provided insight into topics discussed.

**Triangulation**

I decided to interview both staff and patients as this allowed me to explore and compare different sources of data. I collected this data simultaneously so that I could compare concepts throughout the data collection process, which further aided my understanding and interpretation of the data. Once the data were collected, I kept two separate NVivo files with one containing staff data and the other containing patient data. I was able to further compare codes and themes side-by-side throughout the entire analysis process. To understand the range of perspectives and experiences, I searched for both commonalities and discordant views between staff and patient data. I also sought the involvement of different analysts. A.B and K.W have backgrounds in medicine, health psychology and qualitative research and we discussed the
development of codes and themes iteratively. This allowed me to consider different ways of interpreting the data and gain a deeper understanding of it.

**Negative case analysis**

During the analysis process, I searched for consistencies across the data as well as instances where the data contradicted any patterns. Throughout the findings, I refer to instances where conflicting perspectives were identified, less common themes occurred as well as consistencies in the data to provide an in-depth insight into the experiences and perspectives of all the participants in the sample.

**Member checking**

I decided against involving participants in checking whether their data had been interpreted as accurately as possible. It is possible that social desirability may have influenced participants views of their responses which may leave them feeling ashamed, embarrassed, or regretful of certain responses. This may consequently lead to them changing their responses and would have created a more complex analysis process.

**Transferability**

I have provided a “thick description” of the sample, setting, data collection methods to enable the reader to judge whether the findings may be transferable to the contexts and people of which they intend to transfer the findings to. I explored the differences between smoking, alcohol, diet, and PA as well as similarities. Where there were differences, these were reported. However, there were mostly similarities especially where BCTs were reported. Therefore, the findings may be transferable to those with similar experiences with these health behaviours in similar contexts, largely more urban settings with diverse multi-cultural populations.
Dependability and confirmability

*External audit*

As previously discussed, I sought the involvement of two additional analysts who were not involved in the collection of data. We discussed various ways that the data may be interpreted and evaluated whether the interpretations I made were supported by the data. We came to the agreement that the codes and themes identified were indeed supported by the data and in some cases I amended themes where the interpretation was less supported by the data.

*Reflexivity*

I am female, in my early 30’s, from an ethnic minority group with a Psychology background and interests in mental health and health behaviour change. I had no prior affiliation with staff or patients from the integrated healthcare context.

I noticed that patient responses could have been affected by my personal characteristics. Being from an ethnic minority group in some cases made others from ethnic minority groups feel more comfortable expressing their views. One notable case was where one patient from a similar ethnic background asked during the interview if I was also from the same ethnic group. We discussed various foods that our cultures shared, and this made the participant feel more comfortable discussing the types of foods that he consumed. In some cases, I noted that my age and gender could negatively impact the interviews. I felt that in some cases patients who were older, and male held back their responses in interviews because they may have felt more conscious of my judgement as a younger female. In these cases, I attempted to reassure patients that their responses were entirely confidential and there were no ‘right’ or ‘wrong’ answers rather that I was interested in their own experiences and perceptions.

I also felt the characteristics of patients affected the interview process. There were instances where I felt that the mental health difficulties faced by individuals negatively affected the quality of the interviews. There were times when participants were unable to concentrate for long periods or expand their responses despite being prompted. I also sought the opinion of K.W who read a few initial transcripts to provide feedback regarding interview techniques, but it was agreed that some of the interviews were
challenging due to mental health difficulties and would be difficult to overcome. I noticed a difference with more affluent patients, who were educated in health behaviour change and in some cases Psychology and qualitative research. These patients provided richer in-depth descriptions of their experiences and perceptions.

I felt that my background in Psychology facilitated the data collection process in many cases. I have a greater sensitivity to and interest in observing and responding to non-verbal cues and my environment. For example, I noticed when patients became uncomfortable with certain questions/topics. As discussed previously, I noticed several smoking cessation tools and diet related leaflets in a clinic room where I was interviewing a staff member. I drew on these observations and acknowledged them in the interview by asking staff whether these tools were part of the process.

I was aware that social desirability could affect the data collection process, whereby staff may have distorted their responses either positively or negatively based on the relationships I developed with them. Therefore, I made it clear prior to interviews that I was interested in both negative and positive views and the data would be anonymised and treated confidentially, and staff did indeed express both negative and positive views. I believe the relationships I developed with staff had a positive influence as they were more trusting and willing to discuss their experiences knowing that it would be treated in confidence.

My interest and knowledge in health behaviour change, behaviour change theories and frameworks may have affected the way I collected and analysed the data. For example, I may have inadvertently prompted staff and patients to provide certain responses or identified themes that matched with certain concepts. I attempted to avoid this by listening to every interview I conducted and learned from my experiences. I attempted to remain as open as possible to alternative responses and avoid leading staff and patient responses as much as possible. I also discussed both codes and themes with A.B and K.W with different multidisciplinary backgrounds which enabled me to think of different ways the data could be interpreted.
Other methodological considerations

Consideration of different groups and perspectives

One of the strengths of the study is that I was able to recruit staff and patients from both boroughs in the integrated setting and therefore captured the potential diversity of perspectives from participants in living in and experiencing different area-level/environmental factors. Further, I recruited staff from a wide range of roles, different age groups, ethnic groups, years of experience and so I was able to capture any potential differences in experiences and perspectives across these characteristics. It may have been beneficial to recruit more staff from primary care settings alone to capture their potential differing views, but it was difficult to establish contact with them.

I recruited and interviewed patients from ethnically diverse backgrounds. The higher proportion of Black Caribbean patients reflected the higher risk of psychosis among this ethnic minority group (114). Further, the patients had a wide range of CVD risk factors, allowing me to explore perspectives and experiences regarding different health behaviours. However, participants were mostly recruited from secondary care within depot/ clozapine injection clinics and participants may have been less well than others with SMI. Further, most of the participants were on benefits which implies that they were more deprived which is consistent with other findings showing an association between greater deprivation and incidence and increasing prevalence of SMI s (354). The patients I recruited are often seldom heard in research and may have suffered greater difficulties related to behaviour change where there may have been more to gain. However, it would have been beneficial to also recruit more participants that were younger, employed, on oral antipsychotics, recruited via primary care and from White British backgrounds to capture potentially greater diversity of perspectives and experiences. Given the time restrictions of this study this was not possible.

The patients recruited from primary care were approached initially by dual-trained nurses. It is possible that nurses approached those that were perhaps more engaged with their health or patients that they felt they had a good relationship with. However, I had no prior relationship with patients I approached for recruitment in clinics and clinicians were only involved in this type of recruitment to identify those that were eligible and attending the clinics. Therefore, there may be a difference between those I purposively approached for recruitment in clinics and those that dual-trained nurses approached in terms of their motivations to improve their health and/or provide
negative perceptions of the healthcare they experienced due to the relationship they shared with staff. However, all patients comfortably expressed both negative and positive experiences and perceptions of the healthcare they received in this context. Similarly, snowballing methods of recruitment used to identify additional staff may have influenced the types of staff recruited. It is possible that staff only identified others that were more engaged with integrated care and health behaviour change in this population. However, I also found that this was not the case and mixed perceptions were reported. There was also several patients (7/22) and staff (12/32) that declined participation and it is possible that these participants shared conflicting views with those that took part in the study. I was also unable to capture the views of patients less engaged with healthcare services (e.g. those that did not attend the clinics or other services) due to logistic difficulties. It is likely that patients who were less engaged had different views about health behaviour change.

*Inductive and deductive approaches*

It is a strength of the current study that I did not base any of my topic guides on prior literature and/or theoretical behavioural models, as this allowed me to capture any perspectives and/or experiences that were both inconsistent and consistent with previous literature and theory. The strengths and limitations of using the BCTT and COM-B model in the analysis are discussed in Chapter 5, section 5.6.4.2.

*Alternative methodological approaches*

An ethnographic approach involving observing BCTs being applied within appointments may have contained advantages compared to the method I used including greater detail on methods used, less reliance on participant responses and therefore the potential of minimising recall error. However, it is still possible that staff and/or patients may have behaved in a different way to normal circumstances if they were aware they were being observed, in line with social desirability principles. Given the challenges I faced when discussing the prospect of conducting focus groups with participants, I felt that staff and/or patients may have also felt uncomfortable being observed and would have most likely declined participation.
6.6.5 Conclusions

Overall, the findings suggest that mental and physical healthcare providers demonstrated understanding about the challenges that patients with SMI face in overcoming difficulties with unhealthy behaviours as well as the levers. They attempted to support behaviour changes and, in some cases, succeeded with minimal training. Staff roles in supporting behaviour change was important to patients and integrated care could be valuable. Both primary and secondary care had complementary skills and valued the importance of working together and capitalising on the skills they shared. This holds some promise for the integration of mental and physical health services in supporting health behaviour change, but further modifications are required to improve how health behaviours are supported given that patients and staff reported difficulties. The implications of this chapter are discussed further in Chapter 7 (discussion).
Chapter 7 Discussion

7.1 Chapter summary

This thesis explored factors that contributed toward health behaviours in people with SMI in different healthcare contexts to reduce CVD risk. A series of four studies were conducted to address the overarching aim of this thesis. The discussion of the individual study findings, comparison to previous literature and considerations of strengths and limitations can be found within each chapter (3, 4, 5 and 6) corresponding to each study. This chapter draws together the findings from the studies by comparing and interpreting them in relation to one another. This is then followed by the implications of this work for practice, policy, guidelines and research. Finally, the methodological strengths and weaknesses of this thesis overall are discussed.

7.2 Approach to synthesising findings across the studies

There are various approaches to combining mixed-methods studies during the research design phases including “building” whereby one form of data collection informs the data collection approach of another approach or “merging” whereby quantitative data are collected in parallel with qualitative studies (355, 356). As detailed previously, most of the data I analysed were collected prior to the start of my PhD and it was not possible to inform the study design in this way. Therefore, I attempted to synthesise the findings by integrating them through a narrative approach.

I attempted to compare the findings of quantitative and qualitative studies where it was possible to do so. My quantitative studies addressed what factors were associated with PA and/or dietary related changes, whereas my qualitative studies addressed how health behaviours were supported and changed within healthcare settings. Therefore, the questions differed slightly and it was not always possible to compare findings between the two different approaches. Where factors were identified to affect health behaviours in both quantitative and qualitative studies, these were compared using the “weaving” approach (356). This involved synthesising findings of qualitative and quantitative findings together based on the concept and/or theme where possible. However, there were factors to influence health behaviour change which were not measured in quantitative studies but emerged in qualitative studies and in these cases, it was not possible to integrate the findings.
In addition, I was interested in the comparison between a primary care based approach to supporting health behaviours versus an integrated approach. Therefore, I compared the findings from both qualitative studies in the discussion to draw out techniques of supporting health behaviours effectively as well as how services could best be structured. This information was not available in my quantitative studies.

7.3 Main findings

7.3.1 Improvements to unhealthy behaviours

The secondary analysis of PRIMROSE trial data showed that on average people with SMI improved their overall PA levels, fruit and vegetable intake and reduced their overall fat intake from baseline to 12-months. The supplementary quantitative analysis also showed that people with SMI meeting ‘low’ levels of PA and consuming less than five fruit and vegetables at baseline mostly reported improving these behaviours 12-months later. Whilst some reported not improving their diet and PA in the qualitative studies, several others reported improving these behaviours. However, these findings suggest that people with SMI can (even if by a small amount), improve aspects of their self-reported diet and PA. Furthermore my qualitative work demonstrated that people with SMI were often aware of the need to improve their health behaviours and in some cases were interested in improving these behaviours.

I partly justified my focus on diet and PA for my quantitative studies on the basis that alcohol and smoking related behaviours were not classed simply as health behaviours but also classed and treated as addictions which are considered more complex. This was in some cases supported in my primary qualitative analysis of the integrated healthcare context. There were reports among patients and staff that some patients reduced, quit and/or were repulsed by smoking and alcohol. However, patients who reported smoking and drinking alcohol often in most cases minimised these issues, expressed little interest in wanting to reduce and/or quit due to long-standing unhealthy habits and the perceived benefits outweighing the risks. This was supported by staff in some cases who reported difficulties in supporting changes in addiction related behaviours due to engrained long-term habits and in some cases preferred supporting patients with their PA as it was considered less difficult in comparison. This suggests that in some cases addiction related behaviours in people with SMI may potentially be more challenging to tackle particularly in those with engrained habits lacking readiness to change. However, it is important to recognise
that other literature demonstrates that people with mental illness do have interest in quitting smoking (357).

Further, tackling PA related behaviours as opposed to alcohol related behaviours as preferred by staff in the integrated setting, may not necessarily induce improvements to PA. My secondary analysis of PRIMROSE data showed that higher AUDIT (alcohol) scores at baseline were associated to lower PA at 12-months, suggesting that alcohol behaviours may negatively affect PA levels. Further, patients in the integrated setting experienced breathlessness due to smoking related behaviours which compromised their physical capability to exercise. Therefore, if addiction related behaviours are not addressed, this may have negative implications for supporting other behavioural changes.

Additionally, most patients discussed PA and diet changes rather than smoking and alcohol in my secondary qualitative analysis of PRIMROSE. Whilst most patients in the PRIMROSE intervention arm were not considered excessive/ high risk drinkers (AUDIT median score= 2, IQR= 0-7), approximately half (52%, 80/155) were current smokers (174). It may be that patients who took part in the qualitative study were mostly non-smokers or had lower alcohol dependence risk/ hazardous and harmful use. However, staff who supported various behavioural goals were also interviewed and less commonly discussed supporting smoking/ alcohol related behaviours. It is however difficult to conclude whether the reasoning for this was due this topic not being prompted by researchers or whether these behaviours were more difficult to address as this was not discussed.

7.3.2 Identifying factors influencing health behaviour change

My systematic review identified few studies on factors prospectively associated with PA and diet outcomes in people with SMI. However, some consistencies were beginning to emerge regarding PA outcomes; older age (within studies where the average age of participants was 41.5 and 46.9 years) was associated with increasing PA, more negative symptoms were associated with lower PA related outcomes, gender and intentions to exercise were not associated with changes in PA over time. However, fewer studies were identified for diet outcomes which prevented the ability to explore consistencies across the literature. Similarly, my secondary quantitative analysis of PRIMROSE data showed few consistent predictors for aspects of PA and diet. The lack of findings may be explained by methodological limitations. Small
sample sizes, measurement error in both exposure and outcome variables due to self-report and a lack of consideration of time-varying variables may have negatively impacted the findings and may explain differences between these findings and cross-sectional work. It is also possible that other factors influencing long-term behaviour change were not considered in the studies.

In the qualitative studies, I found that components of the COM-B model were in most cases important for health behaviour change. ‘Capability’ (health knowledge, mental health symptoms, medication side-effects, cooking skills, HCP behaviour change knowledge, mental health related skills and health knowledge), ‘Opportunity’ (monitoring and positive relationships with HCPs, availability of behaviour change services, financial resources, outdoor space, opportunities for exercise, cultural and social norms), and ‘Motivation’ (beliefs on ‘good’ and ‘bad’ behaviours, the consequences of behaviours, capability to change, HCP beliefs about roles, fears and pleasures, engrained habits) were reported in some cases to impact supporting and changing behaviours. It was also reported that aspects of capability and opportunity influenced motivation. This highlighted the complexity of behaviour change and suggested that ultimately identifying drivers of motivation were important for facilitating behaviour change. However, drivers of motivation differed for patients and in some cases may have been influenced by personal and service characteristics (discussed further below). This may have provided reasoning for a lack of findings in the secondary quantitative analysis given there were potentially many unmeasured factors.

### 7.3.3 What approaches ‘work’ for whom: considering patient and service typologies

One of the key findings across the qualitative studies was that behaviour change approaches were reported to work differently for different individuals within different service contexts.

#### 7.3.3.1 Identifying readiness to change

Patients recognised that they had a large role in facilitating their own behaviour change in both qualitative studies. Those that were more proactive and motivated required less involvement from HCPs. Though there were not many characteristic differences between proactive and less proactive individuals in PRIMROSE, those that were proactive in the integrated qualitative study were recruited from primary care
services, were on oral antipsychotics, potentially more stable and diagnosed with bipolar disorder. In fact, these patients proactively sought health knowledge from their own sources and relied on HCPs less. This may be due to selection bias as HCPs identified eligible patients from primary care settings for this study. Alternatively, this may show the importance of identifying readiness and commitment to change and reasons why (e.g. stages of mental illness, medication side-effects). Most staff in the integrated context demonstrated an understanding of the concept of “Stages of change” (see Figure 7-1), though it was unclear whether they knew how to target/encourage change at different stages. In contrast, primary care staff in PRIMROSE had not reported this knowledge but PRIMROSE training did not cover this.

![Figure 7-1 Prochaska & DiClemente’s (1983) Stages of Change Model (203)](image)

### 7.3.3.2 Imparting health knowledge

In the secondary qualitative analysis of PRIMROSE, it was reported that imparting health knowledge, patients’ understanding of health consequences and healthy/unhealthy behaviours helped some make positive changes but not others. This was supported in the qualitative study of the integrated context. However, those
that reported health knowledge and changing their behaviour in the integrated setting also reported being provided with information by multiple HCPs consistently, which appeared to create fear and increased engagement with healthcare advice. These patients were more commonly recruited from outpatient mental health services (depot/ clozapine clinics). This may demonstrate the importance of the way in which information is delivered. It is possible that patients may take this information more seriously if it is delivered by multiple HCPs and this generates an emotive response such as fear, particularly if patients are less inclined to engage with healthcare advice. In PRIMROSE, only primary HCPs delivered the intervention, whereas in the integrated service multiple mental and physical HCPs were involved.

### 7.3.3.3 Monitoring and feedback

It was widely reported in PRIMROSE that when patients’ health behaviours and progress were being monitored, this motivated them to change. When patients were able to see the benefits of engaging with healthy behaviours due to being monitored (e.g. weight change), this facilitated motivation but negatively impacted motivation if there were no visible benefits in both qualitative studies. Patients in the integrated setting commonly reported the value of their progress being monitored to increase their engagement in healthy behavioural changes. Though HCPs increased patient opportunity to access behaviour change services, patient progress was not monitored once signposted to services which negatively impacted their motivation to engage with services and change their behaviours. The difference between the findings may be explained by the fact that PRIMROSE was a targeted one-to-one intervention delivered as part of a controlled trial. Therefore, staff were required to monitor patients as one of the core elements and dedicate time for this as part of the intervention. The integrated service was adopted and delivered in different ways as supported by the lack of standardised protocols and processes reported by staff in this service.

### 7.3.3.4 Informal social networks and external peer support

Informal social networks both facilitated and hindered patient health behaviour change in both qualitative studies. Patients mimicked the behaviours they observed within their social environment, which were in some cases negative and positive. Cultural influences on health behaviour change were not reported in the PRIMROSE qualitative sample, but this may have been due to the limited ethnic diversity. In contrast, the integrated setting was within an ethnically diverse region of London.
Cultural norms among ethnically diverse participants were reported to influence health behaviours in both negative and positive ways and staff demonstrated awareness and sensitivity to this. Social support and having friends was not associated with diet and/or PA related outcomes or change in my systematic review and secondary quantitative analysis. The difference between these findings and the qualitative findings may be because quantitative studies measured structural (quantity) and generally functional (emotional, practical etc.) support but it was unclear whether members of the social network were also exhibiting or supporting patients’ healthy behaviours which may be more important.

In both studies those that were isolated were less inclined to report healthy behaviours. However, patients who involved supportive others as part of PRIMROSE (where supportive others also changed health behaviours with patients) reported this facilitated their behaviour change. The involvement of supportive others as part of patient care was less discussed in the integrated setting. However, staff offered patients access to peer PA groups which in most cases facilitated their behaviour change due to encouragement, being motivated by social pressure and opportunities for socialising. Staff also suggested that the value of peer groups was variable as mental health symptoms including paranoia and difficulty engaging with others could negatively affect attendance. This suggests that patients may respond variably to those external to their informal social circle.

7.3.3.5 Perceived benefits of unhealthy behaviours

In both qualitative studies it was suggested that there were difficulties regarding patient perceptions of the perceived benefits (e.g. helping to cope with mental health, pleasure, and enjoyment) of unhealthy behaviours and the need to change behaviour where patients minimised their unhealthy behaviours. Few solutions were reported among staff that delivered PRIMROSE, whilst those with specialisms in PA and behaviour change in the integrated setting reported some ways they targeted these problems. This included encouraging patients to set goals associated with pleasure and enjoyment (e.g. sports/ exercise patients enjoyed or were previously good at). The encouragement of patients’ self-recognition of the impact of unhealthy behaviours was also reported (e.g. encouraging involvement in team sports allowing patient to recognise inability to play as effectively due to lack of fitness/ body weight or breathlessness due to smoking, experiencing a health scare and therefore fear or the realisation they had gained weight after being weighed by HCPs). Though the value
or evidence of these techniques were not consistently reported among patients, this may highlight the value of utilising the expertise of staff with behaviour change and PA knowledge.

### 7.3.3.6 Normalising healthy behaviours and the environment

Both qualitative studies highlighted the importance of engraining healthy behaviours into routine through achievable methods including the use of existing aspects of the environment (e.g. walking between bus stops or using the green spaces near mental health centres for exercise). However, it must be acknowledged that the environment and resources available can differ between patients as supported in the qualitative findings of the integrated context. In some cases, patients living in more deprived locations and experiencing financial strain reported greater consumption of affordable convenience foods and less green spaces for walking. Though this was not explored in the PRIMROSE qualitative study, there was some suggestion that some regions in England had more or limited access to resources including specialist behaviour change services. My supplementary quantitative analysis of PRIMROSE data also showed that those meeting low PA levels at baseline and were employed were more likely to increase their PA levels at follow-up compared with those who were unemployed. Similar findings were also reported in one study in my systematic review; being employed was associated with higher cardiorespiratory fitness (CRF) (259).

### 7.3.4 Supporting health behaviour change: by whom, under what context?

#### 7.3.4.1 Relationships between HCPs and patients

One of the main factors facilitating patient health behaviour change in both qualitative studies was the positive relationships between HCPs and patients. In both studies, patients valued the positive reinforcement they received when achieving progress with health goals from HCPs they shared a relationship with. There was no evidence to suggest that patients showed preferences for specific professional roles in both qualitative studies. In fact, staff in the integrated setting in some cases suggested this preference varied between staff in primary care and secondary care, but in both qualitative studies staff suggested that what mattered was the time to develop these relationships and coach patients. This suggested that trust gained over time was perhaps important for people with SMI. In the integrated setting, a flexible approach was adopted by mental health staff whereby they utilised the knowledge of who
shared a better relationship with patients (i.e. primary or secondary care) to lead the process.

In both qualitative studies however, both primary and secondary care services reported a lack of time to support patients with health behaviour change and in some cases doctors or nurses in the integrated setting met patients on a less regular basis. It was suggested in the integrated setting that those with more regular contact with patients had greater opportunity to follow them up and support them. In fact, those that reported seeing patients often were not doctors and were included on staff caseloads including some nurses, OTs, and care coordinators. Similarly, though some staff in PRIMROSE had more opportunity to follow-up on patient progress given that this was part of a controlled intervention, other staff suggested limited access to time. However, even if some staff such as doctors and nurses were seeing patients less regularly in the integrated setting, their role was still instrumental in facilitating health behaviour change. As detailed before, when the health consequences of unhealthy behaviours were conveyed to patients by multiple HCPs from both physical and mental health backgrounds, this motivated patients to change.

7.3.4.2 Professional background and skills

Primary care staff in PRIMROSE with experience in mental health reported being able to better support patients with their health behaviours versus those lacking experience and skills in this area. Similarly, staff in the integrated setting reported a variation between primary care staff regarding their ability to support patients with SMI with their health behaviours. In some cases, mental health staff suggested that they were better placed to support these changes due to their interpersonal skills and understanding of SMI. This was supported in their understanding of the difficulties that patients with SMI face changing their health behaviours, particularly among those with regular contact with patients (i.e. nurses, psychologists, social workers, OTs, and care-coordinators). In other cases, primary HCPs suggested that they had more knowledge in physical health interventions, and this was supported by a lack of knowledge among mental HCPs regarding aspects of diet and requests for further training. However, HCAs had less health knowledge than primary care nurses in PRIMROSE which negatively impacted their ability to support patients. Nevertheless, it was clear that staff in the integrated setting had complementary skills and used this knowledge to deliver appropriate interventions. In some cases, GPs were called upon for their expertise in physical health and in other cases SMI nurses were utilised for
their expertise in mental health. This suggests that even if certain professions lack knowledge and skills in particular areas, these can be overcome by skill sharing.

Staff with professional backgrounds related to occupational therapy and psychology in the integrated setting reported being trained in a holistic way which they suggested influenced their beliefs of their professional identity and increased their motivation to intervene in patients' health behaviours. However, staff and patients suggested that those in predominantly mental health-based roles automatically focused on and prioritised this as opposed to physical health. This suggests that professional identity may be an important contributor in staff motivation to intervene in people with SMI's health behaviours.

7.3.4.3 Organisational structure and responsibilities

Whilst there may be value in joint working between primary and secondary care services, it was clear that physical separation and a lack of communication between these services in the integrated context hindered their ability to track and intervene in patient health behaviours. It was suggested a joint information system was required to facilitate this working relationship and support patients adequately.

As PRIMROSE was delivered as part of a trial intervention, staff were provided with manuals and protocols to support patients' behaviour change. In contrast, there was a lack of standardised processes and protocols to support health behaviour change within the integrated setting. This resulted in a lack of understanding about the processes amongst staff and the belief that supporting behaviour change was not an essential part of some staff roles. In contrast, those that conducted wellbeing reviews containing questions on health behaviours felt that this was part of their role because it was included in the wellbeing reviews. This suggests that the organisation holds importance in terms of setting out the standards required to support patient behaviour change and influencing staff beliefs about this being part of their roles.

The findings suggested that access to wider multidisciplinary teams with specialisms in diabetes in the integrated setting facilitated staff knowledge on diabetes and physical health services understanding of mental health. However, in PRIMROSE, there were no opportunities to work with multidisciplinary teams as part of the intervention. This was particularly the case when staff struggled to overcome some of the challenges that patients faced. The difficulties overcoming the challenges
patients faced was further supported by most PRIMROSE staff reporting they would like further training in motivational techniques and reassurance of their abilities, for example through sharing experiences and ideas with others delivering PRIMROSE. Similarly, staff in the integrated setting suggested they required more knowledge and training on BCTs, and this was particularly evident among less experienced staff. They suggested this could be delivered by those with expertise in behaviour change such as psychologists. In fact, those with behaviour change and PA backgrounds reported using a range of techniques such as behavioural experiments which were not discussed among other professionals. Staff in the integrated setting with no background in behaviour change often relied on the training they had received many years ago and there was no specific training designed and delivered by the organisation on BCTs despite their aim to encourage health behaviour changes.

Whilst staff in PRIMROSE were required to identify behaviour change services within their local areas and signpost to these services if necessary, it is unclear whether these services were fit for purpose. In the integrated setting however, it was clear that patients reported that some of these services were not adapted to people with different abilities and confidence levels, were short term and did not monitor patient progress. Similarly, staff suggested behaviour change services for the general population needed modification for people with SMI particularly those who did not speak English as a first language, who had difficulties concentrating for long periods and required more practical guidance rather than information.

The findings from both qualitative studies suggested that resource in terms of the availability of specialist behaviour change services was important for supporting behaviour change. The availability of this resource differed across different regions of England where PRIMROSE was delivered and similarly, the funding for specialist services in the integrated service was scarce. In fact, staff sought out ways of increasing funding for PA programs including developing additional relationships with external clubs and charities rather than relying on NHS funds. The lack of resource was further supported by patients who suggested they had to fight against the closure of peer PA group services in their communities. Yet, those attending these services found them helpful for increasing PA.
7.4 Strengths and limitations

The strengths and limitations of each study method have been discussed in the relevant chapters. In this section, I will describe the strengths and limitations of the overall thesis.

The main strength of this thesis is its contribution to knowledge in terms of health promotion for people with SMI. As discussed in Chapter 1, the mortality gap between those with SMI and the general population is ongoing and there limited work and guidance on the ‘active’ components of health behaviour change interventions for people with SMI, what techniques work for whom, under what healthcare contexts (37). This work contributes to knowledge on how to deliver better health behaviour change interventions in primary care and integrated healthcare contexts for people with SMI which may improve care models and consequently contribute towards reducing mortality in people with SMI. In section 7.5, I provide specific recommendations on how this can be done based on the findings. These recommendations are important as there is an emphasis on reducing mortality in people with SMI in the NHS’s long-term plan, on supporting health behaviour change in people with SMI in guidelines and on collaborative working for primary and secondary healthcare services (15, 22, 42, 125, 136-143, 157-160).

This thesis was also developed based on previous literature, expert and stakeholder opinions which also involved previous service users. Consulting these sources ensured that the research questions were important and relevant to those who experienced SMIs.

My systematic review also highlighted several research gaps including the lack of prospective studies on factors associated with PA and dietary changes in people with SMI and a lack of focus on those with bipolar disorder or recruited from primary care services. This supported and justified the need for my secondary PRIMROSE quantitative analysis on factors prospectively associated with diet and PA changes in people with both bipolar and schizophrenia recruited from primary care services. To my knowledge, these were the first studies to explore factors prospectively associated with dietary and PA related changes and outcomes. Implications for improving upon the methodological quality of quantitative prospective studies on this topic were also identified.
One of the strengths of this thesis was the mixed-methods approach. Some factors that could not be explored in quantitative analysis were explored in the qualitative studies. When compared against qualitative findings, potential reasons why a lack of findings were identified in the quantitative studies were apparent.

One of the strengths of this thesis was that I considered both staff and patient perspectives in the qualitative studies which enabled me to triangulate different perspectives and experiences. However, it may have been beneficial to consider carer, family and friends’ perspectives but this was not possible in PRIMROSE and unrealistic in the integrated setting. One of the limitations was that staff motivations, capabilities and opportunities could not be explored in the quantitative analysis of PRIMROSE data exploring factors associated with PA and diet changes as these factors were unmeasured. However, it is plausible that these would have impacted patient behaviour change as evidenced in the qualitative studies.

Further, the PRIMROSE quantitative and qualitative findings were not collected simultaneously. Rather, the qualitative findings were collected once the trial was completed. Participants therefore had to reflect on their experiences and perspectives retrospectively. It may have been more beneficial to collect qualitative data with the quantitative data so that patients and staff were able to directly reflect on their experiences and explore how these changed over time. In fact, some staff and patients had difficulties recalling their experiences in the PRIMROSE qualitative study. Collecting the qualitative and quantitative data throughout the follow-up would have further facilitated the triangulation of data and increase the validity of the findings. However, this may have potentially compromised the trial, forming part of the intervention itself if conducted before the outcomes were measured.

One of the limitations of this thesis was that most of the data used (excluding medical records to determine mental health diagnoses, medication prescriptions, physical health diagnoses in the secondary quantitative PRIMROSE analysis) relied on self-report. It is well reported throughout this thesis that self-reported data is liable to recall bias and reasons why. It would have been beneficial to consult a range of data sources including observational and direct measurements, particularly regarding the application and use of BCTs, the assessment of diet, PA, smoking and alcohol related changes. However, it was not possible to use measures of health behaviours in PRIMROSE as these measures were not employed. Further, observational approaches were not possible in PRIMROSE or the integrated setting (see section
5.4.3.2 and 6.6.4.2 ‘alternative approaches’ for further clarification). However, in line with MRC guidance for process evaluations of complex interventions, consulting and comparing a range of sources would have increased confidence in the findings and the robustness of the conclusions drawn (358). Nevertheless, identifying the BCTs used in both PRIMROSE and the integrated setting using the BCT Taxonomy addressed an important research gap in this area. This not only provided some indication regarding the ‘active’ components of interventions using consistent and standardised definitions, but also provided some guidance to HCPs on how health behaviours may be supported in people with SMI in different settings using descriptive illustrative quotes from staff and patients.

It was not possible to change the design of the data collected within the secondary analysis of PRIMROSE quantitative and qualitative data as these were collected prior to my thesis. However, one of the strengths of this thesis was that the design of my qualitative study on the integrated setting was informed by the findings of the quantitative and qualitative PRIMROSE studies. For example, I kept questions open in nature and did not follow a specific framework to guide the interviews and this allowed me more freedom to explore possible divergences in opinion. I also ensured that I used purposive selection techniques to sample a range of participants with different backgrounds and further reflected how individual characteristics may have shaped participant responses in the analysis. This method also allowed me to explore factors that I was unable to explore in the studies that used PRIMROSE data.

There are many differences between the PRIMROSE trial intervention and the real world integrated healthcare setting I evaluated. PRIMROSE was conducted across multiple sites in England, employed a pragmatic controlled trial study design, conducted among participants with predominantly White backgrounds, utilised primary care staff who were trained in delivering BCTs and a manualised intervention. The integrated setting was conducted in two urban regions in London, was more ethnically diverse, used no standardised processes or procedures for supporting health behaviour change in people with SMI and contained a combination of professions including primary and secondary mental healthcare. Participants in PRIMROSE may have been more motivated to support and change health behaviours since this was part of a health behaviour change trial. Therefore, it is difficult to draw direct comparisons between PRIMROSE quantitative and qualitative studies with the integrated setting qualitative study since there are many differences between the contexts and populations.
To my knowledge however, my thesis is one of the first which explored how health behaviours may be supported and changed from a primary care and integrated mental and physical health setting and compared both approaches. The comparison between the two types of settings and participants led to new insights on how to best support health behaviours in people with SMI in different healthcare contexts and contained important implications for practice. Further, some similarities were also identified across the two contexts despite the differences. It must however be acknowledged that different services (i.e. primary care or integrated settings) may adopt different strategies to support patient health behaviours as there are no standardised approaches. Therefore, the findings may not be transferable to different patients in different contexts experiencing different interventions. However, they can be used as a basis to inform the development of services which support health behaviour change in people with SMI.

7.5 Implications for research

7.5.1 Longitudinal qualitative and quantitative studies on factors associated with health behaviour change

More longitudinal research is required to identify factors associated with health behaviour change in people with SMI. However, longitudinal studies require time and resource, and the use of routine health records could be considered in settings where health behaviours are regularly monitored using validated measures. Alternatively, the use of existing cohort or trial data could be explored. However, more consideration needs to be given to the design of these studies including larger sample sizes, representative samples, the impact of time-varying exposures and potential measurement error in exposure and outcome variables.

As well as considering the exposure variables used in studies 1 and 2 to determine the replicability of the findings, the COM-B model could also be used as a potential framework to identify influences of patient behaviour change (see Table 7-1 for list of potential variables) as these were reported to influence behaviour change in the qualitative studies. However, these factors may change over time and should ideally be measured throughout follow-up. Capability, opportunity, and motivation may also influence each other, and future research may attempt to explore these associations further and their impact on patient behaviour over time.
### Table 7-1 Potential variables associated with supporting and changing health behaviours

<table>
<thead>
<tr>
<th>COM-B Components</th>
<th>Staff</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Knowledge in behaviour change</td>
<td>• Mental health symptoms</td>
<td></td>
</tr>
<tr>
<td>• Knowledge of mental health and mental health related medications</td>
<td>• Medication side-effects</td>
<td></td>
</tr>
<tr>
<td>• Interpersonal and communication skills</td>
<td>• Levels of cognition</td>
<td></td>
</tr>
<tr>
<td>• Knowledge of protocols and processes</td>
<td>• Understanding of health behaviours and health consequences</td>
<td></td>
</tr>
<tr>
<td><strong>Opportunity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Resource</td>
<td>• Social and cultural norms</td>
<td></td>
</tr>
<tr>
<td>• Time</td>
<td>• Behaviours exhibited by social networks</td>
<td></td>
</tr>
<tr>
<td>• Support from colleagues</td>
<td>• Support from and relationships with HCPs</td>
<td></td>
</tr>
<tr>
<td>• Access to multidisciplinary teams</td>
<td>• Financial circumstances</td>
<td></td>
</tr>
<tr>
<td>• Access to relevant information sharing systems</td>
<td>• Accessibility to convenience foods</td>
<td></td>
</tr>
<tr>
<td>• Access to protocols and standardised processes</td>
<td>• Neighbourhood safety, density, and access to green space</td>
<td></td>
</tr>
<tr>
<td><strong>Motivation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Beliefs about capabilities to support behaviour change</td>
<td>• Beliefs about the consequences of their behaviour</td>
<td></td>
</tr>
<tr>
<td>• Beliefs about role identity and responsibilities</td>
<td>• Beliefs in their capabilities</td>
<td></td>
</tr>
<tr>
<td>• Fears</td>
<td>• Fears</td>
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<td></td>
<td>• Pleasures</td>
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<td></td>
<td>• Habits</td>
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</table>

Qualitative studies could also take a longitudinal approach where possible, interviewing participants over a period to further explore changes to supporting and changing health behaviours. This may provide a clearer overview of how elements of health behaviours change over time, rather than relying upon participant recall at one point in time. Alternative qualitative methodologies could also be explored particularly where patients may find it difficult to explain or recall their experiences and perspectives in depth. Visual methodologies such as auto-photography could be used. The perspectives and experiences of staff, carers, friends and family members could also be explored to further triangulate data, provide a deeper insight into the research topic and gain further understanding of how health behaviours may be shaped by social networks since this was identified as having an influence on health behaviours in the findings.
Longitudinal qualitative and quantitative studies could be conducted simultaneously to triangulate data and enable more robust conclusions. Further, quantitative studies measuring health behaviours over time should use objective measures such as accelerometers for PA, carbon monoxide measures for smoking and blood alcohol tests rather than relying on self-report. More research could also be conducted on identifying more objective ways of measuring diet in people with SMI. To my knowledge, this has not yet been done but could improve the validity of the data collected regarding dietary related changes.

### 7.5.2 Evaluation of health behaviour change trials and services

Health behaviour change RCTs for people with SMI should explicitly state the use of BCTs that form intervention components, ideally using the BCT Taxonomy for consistency. This could inform the design of other trials in this area, enabling comparisons between different approaches. It would also be valuable to explore whether BCTs were used, how patients interacted with them and what effect they had on health behaviours. Rather than relying purely on patient and staff interviews for these data, a combination of quantitative and ethnographic approaches could be used. All intervention appointments should be recorded consistently and returned to trial teams so that researchers trained in using the BCT Taxonomy can identify techniques being applied in practice. These data could be linked to quantitative outcomes to explore the association between BCTs and patient health behaviour change. These studies could also explore whether demographic and some COM-B related patient and service/staff characteristics (described in Table 7-1) may modify the effect between associations.

RCTs may also collect further data regarding the extent to which patients perceived certain BCTs as helpful and how easy those delivering the intervention found these to apply. Qualitative studies could then explore these perspectives and experiences in more depth. In line with MRC guidance for the process evaluation of complex interventions, triangulating a combination of self-reported, observational and direct measurements data can increase the validity of the data and increase confidence in the findings (358).

Further research is needed to understand more about how populations receiving interventions differ between settings, the different strategies adopted within services, specialist behaviour change services where patients are signposted and how they
may work to increase the transferability of findings to different contexts, services and populations. Collaborations between academic institutions and various Trusts could also be considered to facilitate robust evaluations. Comparisons between different services could also be conducted to identify useful models of care and inform clinical guidelines and practice.

7.6 Implications for practice, policy and guidelines

The implications discussed below may be used as a basis to potentially inform policy, practice and guidelines for the physical health service provision for people with SMI. It is important to note that the implications discussed below have emerged from small scale studies using mostly qualitative methods and would require further investigation in larger scale studies prior to informing practice. However, the findings within the studies support the value and importance of continuing to encourage unhealthy behaviour prevention and change in people with SMI and reinforce the notion that this is potentially possible. Further, I provide suggestions on how health behaviours may be supported and changed considering individual needs, service characteristics and organisational infrastructures which could be further investigated prior to being implemented. These can eventually be used as a basis to inform guidelines and practice once further evidence of their value is identified given the lack of knowledge and information on how this can be done. These suggestions are summarised in Figure 7-2 and 7-3.

7.6.1 Encouragement of prevention and change

The findings suggest that there is value in continuing to encourage healthy behaviour changes in people with SMI as some are willing and motivated to change. It was also evident that staff did deliver interventions both in a primary care trial context and a real world integrated healthcare setting, suggesting that it is possible for HCPs in different settings to support these health behaviours in people with SMI. Given the NHS long-term plans to focus on reducing mortality for people with SMI, this is reassuring (160). However, more consideration needs to be given to how these behaviours are supported more effectively and later I provide suggestions that could be taken forward and tested in future studies based on the findings of this thesis.

The findings suggest that it is important that addiction related behaviours are addressed as they may impair patients’ physical capability to change their other behaviours such as increasing their PA. More training could be provided to HCPs on
how to tackle long term addiction related behaviours as well as greater access to specialist services. This could act as both an information source for staff and a service that patients are referred if needed. Given that there are difficulties tackling engrained addiction related behaviours, there should be more emphasis on the prevention of these behaviours before they become persistent unhealthy habits. This suggests the need to focus on targeting patients early when these unhealthy behaviours begin to develop before they have become habitual.

7.6.2 Individual needs, differences, and techniques to target these

The findings highlight the importance of taking into consideration and identifying individual needs and circumstances. What may work for one patient, may not work for another and it could be important that HCPs take time to develop an understanding of individual patients and be flexible in their approach. A greater understanding is required of the “Stages of Change”. This could include identifying what stage the patient has reached, why (using the COM-B model) and what techniques can be used (flexibly) to progress patients through the stages.

HCPs could consider what may be impairing a patient’s ability to make healthy changes. For example, financial circumstances, medication side-effects, mental health symptoms. HCPs can then flexibly consider ways to overcome these difficulties including methods of accessing cheaper healthier foods, free access to outdoor gyms, exercise at home, walks in the park and changing medication times to avoid lethargy during periods of exercise.

As social networks had a large influence on patient health behaviours, HCPs could consider the social environment surrounding the patient. This includes whether they are isolated, whether they are amongst unhealthy or healthy social networks and the extent to which they model these behaviours. Considerations could then be given to the involvement of social networks in helping patients to change their health behaviours, peer PA groups or peer coaching. However, HCPs could consider the extent to which patients prefer involving members of the informal social network or external peer support services as this may vary.

It may be important that HCPs monitor, follow-up and provide feedback to patients regarding their progress with their goals including health markers such as weight, blood pressure etc. HCPs could display positive reinforcement where possible and
acknowledge patient progress given that this facilitates motivation. However, care should also be taken when providing feedback to patients regarding their progress as this may also negatively impact motivation if there is a lack of success. Ensuring that success is experienced early by setting achievable goals may avoid this.

HCPs could also encourage patients to embed healthy habits into their routine so that it is sustained. Suggestions of realistic ways to embed behaviours into routine such as walking to desired destinations rather than taking the bus may feel more achievable and over time habitual when repeated continuously. In line with this, consideration could be given to patients’ access to certain facilities as discussed earlier.
### Suggestions on potential techniques to support health behaviours in people with SMI:

1) **Understand the individual:**
- Consider using Stages of Change model and COM-B model together as a framework to inform understanding.
- Identify: where the patient is in the contemplation cycle and what may be impairing the individuals' ability to move toward the action stages of change.
- Consider: pleasure/enjoyment of unhealthy behaviours, lack of understanding of how to make healthy changes, lack of awareness of the health consequences, lack of capability due to effects of other behaviours (i.e. smoking causing breathlessness), financial strain, medication side-effects, social networks, lack of access to green space etc.

2) **Intervene using techniques to suit individual needs identified in stage 1:**
- Provide information about the negative impact of unhealthy behaviours consistently (across both primary and secondary care providers).
- Provide information on how to change health behaviours (if financial difficulties are negatively impacting change, consider cost-efficient ways of improving health behaviours such as walking rather than using the gym/local markets for fruit and vegetables etc.).
- Encourage self-awareness of unhealthy behaviours (e.g. weighing patients and communicating healthy weight ranges, encouraging attendance of PA sessions they enjoy such as football to encourage awareness of fitness).
- Increase accessibility to peer groups (e.g. PA, smoking cessation) to increase motivation and increase access to healthy social networks to enable social modelling and comparison.
- If applicable, change medication times (such as from morning to night) to encourage uptake of PA during the day.
- Refer to a service specialised in supporting certain behaviours (e.g. smoking cessation/weight reduction in people with SMI) where existing staff time and knowledge is limited.
- If referring, ensure patient progress is monitored, supporting the patient in overcoming setbacks and in rewarding progress.
- Utilise the expertise and skills of staff with specialisms in health behaviour change and/or mental health for guidance and training of core staff.

3) **Monitor, follow-up and sustain:**
- When patients are willing to change their behaviours, set small goals to facilitate tracking of progress and encourage continued change.
- Goals should be attainable to reinforce behaviours early on rather than discourage change.
- Monitor and follow-up on progress through clinical assessments such weight or healthy eating diaries.
- Provide feedback on patient progress and display positive social reward such as praise for success.
- Encourage ways to sustain healthy behaviours (e.g. walking between bus stops, encouraging activities that patients enjoy such as dancing).

![Figure 7-2 Suggestions on potential techniques to support health behaviours in people with SMI.](image-url)
7.6.3 Professional roles, integrated working, and service design

To encourage staff motivation to support health behaviour change in people in SMI future, staff could be trained in a holistic way rather than purely mental or physical health. If the belief that mental and physical health are equally important and contribute toward each other is instilled early on, it may be likely that staff will be more invested in targeting health behaviour change in people with SMI. Standardised protocols and procedures for supporting health behaviours could be employed to increase staff awareness of targeting health behaviours and instil the belief that this is part of their role.

Though it is appreciated that staff in certain professions including doctors and nurses may have less time and see patients less regularly than other professions, it must be acknowledged that they had an important role in facilitating health behaviour change in the studies. Both doctors and nurses from physical and mental health services have the power to change patient perceptions about the consequences of unhealthy behaviours. This power appears to be heightened when staff from mental and physical health services delivering this information consistently between them. Therefore, working together in this manner to deliver this information could benefit patients with SMI. Although doctors and nurses may not have the opportunity of following up on patients regularly, this suggests they could still informally discuss health behaviour change with them where possible.

It is also possible that those with more regular contact with patients such as care coordinators, OTs etc may be better placed to continue monitoring and following up on patient progress. However, staff should be provided with dedicated time to do this and develop trusting relationships with patients to facilitate health behaviour change.

When deciding whether primary and/or secondary care services take the lead in supporting patients’ health behaviour change, decisions could be based on who patients share a better relationship with as this increases the chances that patients will respond positively to advice and support. It is also evident that staff from primary and secondary mental health services share complementary skills that when used together may mean that patients receive the optimum level of care. Therefore, primary and secondary care services could be flexible in their approach to supporting health behaviour change in people with SMI and consulting each other’s skills when necessary. However, staff within both services should have the appropriate structure
to facilitate cross-working. Access to information sharing systems with sections on health behaviour change could improve communication between primary and secondary care, ensure that patients can be followed up and appropriate interventions offered when needed. Organisations should also consider the co-location of primary and secondary care services to facilitate collaborative working. However, given the current NHS climate, this may not be realistic and organisations could consider organising meetings between primary and secondary care services to discuss patients where possible, and shared learning opportunities.

Although staff in primary and secondary care services share complementary skills, it would be valuable for all staff to receive training on BCTs, mental and physical health as all HCPs come into contact at some point with patients with SMI and difficulties regarding their health behaviours. Staff should have some knowledge base of these factors and should have access to those with specialisms in behaviour change, physical and mental health where they may need further advice. In line with this, access to multidisciplinary teams such as diabetes so that staff with different specialisms can share their knowledge and educate each other. Particular attention could be given to less experienced or confident staff members.

Signposting patients to specialist behaviour change services such as peer groups for PA, smoking cessation, diabetes could be valuable, given the lack of time HCPs may have to support patient health behaviours. However, patients should still be monitored by HCPs when referred to services. Additionally, more work is needed to ensure that these services are adapted for people with SMI. PPI and liaising with mental health teams could help to identify how services may best be adapted.
Suggestions on potential service design and training areas to support health behaviours in people with SMI:

1) **Training, reinforcing role identity and responsibilities:**
   - Staff working with people with SMI from different professions could be trained in both mental and physical health to reinforce incorporating both into practice and facilitate confidence and understanding.
   - All staff could receive training on BCTs.
   - Training could cover how to tackle health behaviours and in particular, addictions such as smoking and their influence on other behaviours (such as exercise).
   - Increase staff accessibility to standardised processes and protocols with reference to how health behaviours could be supported (e.g. when limited PA identified, list some strategies on how this could be targeted including providing information on health consequences, ways to normalise behaviour etc., list suitable services available to support this and contact details of specialist staff such as psychologists for further input).
   - Increase communication with wider multidisciplinary teams in relevant physical health conditions (such as diabetes) to increase shared learning opportunities.

2) **Follow-up, monitoring and external service use:**
   - Could provide staff (ideally care coordinators) with dedicated time to follow-up on patient progress in healthy behaviour change, in addition to addressing patients’ mental health needs.
   - Where external behaviour change services are used, ensure they are suitable for people with SMI (e.g. identify services with shorter sessions to facilitate concentration levels, ensure sessions are regular and provide practical guidance etc.).

3) **Joint-working between primary and secondary care:**
   - There could be a collaborative approach between all primary care and secondary care staff where both work together to target patients’ health behaviours using the appropriate skill-mix to deliver interventions (e.g. primary care knowledge on health behaviours and secondary cares knowledge on SMI, barriers, facilitators to behaviour change etc.).
   - Key messages on health and associated recommended behaviour change could be communicated with and endorsed by both primary and secondary care providers (this can encourage moving to action).
   - Staff could utilise their knowledge on which services (primary or secondary care) share a better relationship with patients to intervene appropriately.
   - Communication between primary and secondary care could be enhanced by increasing access to an information sharing with sections on how health behaviours are being addressed/ and monitored to facilitate intervention and tracking.
   - Primary and secondary care services could organise regular meetings to facilitate communication and cross-working, including physical health/ health behaviours as well as mental wellbeing.

Figure 7-3 Suggestions on potential service design and training areas to support health behaviours in people with SMI.
7.7 Conclusions

Given the reduced life expectancy due to CVD in people with SMI, ongoing mortality gap between people with SMI and the general population and NHS’s long-term plans to reduce early mortality in people with SMI, it is important to identify ways to better support, change and prevent unhealthy behaviours in people with SMI. My quantitative findings showed that some patients improved aspects of their diet and physical activity, though few factors predicted this. This was also evident in the qualitative findings where in some cases patients were interested in and many were aware of the need to improve their health behaviours. Further, health behaviour change interventions had been delivered in primary and integrated care settings and some of the techniques used positively influenced health behaviour change. This potentially holds promise for the capability and motivation of staff in different services to support health behaviour change in people with SMI and patients’ motivation and capability to change.

The findings from this thesis suggest that lessons can be learned from both primary care and integrated mental and physical health services that which can be tested in larger scale studies to improve the design of interventions and services to support health behaviour change. This is important given the lack of knowledge on what works for people with SMI, for whom, under what healthcare context and limited information in guidelines regarding how health behaviours can be supported in different settings including primary care and integrated care models. It was clear that delivering consistent health messages across settings with reinforcement from different HCPs encountering people with SMI was valuable in the present studies. Further, considering individual needs (e.g. using the Stages of Change and COM-B model to identify these) may increase the understanding of patients’ behaviour and in turn, the ability to better meet their needs by offering tailored interventions. There was also a need to move away from signposting patients to behaviour change services only, to monitoring and feedback on progress when referred in the studies.

The findings also suggested that staff supporting people with SMI in health behaviour change required further training in BCTs and greater shared learning opportunities across multidisciplinary services and primary and secondary care. Staff particularly required support on addressing ‘hard to change’ behaviours such as smoking and alcohol addictions as these impacted on other behaviours. It was also evident that staff required clear protocols for incorporating behaviour change in their work.
However, mental and physical HCPs had complementary skills that when used flexibly in partnership and supported by an organisational infrastructure to target patients’ individual needs, may increase the likelihood of effective behaviour change.

However, more research is needed to optimise the effectiveness of health behaviour change services and interventions in different healthcare contexts. This includes further research on understanding individual differences influencing health behaviour change over time and what works for whom under what contexts such as the ‘active’ components within interventions and services offered within different healthcare contexts.
References


68. Weinberger AH, Platt, J., Esan, H., Galea, S., Erlich, D. & Goodwin, R.D. Cigarette smoking is associated with increased risk of substance use


143. Working Group for Improving the Physical Health of People with SMI. Improving the physical health of adults with severe mental illness: essential actions (OP100)


158. Royal College of Psychiatrists. Improving mental health services in systems of integrated and accountable care: emerging lessons and priorities United Kingdom2019 [Available from: https://www.rcpsych.ac.uk/docs/default-


167. Ashdown-Franks G, Williams, J., Vancampfort, D., Firth, J., Schuch, F., Hubbard, K., Craig, T., Gaughran, F. & Stubbs, B. Is it possible for people with severe mental illness to sit less and move more? A systematic review of interventions to increase physical activity or reduce sedentary behaviour. Schizophr Res. 2018;202:3-16.


252. Hassan S, Ross, J., Walters, K. Marston, L & Osborn, D. Identifying factors prospectively associated to physical activity and dietary related outcomes in people with severe mental illness: a systematic review of


longitudinal studies protocol 2018 [Available from: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=98998


295. Bazargan M, Smith, J., Saqib, M., Helmi, H., Assari, S., Associations between Polypharmacy, Self-Rated Health, and Depression in African American Older Adults; Mediators and Moderators


304. Rungruang-siripan M, Sithimongkol, Y., Maneesriwongul, W., Talley, S., Vorapong-sathorn, T., Mediating Role of Illness Representation Among Social


317. NHS. What is the body mass index (BMI)? 2019 [Available from: https://www.nhs.uk/common-health-questions/lifestyle/what-is-the-body-mass-index-bmi/].


320. Bourassa KJ, Ruiz JM, Sbarra DA. Smoking and Physical Activity Explain the Increased Mortality Risk Following Marital Separation and Divorce:
325. Teasdale SB, Firth, J., Stubbs, B. & Burrows, T.L. ‘You are what you eat’ (not what you said you ate yesterday): Why a one-off 24-hour dietary recall fails capture usual dietary intake in schizophrenia. Schizophr Res. 2018;199.

346. Richards HE, C. The ‘doctor’ or the ‘girl from the University’? Considering the influence of professional roles on qualitative interviewing. Fam Pract. 2000;17:71-5.
Appendices

Appendix A. The barriers and facilitators of supporting and changing health behaviours in people with SMI identified in focus groups and mapped on to the TDF and COM-B model

<table>
<thead>
<tr>
<th>Which barriers need to be addressed and facilitators harnessed?</th>
<th>Who needs to be targeted?</th>
<th>Theoretical domains in which the barriers and facilitators lie</th>
<th>Suggested intervention components to address the barriers and harness the facilitators</th>
</tr>
</thead>
</table>
| Negative attitudes of HCPs towards CVD intervention in people with SMI (e.g. losing weight and stopping smoking) | HCPs | Optimism (pessimism)/ reflective motivation | Nurse training on:  
Experiences of SMI  
Effective interventions for CVD risk management in SMI  
Examples of service user motivation in managing their own health = service user involvement in training  
Peer influence = involve a nurse in delivering the training |
| Difficulties for service users to access GP services | Patients and HCPs | Environmental context and resources/ physical opportunity | Direct telephone number of HCP |
| Difficulties in managing a healthy lifestyle due to the side-effects of antipsychotic medication | Patients and HCPs | Knowledge and physical and mental skills/ psychological and physical capability | Training HCPs on the effects of antipsychotics |
| Difficulties in managing a healthy lifestyle due to the impact of mental health symptoms on the patient’s ability to engage in healthy behaviours | Patients and HCPs | Physical skills, memory attention, decision processes and knowledge/ Psychological and physical capability | Training – only initiate CVD risk prevention when the service user is well.  
Action planning  
Recording and reviewing progress |
<table>
<thead>
<tr>
<th>Difficulties in managing a healthy lifestyle due to a lack of incentivised services</th>
<th>Patients and HCPs</th>
<th>Environmental context and resources/ physical opportunity</th>
<th>Local directory of services to refer people with SMI to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness of increased risk and effective interventions for managing CVD risk in people with SMI</td>
<td>Patients and HCPs</td>
<td>Knowledge/ psychological capability</td>
<td>Training on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Increased risk of CVD in SMI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>What interventions work for patients with SMI (e.g. simple behavioural interventions, NRT, statins)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Examples of service users managing their own health – service users delivering training</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Decision aid on CVD risk factors and appropriate interventions</td>
</tr>
<tr>
<td>Patients not turning up to scheduled appointments at their GP practice</td>
<td>Patients and HCPs</td>
<td>Behavioural regulation/ psychological capability</td>
<td>Have one named practice nurse/GP overseeing care to ensure continuity and to build a relationship</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contact details of supportive others to follow-up non-attendees</td>
</tr>
<tr>
<td>Involving supportive others in the patient’s care</td>
<td>Patients and HCPs</td>
<td>Social influences/ social opportunity</td>
<td>Involve supportive others in monitoring adherence to treatments and progress with goals</td>
</tr>
<tr>
<td>Continuity of care</td>
<td>HCPs</td>
<td>Environmental context and resources/ physical opportunity</td>
<td>Have one named practice nurse/GP overseeing care to ensure continuity and to build a relationship</td>
</tr>
<tr>
<td>Providing positive feedback to patients during the appointments</td>
<td>HCPs</td>
<td>Reinforcement/ reflective motivation</td>
<td>Positive feedback</td>
</tr>
<tr>
<td>Setting small, achievable patient-led goals</td>
<td>Patients and HCPs</td>
<td>Goals/ reflective motivation</td>
<td>Setting a behavioural goal</td>
</tr>
</tbody>
</table>

Source: This table is based on Table 15 in PRIMROSE Programme Grants for Applied Research report (PGFAR) (1) (p.97).
Appendix B. The PRIMROSE logic model

Source: This table is based on Figure 4 in PRIMROSE Programme Grants for Applied Research report (PGFAR) (1)(p.97).
Appendix C. Staff and patient topic guides used for the process evaluation of PRIMROSE

Healthcare professional Topic Guide – PRIMROSE process evaluation

1. Introduction (5 mins)
   a) Nature and purpose of research

   The aim of this study is to explore your experiences of delivering the PRIMROSE intervention to patients with SMI who are at a high risk of developing CVD. We are also interested in your views on the training provided to help you deliver the intervention.

   We would like to know what you think the barriers and facilitators were to delivering the intervention and your thoughts on whether or not the training equipped you with the right skills for delivering the intervention.

   We are interested in all of your thoughts today so please share any positive or negative views on the primrose intervention and training programme.

   Do you have any immediate thoughts/comments or questions before we start?

   b) Anonymity of presentation of results

       • Introduce digital audio recorder
       • Stress confidentiality
       • Set ground rules
       • Advise that there are no right or wrong answers
       • Discuss length of interview
       • Sign consent form

2. Introduce participants & context. Start recording

   a) Ask each participant to say a little bit about themselves :

       - What previous experience of research have you had?
       - Why did you agree to take part in PRIMROSE?

3a) Intervention Experience – Impact on nurses/HCA

   a) Can you start by telling me a little about your experiences of the PRIMROSE study?
      (How have you found it?)

   b) Can you tell me about/describe a typical intervention appointment for you? What did you do with the patient? Can you give me an example of that?

   c) Can you tell me about an intervention appointment that you felt went well?
      - What do you think went well?
      - What do you think could have been done differently?
d) Can you tell me about an intervention appointment which was more difficult for you?
   - Why do you think this didn’t go so well?
   - What do you think could have been done differently?

e) What do you think about the service in general?
   - What has gone well?
   - What has gone badly/not so well?
   - Is there anything you would change?
     - e.g. frequency of appointments, length, how many?

3b) Intervention Experience – impact on patients
a) Can you give me an example of a patient who made progress?
   - Why do you think this occurred?
   - How did you manage this?
   - Is there anything with hindsight you might do differently with this patient?
   - Can you think of anything else that would make a difference?

b) Can you give me an example of a patient who made little/no progress or got worse?
   - Why do you think this occurred?
   - How did you manage this?
   - Is there anything with hindsight you might do differently with this patient?
   - Can you think of anything else that would make a difference?

c) What factors do you think might have kept the patients motivated to see you?
   - For example, were there supportive others who encouraged the patient to attend, the relationship you had with the patient etc.

d) How did you encourage patients to attend?

e) What factors might have caused a patient not to attend the intervention appointments?
   - For example, time of appointments, personal situation?

f) In general how do you think the intervention has had an impact on patients?
   - Can you give me an example? Was there anything tangible that you could see as evidence of impact on mental health and physical health? Explore positive and negative

g) Do you think it would be possible to offer this intervention to patients as part of regular practice? If yes then how, if no then why not?
3c) Intervention experience

a) What previous experience have you had with patients with SMI (Formal/Informal?)
   - How did you feel about working with this particular patient group?

b) What do you think about your skills to deliver the intervention?
   - Mental health
   - Physical health
   - Medications

c) What did you think about the training? (if helpful then how, if unhelpful then why not)
   - If not, what was needed?
   - Anything you would change/alter/improve?
   - Practical aspects such as location, timing etc, manuals, material, trainers

B. Professional roles and identity

a) How do you see the work you did in PRIMROSE fitting in your normal job role?
   - Explore why it did or didn’t fit
   - Explore whose role it might be if they didn’t feel like it fit

C. Beliefs about consequences

a) Reflecting on your experience what do you think the benefits/advantages might be of the intervention?
   - for patients/you/the practice/other practice staff

b) What do you think might be the disadvantages?
   - for patients/you/the practice/other practice staff

D. Memory, attention, decision processes

a) Were there any circumstances where you decided not to deliver the intervention to a patient?
   - Particular appointments or entire intervention
   - Particular patients?
   - Reasons why?

E. Environment and resources

a) What resources did you need to help you carry out the intervention?
   - Other people covering your normal duties? Admin support?
   - Access to support from team, colleagues, GP, other PRIMROSE nurses?

b) What influenced your ability to provide the intervention?
   - (resources, needs of patient/other patients, availability of equipment/space, time, competing tasks, practice team’s views/attitudes)

c) How did you plan intervention appointments?
   - Prompts/reminders for invitation?
   - How was this information recorded and monitored?
- Draw upon experiences in other long term condition management – e.g. diabetes.

**F. Behavioural regulation**

a) How did you monitor attendance?

**G. Emotions**

a) How did you feel about delivering the intervention?
   - Confidence?
   - What emotional response did it evoke? Fear, anxiety etc? Why?
   - If negative emotion, what do you think might have helped you to change this response?

**6. Finishing the Intervention**

a) How did you feel about ending the intervention & finishing the sessions with patients?
   - What did your patients feel about it coming to an end?
   - What aspects were discussed at the final appointment?

**7. Going Forward**

a) How will you use the training/experience gained from the PRIMROSE study going forward in regular practice?

b) If you were going to continue to provide the intervention how would you suggest it be done in your practice?
   - Should anything be changed?
   - Length of appointments
   - Frequency of appointment
   - Support provided
   - Training provided

c) What would be your thoughts on providing this intervention long term?

**7. Conclude interview**

Do you have any other comments to make regarding your experiences as a PRIMROSE intervention nurse?

I just want to finish by saying thank you for being a part of PRIMROSE and thank you for taking part in this interview.
Patient Topic Guide – PRIMROSE process evaluation

1. Introduction
   a) Nature and purpose of research
   Thank you very much for taking part in the interview today, we really appreciate you giving your time to talk to us. Please be honest and open about your views, there are no right or wrong answers so any thoughts or comments you have please do share them.

   We want to explore your experiences and views on the PRIMROSE service that you have recently received at your GP practice.

   Do you have any immediate thoughts/comments or questions before we start?

   b) Anonymity of presentation of results
      • Introduce digital audio recorder
      • Stress confidentiality

2. Experience of receiving the service
   a) Why did you agree to take part in the PRIMROSE service?

   b) Were you able to access the nurse/HCA to take part in the PRIMROSE service?
      - how were you contacted?/ any difficulties?/anything that helped make accessing the service easier?

   c) Did you ever talk on the telephone vs. meeting in person?
      - What was good/bad about these telephone sessions? Why?

   d) Did you understand the purpose of the PRIMROSE service appointments?
      - Ask the patient to summarise the purpose?/Who explained things to you?/How was information given?/Could it have been explained better?

   e) Were you able to set a goal that was relevant to you during your appointment with the nurse/HCA?

   f) Is there anything you did not like about the PRIMROSE service?

   g) Was there anything good about the PRIMROSE service provided by the nurse/HCA?

   h) Did you find the PRIMROSE appointments useful?
      Why?/What in particular?

   i) Do you think the service has had a positive effect on your physical health?
      - In what way? Can you give me an example?

   j) Do you think that anything could be improved about the PRIMROSE service?
      - What? How? What services would you like to receive to lower your risk of CVD?
k) What might have helped you to take part in the PRIMROSE service?
- What might make it easier? What might make it difficult?

l) Would you recommend this type of service to someone else?
- If yes, why? If not, why not?

m) How does the PRIMROSE service compare with the usual care you receive from your GP practice?

3. Social Support
   a) Were you given the opportunity to involve anyone in the primrose service?
      - How was this discussed with you?
      - How was it suggested they were involved?
      - Were you given a choice over how they were involved?

   b) How they were involved?

   c) How would you have liked this person to be involved?

   d) When thinking about your experiences with your GP practice – has the involvement of supportive others been discussed with you before?
      Yes – how was this explored with you?
      Different in different services?
      No – would you like this to be explored? What would you like to see happen?

   e) When thinking about your experiences with other health services – has the involvement of supportive others been discussed with you before?
      Yes – how was this explored with you?
      Different in different services?
      No – would you like this to be explored? What would you like to see happen?
      How does this compare with their experience in primary care?

   f) What might have helped you to involve someone in the PRIMROSE service?
      - What might make it easier?
      - What might make it difficult?

   g) How do you think that the involvement of someone in your care could be improved?

8. Conclude discussion
I just want to finish by asking you:
- Is there anything that has not been discussed that you would like to raise?
- Are there any other comments/questions or ideas?
Appendix D. List of non-English language articles in systematic review

Physical activity searches

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Language</th>
<th>Reference</th>
</tr>
</thead>
</table>

Diet searches

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Language</th>
<th>Reference</th>
</tr>
</thead>
</table>
Appendix E. Example search strategies conducted in MEDLINE for diet and physical activity

Physical activity

1. exp "Bipolar and related disorders"/ or exp affective disorders, psychotic/ or exp psychotic disorders/ or exp schizophrenia/
2. exp Schizophrenic Psychology/
3. sever* mental* disorder*.mp.
4. sever* mental* ill*.mp.
5. serious* mental* ill*.mp.
6. serious* mental* disorder*.mp.
7. psychotic.mp.
8. psychos*.mp.
9. psychotic depress*.mp.
10. persistent delusion* disorder*.mp.
11. schizophren*.mp.
12. schizoaffective disorder*.mp.
13. bipolar*.mp.
14. exp Exercise/
15. exp Exercise Therapy/
16. exp physical fitness/
17. physical* activ*.mp.
18. physical* exercise*.mp.
19. exercise therap*.mp.
21. physical* inactiv*.mp.
22. physical* fit*.mp.
23. physical* train*.mp.
24. exp Sedentary Lifestyle/
25. (sedentary lifestyle* or sedentary behavio?r*).mp.
26. (lifestyle change* or behavio?r change*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 
27. exp Cohort Studies/
28. exp epidemiologic studies/
29. cohort*.mp.
30. longitudinal*.mp.
31. prospective*.mp.
32. retrospective*.mp.
33. follow-up*.mp.
34. exp clinical trial/
35. exp Clinical Studies as Topic/
36. exp Randomized Controlled Trial/
37. exp Randomized Controlled Trials as Topic/
38. exp multicenter study/
39. exp Multicenter Studies as Topic/
40. clinical trial*.mp.
41. random* trial*.mp.
42. controlled trial*.mp.
43. exp meta-analysis/
44. exp Meta-Analysis as Topic/
45. ((comprehensive* or integrative or systematic) and (bibliographic* or review* or literature*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
46. (meta-analy* or meta analy* or meta-regress* or meta regress*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
47. ((research or information or data) and synthes*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
48. or/1-13
49. or/14-26
50. or/27-47
51. 48 and 49 and 50
52. exp Animals/ not Humans/
53. 51 not 52
Diet

1. exp "Bipolar and related disorders"/ or exp affective disorders, psychotic/ or exp psychotic disorders/ or exp schizophrenia/
2. exp Schizophrenic Psychology/
3. sever* mental* disorder*.mp.
4. sever* mental* ill*.mp.
5. serious* mental* ill*.mp.
6. serious* mental* disorder*.mp.
7. psychotic.mp.
8. psychos#.mp.
9. psychotic depress*.mp.
10. persistent delusion* disorder*.mp.
11. schizophren*.mp.
12. schizoaffective disorder*.mp.
13. bipolar*.mp.
14. exp Cohort Studies/
15. exp epidemiologic studies/
16. cohort*.mp.
17. longitudinal*.mp.
18. prospective*.mp.
19. retrospective*.mp.
20. follow-up*.mp.
21. exp clinical trial/
22. exp Clinical Studies as Topic/
23. exp Randomized Controlled Trial/
24. exp Randomized Controlled Trials as Topic/
25. exp multicenter study/
26. exp Multicenter Studies as Topic/
27. clinical trial*.mp.
28. random* trial*.mp.
29. controlled trial*.mp.
30. exp meta-analysis/
31. exp Meta-Analysis as Topic/
32. ((comprehensive* or integrative or systematic) and (bibliographic* or review* or literature*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
33. (meta-analy* or meta analy* or meta-regress* or meta regress*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

34. ((research or information or data) and synthes*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

35. exp Diet Therapy/
36. exp Diet/
37. exp Nutrition Therapy/
38. (Healthy food* or unhealthy food*).mp.
40. Food choice*.mp.
41. Food preference*.mp.
42. diet* change*.mp.
43. diet* preference*.mp.
44. healthy diet*.mp.
45. unhealthy diet*.mp.
46. poor* diet*.mp.
47. diet* habit*.mp.
48. diet* choice*.mp.
49. nutrition*.mp.
50. (healthy eat* or unhealthy eat*).mp.
51. (Fruit* or vegetable*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
52. fibre*.mp.
53. ((saturate* or unsaturate*) and fat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
54. (lifestyle change* or behavio?r change*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
55. or/1-13
56. or/14-34
57. or/35-54
58. 55 and 56 and 57
59. exp Animals/ not Humans/
60. 58 not 59
Appendix F. Total articles retrieved within each concept domain, combined retrieval and following the removal of duplicates for physical activity searches

Total articles retrieved in MEDLINE, PsycINFO, EMBASE and CINHAL from PA searches

<table>
<thead>
<tr>
<th>Domain/s</th>
<th>No. of articles retrieved (inception to 16.03.18)</th>
<th>MEDLINE (Ovid)</th>
<th>PsycINFO</th>
<th>EMBASE</th>
<th>CINHAL Plus</th>
</tr>
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<tbody>
<tr>
<td>Concept 1: Population</td>
<td></td>
<td>246462</td>
<td>204516</td>
<td>334872</td>
<td>51586</td>
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<tr>
<td>Concept 2: Outcome (physical activity)</td>
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<td>294691</td>
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Number of articles retrieved in grey literature databases from PA searches

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<tr>
<td>Psychosis ‘AND’ physical activity</td>
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<td>15</td>
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<tr>
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<td>46</td>
<td>9</td>
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<td>Bipolar ‘AND’ physical activity</td>
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<td>6</td>
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<td>Total screened by title and abstract</td>
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<td>Total screened at full-text</td>
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Appendix G. Total articles retrieved within each concept domain, combined retrieval and following the removal of duplicates for diet searches

Total articles retrieved by searching MEDLINE, PsycINFO, EMBASE and CINHAL Plus from diet searches

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<th>PsycINFO</th>
<th>EMBASE</th>
<th>CINHAL Plus</th>
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<td>Concept 1: Population</td>
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<td>204516</td>
<td>334872</td>
<td>51586</td>
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Number of articles retrieved in grey literature databases from diet searches

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<tbody>
<tr>
<td>Severe mental illness ‘AND’ diet</td>
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<td>9</td>
<td>2</td>
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<tr>
<td>Psychosis ‘AND’ diet</td>
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<td>0</td>
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<td>Schizophrenia ‘AND’ diet</td>
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<td>1</td>
<td>21</td>
<td>1</td>
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<tr>
<td>Bipolar ‘AND’ diet</td>
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<td>Total screened by title and abstract</td>
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<td>Total screened at full-text</td>
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Appendix H. Associations between baseline factors associated and missing continuous outcome change scores using random effects univariable logistic regression analyses

Baseline factors associated with missing MET minutes change scores

<table>
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<tr>
<th>Explanatory variables</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p-Value</th>
<th>N</th>
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<tbody>
<tr>
<td>Age</td>
<td>0.99</td>
<td>0.95 to 1.02</td>
<td>0.816</td>
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<tr>
<td>Sex (ref. female)</td>
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<td></td>
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<tr>
<td>Male</td>
<td>1.71</td>
<td>0.90 to 3.22</td>
<td>0.096</td>
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<td>Townsend (ref. 1-least deprived)</td>
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</tr>
<tr>
<td>2</td>
<td>1.39</td>
<td>0.28 to 6.88</td>
<td>0.474±</td>
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<td>3</td>
<td>0.80</td>
<td>0.17 to 3.77</td>
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<td>0.16 to 2.44</td>
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<td>5</td>
<td>1.58</td>
<td>0.53 to 4.66</td>
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<td>Ethnicity (ref. white)</td>
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<td></td>
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<tr>
<td>Black</td>
<td>2.27</td>
<td>0.69 to 7.41</td>
<td>0.252±</td>
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<tr>
<td>Asian</td>
<td>1.70</td>
<td>0.34 to 8.32</td>
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<td>Other</td>
<td>2.91</td>
<td>0.72 to 11.7</td>
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<td>Marital status (ref. single)</td>
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<tr>
<td>Married/ cohabiting/ civil partnership</td>
<td>0.44</td>
<td>0.20 to 0.95</td>
<td>0.082±</td>
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<td>Separated/divorced/ civil partnership dissolved Widowed</td>
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<td>0.47 to 2.2.9</td>
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<td>Living arrangements (ref. with parent/ family)</td>
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<td>Independently</td>
<td>0.61</td>
<td>0.18 to 1.97</td>
<td>0.420±</td>
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<td>Supported/ residential</td>
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<td>0.20 to 3.71</td>
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<tr>
<td>Other</td>
<td>1.18</td>
<td>0.32 to 4.32</td>
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<td>Employment (ref. unpaid employment)</td>
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<tr>
<td>Paid employment</td>
<td>1.06</td>
<td>0.52 to 2.14</td>
<td>0.17</td>
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<td>Mental health diagnosis (ref. schizophrenia/ schizoaffective disorder)</td>
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<tr>
<td>Bipolar disorder</td>
<td>0.96</td>
<td>0.47 to 1.95</td>
<td>0.989±</td>
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<td>Other psychosis</td>
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<td>0.41 to 2.48</td>
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<td>Having a mental health key worker (ref. no)</td>
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<td>Yes</td>
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<td>0.31 to 1.24</td>
<td>0.183</td>
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<tr>
<td>Diagnosis of hypertension in the last five years (ref. no)</td>
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<td>Yes</td>
<td>0.35</td>
<td>0.13 to 0.95</td>
<td>0.039*</td>
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<tr>
<td>Diagnosis of diabetes in the last five years (ref. no)</td>
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<td>Yes</td>
<td>0.37</td>
<td>0.08 to 1.64</td>
<td>0.195</td>
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<tr>
<td>Diagnosis of raised cholesterol in the last five years (ref. no)</td>
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<td>0.65</td>
<td>0.32 to 1.33</td>
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<td><strong>BMI</strong></td>
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<td>0.98</td>
<td>0.93 to 1.04</td>
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<td><strong>Alcohol dependence risk</strong></td>
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<td>0.98 to 1.07</td>
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<td>AUDIT score</td>
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<tr>
<td><strong>History of alcohol problem (ref. no)</strong></td>
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<td>0.95</td>
<td>0.44 to 2.03</td>
<td>0.909</td>
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<tr>
<td><strong>Cigarette use</strong></td>
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<td>0.99</td>
<td>0.96 to 1.02</td>
<td>0.778</td>
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<tr>
<td><strong>CVD risk</strong></td>
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<td>0.98</td>
<td>0.95 to 1.02</td>
<td>0.501</td>
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<td>QRISK score</td>
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<td><strong>DINE</strong></td>
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<td>1.01</td>
<td>0.98 to 1.04</td>
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<td>Total fat score</td>
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<td>Fibre scores</td>
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<td>0.96 to 1.01</td>
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<td><strong>Total fruit and vegetable intake per day</strong></td>
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<td>0.97</td>
<td>0.86 to 1.11</td>
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<td>Sitting time score</td>
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<td>0.99 to 1.00</td>
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<td>0.25 to 0.90</td>
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<td>Cardiovascular disease medication</td>
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<td><strong>Health-related quality of life</strong></td>
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*overall p-value, *p*-values in **bold** ≤0.05
Baseline factors associated with missing fruit and vegetables change scores

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<th>Explanatory variables</th>
<th>Odds ratio</th>
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<td>0.96 to 1.03</td>
<td>0.930</td>
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<td>Sex (ref. female)</td>
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<td>Male</td>
<td>1.68</td>
<td>0.86 to 3.26</td>
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<td>Townsend (ref. 1- least deprived)</td>
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<td>Black</td>
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<td>Asian</td>
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<td>0.38 to 9.19</td>
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<td>0.38 to 9.19</td>
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<td>Marital status (ref. single)</td>
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<td>Married/cohabiting/c civil partnership</td>
<td>0.55</td>
<td>0.25 to 1.21</td>
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<td>Separated/divorced/c civil partnership dissolved</td>
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<td>Widowed</td>
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<td>Living arrangements (ref. with parent/family)</td>
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<tr>
<td>Independently</td>
<td>0.50</td>
<td>0.15 to 1.67</td>
<td>0.117±</td>
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<tr>
<td>Supported/residential</td>
<td>0.48</td>
<td>0.09 to 2.44</td>
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<td>Other</td>
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<td>Employment (ref. unpaid employment)</td>
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<td>Paid employment</td>
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<tr>
<td>Bipolar disorder</td>
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<td>0.52 to 2.38</td>
<td>0.844±</td>
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<td>Other psychosis</td>
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<td>0.52 to 3.32</td>
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± Overall p-value
Baseline factors associated with missing sitting minutes change scores

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<th>p-value</th>
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<td><strong>Cigarette use</strong></td>
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<td>0.96 to 1.02</td>
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<td>0.96 to 1.01</td>
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<td>0.84 to 1.10</td>
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<td>Cardiovascular disease medication</td>
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± Overall p-value, *p-values in bold ≤0.05
Baseline factors associated with missing total fat change scores

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<tr>
<td>Diagnosis of diabetes in the last five years (ref. no)</td>
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<td>0.21</td>
<td>0.02 to 1.64</td>
<td>0.138</td>
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<td>Diagnosis of raised cholesterol in the last five years (ref. no)</td>
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<tr>
<td>Yes</td>
<td>0.52</td>
<td>0.24 to 1.15</td>
<td>0.109</td>
<td>326</td>
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<tr>
<td>BMI</td>
<td>0.99</td>
<td>0.94 to 1.05</td>
<td>0.884</td>
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<tr>
<td>Variable</td>
<td>Coefficient</td>
<td>95% Confidence Interval</td>
<td>p-value</td>
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<td>-------------------------------------------------------------------------</td>
<td>-------------</td>
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<tr>
<td>Alcohol AUDIT score</td>
<td>1.01</td>
<td>0.96 to 1.06</td>
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<tr>
<td>History of alcohol problem (ref. no)</td>
<td>0.73</td>
<td>0.30 to 1.74</td>
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</tr>
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<td>Cigarette use</td>
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<td>0.95 to 1.02</td>
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<tr>
<td>CVD risk QRISK score</td>
<td>0.98</td>
<td>0.95 to 1.02</td>
<td>0.514</td>
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<tr>
<td>DINE</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total fat score</td>
<td>1.02</td>
<td>0.99 to 1.05</td>
<td>0.118</td>
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<tr>
<td>Fibre score</td>
<td>0.99</td>
<td>0.96 to 1.02</td>
<td>0.755</td>
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<tr>
<td>Total fruit and vegetable intake per day</td>
<td>0.96</td>
<td>0.83 to 1.10</td>
<td>0.590</td>
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</tr>
<tr>
<td>IPAQ</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>MET minutes score</td>
<td>0.99</td>
<td>0.99 to 1.00</td>
<td>0.600</td>
<td>320</td>
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<td>Sitting time score</td>
<td>0.99</td>
<td>0.99 to 1.00</td>
<td>0.367</td>
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<tr>
<td>Medication count†</td>
<td>1.02</td>
<td>0.94 to 1.08</td>
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<tr>
<td>First generation antipsychotic prescription (ref. not prescribed)</td>
<td>0.51</td>
<td>0.15 to 1.77</td>
<td>0.294</td>
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<tr>
<td>Second generation antipsychotic prescription (ref. not prescribed)</td>
<td>0.55</td>
<td>0.28 to 1.09</td>
<td>0.090</td>
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</tr>
<tr>
<td>Antidepressant prescription (ref. not prescribed)</td>
<td>1.16</td>
<td>0.58 to 2.31</td>
<td>0.667</td>
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<tr>
<td>Morisky Scale of Adherence (MMS)</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Psychiatric medication</td>
<td>1.01</td>
<td>0.81 to 1.26</td>
<td>0.865</td>
<td>303</td>
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<tr>
<td>Cardiovascular disease medication</td>
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<td>0.64 to 1.25</td>
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<td>145</td>
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<tr>
<td>Psychological wellbeing</td>
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<td>WEMWBS score</td>
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<td>0.94 to 1.00</td>
<td>0.077</td>
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<td>Social support</td>
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<tr>
<td>MOS-SSS score</td>
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<td>0.97 to 1.00</td>
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<td>Health-related quality of life</td>
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<tr>
<td>EQ-5D-5L score</td>
<td>0.35</td>
<td>0.09 to 1.31</td>
<td>0.122</td>
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</table>

± Overall p-value
### Baseline factors associated with missing fibre change scores

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p-Value</th>
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<tr>
<td><strong>Age</strong></td>
<td>1.00</td>
<td>0.96 to 1.03</td>
<td>0.899</td>
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<tr>
<td><strong>Sex (ref. female)</strong></td>
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<tr>
<td>Male</td>
<td>1.53</td>
<td>0.77 to 3.04</td>
<td>0.222</td>
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<tr>
<td><strong>Townsend (ref. 1.: least deprived)</strong></td>
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<td></td>
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<tr>
<td>2</td>
<td>1.49</td>
<td>0.28 to 7.82</td>
<td>0.513±</td>
<td>255</td>
</tr>
<tr>
<td>3</td>
<td>0.49</td>
<td>0.08 to 2.93</td>
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<td>4</td>
<td>0.51</td>
<td>0.12 to 2.19</td>
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<td>5</td>
<td>1.22</td>
<td>0.38 to 3.88</td>
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<td><strong>Ethnicity (ref. white)</strong></td>
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<td></td>
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<td>Black</td>
<td>1.81</td>
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<tr>
<td>Asian</td>
<td>2.05</td>
<td>0.40 to 10.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2.04</td>
<td>0.40 to 10.38</td>
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<td></td>
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<td><strong>Marital status (ref. single)</strong></td>
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<td></td>
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<tr>
<td>Married/ cohabiting/ civil partnership</td>
<td>0.63</td>
<td>0.28 to 1.40</td>
<td>0.288±</td>
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<td>Separated/divorced/ civil partnership dissolved</td>
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<td>0.55 to 3.04</td>
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<tr>
<td>Widowed</td>
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<tr>
<td><strong>Living arrangements (ref. with parent/ family)</strong></td>
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<td></td>
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<tr>
<td>Independently</td>
<td>0.49</td>
<td>0.14 to 1.65</td>
<td>0.138±</td>
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<td>Supported/residential</td>
<td>0.31</td>
<td>0.04 to 1.94</td>
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<tr>
<td>Other</td>
<td>1.20</td>
<td>0.31 to 4.56</td>
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<td><strong>Employment (ref. unpaid employment)</strong></td>
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<td>Paid employment</td>
<td>1.41</td>
<td>0.68 to 2.91</td>
<td>0.348±</td>
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<td><strong>Mental health diagnosis (ref. schizophrenia/ schizoaffective disorder)</strong></td>
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<td>Bipolar disorder</td>
<td>1.15</td>
<td>0.52 to 2.55</td>
<td>0.748±</td>
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<td>Other psychosis</td>
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<td><strong>Having a mental health key worker (ref. no)</strong></td>
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<tr>
<td>Yes</td>
<td>0.54</td>
<td>0.25 to 1.16</td>
<td>0.119</td>
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<td><strong>Diagnosis of hypertension in the last five years (ref. no)</strong></td>
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<td>Yes</td>
<td>0.437</td>
<td>0.16 to 1.18</td>
<td>0.103</td>
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<td><strong>Diagnosis of diabetes in the last five years (ref. no)</strong></td>
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<td>0.21</td>
<td>0.02 to 1.64</td>
<td>0.138</td>
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<tr>
<td><strong>Diagnosis of raised cholesterol in the last five years (ref. no)</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>0.52</td>
<td>0.24 to 1.15</td>
<td>0.109</td>
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353
<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>95% CI</th>
<th>p-Value</th>
<th>N</th>
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<tbody>
<tr>
<td><strong>BMI</strong></td>
<td>0.99</td>
<td>0.94 to 1.05</td>
<td>0.884</td>
<td>326</td>
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<tr>
<td><strong>Alcohol AUDIT score</strong></td>
<td>1.01</td>
<td>0.96 to 1.06</td>
<td>0.661</td>
<td>326</td>
</tr>
<tr>
<td><strong>History of alcohol problem (ref. no)</strong></td>
<td>0.73</td>
<td>0.30 to 1.74</td>
<td>0.480</td>
<td>326</td>
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<tr>
<td><strong>Cigarette use</strong></td>
<td>0.98</td>
<td>0.95 to 1.02</td>
<td>0.419</td>
<td>326</td>
</tr>
<tr>
<td><strong>CVD risk QRISK score</strong></td>
<td>0.98</td>
<td>0.95 to 1.02</td>
<td>0.514</td>
<td>326</td>
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<tr>
<td><strong>DINE</strong> Total fat score</td>
<td>1.02</td>
<td>0.99 to 1.05</td>
<td>0.118</td>
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<tr>
<td><strong>DINE</strong> Fibre score</td>
<td>0.99</td>
<td>0.96 to 1.02</td>
<td>0.755</td>
<td>326</td>
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<tr>
<td><strong>Total fruit and vegetable intake per day</strong></td>
<td>0.96</td>
<td>0.83 to 1.10</td>
<td>0.590</td>
<td>325</td>
</tr>
<tr>
<td><strong>IPAQ MET minutes score</strong></td>
<td>0.99</td>
<td>0.99 to 1.00</td>
<td>0.600</td>
<td>320</td>
</tr>
<tr>
<td><strong>IPAQ Sitting time score</strong></td>
<td>0.99</td>
<td>0.99 to 1.00</td>
<td>0.367</td>
<td>320</td>
</tr>
<tr>
<td><strong>Medication count</strong></td>
<td>1.01</td>
<td>0.94 to 1.08</td>
<td>0.711</td>
<td>326</td>
</tr>
<tr>
<td><strong>First generation antipsychotic prescription (ref. not prescribed)</strong></td>
<td>Prescribed</td>
<td>0.51</td>
<td>0.15 to 1.77</td>
<td>0.294</td>
</tr>
<tr>
<td><strong>Second generation antipsychotic prescription (ref. not prescribed)</strong></td>
<td>Prescribed</td>
<td>0.55</td>
<td>0.28 to 1.09</td>
<td>0.090</td>
</tr>
<tr>
<td><strong>Antidepressant prescription (ref. not prescribed)</strong></td>
<td>Prescribed</td>
<td>1.16</td>
<td>0.58 to 2.31</td>
<td>0.667</td>
</tr>
<tr>
<td><strong>Morisky Scale of Adherence (MMS)</strong> Psychiatric medication</td>
<td>1.01</td>
<td>0.81 to 1.26</td>
<td>0.865</td>
<td>303</td>
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<tr>
<td><strong>Morisky Scale of Adherence (MMS)</strong> Cardiovascular disease medication</td>
<td>0.89</td>
<td>0.64 to 1.25</td>
<td>0.530</td>
<td>145</td>
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<td><strong>Psychological wellbeing WEMWBS score</strong></td>
<td>0.97</td>
<td>0.94 to 1.00</td>
<td>0.077</td>
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<tr>
<td><strong>Social support MOS-SSS score</strong></td>
<td>0.98</td>
<td>0.97 to 1.00</td>
<td>0.131</td>
<td>325</td>
</tr>
<tr>
<td><strong>Health-related quality of life EQ-5D-5L score</strong></td>
<td>0.35</td>
<td>0.09 to 1.31</td>
<td>0.122</td>
<td>326</td>
</tr>
</tbody>
</table>

± Overall p-Value
Appendix I. Sensitivity analysis of baseline factors associated with primary and secondary continuous change score outcomes using random effects multivariable models removing outliers

Associations between baseline factors and primary and secondary continuous change score outcomes using random effects multivariable models following the removal of outliers

<table>
<thead>
<tr>
<th>Possible explanatory variables</th>
<th>Outcomes</th>
<th>Primary</th>
<th>Secondary</th>
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<td></td>
<td>MET</td>
<td>Fruit and vegetable portions</td>
<td>Sitting minutes</td>
</tr>
<tr>
<td></td>
<td>minutes</td>
<td>change score</td>
<td>change score</td>
</tr>
<tr>
<td></td>
<td>score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>19.97</td>
<td>-0.01</td>
<td>-1.33</td>
</tr>
<tr>
<td></td>
<td>(-50.22 to 90.16; 0.577)</td>
<td>(-0.04 to 0.00; 0.221)</td>
<td>(-8.82 to 6.14; 0.727)</td>
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<tr>
<td>Sex (ref. male)</td>
<td>Female</td>
<td>-308.54</td>
<td>-0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1458.24 to 841.16; 0.599)</td>
<td>(-0.64 to 0.34; 0.556)</td>
</tr>
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<td></td>
<td></td>
<td>-1425.21</td>
<td>2.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-2933.95 to 83.52; 0.064)</td>
<td>(-188.27 to 53.96; 0.277)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1978.34</td>
<td>2.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-5101.04 to 1144.36; 0.214)</td>
<td>(-188.27 to 53.96; 0.277)</td>
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</tbody>
</table>

Note: *P-value*
<table>
<thead>
<tr>
<th>Mental health diagnosis (ref. schizophrenia/schizoaffective disorder)</th>
<th>Bipolar disorder</th>
<th>Other psychosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-174.51 (-1474.46 to 1125.43; 0.792)</td>
<td>1228.56 (-356.31 to 2813.45; 0.129)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First-generation antipsychotic prescription (ref. not prescribed)</th>
<th>Prescribed</th>
<th>-3.52 (-6.75 to -0.28; 0.033*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-129.17 (-1028.42 to 1125.99; 0.929)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Antidepressant prescription (ref. not prescribed)</th>
<th>Prescribed</th>
<th>-51.65 (-162.06 to 58.75; 0.359)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-10.10 (-129.17 to 108.97; 0.321)</td>
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</tr>
</tbody>
</table>

| Medication total | -10.10 (-129.17 to 108.97; 0.868) | -0.02 (-0.08 to 0.02; 0.321) |

<table>
<thead>
<tr>
<th>Diagnosis of hypertension in last 5 years (ref. not diagnosed)</th>
<th>Diagnosed</th>
<th>475.26 (-861.14 to 1811.67; 0.486)</th>
<th>23.51 (-118.90 to 165.93; 0.746)</th>
<th>-0.51 (-3.64 to 2.61; 0.746)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1677.63 (-3671.13 to 315.87; 0.099)</td>
<td>20.55 (-206.84 to 247.95; 0.226)</td>
<td>-2.72 (-7.12 to 1.68; 0.859)</td>
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### Diagnosis raised
*cholesterol in last 5 years (ref. not diagnosed)*

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<td>Diagnosed</td>
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<td>-</td>
<td>-126.90</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-262.58 to 8.77; 0.067)</td>
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</tr>
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### Diet

<table>
<thead>
<tr>
<th>Diet</th>
<th>DINE Fat score</th>
<th>DINE Fibre score</th>
<th>Fruit and vegetable intake (portions per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DINE Fat score</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DINE Fibre score</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fruit and vegetable intake (portions per day)</td>
<td>-218.80</td>
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<tr>
<td></td>
<td>(-438.85 to 1.23; 0.051)</td>
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</table>

### Physical activity

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>IPAQ MET minutes</th>
<th>IPAQ Sitting time</th>
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</thead>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IPAQ MET minutes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IPAQ Sitting time</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-0.00 to 0.00; 0.291)</td>
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### Alcohol

<table>
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<th>Alcohol</th>
<th>AUDIT score</th>
<th>Smoking</th>
<th>Cigarette use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-97.51</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AUDIT score</td>
<td>(-182.43 to -12.60; 0.024*)</td>
<td>(-0.03 to 0.17; 0.211)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.10)</td>
<td>(-0.03)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.479)</td>
<td>(0.291)</td>
<td></td>
</tr>
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</table>

### Smoking

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Cigarette use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Cigarette use</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(-0.03 to 0.17; 0.211)</td>
</tr>
</tbody>
</table>

### CVD risk

<table>
<thead>
<tr>
<th>CVD risk</th>
<th>QRISK-2-2016 score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-10.85</td>
</tr>
<tr>
<td>QRISK-2-2016 score</td>
<td>(-92.06 to -9.55; 0.793)</td>
</tr>
<tr>
<td></td>
<td>-0.58</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(-0.11 to 0.22; 0.898)</td>
</tr>
<tr>
<td></td>
<td>(-0.29)</td>
</tr>
<tr>
<td></td>
<td>(0.306)</td>
</tr>
</tbody>
</table>

### BMI

<table>
<thead>
<tr>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>-</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>-0.10</td>
</tr>
<tr>
<td>(-0.29 to 0.09; 0.306)</td>
</tr>
</tbody>
</table>

### Psychological wellbeing

<table>
<thead>
<tr>
<th>Psychological wellbeing</th>
<th>WEMWBS score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-2.49‡</td>
</tr>
<tr>
<td>WEMWBS score</td>
<td>(-58.14 to -2.71; 0.930)</td>
</tr>
<tr>
<td></td>
<td>3.12</td>
</tr>
<tr>
<td></td>
<td>(53.15; 8.97; 0.294)</td>
</tr>
</tbody>
</table>

### Social support

<table>
<thead>
<tr>
<th>Social support</th>
<th>MOS-SSS score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>MOS-SSS score</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(-0.02)</td>
</tr>
<tr>
<td></td>
<td>(0.00 to -0.07; 0.02)</td>
</tr>
<tr>
<td></td>
<td>(0.01; 0.250)</td>
</tr>
</tbody>
</table>

### Health-related quality of life
<table>
<thead>
<tr>
<th></th>
<th>EQ-5D-5L score</th>
<th>0.12</th>
<th>66.33</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-1200.29)</td>
<td>(-1.04 to</td>
<td>(-203.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>to 1.28;</td>
<td>to</td>
<td>to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3922.11;</td>
<td>0.836)</td>
<td>335.95;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.298)</td>
<td></td>
<td>0.630)</td>
<td></td>
</tr>
</tbody>
</table>

‡ Corresponding explanatory variable associated with corresponding missing outcome data and therefore included in model.

*p-values in **bold** indicate ≤0.25 threshold.
Appendix J. Supplementary analysis: baseline factors associated with binary MET minutes and fruit and vegetable outcomes in univariable analysis

Associations between baseline factors and binary primary (MET minutes and fruit and vegetables) outcomes using random effects univariable logistic regression analyses

<table>
<thead>
<tr>
<th>Possible explanatory variables</th>
<th>Outcomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MET minutes binary (≥10% increase vs. &lt;10% change from baseline to follow-up)</td>
<td>Fruit and vegetable binary (≥10% increase vs. &lt;10% change from baseline to follow-up)</td>
</tr>
<tr>
<td>Age</td>
<td>1.01 (0.97 to 1.05; 0.489)</td>
<td>1.00 (0.97 to 1.03; 0.743)</td>
</tr>
<tr>
<td>Sex (ref. male)</td>
<td>1.28 (0.61 to 2.68; 0.504)</td>
<td>1.40 (0.79 to 2.47; 0.248**)</td>
</tr>
<tr>
<td>Employment (ref. unpaid employment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid employment</td>
<td>5.68 (1.24 to 25.97; 0.025*)</td>
<td>1.28 (0.65 to 2.52; 0.459)</td>
</tr>
<tr>
<td>Marital status (ref. single)</td>
<td>Overall $p= 0.195^{**}$</td>
<td>Overall $p= 0.550$</td>
</tr>
<tr>
<td>Married/cohabiting/in civil partnership</td>
<td>0.60 (0.25 to 1.39; 0.235)</td>
<td>1.38 (0.69 to 2.74; 0.349)</td>
</tr>
<tr>
<td>Separated/divorced/civil partnership dissolved</td>
<td>0.76 (0.23 to 2.46; 0.653)</td>
<td>0.93 (0.39 to 2.25; 0.890)</td>
</tr>
<tr>
<td>Widowed</td>
<td>0.95 (0.00 to 0.93; 0.044*)</td>
<td>0.47 (0.07 to 2.93; 0.420)</td>
</tr>
<tr>
<td>Mental health diagnosis (ref. schizophrenia/schizoaffective disorder)</td>
<td>Overall $p= 0.162^{**}$</td>
<td>Overall $p= 0.249^{**}$</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>0.87 (0.36 to 2.12; 0.770)</td>
<td>0.81 (0.42 to 1.56; 0.538)</td>
</tr>
<tr>
<td>Other psychosis</td>
<td>0.41 (0.15 to 1.10; 0.078**)</td>
<td>1.64 (0.68 to 3.95; 0.263)</td>
</tr>
<tr>
<td>First-generation antipsychotic prescription (ref. not prescribed)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

359
<table>
<thead>
<tr>
<th>Prescribed</th>
<th>0.82</th>
<th>0.66</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.34 to 2.09; 0.685)</td>
<td>(0.29 to 1.49; 0.320)</td>
</tr>
</tbody>
</table>

**Second-generation antipsychotic prescription (ref. not prescribed)**

<table>
<thead>
<tr>
<th>Prescribed</th>
<th>0.69</th>
<th>0.77</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.31 to 1.54; 0.374)</td>
<td>(0.42 to 1.39; 0.386)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Antidepressant prescription (ref. not prescribed)</th>
<th>Prescribed</th>
<th>0.66</th>
<th>1.48</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.31 to 1.41; 0.288)</td>
<td>(0.80 to 2.74; 0.374)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medication total</th>
<th>0.94</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.88 to 1.02; 0.164**)</td>
<td>(0.94 to 1.07; 0.815)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis of hypertension in last 5 years (ref. not diagnosed)</th>
<th>Diagnosed</th>
<th>0.68</th>
<th>0.62</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.30 to 1.52; 0.359)</td>
<td>(0.31 to 1.23; 0.359)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis of diabetes in last 5 years (ref. not diagnosed)</th>
<th>Diagnosed</th>
<th>0.80</th>
<th>1.06</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.26 to 2.42; 0.697)</td>
<td>(0.42 to 2.64; 0.894)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis raised cholesterol in last 5 years (ref. not diagnosed)</th>
<th>Diagnosed</th>
<th>1.11</th>
<th>0.84</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.44 to 2.80; 0.818)</td>
<td>(0.42 to 1.66; 0.622)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diet</th>
<th>DINE Fat score</th>
<th>0.98</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.95 to 1.01; 0.313)</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DINE Fibre score</th>
<th>0.96</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.93 to 0.99; 0.014*)</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit and vegetable intake (portions per day)</th>
<th>0.87</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.75 to 1.01; 0.068**)</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>IPAQ MET minutes</th>
<th>1.00</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0.99 to 1.00; 0.241**)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IPAQ Sitting time</th>
<th>-</th>
<th>0.99</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.99 to 1.00; 0.235**)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Alcohol</strong></td>
<td>1.00</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUDIT score</td>
<td>(0.95 to 1.05; 0.920)</td>
<td>(0.95 to 1.02; 0.509)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td>1.01</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cigarette use</td>
<td>(0.98 to 1.05; 0.298)</td>
<td>(0.97 to 1.02; 0.923)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CVD risk</strong></td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QRISK-2-2016 score</td>
<td>(0.96 to 1.03; 0.788)</td>
<td>(0.96 to 1.02; 0.716)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>0.95</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.90 to 1.00; 0.078**)</td>
<td>(0.94 to 1.04; 0.759)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Psychological wellbeing</strong></td>
<td>0.99</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEMWBS score</td>
<td>(0.96 to 1.03; 0.918)</td>
<td>(0.98 to 1.04; 0.243**)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social support</strong></td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOS-SSS score</td>
<td>(0.99 to 1.01; 0.529)</td>
<td>(0.99 to 1.01; 0.678)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health-related quality of life</strong></td>
<td>2.87</td>
<td>2.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQ-5D-5L score</td>
<td>(0.67 to 11.8; 0.152**)</td>
<td>(0.58 to 7.71; 0.252)</td>
</tr>
</tbody>
</table>

- association not explored
* p-values in bold < 0.05
** p-values in bold meeting > 0.05 to 0.25 threshold
Appendix K. Supplementary analysis: baseline factors associated with binary MET minutes and fruit and vegetable outcomes in multivariable analysis

Associations between baseline factors and primary (MET minutes and fruit and vegetables) binary outcomes using random effects multivariable logistic regression analyses

<table>
<thead>
<tr>
<th>Possible explanatory variables</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MET minutes binary (≥10% increase vs. &lt;10% increase/ any decrease from baseline to follow-up)</td>
</tr>
<tr>
<td>Age</td>
<td>1.02 (0.98 to 1.07; 0.259)</td>
</tr>
<tr>
<td>Sex (ref. male)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.31 (0.56 to 3.07; 0.521)</td>
</tr>
<tr>
<td>Employment (ref. unpaid employment)</td>
<td></td>
</tr>
<tr>
<td>Paid employment</td>
<td>7.72 (1.59 to 37.35; 0.011*)</td>
</tr>
<tr>
<td>Marital status (ref. single)</td>
<td></td>
</tr>
<tr>
<td>Married/cohabiting/in civil partnership</td>
<td>-</td>
</tr>
<tr>
<td>Separated/divorced/civil partnership dissolved</td>
<td>-</td>
</tr>
<tr>
<td>Widowed</td>
<td>-</td>
</tr>
<tr>
<td>Mental health diagnosis (ref. schizophrenia/ schizoaffective disorder)</td>
<td></td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>-</td>
</tr>
<tr>
<td>Other psychosis</td>
<td>-</td>
</tr>
<tr>
<td>First-generation antipsychotic prescription (ref. not prescribed)</td>
<td></td>
</tr>
<tr>
<td>Prescribed</td>
<td>-</td>
</tr>
</tbody>
</table>

362
| Second-generation antipsychotic prescription (ref. not prescribed) | Prescribed | - |
| Antidepressant prescription (ref. not prescribed) | Prescribed | 1.44 (0.73 to 2.81; 0.285) |
| Medication total | - | - |
| Diagnosis of hypertension in last 5 years (ref. not diagnosed) | Diagnosed | 0.59 (0.28 to 1.24; 0.167) |
| Diagnosis of diabetes in last 5 years (ref. not diagnosed) | - | - |
| Diagnosis raised cholesterol in last 5 years (ref. not diagnosed) | Diagnosed | - |
| Diet | DINE Fat score | - |
| DINE Fibre score | 0.95 (0.92 to 0.99; 0.018*) |
| Fruit and vegetable intake (portions per day) | - |
| Physical activity | IPAQ MET minutes | - |
| IPAQ Sitting time | - | 0.99 (0.99 to 1.00; 0.795) |
| Alcohol | AUDIT score | - |
| Smoking | Cigarette use | - |
| CVD risk | QRISK-2-2016 score | - |
| BMI | - | - |
| Psychological wellbeing | WEMWBS score | 1.01 (0.98 to 1.05; 0.217) |
| Social support | MOS-SSS score | - |

363
| Health-related quality of life | - | - |
| EQ-5D-5L score | - | - |

- variable not entered into model

*p-values in **bold** < 0.05
Appendix L. Comparison of characteristics between all staff who delivered and patients who received PRIMROSE and the qualitative samples

The table below displays the characteristics of the qualitative staff sample compared to all staff delivering PRIMROSE to explore whether the qualitative sample captured the variation within all staff delivering PRIMROSE and therefore the potential of differing views. The lack of diversity regarding ethnicity and gender in the sample were similar compared to all staff delivering PRIMROSE (n=39/41 female, n=36/41 White British). The variation between staff professions was broadly well captured in the qualitative staff sample, as well as length of employment, ages and whether staff were taking part in other research. However, most of the sample interviewed delivered many appointments and there was only 1 participant that delivered less than 5 appointments.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Qualitative Staff sample (n=15)</th>
<th>All PRIMROSE Staff (n=41)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (n)</td>
<td></td>
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<td>&lt;25</td>
<td>-</td>
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</tr>
<tr>
<td>25-35</td>
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<td>36-45</td>
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<td>46-55</td>
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<tr>
<td>56-65</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Gender (n)</td>
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<tr>
<td>Female</td>
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<td>39</td>
</tr>
<tr>
<td>Male</td>
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<td>2</td>
</tr>
<tr>
<td>Ethnicity (n)</td>
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<td></td>
</tr>
<tr>
<td>White British</td>
<td>15</td>
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<tr>
<td>White Other</td>
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<td>Asian Other</td>
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</tr>
<tr>
<td>Provider type (n)</td>
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<tr>
<td>Healthcare Assistant</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Practice Nurse</td>
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<td>15</td>
</tr>
<tr>
<td>Research Nurse</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>GP</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Length of experience as a nurse/HCA (years, months) (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11 to 15</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>16 to 20</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>21 to 30</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
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</table>

<table>
<thead>
<tr>
<th>Previous experience of research (n)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Number of PRIMROSE intervention appointments delivered</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>-</td>
</tr>
<tr>
<td>2-5</td>
<td>1</td>
</tr>
<tr>
<td>6-10</td>
<td>1</td>
</tr>
<tr>
<td>11-15</td>
<td>2</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
</tr>
<tr>
<td>21-25</td>
<td>3</td>
</tr>
<tr>
<td>26-30</td>
<td>-</td>
</tr>
<tr>
<td>31-35</td>
<td>-</td>
</tr>
<tr>
<td>36-40</td>
<td>1</td>
</tr>
<tr>
<td>41-45</td>
<td>3</td>
</tr>
<tr>
<td>46-50</td>
<td>1</td>
</tr>
<tr>
<td>51-55</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: This table is based on Table 2 published in BMC Health Services Research (246)
The table below compares the characteristics of the qualitative patient sample with all patients receiving the PRIMROSE intervention. Characteristics including age, gender and mental health diagnoses were well captured in the qualitative sample. However, the full range of marital status categories (being divorced, separated/widowed) and ethnic groups ('black' or 'other' groups) were not captured and it is possible that these participants may have had different views to participants sampled. Further, most of the sample (n=12/15) interviewed attended 6/more intervention appointments and there were none that attended less than 2, even though there were many in the overall sample (n=47/155).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Qualitative patient Sample (n=15)</th>
<th>All patients allocated to the PRIMROSE intervention (n=155)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>9</td>
<td>67</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>88</td>
</tr>
<tr>
<td>Age group (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>40-49</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>50-59</td>
<td>3</td>
<td>38</td>
</tr>
<tr>
<td>60-69</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>70+</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Marital Status (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>8</td>
<td>66</td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>7</td>
<td>59</td>
</tr>
<tr>
<td>Separated or divorced</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>Widowed</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Ethnicity (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>13</td>
<td>134</td>
</tr>
<tr>
<td>Black</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizophrenia/ schizoaffective disorder</td>
<td>6</td>
<td>54</td>
</tr>
<tr>
<td>Bipolar affective disorder</td>
<td>7</td>
<td>71</td>
</tr>
<tr>
<td>Other Psychosis</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Intervention appointments attended (over 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>2-5</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>6+</td>
<td>12</td>
<td>72</td>
</tr>
</tbody>
</table>

Source: This table is based on Table 3 published in BMC Health Services Research (246)
### Table 1. Descriptive codes identified in staff and patient interviews regarding how health behaviour change was supported by staff in PRIMROSE mapped to the behaviour change taxonomy (version 1) labels

<table>
<thead>
<tr>
<th>Descriptive codes identified from raw patient data</th>
<th>Descriptive codes identified from raw staff data</th>
<th>Behaviour change technique (BCTs) labels in the BCTT (v1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring progress</td>
<td>Monitoring progress</td>
<td>Self-monitoring of behaviour (2.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biofeedback (2.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feedback on behaviour (2.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action planning (1.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review behavioural goal(s) (1.5)</td>
</tr>
<tr>
<td>Monitoring progress</td>
<td>Monitoring progress</td>
<td>Monitoring of behaviour and outcome (2.1 and 2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information about antecedents (4.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instruction on how to perform behaviour (4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem-solving (1.2)</td>
</tr>
<tr>
<td>Tangible positive outcomes</td>
<td>Tangible positive outcomes</td>
<td>Biofeedback (2.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feedback on behaviour (2.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social reward (10.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of behaviour and outcome (2.1 and 2.5)</td>
</tr>
<tr>
<td>Positive reinforcement</td>
<td>Positive reinforcement</td>
<td>Biofeedback (2.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social reward (10.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
</tr>
<tr>
<td>Providing advice and guidance</td>
<td>Providing advice and guidance</td>
<td>Information about health consequences (5.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feedback on behaviour (2.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social support (practical) (3.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action planning (1.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review behavioural goal(s) (1.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goal setting (outcome and behaviour) (1.1 and 1.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of behaviour and outcome (2.1 and 2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information about antecedents (4.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instruction on how to perform behaviour (4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem-solving (1.2)</td>
</tr>
<tr>
<td>Providing information, suggestions and direction</td>
<td>Providing information, suggestions and direction</td>
<td>Feedback on behaviour (2.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Habit reversal (8.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social support (practical) (3.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
</tr>
<tr>
<td>Facilitating cognitive awareness of health and lifestyle changes</td>
<td>Information about health consequences (5.1)</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Being persistent</strong></td>
<td>Information about health consequences (5.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Goal setting</strong></td>
<td>Habit reversal (8.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Action planning (1.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goal setting (outcome and behaviour) (1.1. and 1.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem-solving (1.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Review behavioural goal(s) (1.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goal setting (outcome and behaviour) (1.1. and 1.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instruction on how to perform behaviour (4.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Building lifestyle changes into routine and enjoying it</strong></td>
<td>Problem-solving (1.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Social support</strong></td>
<td>Feedback on behaviour (2.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Habit reversal (8.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring of behaviour and outcome (2.1 and 2.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem-solving (1.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Being friendly and supportive</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instruction on how to perform behaviour (4.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Being non-judgemental and encouraging</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social reward (10.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verbal persuasion about capability (15.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Creating a therapeutic environment</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Created rapport, trust and relationships with patients</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Making appointments fun and engaging</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Ability to relate to patients</strong></td>
<td>Social support (emotional) (3.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Involving supportive others/ Involvement from peers, family and friends</strong></td>
<td>Restructuring the physical and social environment (12.1 and 12.2)</td>
<td></td>
</tr>
<tr>
<td>Social support (practical) (3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Being accommodating</strong> and flexible to suit patient needs</td>
<td>Review behavioural goal(s) (1.5)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Staff and patient reported descriptions of the methods to support health behaviour change by staff in PRIMROSE mapped to the behaviour change technique taxonomy (BCTT, version 1) with illustrative quotes

<table>
<thead>
<tr>
<th>BCT Taxonomy broader grouping</th>
<th>BCT label from BCT Taxonomy</th>
<th>Methods used to facilitate application</th>
<th>Illustrative quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goals and planning</td>
<td>Goal setting (outcome and behaviour) (1.1. and 1.3)</td>
<td>Reviewing unhealthy habits in initial consultations and enabling patients to set targets to either help modify a behaviour or achieve a specific outcome such as reduction in cholesterol.</td>
<td>“The other patient, his chosen topic was to get off smoking… We had spoken about all the health behaviours and then the patient chose one health behaviour, so we explored that in more depth” (Staff 13, Practice Nurse, 30’s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“The main concern was the weight and the cholesterol, those were the main concerns, because the weight wasn’t any… getting any lower, in fact it was getting higher and higher, and I wasn’t going out as much, I wasn’t active enough to bring the weight down, and diet wasn’t good enough. So we had to set goals to improve on that so that the cholesterol could be…helped, to bring the cholesterol down and bring the weight down as well.” (Patient 112, Female, 50’s, Other Psychosis)</td>
</tr>
<tr>
<td>Action planning (1.4)</td>
<td>Breaking down goals into smaller</td>
<td></td>
<td>“It’s about, well, we need to make this a bit more manageable, something that will then achieve that goal. So we’re talking about food types and, well, we’re going to eat more of this and less of this, and which ones are you going to eat when, and this sort of thing, and making those kinds of goals…” (Staff 6, HCA, 50’s)</td>
</tr>
<tr>
<td><strong>Review behavioural goal(s)</strong> (1.5)</td>
<td>Using open-ended questions to jointly discuss progress within consultations including whether the persons behaviour aligned with the goals set. Goals were adapted on the basis of feedback provided.</td>
<td>“...how easy did you find that goal, was it challenging, do you want to continue with that or try something else… then we’d carry on about how that was going to have an impact on his week, not just, okay, so we’re swapping it, but how he was, because he only had one arm, as well, so he had to think about the goals that were easy for him to be doing with one arm… changing to cereal because porridge was an idea but that’s really hard to make with one hand, apparently” (Staff 2, HCA, 50’s)</td>
<td></td>
</tr>
</tbody>
</table>

| **Problem-solving** (1.2) | Discussing with patients factors | “...when they don’t perhaps achieve it, look at why. And then get them to see how they can change, turn that around.” (Staff 8, Practice Nurse, 50’s) |
that may be affecting their behaviour and encouraging ways to overcome problems

<table>
<thead>
<tr>
<th>2. Feedback and monitoring</th>
<th>Self-monitoring of behaviour (2.3)</th>
<th>Encourage use of health planning books to self-monitor behaviour provided as part of the intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“…if they didn’t fill in their books, they wrote a note, or something, to themselves, on their phone, and then they told me about it when they came in…so they were tracking…the people that tracked definitely were the most successful...” (Staff 6, HCA, 50’s)</td>
<td>“I was also given a booklet so I can monitor everyday activities and what changes I’ve made. So the information was given, a booklet was given so that I can write down what activities I’ve done, what sorts of changes I’ve made every day, and they were both helpful... they were both helpful” (Patient 112, Female, 50’s, Other Psychosis)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitoring of behaviour and outcome (2.1 and 2.5)</th>
<th>Staff continuously checked progress through monitoring clinical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“…I would ask them how they’d got on, what they’d been up to, have a look in their little health plan book, and to see what they’d eaten.” (Staff 3, Practice Nurse, 50’s)</td>
</tr>
<tr>
<td></td>
<td>“…she monitored me on the computer regarding weight and any changes, so that was her role in the study.” (Patient 112, Female, 50’s, Other Psychosis)</td>
</tr>
</tbody>
</table>

“…she would ask me questions: how I’m getting on, any issues I may have, any problems I may have. Sometimes I had problems with my cholesterol and I needed further advice....” (Patient 112, Female, 50’s, Other Psychosis)
<table>
<thead>
<tr>
<th>Biofeedback (2.6)</th>
<th>Monitoring through clinical measures including weight, blood pressure and blood tests and communicating results to patients.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“I kind of tried to make it fun for them by doing the blood pressure, the weight. We checked the cholesterol, perhaps once every months I think I did their cholesterols, and so we got that once every three months and it was a bit like trying to encourage them. Oh, see what your weight is next time and I’ll see what you’ve dieted next time.” (Staff 3, Practice Nurse, 50’s)</td>
</tr>
<tr>
<td></td>
<td>“…they take your blood and weigh you and different things like that, you know. And we just have a talk, you know.” (Patient 83, Male, 50’s, Schizophrenia)</td>
</tr>
<tr>
<td>Feedback on behaviour (2.2)</td>
<td>When monitoring behaviour, staff would discuss with patients their progress and whether any</td>
</tr>
<tr>
<td></td>
<td>“We’d discuss what they’d eaten, what exercise they’d done, how they could do more exercise, how they could improve their diet.” (Staff 3, Practice Nurse, 50’s)</td>
</tr>
<tr>
<td></td>
<td>“Well, I just see her, and she checks up on the sheets I fill in, and she weighs me and sees if I’m progressing, yes.” (Patient 83, Male, 50’s, Schizophrenia)</td>
</tr>
<tr>
<td>3. Social support</td>
<td>Social support (emotional) (3.3)</td>
</tr>
<tr>
<td></td>
<td>Social support (practical) (3.2)</td>
</tr>
<tr>
<td>4. Shaping knowledge</td>
<td>Instruction on how to perform behaviour (4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Information about antecedents (4.2)</td>
<td>Encouraging patients to record emotions when undesired behaviour occurred to provide information on emotions that caused unwanted behaviour</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>5. Natural consequences</strong></td>
<td><strong>Information about health consequences (5.1)</strong></td>
</tr>
<tr>
<td>Staff communicating the health risks of unhealthy behaviours</td>
<td><strong>“I just said to him, you need to stop but we need to help you to do that because you are going to kill yourself. And at that point he said, okay… You are advising them, but that’s what I would said to anybody else that would come in. You’re drinking three or four bottle of wine a day, you are going to give yourself a heart attack. If you want some help I can help you now.”</strong> (Staff 5, Practice Nurse, 40’s)</td>
</tr>
</tbody>
</table>

“So I came away with lots of sort of ideas, suggestions, not, do this, do that, do that. It was very much suggestions that we had kind of talked about between us.” (Patient 17, Male, 40’s, Schizophrenia)

“And so I broke it down and said, just put key words in there [health plan diary]: sad, fed up, fat, heavy, anything. Just a word to sum up how they felt, even just one word a day: good, energetic. And then they could look back on that, and perhaps they might see a pattern, or they might see a barrier that perhaps they hadn’t identified themselves.” (Staff 4, HCA, 50’s)

“Because I was keeping a diary of when did I feel good and when did I not. And so what was I eating and what was happening… And I learnt a lot about me and my relationship to food; my medication’s relationship to food. Because I’m… My medications were all… You know, made me crave sugar and I think it was about how I had to… I manage that.” (Patient 17, Male, 40’s, Schizophrenia)
<table>
<thead>
<tr>
<th>8. Repetition and substitution</th>
<th>Habit reversal (8.4)</th>
<th>Staff prompted the replacement of unwanted habits with healthier behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“...I encouraged her to take her mind off wanting cigarettes by doing something different, and she got back into playing her guitar and keyboard and playing music and making music. So I think that helped and she was a lot more relaxed. When she wanted a cigarette she'd go and play her guitar...” (Staff 15, Practice Nurse, 60's)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“...there was things I was taking out, I took snacks out, for example. Because she said, look, you had a KitKat, you've had this, why don't you just stop them? So, and also eating late at night. I don't eat late at night, now. I have a meal, I might go and have a drink, but I don't eat late at night, you know” (Patient 81, Male, 60's, Bipolar Affective disorder)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Reward and threat</th>
<th>Social reward (10.4)</th>
<th>Staff delivering the intervention displayed praise to patients.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“And having that, you know, that recognition of, you know, of losing two pound or whatever, that was really positive. But it wasn’t done in a fake way or, “well done”. It was actually “that’s brilliant”, it was genuinely meant.” (Patient 17, Male, 40’s, Schizophrenia)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I’d praise him on the stuff that went really, really well...” (Staff 2, HCA, 50’s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Antecedents</th>
<th>Restructuring the physical and social environment (12.1 and 12.2)</th>
<th>Changing physical and social environments with replacement of positive social</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“I think we, we looked at it as a whole, so we were looking at where he was eating, obviously with one arm, convenience food a lot, so instead of always going to KFC let’s try something else, and then he found a friend that went to this other café, so then he had someone to go and socialise, so it wasn’t just about going to get food anymore… We’ve found little things like his friend goes to this café, he found that out, so now he goes there every week and that gets him out of the house for something else.” (Staff 2, HCA, 50’s)</td>
</tr>
</tbody>
</table>
and healthy contexts

<table>
<thead>
<tr>
<th>15. Self-belief</th>
<th>Verbal persuasion about capability (15.1)</th>
<th>Encouragement displayed by staff delivering intervention when patients had not achieved what they aimed to.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;...with the guy that wasn’t doing as well as we would’ve thought, just by saying, don’t set yourself targets that are too hard to achieve; just even the smallest of changes can make a difference, and don’t be afraid of coming back and saying, I haven’t been able to do it, for whatever reason. There’s always a next time, as long as you don’t give up, and I think that’s the main thing, and just giving them that encouragement to feel that you’re not being judged by the fact that you haven’t been successful in what you’re trying to do&quot; (Staff 10, Practice Nurse, 40’s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;...she was really nice and kind and wasn’t judgemental or anything like that. And all what I said, I had a week where I hadn’t managed to do what I said for a couple of weeks. She was like, Oh, don’t worry about it. It’s fine we can try this week. So it was really good.” (Patient 6, Female, 40’s, Bipolar Affective disorder)</td>
<td></td>
</tr>
</tbody>
</table>

Source: This table has been published in the British Journal of Health Psychology (329)
Appendix N. Recruitment materials for study 4

Staff Participant Information Sheet

Exploring staff perspectives on how the [anonymised] supports health behaviours in people with severe mental illness.

Name of researchers: Professor Kate Walters (Chief investigator) and Suzan Hassan (PhD Student)

We are inviting you to take part in our research project. Before you choose whether you would like to take part, it is important that you understand the purpose of the project and what participation will involve for you. Please read the information below carefully. Please take the time to consider any questions you may have and discuss with the researcher. If you would like to discuss the information with others, please feel free to do so. This study is being conducted as part of a PhD student project in fulfilment for the award of Doctor of Philosophy.

- Part 1 describes information about the purpose of the project and what participation will involve if you decide to take part.
- Part 2 describes in more detail the general procedures about the study.

Part 1

1. What is the purpose of the study?

We already know that people with severe mental illness (SMI) are at greater risk of health problems and early mortality compared to people in the general population. We also know that unhealthy behaviours including eating an unbalanced diet, doing little or no exercise, smoking and drinking alcohol excessively contribute toward this problem.

Part of the NHS's five-year forward plan includes integrating services for people with SMI more so that mental and physical health are better addressed. This includes introducing more interventions to support health behaviour change within integrated services. By health behaviours, we mean: diet, exercise, cigarette and alcohol use. There is currently very little research on integrated contexts including:

- How health behaviours are currently supported
- What helps and/or prevents health behaviour change in patients
- What helps and/or prevents staff supporting health behaviour change in patients
- Staff perceptions on health behaviours
- What training and/or resource may be needed to support health behaviour change
- How the integrated nature of a service may impact health behaviour change
The study aims to find out how or whether the [anonymised] has supported people with severe mental illness (SMI) in making health behaviour changes. We are interested in hearing staff views regarding: how the [anonymised] has supported people with SMI in terms of health behaviours, what is helpful and/or challenging, how the integrated nature of the [anonymised] may impact health behaviour change, how staff perceive health behaviours and what support is needed to help patients make healthy changes. We are also interested in how patients feel they have been supported in making these changes, but we will be asking them about this separately.

It is hoped that this information will be used to:

- Inform and guide future service provisions, models and services on how health behaviours could/should be supported for patients.
- Identify weaknesses and strengths in the [anonymised] and therefore inform [anonymised] development.
- Inform policy regarding whether integrated approaches are helpful in supporting health behaviours.
- Identify how to better support staff involved in helping support health behaviour change.
- Identify what level of resource that may be required within the [anonymised] to support health behaviours.

2. Why have I been invited to take part?
We are inviting staff working within the [anonymised] in the London Boroughs of [anonymised]. We are contacting staff who are either:
   a) part of or affiliated with the [anonymised]
   b) involved in the care of people with SMI [anonymised]
   c) part of senior organisational management involved in the implementation/design/monitoring of the [anonymised]
   d) a combination of all the above
We are focusing on the [anonymised] as this is one example of an integrated healthcare context. We are interested in finding out how supporting health behaviours within this kind of approach is working in this borough.

3. Do I have to take part?
No. Taking part is entirely voluntary and you are not obliged to take part as your role. It is your decision to take part in the study or not. You do not have to give a reason if you choose to take part or not. If you agree to take part, we will give you a consent form to read and sign. Taking part or not taking part will not affect your employment and/or involvement in the [anonymised]. If you decide that you want to take part, but later change your mind, it is possible to withdraw from the study at any time.
any time without giving a reason. If you withdraw, you can decide whether we can use any
information you have given us up to two weeks after the data are collected. The data cannot be
withdrawn beyond this point as it will be anonymised and added to the rest of the information we
collect from other participants. Withdrawing from the study will not affect your employment.

4. **What will happen to me if I take part?**
   - If you are interested in taking part or hearing more, please fill out and return the enclosed
     reply slip in the pre-paid envelope or please email/call us expressing your interest in taking
     part. **Contact details are available at the end.**
   - We will then contact you to discuss the study in a bit more detail. We will give you some time
to ask any questions that you may have.
   - If you then agree to taking part in the study, we will describe in more detail what participation
     involves. If you are eligible to take part, we will take your written signed consent to take part
     in the study on the day of the interview and/or focus group.
   - Participation may involve being invited to take part in a focus group with other staff and two
     researchers who will facilitate discussions and take notes. We will ensure that we are mindful
     of which staff we place together in focus groups, to avoid the prospect of staff feeling unable
     to express their opinions. We will ask questions and conduct group exercises to determine
     your perspectives on: health behaviour changes, what makes the service ‘integrated’, how
     the [anonymised] supports health behaviour change, what prevents/helps supporting and
     making health behaviour changes and what support may be needed to help. We will also
     ask a bit about your background such as your age, gender, ethnicity, job role etc to
     understand more about the different participants that take part and ensure we have included
     people from different backgrounds in the study.
   - Rather than being invited to partake in a focus group, some staff may be asked whether they
     would like to take part in a one to one interview. This will involve meeting the researcher who
     will ask questions about the topics above. Alternatively, some staff may be asked whether
     they would like to take part in both a focus group and an interview to explore opinions in more
     depth.
   - We would like to audio-record the focus group and one to one interviews with your
     permission. This helps us analyse the information and make sure that we have understood
     everything correctly. However, we will remove any identifiable information when we analyse
     this information and all recordings will be held securely in a password encrypted electronic
     file at UCL.
   - Focus groups and interviews will take place quiet settings in pre-booked meeting rooms
     either at the [anonymised] primary care clinic or UCL, where no one else will be able to hear
     our discussions. However, this will be arranged with you to meet your availability. Focus
     groups and interviews are expected to last up to 1-hour.
5. What are the possible disadvantages and risks of taking part?

There are no foreseeable disadvantages or risks to taking part in the study. However, the study will require a meeting and therefore commitment of your time.

6. What are the possible benefits of taking part?

Although there is no direct benefit of taking part in the study, it is hoped that an understanding of your views will help shape the way integrated healthcare settings support health behaviours for people with SMI in future. The information that you provide will be helpful to patients receiving healthcare, other staff delivering healthcare and those in charge of managing healthcare services. It is hoped that this may help improve health behaviour services in both the [anonymised] and wider context for people with SMI.

7. What if there is a problem?

We advise you to contact the research team in the first instance if you have any concerns or complaints. Any complaints that arise during the study will be appropriately addressed. We have provided more detail on this in part 2 of the document.

8. Will my taking part in this study be kept confidential?

Yes, all the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications. We provide more detail on this in part 2.

CONTACT DETAILS

Researcher: Suzan Hassan   Tel: 07494408973   Email: suzan.hassan@ucl.ac.uk

Address:
University College London,
Primary Care and Population Health,
Royal Free London NHS foundation Trust,
Medical School,
London
NW3 2PF

If you are considering taking part, please read the additional information in Part 2.
Part 2

9. What will happen if I no longer want to carry on with the study?

You are free to withdraw from the study at any point without giving reason. Withdrawing from the study or withdrawing your information will not affect your employment/ involvement within the [anonymised].

10. What if there is a problem?

We will take every care to ensure that your wellbeing is not compromised in any way. However, if you have any concerns about how you have been approached or treated, please speak to the research team who will do their best to answer any questions. If you remain unhappy and wish to complain formally, you can do this via the hospital’s Patient Advisory Liaison Service (PALS).

Email: [anonymised]

Address: [anonymised]

Phone number: [anonymised]

It is unlikely that you will be injured by taking part in the study. However, if this does occur and you suspect that the injury is a result of the Sponsor (University College London) negligence, you may be entitled to seek compensation. After talking to the study team, please make a claim in writing to the Chief Investigator of the study (Professor Kate Walters). We will then pass the claim to the Sponsor’s Insurers. You may have to pay your legal costs and you should consult a lawyer about this.

11. Will my taking part in this project be kept confidential?

All the information collected from you will be kept confidential at all times. However, there are limits to your confidentiality in circumstances involving you disclosing information that may put you and/or others at risk. The information will be held securely on paper and electronically at University College London under the provisions of The General Data Protection Regulation 2018. All paper files will be stored and locked away. Electronic files will be password protected. Your personal details such as your name, gender, ethnicity, job role etc., will not be passed to anyone outside the research team. You will be allocated a participant number which will be used as code to identify you on study forms, so that only researchers within the team are able to identity you.

The audio-recordings from the interview will be written out word-for-word by an external typist. We will use a UK-based third-party typist company who have a strict confidentiality agreement in place.
with University College London. We will publish parts of the transcripts but not any personal identifiable information with it.

Your records will be available to people authorised to work on the study but may also need to be made available to people authorised by the Sponsor (University College London), which is the organisation responsible for ensuring that the study is carried out correctly. We will also present some of the interviews to mental health service users from the McPin Foundation (an organisation aimed at involving people with lived experiences in mental health research) to gain their views about how we can better understand some of the information. However, we will remove any identifiable information such as names from these interviews, so that participants cannot be identified. By signing the consent form you agree to this access for the current study.

12. Local Data Protection Privacy Notice

University College London is the sponsor for this study based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Your data will be securely archived at the end of the study. In line with regulations, University College London will keep identifiable information about you for up to twenty years until the study has ended.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained if you do not request the information to be withdrawn. To safeguard your rights, we will use the minimum personally-identifiable information possible.

The lawful basis that will be used to process personal data are: ‘Public task’ for personal data and ‘Research purposes’ for special category data.

You can find out more about how we use your information by contacting UCL Data Protection Office at data-protection@ucl.ac.uk or by visiting this website: https://www.ucl.ac.uk/legal-services/privacy/participants-health-and-care-research-privacy-notice.

[Anconymised] NHS foundation and University College London will use your name and contact details to contact you about the research study, and make sure that relevant information about the study is recorded, and to oversee the quality of the study. Individuals from University College London and regulatory organisations may look at your research records to check the accuracy of the research study. [Anonymised] NHS Foundation will pass these details to University College London along with the information collected from you. The only people in University College London who will have access to information that identifies you will be people who need to contact you to approach you for...
participation, collect information or audit the data collection process. The people who analyse the information will not be able to identify you and will not be able to find out your name or contact details.

13. What will happen to the results of the research study?

We are unable to give you the results of your individual interview. However, the wider scientific results will be available once the study has finished. This is expected to be published in a scientific journal or presented at a conference. This research may also be presented to healthcare professionals and communicated via internet blogs and social media platforms. The research is also being conducted as part of a PhD project and will be written up in a thesis chapter. Participants will not be identifiable in any of the results. If you would like to see the final results or publication, please contact a member of the research team.

14. Who is organising and funding the research?

The study is funded by a PhD studentship award granted from the National Institute of Health Research (NIHR) School for Primary Care Research (SPCR). University College London are the sponsors of the study.

15. Who has reviewed the study?

To protect your interests, all research that is done in the NHS is carefully looked after by an independent group of people, known as the Health Research Authority (HRA) and a Research Ethics Committee before starting. This study has been reviewed and given a favourable opinion by London-Westminster Research Ethics committee (REC reference 19/L0/1233) Research Ethics Committee and HRA approval.

16. Further information

We would encourage you to ask researchers or healthcare providers any questions that you may have at any point during the study. Please speak to a member of the research team who will be able to provide you with further information. If you have any concerns about taking part in the study, please contact the research team.

CONTACT DETAILS

Researcher: Suzan Hassan  Tel: 07494408973  Email: suzan.hassan@ucl.ac.uk

Address:
University College London,

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Staff Participant Information Sheet, IRAS: 246924, version 2.0 (14/08/19)
Service user Participant Information Sheet

How do healthcare services support your health behaviours?

Name of researchers: Professor Kate Walters (Chief Investigator) and Suzan Hassan (PhD Student)

We are inviting you to take part in our research project. Before you choose whether you would like to take part, it is important that you understand the purpose of the project and what participation will involve for you. Please read the information below carefully or please ask the researcher/ health care provider to read the information to you. Please take the time to consider any questions you may have and discuss with the researcher. If you would like to discuss the information with others, please feel free to do so. This study is being conducted as part of a PhD student project in fulfilment for the award of Doctor of Philosophy.

- Part 1 describes information about the purpose of the project and what participation will involve if you decide to take part.
- Part 2 describes in more detail the general procedures about the study.

Part 1

1. What is the purpose of the study?

The study aims to find out how or whether health services have supported people with a mental health diagnosis in staying healthy, for example in their diet, exercises, smoking cigarettes and drinking alcohol. We already know that eating an unbalanced diet, doing little or no exercise, smoking and drinking regularly causes health issues like high blood pressure, high cholesterol levels, diabetes etc which can then put people at risk of other problems such as strokes and heart attacks.

We are interested in hearing your views about your keeping healthy. It does not matter if you feel that you have not made any healthy lifestyle changes. We would like to understand whether health services supported you in staying healthy, what you found helpful or challenging in making or attempting to make changes and how services that you have received such as smoking cessation, exercise groups or diet expertise have helped.
It is hoped that the information will help contribute to help improve future health services to:

- Better support patients
- Better support staff
- Reduce physical health problems

2. Why have I been invited to take part?

We are inviting people who live within the London Boroughs of [anonymised] who have a mental health diagnosis in their medical records, are living at home. We are focussing on this area of London because some people with a mental health diagnosis are receiving a new type of health service known as “Integrated Care”. This is where both mental and physical health are treated together so that patients should have better access to the care they need. We are interested in finding out how supporting healthy lifestyles within this kind of approach is working in this borough.

3. Do I have to take part?

No. Taking part is entirely voluntary. It is your decision to take part in the study or not. You do not have to give a reason if you choose to take part or not. If you agree to take part, we will give you a consent form to read and sign. If you decide that you want to take part, but later change your mind, it is possible to withdraw from the study at any time without giving a reason. If you withdraw, you can decide whether we can use any information you have given us up to two weeks after the data are collected. The data cannot be withdrawn beyond this point as it will be anonymised and added to the rest of the information we collect from other participants. However, if you lose capacity during the study, we will keep the information we have collected from you if you have provided your consent for this. Taking part or not taking part or withdrawing from the study will not affect the care you receive.

4. What will happen to me if I take part?

- If you are interested in taking part or hearing more, please fill out and return the enclosed reply slip in the pre-paid envelope or please email/call us expressing your interest in taking part. Contact details are available at the end.
- We will then contact you to discuss the study in a bit more detail. We will give you some time to ask any questions that you may have.
- If you then agree to taking part in the study, we will describe in more detail what participation involves. If you are eligible to take part, we will take your written signed consent to take part in the study.

Page 2 of 8

Service User Participant Information Sheet, IRAS: 244924, version 2 (14/08/19)
• Taking part will involve meeting with the researcher on one occasion to answer some questions about your opinions on healthy lifestyles, how health services may or may have not supported you in this, how health services communicate to each other about your health, what you found useful or problematic in making changes and what you found useful or unhelpful if being supported to make health behaviour changes. We will also ask a bit about your background such as your age, gender, ethnicity, marital status etc. to understand more about the different participants that take part and ensure we have included people from different backgrounds in the study.

• We would like to audio-record the conversation with your permission. This helps us analyse the information and make sure that we have understood everything correctly. We will remove any information that links back to your personal details when we analyse the data and we will store all recordings securely at UCL.

• The interview can take place in a quiet setting where you choose including your home or clinic, where no one else will be able to hear our conversation. This is expected to last around 1-hours depending on how much you would like to tell us.

5. Payments

We will offer you a £10 high-street voucher if you agree to take part in the study as a thank-you for your time.

6. What are the possible disadvantages and risks of taking part?

There are no foreseeable disadvantages or risks to taking part in the study. There may be some questions which may be sensitive in nature, however this is unlikely. However, if you feel the questions are sensitive, you do not have to answer them and we can stop the interview at any point if you feel uncomfortable. The study will also require a meeting and therefore commitment of your time.

7. What are the possible benefits of taking part?

Although there is no direct benefit of taking part in the study, it is hoped that an understanding of your views will help shape the way healthcare services support health behaviours in future. The information that you provide will be helpful to staff delivering healthcare, and those in charge of managing healthcare services. It is hoped that this may help improve health behaviour services for future patients and therefore patients’ physical health.

8. What if there is a problem?
We advise you to contact the research team in the first instance if you have any concerns or complaints. Any complaints that arise during the study will be appropriately addressed. We have provided more detail on this in part 2 of the document.

9. Will my taking part in this study be kept confidential?

Yes, all the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications. We provide more detail on this in part 2.

CONTACT DETAILS

Researcher: Suzan Hassan    Tel: 07.454408973    Email: suzan.hassan@ucl.ac.uk

Address:
University College London,
Primary Care and Population Health,
Royal Free London NHS Foundation Trust,
Medical School,
London
NW3 2PF

If you are considering taking part, please read the additional information in Part 2.
Part 2

10. What will happen if I no longer want to carry on with the study?

You are free to withdraw from the study at any point without giving reason. If you withdraw from the study, you can decide whether we can use any information you have provided us. Withdrawing from the study or withdrawing your information will not affect the care that you receive.

11. What if there is a problem?

We will take every care to ensure that your wellbeing is not compromised in any way. However, if you have any concerns about how you have been approached or treated by members of staff, please speak to the research team who will do their best to answer any questions. If you remain unhappy and wish to complain formally, you can do this via the hospital’s Patient Advisory Liaison Service (PALS).

Email: [anonymised]

Address:
[anonymised]

Phone number: [anonymised]

It is unlikely that you will be injured by taking part in the study. However, if this does happen and you suspect that you have been injured by taking part and the injury is a result of the Sponsor’s (University College London) negligence, you may be entitled to seek compensation. After talking to the study team, please make a claim in writing to Professor Kate Walters who is the Chief Investigator of the study (contact details below). We will then pass the claim to the Sponsor’s Insurers. You may have to pay your legal costs and you should consult a lawyer about this.

12. Will my taking part in this project be kept confidential?

All the information collected from you will be kept confidential at all times. However, there are some limits to your confidentiality in circumstances involving you disclosing information that may put you and/or others at risk. The information will be held securely on paper and electronically at University College London under the provisions of The General Data Protection Regulation 2018. All paper files will be stored and locked away. Electronic files will be password protected. Your personal details such as your name, gender, ethnicity, address etc., will not be passed to anyone outside the research team. You will be allocated a participant number which will be used as code to identify you on study forms, so that only researchers within the team are able to identify you.
The audio-recordings from the interview will be written out word-for-word by an external typist. We will use a UK-based third-party typist company who have a strict confidentiality agreement in place with University College London. We will publish parts of the transcripts but not any personal identifiable information with it.

Your records will be available to people authorised to work on the study but may also need to be made available to people authorised by the Sponsor (University College London), which is the organisation responsible for ensuring that the study is carried out correctly. We will also present some of the interviews to mental health service users from the McPin Foundation (an organisation aimed at involving people with lived experiences in mental health research) to gain other service user views about how we can better understand some of the information. However, we will remove any identifiable information such as names from these interviews, so that you cannot be identified. By signing the consent form you agree to this access for the current study.

13. Local Data Protection Privacy Notice
University College London is the sponsor for this study based in the United Kingdom. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Your data will be securely archived at the end of the study. In line with regulations, University College London will keep identifiable information about you for up to twenty years until the study has ended.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained if you do not request the information to be withdrawn. To safeguard your rights, we will use the minimum personally identifiable information possible.

The lawful basis that will be used to process personal data are: ‘Public task’ for personal data and ‘Research purposes’ for special category data.

You can find out more about how we use your information by contacting UCL Data Protection Office at data-protection@ucl.ac.uk or by visiting this website: https://www.ucl.ac.uk/legal-services/privacy/participants-health-and-care-research-privacy-notice.

[Anonymised] NHS foundation and University College London will use your name and contact details to contact you about the research study, and make sure that relevant information about the study is recorded, and to oversee the quality of the study. Individuals from University College London and
regulatory organisations may look at your research records to check the accuracy of the research study. [Anonymised] NHS Foundation will pass these details to University College London along with the information collected from you. The only people in Universitry College London who will have access to information that identifies you will be people who need to contact you to approach you for participation, collect information or audit the data collection process. The people who analyse the information will not be able to identify you and will not be able to find out your name or contact details.

14. What will happen to the results of the research study?

We are unable to give you the results of your individual interview. However, the wider scientific results will be available once the study has finished. This is expected to be published in a scientific journal or presented at a conference. This research may also be presented to healthcare professionals and communicated via internet blogs and social media platforms. The research is also being conducted as part of a PhD project and will be written up in a thesis chapter. Participants will not be identifiable in any of the results. If you would like to see the final results or publication, please contact Suzan Hassan.

15. Who is organising and funding the research?

The study is funded by a PhD studentship award granted from the National Institute of Health Research (NIHR) School for Primary Care Research (SPCR). University College London are the sponsors of the study.

16. Who has reviewed the study?

To protect your interests, all research that is done in the NHS is carefully looked at by an independent group of people, known as the Health Research Authority (HRA) and a Research Ethics Committee before starting. This study has been reviewed and given a favourable opinion by London-Westminster Research Ethics committee (REC reference 19/LO/1233) HRA approval.

17. Further information

We would encourage you to ask researchers or health care providers any questions that you may have at any point during the study. Please speak to a member of the research team who will be able to provide you with further information. If you have any concerns about taking part in the study, please contact the research team.

CONTACT DETAILS

Service user Participant Information Sheet, IRAS: 248924, version 2 (14/08/19)
Researcher: Suzan Hassan  Tel: 07494408973  Email: susan.hassan@ucl.ac.uk

Address:
University College London,
Primary Care and Population Health,
Royal Free London NHS foundation Trust,
Medical School,
London
NW3 2PF

Chief Investigator: Professor Kate Walters
Address:
University College London,
Primary Care and Population Health,
Royal Free London NHS foundation Trust,
Medical School,
London
NW3 2PF
Appendix O. Staff and patient background questionnaires for study 4

Staff questionnaire

Thank you for agreeing to take part in our study. We would like to ensure that we interview a range of staff in the [anonymised] to explore different opinions. We would therefore like to know a bit more about your background. This information will also help us analyse our data. We will ensure that all your information is anonymised when we write up our findings. There are no right or wrong answers. If you would prefer to not answer some of the questions, please move onto the next questions. Please ask the researcher if you have any questions.

Demographics

<table>
<thead>
<tr>
<th>What is your age?</th>
<th>Male ☐</th>
<th>Female ☐</th>
<th>Other, specify: ☐</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>How would you describe your gender? (tick)</th>
<th>White British ☐</th>
<th>Black or Black British African ☐</th>
<th>Asian or Asian British Indian ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>White Irish ☐</td>
<td>Black or Black British African ☐</td>
<td>Asian or Asian British Pakistani ☐</td>
</tr>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>White Other ☐</td>
<td>Black or Black British Black Other ☐</td>
<td>Asian or Asian British Bangladeshi ☐</td>
</tr>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>Mixed White/Black Caribbean ☐</td>
<td>Black or Black British Other ☐</td>
<td>Asian or Asian British Asian Other ☐</td>
</tr>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>White/Black African ☐</td>
<td>Black or Black British Other, specify: ☐</td>
<td>Asian or Asian British Not known ☐</td>
</tr>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>White/Asian ☐</td>
<td>Black or Black British Other, specify: ☐</td>
<td>Asian or Asian British Not known ☐</td>
</tr>
<tr>
<td>How would you describe your gender? (tick)</td>
<td>Mixed Other ☐</td>
<td>Black or Black British Other, specify: ☐</td>
<td>Asian or Asian British Not known ☐</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which borough do you work under as part of the [anonymised]??</td>
<td>[anon]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job role and experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is your job title?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How long have you been employed in this role?</td>
<td>4 years 2 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What type of involvement do you have in the [anonymised]??</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How long have you been involved in the [anonymised]??</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What mental health and/or physical services do you work across? (Please list, or mark as not applicable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have any previous experience (prior to working within the [anonymised]) with people with severe mental illness? If so, what?</td>
<td>Yes ✔ No ❑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have any previous experience (prior to working within the [anonymised]) with physical health problems? If so what?</td>
<td>Yes ✔ No ❑</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Health behaviour change experience

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>If yes, specify:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have any previous experience (prior to working within the [anonymised]) with either setting up/delivering health behaviour change interventions in the general population?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have any previous experience (prior to working within the [anonymised]) with either setting up/delivering health behaviour change interventions in the people with severe mental illness?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Researcher administered service user questionnaire

Participant ID: 

[Researcher to explain the following] Thank you for agreeing to take part in our study. We want to make sure that we get a range of people to take part in our study so that we can explore different opinions. We would therefore like to know a bit more about your background. This information will also help us analyse our data. We will make sure that none of your information can be identified when we write up our findings.

I am now going to ask you some questions to get some more background information. There are no right or wrong answers. You do not have to answer anything that you may be uncomfortable answering.

Demographics

<table>
<thead>
<tr>
<th>What is your age?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What borough do you currently live in? (tick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anon [ ]</td>
</tr>
<tr>
<td>__________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How would you describe your gender? (tick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male [ ]</td>
</tr>
<tr>
<td>__________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How would you describe your ethnicity? (tick)</th>
<th>White</th>
<th>Black or Black British</th>
<th>Asian or Asian British</th>
</tr>
</thead>
<tbody>
<tr>
<td>White British [ ]</td>
<td>Black Caribbean [ ]</td>
<td>Asian Indian [ ]</td>
<td></td>
</tr>
<tr>
<td>Irish [ ]</td>
<td>African [ ]</td>
<td>Pakistani [ ]</td>
<td></td>
</tr>
<tr>
<td>White Other [ ]</td>
<td>Black other [ ]</td>
<td>Bangladeshi [ ]</td>
<td></td>
</tr>
<tr>
<td>Mixed [ ]</td>
<td>Other [ ]</td>
<td>Asian Other [ ]</td>
<td></td>
</tr>
<tr>
<td>White/Black Caribbean [ ]</td>
<td>Other, specify: [ ]</td>
<td>Refused [ ]</td>
<td></td>
</tr>
<tr>
<td>White/Black African [ ]</td>
<td>Other, specify: [ ]</td>
<td>Not known [ ]</td>
<td></td>
</tr>
<tr>
<td>White/Asian [ ]</td>
<td>Other, specify: [ ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed Other [ ]</td>
<td>Other, specify: [ ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 1 of 4

Service user background questionnaire, IRAS: 246924, version 1.0 [16/04/19].
**Who do you live with?**

**How would you describe your employment status? (tick all that apply)**

- Full-time paid (>30hrs/week)
- Part-time paid (<30hrs/week or less)
- Voluntary work
- In education
- Retired
- Unemployed, on benefits
- Unemployed, not on benefits
- Other: specify: ___________________

**Healthcare services engagement**

| How many times in the last year have you seen the following...? | GP: __________  
|---------------------------------------------------------------|----------------
|                                                               | Practice Nurse: __________  
|                                                               | Mental health key worker: __________  
|                                                               | Psychiatrist: __________  
|                                                               | Other health professional (specify): __________ |
Mental and physical health factors

Do you have any of the following?  
High blood pressure □  High cholesterol □

Have you been told that you have diabetes or pre-diabetes?  
Yes □  No □  Diabetes/prediabetes (circle)

Do you smoke?  
Yes □  No □

Alcohol use- Brief AUDIT-C

<table>
<thead>
<tr>
<th>Scoring system</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do you have a drink containing alcohol?</th>
<th>Never</th>
<th>Monthly/less</th>
<th>2-4 times per month</th>
<th>2-3 times per week</th>
<th>4+ times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many units of alcohol do you drink on a typical day when you are drinking?</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7-8</td>
<td>10+</td>
</tr>
<tr>
<td>How often have you had 0 more units if female or 0 or more if male, on a single occasion in the last year?</td>
<td>Never</td>
<td>Less than monthly</td>
<td>Monthly</td>
<td>Weekly</td>
<td>Daily/ almost daily</td>
</tr>
</tbody>
</table>

Total overall score

Have you been told that you should lose weight by a health professional?

What diagnoses have you received from mental health practitioners for your mental health?
Alcohol unit reminder for researcher

This is one unit of alcohol...

...and each of these is more than one unit

Service user background questionnaire, IRAS: 246924, version 1.0 (16/04/19).
Appendix P. Staff and patient topic guides for study 4

Draft Staff Interview Topic Guide

Prior to interview

- Introduce myself and my role and explain that I am not affiliated with neither mental nor physical health teams and I am completely separate from the [anonymised]
- Explain the purpose of the interview; exploring their views on how [anonymised] may or may not have helped in terms of supporting health behaviours (e.g. smoking, diet etc.)
- Explain procedures (broad questions will be asked, interviews will be audio-recorded to help analysis)
- Reiterate that all information will be held confidentially and securely
- Read and sign the consent form, provide a copy to participant
- Check whether the length of interview suits their time availability
- Explain that I may take notes during the interview to aid my understanding
- Explain that all opinions are valid and there are no correct answers

Can you tell me a bit about how you are involved in the [anonymised]?
- What is your role?
- What other commitments/roles do you have?

Can you tell me about [what happened in a recent experience/what happens when a patient with psychosis presents/presenting/screenscreening with] cardiovascular disease risk factors? What was your approach in addressing this?
- What is/was the decision making process in terms of whether or not lifestyle factors are addressed? (What was/is your role?)
- Can you explain why?
- How are/were these addressed? (What was/is the patients’ role? What was/is the patients’ role in the decision-making? Is anyone else involved?)
- Can you explain why?

Can you explain [how did the [anonymised]/how the [anonymised] may support patients with psychosis with consuming a healthy diet?
- Can you explain your role/ involvement in this process?
- What resource/support is available in the [anonymised] to facilitate this?
- How were/are patients’ progress monitored?
- How were/are long-term changes encouraged?
- What happened/happens when a patient may struggle/not engage?

Can you explain [how did the [anonymised]/how the [anonymised] may support patients with psychosis doing more exercise?]
- Can you explain your role/ involvement in this process?
- What resource/support is available in the [anonymised] to facilitate this?
- How were/are patients’ progress monitored?
- How were/are long-term changes encouraged?
- What happened/happens when a patient may struggle/not engage?

Can you explain [how did the [anonymised]/how the [anonymised] may support patients with psychosis regarding smoking cessation?
- Can you explain your role/ involvement in this process?
- What resource/support is available in the [anonymised] to facilitate this?
- How were/are patients’ progress monitored?
- How were/are long-term changes encouraged?
Can you explain [how did the [anonymised]/ how the [anonymised] may] support patients with psychosis with alcohol reduction?

- Can you explain your role/ involvement in this process?
- What resource/ support is available in the [anonymised] to facilitate this?
- How were/are patients' progress monitored?
- How were/are long-term changes encouraged?
- What happened/happens when a patient may struggle/ not engage?

Can you describe any other ways that you/ the [anonymised] have been involved in supporting patients with psychosis to live a healthy lifestyle?

- Has this helped?

[Depending on role as may not be directly involved] What factors do you think help/ encourage [you personally/ the [anonymised]] to support lifestyle changes in patients with psychosis?

[Depending on role as may not be directly involved] What are some factors that may prevent or discourage [you personally/ the [anonymised]] from supporting lifestyle changes in patients with psychosis?

You mentioned the following [barriers] problems that prevent/ affect your ability to support lifestyle changes in patients with psychosis. Can you explain some ways that these problems could be overcome and/or addressed in the [anonymised]?

- What would help?

[If not already covered] How helpful do you think current provisions are in the [anonymised] for improving health behaviours in patients with psychosis (E.g. diet, smoking, alcohol, exercise)?

- Can you explain why?
- Why do you think some patients are more able to make and/or maintain lifestyle changes than others in the [anonymised]?
- Why do some patients struggle?
- What helps those that are able to make changes?

How well do you feel that mental and physical health services in primary and secondary care work together in the [anonymised] to support people with psychosis with their health behaviours?

- Can you explain why?
- How do you feel about that?
- What can be improved?
- How do you think the integrated nature of the [anonymised] may impact on patients' lifestyle changes or overall health?
- Can you tell me a bit about how the [anonymised] is an integrated healthcare service for people with psychosis?
- In what way is it an 'integrated' service?
- How are both mental and physical addressed together?
- How do mental and physical health services share information?
- How are decisions about patient treatment agreed between mental and physical health services?
Can you tell us a bit about your understanding and knowledge of behaviour change techniques?

- What ones are you familiar with? Monitoring
- What techniques do you/the [anonymised] use with patients with SMI?
- If you/ the [anonymised] were to take a more active role in encouraging healthier lifestyles, what would you like to know about BCTs?
  - Check for agreement and disagreement, different experiences, examples, thoughts, encourage quieter people to speak up (primary care vs secondary care, different roles, settings etc.)

What do you think about:

1) Having further training in behaviour change techniques?

2) Peer support delivering this advice (or them supporting you)? What do you think their role could be?

We are reaching the end of the interview now, so I would like to finish by asking you: Is there anything that has not been discussed that you would like to raise? Do you have any other comments/questions or ideas?

Notes:

- Thank participants
- Debrief participants
- Ask if they have any further questions about the study

[Take field notes]

- Setting: home/ clinic/ busy/ quiet/ comfortable?
- Participant factors: behaviour, personality, mood
- Any impact of researcher characteristics on interview? (Gender, age, appearance, ethnicity, education, culture, class, ability)
- Any impact of participant characteristics on interview? (As above)
- Any key events during the interview?
- Any changes to the interview topic guide?
Prior to interview

- Introduce myself and my role and explain that I am not affiliated with neither mental nor physical health teams and that questions regarding health matters should be directed toward health care professionals
- Explain the purpose of the interview: exploring their views on how health services may or may not have helped in terms of supporting them to be healthy (e.g. smoking, diet etc.)
- Explain procedures (specific questions will be asked, interviews will be audio-recorded to aid analysis)
- Reiterate that all information will be held confidentially and securely
- Read and sign the consent form, provide a copy to participant
- Check whether the length of interview suits their time availability
- Explain that I may take notes during the interview to aid my understanding
- Explain that all opinions are valid and there are no correct answers

Can you tell me a little bit about the types of healthcare that you are receiving at the moment/
have received recently?

- Have you seen anyone about your physical health?
- What about your mental health?
- Why did you see them?

Can you tell me a little bit about the healthcare advice or recommendations that healthcare professionals such as [healthcare provider] have given you about a healthy lifestyle?

- What did they say to you? Diet/ exercise/ smoking/ alcohol?
- Why do you think they said this?
- Is there anything that you personally think you may need to change? Do you...eat healthily/exercise/ smoke/ drink alcohol?
- Was this always the case? (if stating currently healthy)
- How do you feel about [healthcare provider] not recommending this?

EXERCISE

Can you tell me about your current levels of exercise?

- What do you do?
- How do you feel about this?

[If current levels moderate-high] What motivates you? What helps you keep this going? What gets in the way? How do you overcome this?

[If current levels low] Have there been times where you have exercised more/ tried to exercise more?

- Can you tell me a bit about it and how you went about exercising more?
- Why was this?
- What has helped or encouraged you?
- What has stopped or prevented you from continuing?
- What would help/ encourage you?

How [did or does or would] exercising fit into your daily lifestyle?

- How easy or difficult was/would it to make this a habit? Why (what prevented/ what helped)?
- How difficult or easy was/would this to maintain? Why (what prevented/ what helped)?
- What would help you make this a habit/ maintain it?
*HYPOTHETICAL Qs: What would you feel if your GP asked about exercise. What would you feel if your psychiatrist asked about exercise? Keyworker/ practice nurse? Would it make a difference to you changing your behaviour depending on who asked?

DIET

Can you tell me about your current diet?
- What do you eat and drink?
- How do you feel about this?

[If current diet healthy] What motivates you to eat healthily? What helps you keep this going? What gets in the way? How do you overcome this?

[If current diet unhealthy] Have there been times where you have eaten a healthier diet/ tried to eat a healthier diet?
- When was this?
- Why was this?
- Can you tell me a bit about it and how you went about eating healthier?
- How did you feel you did with this? Why?
- What has helped or encouraged you?
- What has stopped or prevented you from continuing?
- What would help/ encourage you?

How [did or does or would] improving your diet fit into your daily lifestyle?
- How easy or difficult was/would it to make this a habit? Why (what prevented/ what helped)?
- How difficult or easy was/would this be to maintain? Why (what prevented/ what helped)?
- What would help you make this a habit/ maintain it?

*HYPOTHETICAL Qs: What would you feel if your GP asked about diet, What would you feel if your psychiatrist asked about diet? Key worker/ practice nurse? Would it make a difference to you changing your behaviour depending on who asked?

SMOKING (if applicable)

Ex-smokers: What made you quit smoking? How did you do it?
- How did you overcome any difficulties in quitting?

Current smokers: Have you ever tried to or quit/reduced the amount you smoked before?
- Can you tell me a bit about it and how you went about reducing/ quitting smoking?
- How did you feel you did with this? Why?
- Why did you do this?
- What has helped or encouraged you?
- What has stopped or prevented you from continuing to cut down or quit? What made you restart?
- What would help/ encourage you?

How [did or does or would] quitting/reducing smoking fit into your daily lifestyle?
- How easy or difficult was/would it be to make this a habit? Why (what prevented/ what helped)?
- How difficult or easy was/would this be to maintain? Why (what prevented/ what helped)?
- What would help you make this a habit/ maintain it?

*HYPOTHETICAL Qs: What would you feel if your GP asked about smoking, What would you feel if your psychiatrist asked about smoking? Key worker/ practice nurse? Would it make a difference to you changing your behaviour depending on who asked?
ALCOHOL (if applicable)

Have you ever tried to or quit/ reduced drinking alcohol before?

- Can you tell me a bit about it and how you went about reducing the amount of alcohol you were drinking or quitting drinking alcohol?
- How did you feel you did with this?
- What has helped or encouraged you?
- What has stopped or prevented you?
- What would help/ encourage you?

How [did or does or would] quitting/ reducing your alcohol consumption into your daily lifestyle?

- How easy or difficult was it to make this a habit? Why (what prevented/ what helped)?
- How difficult or easy was this to maintain? Why (what prevented/ what helped)?
- What would help you make this a habit/ maintain it?

*HYPOTHETICAL Qs: What would you feel if your GP asked about alcohol, What would you feel if your psychiatrist asked about alcohol? Key worker/ practice nurse? Would it make a difference to you changing your behaviour depending on who asked?

Can you describe any services or support that you have access to that may help in supporting you in [healthy lifestyle/ refer to behaviour change mentioned earlier e.g. stopping smoking/ exercising] more?

- Do you use these? Why/ why not?
- Can you tell me a bit about what happens in these groups/ facilities? (E.g. who runs them, what happens in appointments)?
- How did you come to finding out about/ attending these?
- What helped you attend/ put you off from attending?
- Do/ did they help? Why?
- What kinds of facilities do you think would help you to change [lifestyle factor mentioned before]? Why?

How well do you feel [healthcare professionals/ specialist service] helped you to [lifestyle change]?

- Why do you think this?
- What support did they provide?
- Was there anything else they could have done to help you?
- Would you change anything in terms of how they helped you?
- You mentioned [barriers] prevented/ stopped your [lifestyle changes] earlier, how do you think [healthcare professionals/specialist service] could they have helped with these?
- You mentioned [facilitators] helped with your [lifestyle changes] earlier, what influence (if any) did [healthcare professionals/specialist service] have on these?

Thinking about both your mental and physical healthcare providers such as [healthcare professional] ...

How well do you feel that mental and physical health services work together to help you achieve a healthier lifestyle? [e.g. if you had a blood test for diabetes at the GP, would your mental health worker know about this? If your mental health worker gave you advice about weight reduction, would your GP know about this?]

- Can you give an example of when you think it has worked well/ not so well?
- Why do you think this?
- Has this helped you in anyway?
- What is your preference for them working together to help you with a healthy lifestyle?
Can you describe whether there is anything else that both your mental and physical health care teams could have done together to help you?

- Why do you think this is?
- Information sharing/communication?

What do you feel about a trained support worker giving you advice to help achieve a healthier lifestyle? What do you feel about training to be one?

We are reaching the end of the interview now, so I would like to finish by asking you: Is there anything that has not been discussed that you would like to raise? Do you have any other comments/questions or ideas.

Notes:

- Thank participants
- Give participants voucher
- Debrief participants
- Ask if they have any further questions about the study

[Take field notes]

- Setting: home/clinic/busy/quiet/comfortable?
- Participant factors: behaviour, personality, mood
- Any impact of researcher characteristics on interview? (Gender, age, appearance, ethnicity, education, culture, class, ability)
- Any impact of participant characteristics on interview? (As above)
- Any key events during the interview?
- Any changes to the interview topic guide?
Appendix Q. Staff and patient consent forms for study 4

STAFF CONSENT FORM

Exploring staff perspectives on how the [anonymised] supports health behaviours in people with severe mental illness.

Thank you for considering taking part in our research. Please make sure that the researcher has explained the project to you in detail and has answered any questions you have before you decide to take part. Please do not hesitate to ask any other questions you have if you are unsure about anything. Please complete the form below once you have read the information sheet.

By initialling each box, I confirm that I understand that I will be consenting to this part of the study. If I do not initial the boxes, I understand this means I do not give my consent to taking part in the study.

Name of Researchers: Professor Kate Walters (Chief Investigator) / Suzan Hassan (PhD Student) /

Please initial box

1. I confirm that I have read and understood the information sheet for the above study dated: 

...........................................(version...........). I confirm I was given time to consider taking part and the opportunity to ask questions which were answered satisfactorily.

2. I understand that taking part in the study is voluntary and I am able to withdraw myself. Any information collected from me can be withdrawn up to two weeks from data collection and not beyond this point. I understand that withdrawing myself or my information will not affect my employment or my standing in my profession.

3. I understand that relevant sections of the data collected during the study, may be looked at by individuals from the sponsor of the study (University College London) and responsible persons authorised by the sponsor, from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research.

4. I understand that some of the interviews and/or focus groups may be shared with mental health service users from the MoPin Foundation to help with the analysis process. I understand that my personal information will be anonymised in these interviews so that my data is not identifiable.

5. I understand that the focus group and/or interview will be audio-recorded and the contents will be written out word for word (transcribed).

Page 1 of 2

Staff Consent Form, IRAS: 246924, version 1.0 (14/08/19)
Please initial box

6. I understand that only anonymised information collected from me will be used to support other research in the future.

7. I agree to anonymised extracts of my interview being used in publications, reports or presentations that are relevant to the study.

8. I give permission for researchers to contact me again if they require any further information or to give me more information to participate in further interviews and/or focus groups related to the current study.

9. I voluntarily agree to take part in the above study.

____________________________              ________________              _______________________
Name of participant                       Date                                Signature

____________________________              ________________              _______________________
Name of person taking consent              Date                                Signature

Page 2 of 2

Staff consent form, IRAS: 240914, version 2.0 (14/08/19)
SERVICE USER CONSENT FORM

How do healthcare services support your health behaviours?

Thank-you for considering taking part in our research. Please make sure that the researcher has explained the project to you in detail and has answered any questions you have before you decide to take part. Please do not hesitate to ask any other questions you have if you are unsure about anything. Please complete the form below once you have read the information sheet or listened to someone read it to you.

By initialing each box, I confirm that I understand that I will be consenting to this part of the study. If I do not initial the boxes, I understand this means I do not give my consent to taking part in the study.

Name of Researchers: Suzan Hassan/ Professor Kate Walters

1. I confirm that I have read and understood the information sheet for the above study dated: .......................................................(version: ...........). I confirm I was given time to consider taking part and the opportunity to ask questions which were answered satisfactorily.

2. I understand that taking part in the study is voluntary and I am able to withdraw myself at any time. Any information that is collected from me can be withdrawn up to two weeks from data collection and not beyond this point. I understand that withdrawing myself or my information will not affect my medical care or legal rights.

3. I understand that relevant sections of my medical notes and data collected during the study, may be looked at by individuals from the sponsor of the study (University College London) and responsible persons authorised by the sponsor from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.

4. I understand that should I lose capacity to consent during the study, all the data already collected from and about me will be retained and used by University College London.

5. I understand that some of the interviews may be shared with mental health service users from the Mopin Foundation to help with the analysis process. I understand that my personal information will be anonymised in these interviews so that my data is not identifiable.

6. I understand that the interview will be audio-recorded and the contents will be written out word for word (transcribed).

Page 1 of 2

Service user Consent Form, IRAS: 246024, version 2.0 (14/08/10)
7. I understand only anonymised information collected from me will be used to support other research in the future.

8. I agree to anonymised extracts of my interview being used in publications, reports or presentations that are relevant to the study.

9. I voluntarily agree to take part in the above study.

Name of participant __________________________ Date __________________________ Signature __________________________

Name of person taking consent __________________________ Date __________________________ Signature __________________________
Appendix R. Research Ethics Committee (REC) and Health Research Authority (HRA) approvals for study 4

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval.

06 September 2019

Professor Kate Walters
Professor of Primary Care & Epidemiology
University College London
Research Department of Primary Care and Population Health
Upper Third Floor, UCL Medical School (Royal Free Campus)
Rowland Hill Street, London
NW3 2PF

Dear Professor Walters

Study title: Exploring the mechanisms behind how health behaviours are supported and changed within an integrated healthcare context for people with severe mental illness (SMI)

REC reference: 19/LO/1233
Protocol number: N/A
IRAS project ID: 246924

Thank you for your letter of 19 August 2019, responding to the Committee's request for further information on the above research [and submitting revised documentation].

The further information has been considered on behalf of the Committee by the Alternate Vice-Chair.
Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation [as revised], subject to the conditions specified below.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study:

Confirmation of Capacity and Capability (in England, Northern Ireland and Wales) or NHS management permission (in Scotland) should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA and HCRW Approval (England and Wales) NHS permission for research is available in the Integrated Research Application System.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations.

Registration of Clinical Trials

It is a condition of the REC favourable opinion that all clinical trials are registered on a publicly accessible database. For this purpose, clinical trials are defined as the first four project categories in IRAS project filter question 2. For clinical trials of investigational medicinal products (CTIMPs), other than adult phase I trials, registration is a legal requirement.

Registration should take place as early as possible and within six weeks of recruiting the first research participant at the latest. Failure to register is a breach of these approval conditions, unless a deferral has been agreed by or on behalf of the Research Ethics Committee (see here for more information on requesting a deferral: https://www.hra.nhs.uk/planning-and-improving-research/research-planning/research-registration-research-project-identifiers/).

As set out in the UK Policy Framework, research sponsors are responsible for making information about research publicly available before it starts e.g. by registering the research project on a publicly accessible register. Further guidance on registration is available at: http://www.hra.nhs.uk/planning-and-improving-research/research-planning/transparency-responsibilities/.

You should notify the REC of the registration details. We will audit these as part of the annual progress reporting process.
It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

**After ethical review: Reporting requirements**

The attached document “After ethical review – guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study, including early termination of the study
- Final report

The latest guidance on these topics can be found at [https://www.hra.nhs.uk/approvals-amendments/managing-your-approval/](https://www.hra.nhs.uk/approvals-amendments/managing-your-approval/).

**Ethical review of research sites**

**NHS/HSC sites**

The favourable opinion applies to all NHS/HSC sites listed in the application subject to confirmation of Capacity and Capability (in England, Northern Ireland and Wales) or management permission (in Scotland) being obtained from the NHS/HSC R&D office prior to the start of the study (see “Conditions of the favourable opinion” below).

**Non-NHS/HSC sites**

I am pleased to confirm that the favourable opinion applies to any non-NHS/HSC sites listed in the application, subject to site management permission being obtained prior to the start of the study at the site.

**Approved documents**

The final list of documents reviewed and approved by the Committee is as follows:

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<tr>
<th>Document</th>
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**Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

**User Feedback**

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:

http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

**HRA Learning**

We are pleased to welcome researchers and research staff to our HRA Learning Events and online learning opportunities—see details at:

https://www.hra.nhs.uk/planning-and-improving-research/learning/

<table>
<thead>
<tr>
<th>Reference</th>
<th>Please quote this number on all correspondence</th>
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<tr>
<td>19/LO/1233</td>
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</table>
With the Committee’s best wishes for the success of this project.

Yours sincerely

Mr Malcolm Morton
Alternate Vice Chair of Committee & Meeting Chair
Email: nrescommittee.london-westminster@nhs.net

Enclosures:  “After ethical review – guidance for researchers” [SL-AR2]

Copy to: Miss Nikkayla Dixon
Professor Kate Walters  
Professor of Primary Care & Epidemiology  
University College London  
Research Department of Primary Care and Population  
Health  
Upper Third Floor, UCL Medical School (Royal Free Campus)  
Rowland Hill Street, London  
NW3 2PF  
17 September 2019  

Dear Professor Walters,

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title: Exploring the mechanisms behind how health behaviours are supported and changed within an integrated healthcare context for people with severe mental illness (SMI)

IRAS project ID: 246924
Protocol number: N/A
REC reference: 19/LO/1233
Sponsor: University College London

I am pleased to confirm that HRA and Health and Care Research Wales (HCRW) Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, in line with the instructions provided in the “Information to support study set up” section towards the end of this letter.

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland? HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report.
(including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?
HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?
The standard conditions document “After Ethical Review – guidance for sponsors and investigators”, issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:
  - Registration of research
  - Notifying amendments
  - Notifying the end of the study
The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is 246924. Please quote this on all correspondence.

Yours sincerely,
Rachel Katzenellenbogen
Approvals Specialist

Email: nrescommittee.northwest-haydock@nhs.net

Copy to: Miss Nikkayla Dixon
List of Documents

The final document set assessed and approved by HRA and HCRW Approval is listed below.

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### Appendix S. Process of mapping coded data to BCTT and individual BCT labels with illustrative quotes: study 4

#### Table 1. Descriptive codes identified in staff and patient interviews regarding how health behaviour change was supported by staff in the integrated mental and physical health setting mapped to the behaviour change taxonomy (version 1) labels

<table>
<thead>
<tr>
<th>Descriptive codes identified from raw patient data</th>
<th>Descriptive codes identified from raw staff data</th>
<th>Behaviour change technique (BCTs) labels in the BCTT (v1)</th>
</tr>
</thead>
</table>
| Graded approach, building on achievements slowly and creating relationship | Practical social support taking people to groups/signposting to long-term support services | • Graded tasks (8.7)  
• Social support (emotional) (3.3)  
• Social support (emotional) (3.3)  
• Social support (practical) (3.2) |
| Signposting to services | Involvement of supportive others | • Social support (practical) (3.2) |
| Encouragement | Encouragement, emphasising benefits and incentives | • Social reward (10.4)  
• Social support (emotional) (3.3)  
• Verbal persuasion about capability (15.1)  
• Pros and cons (9.2)  
• Material reward (behaviour) (10.2)  
• Non-specific incentive (10.6) |
| Relationship with psychiatrists and GPs | Problem-solving | • Social support (emotional) (3.3)  
• Verbal persuasion about capability (15.1)  
• Focus on past success (15.3) |
| GP, nurse, psychiatrist providing knowledge | Providing knowledge/ Motivational interviewing | • Biofeedback (2.6)  
• Instruction on how to perform behaviour (4.1)  
• Information about health consequences (5.1)  
• Action planning (1.4)  
• Behavioural practice/rehearsal (8.1)  
• Demonstration of the behaviour (6.1) |
<table>
<thead>
<tr>
<th>Biofeedback</th>
<th>Biofeedback</th>
<th>• Biofeedback (2.6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Being realistic and meeting needs of client</strong></td>
<td>• Habit formation (8.3)</td>
<td>• Instruction on how to perform behaviour (4.1)</td>
</tr>
<tr>
<td><strong>Enabling honest conversations using interpersonal skills</strong></td>
<td>• Graded tasks (8.7)</td>
<td>• Social support (emotional) (3.3)</td>
</tr>
<tr>
<td><strong>Goal setting, review and follow-up</strong></td>
<td>• Monitoring of behaviour (2.1) and outcomes (2.5) of behaviour by others without any feedback</td>
<td>• Goal setting (Behaviour and outcome) (1.1., 1.3) • Action planning (1.4) • Review behaviour goal(s) (1.5) • Social reward (10.4)</td>
</tr>
<tr>
<td><strong>Identifying activities patients enjoy</strong></td>
<td>• Associative learning (7.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Identifying what patients were good at in the past</strong></td>
<td>• Focus on past success (15.3)</td>
<td></td>
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<tr>
<td><strong>Substitution of behaviours</strong></td>
<td>• Behaviour substitution (8.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Visual tools to increase knowledge</strong></td>
<td>• Information about health consequences (5.1)</td>
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</table>
• Behaviour substitution (8.2)
Table 2. Staff and patient reported descriptions of the methods to support health behaviour change by staff in the integrated mental and physical setting mapped to the behaviour change technique taxonomy (BCTT, version 1) with illustrative quotes

<table>
<thead>
<tr>
<th>BCT Taxonomy broader grouping</th>
<th>BCT label from BCT taxonomy</th>
<th>Methods used to facilitate application</th>
<th>Illustrative quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goals and planning</td>
<td>Goal setting (Behaviour and outcome) (1.1., 1.3)</td>
<td>Communicating with patients to identify behaviours and/or outcomes that they would like to address such as becoming more active and/or losing weight. Using this information to agree on personalised and meaningful goals to help patients achieve their desired behaviours and/or outcomes.</td>
<td>… you can do… short-term, medium-term and long-term goals. In terms of physical health you can kinda’ look at their long-term goal of, for instance, being able to do a bit more exercise and being able to go out and walk if you’ve got chest problems or anything like that or wanting to give up anything. And then working back in, like, oh, well, this can be the medium-term, and this can… Like, short-term we’ll… Do these things, and we’ll, like, keep coming back to those. And then they’ve set the goals… (S11 Female, 20’s, Allied health professionals &amp; other team roles)… we can then try and look at what their goals and values and their difficulties are, and we do that on a one to one basis. And they’re just, they’re not just one of a number, um, it very much is a personal thing, that’s geared towards them… she set herself a target of 30 stone by Christmas (S17 Female, 50’s, Allied health professionals &amp; other team roles).</td>
</tr>
<tr>
<td>Problem-solving (1.2)</td>
<td>Encouraging patient to identify triggers of unhealthy behaviours such as stress in the environment and helping to identify ways that patient could manage their stress</td>
<td>…to really try to help us focus on noticing the triggers of the eating binges…. she was able to notice that there were some quite, quite straightforward triggers that happened. So if there was a family row, that was a… There was a load of stress in the family, she would go straight out of the family home, there was a [fast food restaurant] really near her and she would just go there and eat every day… as we did all that work on mood, a lot of the ways that she was using to manage mood were around food. So part of the work was around thinking of other ways of managing mood rather than using food. (S18...</td>
<td></td>
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<tr>
<td>Action planning (1.4)</td>
<td>Jointly formulating a care plan with patients involving guidance on what foods to consume and when or how to maintain health such as attending yoga sessions or utilising particular contexts such as social environment.</td>
<td>“...just planning maybe like a week’s worth of food write a care plan and say okay, look, let’s try this and you can let me know how it goes.” (S12 Female, 20’s, Nurse)</td>
<td>“...we drew up, erm, a care plan... things that I will do to help myself... we talked about doing yoga, some of the safety nets, and support network I utilise... so we just put a care plan together with some action plans... Of, yeah, things to keep me maintaining my health.” (P13 Female, 30’s, Bipolar)</td>
</tr>
<tr>
<td>Review outcome goal(s) (1.7)</td>
<td>Identifying whether the patients’ behaviour aligns with the goals they had set.</td>
<td>“...care planning... That’s a really good way to review as well... What they goals were last year or six months ago. And how far they are to getting there.” (S15 Male, 30’s, Allied health professionals &amp; other team roles)</td>
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<tr>
<td>2. Feedback and monitoring</td>
<td>Monitoring of behaviour (2.1) and outcomes (2.5) of behaviour by others without any feedback</td>
<td>Certain staff given responsibility of observing whether patients are continuing with certain behaviours such as healthy eating or outcomes such as reduced weight. However, no indication of whether this is then communicated to patients during process.</td>
<td>“...that care coordinator then should ideally be monitoring and encouraging, um, that process to continue.” (S1 Male, 50’s, Allied health professionals &amp; other team roles)</td>
</tr>
<tr>
<td>Feedback on behaviour (2.2) and/or feedback on outcome (2.7)</td>
<td>Providing feedback to patients on the progress they have made with their behaviour or outcome of the behaviour and discuss how they may improve or progress further.</td>
<td>I help people identify...how things have changed for them. You know, and what they might have been like...Previously, or at their presentation, how much they're doing now and how different that is...... How we might progress it and how it might look...Towards the end of the progression... (S13 Male, 40's, Allied health professionals &amp; other team roles)</td>
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<td>Self-monitoring of behaviour (2.3)</td>
<td>Encouraging patients to use food diaries to keep track of eating habits.</td>
<td>....one of the strategies could be, like, keeping a food diary. (S10 Male, 40’s, Allied health professionals &amp; other team roles)</td>
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<tr>
<td>Biofeedback (2.6)</td>
<td>Monitoring patients using clinical measures such as weight, blood pressure, carbon monoxide, blood tests and communicating the results to patients.</td>
<td>Seeing...their blood sugars, their weight, their BMI. (S12 Female, 20’s, Nurse) ... carbon monoxide monitoring and all that stuff. And so we have a healthcare assistant who will do that for people in-house (S20 Male, 30’s, Doctor) It’s also helpful to use the... ‘smokerlyzer’ in which they breathe into the machine. Um, and you can see your tar levels, your carbon dioxide levels. (S3 Female, 40’s, Nurse)</td>
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The other day when I was here, and they said, my blood, um, my blood pressure… is a little bit high… I was weighed, she weighed me… I’ve always weighed 15 stone, but all of a sudden, I’ve grown to 16 and a half stone (P1 Male, 40’s, Bipolar)

When the nurse weighed me, about 90 (kg) or something… my sugar level gone 6.5. (P9 Female, 50’s, Schizophrenia)

<table>
<thead>
<tr>
<th>3.Social support</th>
<th>Social support (practical) (3.2)</th>
<th>Involving informal social networks to provide practical care for patients. Referring patients to receive practical support from specialist behaviour change services.</th>
</tr>
</thead>
</table>
|                  |                                 | She’s overweight, she does little exercise. She eats, um, a really stodgy diet, or she ate a really stodgy diet. So, we got, um, her daughter involved, there’s a grandchild as well. So, we got her daughter involved in thinking about the types of food and looking after mum a bit more and having a bit of variety. A little bit more walking was happening. But essentially she was very unwell. She needed looking after…We have…have alcohol and drug workers that come in to visit and so the care coordinators highlight where there is some people who needs a bit more support in that area. (S7 Female, 50’s, Nurse)

…if it’s more about kind of support with, um, planning a healthy diet and actually buying the foods. In the past I’ve, um, I’ve referred for floating support through local resource… Which is a community centre but they also offer one-to-one support. (S15 Male, 30’s, Allied health professionals & other team roles)

…signpost to other organisations as a longer term strategy of support. (S17 Female, 50’s, Allied health professionals & other team roles)

…the 12 week free [physical activity] course… So the healthcare assistant signed me up to it. (P13 Female, 30’s, Bipolar)

[OT name] has got me started into, you know, um, to maybe… getting into
maybe cooking classes. (P4 Female, 30’s, Schizophrenia)

I go to [location anonymised] for Zumba exercise… they referred to the… Yeah, I don’t know. Referred to the, um, service, and she came and, uh, she, uh, arranged it for me to do… Nurse, I think. Nurse or social worker. (P9 Female, 50’s, Schizophrenia)

| Social support (emotional) (3.3) | Taking patients to physical activity groups and performing physical activity with them. Using interpersonal skills to build relationship, trust with patients and whilst using a non-judgemental approach to encourage patients to feel comfortable to discuss any problems they may be having with their health behaviours and encourage attendance of physical activity groups. Set up peer group activities to encourage behaviour changes amongst peers and… | I’ve taken them on walking groups, um, consistently in my previous role, I’m taking someone on Monday to football group. So, it’s a lot of hand-holding (S1 Male, 50’s, Allied health professionals & other team roles) …initially it would be…shall we try and meet up outside, which we did…then it was, um, like, okay, shall we walk a little bit together, shall we walk to the venue together, so I would go there and meet and we would walk together and then walk back…. not being judgemental of it. It’s just trying to help…. encouragement for the person that they are and the difficulties that they’ve got….they…need the support that’s there (S17 Female, 50’s, Allied health professionals & other team roles) …we’re there for them…You know what I mean, and there’s a difference…people access us or me or…Our service willingly, because they need help…. And they don’t feel like they’re gonna’ be judged for it…And they don’t feel like they’re gonna’ be sectioned for it…I would say it’s a support service, that helps people… he comes in and says he feels so comfortable…Because nobody asks him about his past, nobody asks, nobody, you know, you know, probes…Into what his experiences…(S13 Male, 40’s, Allied health professionals & other team roles )

The badminton group and the football group. That is kind of a way of peer supporting… coz it’s quite nice to see the interactions of, like, one patient
interaction and encouragement from peers.

support and, like, encouraging another patient. (S11 Female, 20’s, Allied health professionals & other team roles)

… if I’m in a class… It encourages you… it’s also just nice… I don’t know many people in [location anonymised], so when I did go to those classes I did end up having a chat with people at the end. (P13 Female, 30’s, Bipolar)

… out of all of them he (GP) listens really, really well… So it’s like when I feel like I say something I feel like he takes it on board and I think… And sometimes he just says like, oh I’m really sorry to hear that… And it’s like it’s okay. Okay you’re empathising.. you know, he’s making the effort to do that. (P10 Female, 40’s, Bipolar)

[GP and SMI nurse] were really, uh, they were brilliant. I would like to see the, the, uh, [SMI nurse] again as well… Because she’s, she’s so good… Because she, she giving advice and she listening you… Very friendly, they care about you… They’re looking after you. (P12 Female, 40’s, Bipolar)

4. Shaping knowledge

Instruction on how to perform the behaviour (4.1)

Providing information on how to perform healthy behaviours through advice, visual tools and demonstration.

…essentially providing information around… how therapies work. How nicotine replacement therapies work and stuff. So, you might have, you might have people who would say, well, I tried the patch before, you know, and it didn’t work, you know. And, so, just giving more accurate information around the you know success rates in using two nicotine replacement therapies at once, for example, and, you know, using the appropriate nicotine replacement therapies, as opposed to just trying one thing and saying that none of it works. (S13 Male, 40’s, Allied health professionals & other team roles)

… advising them about food groups… I’ll always ask them about, you know, your diet, five a day, and you ask them, tell me exactly what I mean by five a day, rather than saying, oh, yes, and how many times have… I’ll always tell people about what we have available, smoking cessation… And I’ll tell them a
little bit about how they take it (S5 Female, 50’s, Nurse)

…work with that person, um, actively through, um, one to one work in their home to facilitate their improved diet, their improved cooking skills (S1, Male, 50’s, Allied health professionals & other team roles)

…she said, this Doctor, don’t eat too much cheese, don’t eat too much butter…It’s like, uh, you should eat, uh, healthy salads, vegetables…You know, brown bread, not a lot, something like that, yeah. (P12 Female, 40’s, Bipolar)

…eat more health[y]… More fruits, more vegetables and what portions to have. (P3 Male, 50’s, Schizophrenia)

… I’ve had like questionnaires before on the right types of food and leaflets and stuff. (P7 Male, 40’s, Schizoaffective)

<p>| Behavioural experiments (4.4) | Ask patient to perform unwanted and/or wanted behaviour and record how they feel after to test hypothesis about the behaviour and enable understanding of its consequences. | …people feel that by having cigarettes it actually reduces their anxiety at the time but then of course the evidence base is such that anxiety increases usually in people who smoke… get them to do a behaviour experiment where they smoke as normal and then sort of rate their anxiety on the following day or they reduce their smoking and rate their anxiety on the following day… (S18 Male, 50’s, Allied health professionals &amp; other team roles) |
|5. Natural consequences| Information about health | Providing information through advice and visual tools about the | The other lever is actually around kind of physical health difficulties, so if they’re already starting to have problems with their liver or…other elements of kind of physical functioning then it’s a start… Reason to make changes. (S18 Male, |</p>
<table>
<thead>
<tr>
<th>Information about social and environmental consequences (5.3)</th>
<th>Providing patients with information regarding how much money they spend as a result of unhealthy behaviours and suggesting that</th>
<th>50's, Allied health professionals &amp; other team roles</th>
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<td></td>
<td>I'd start educating them... I talk to them about their insulin and what happens when they eat. Um, what happens when they eat late at night. What happens if they're unable to burn off some of those calories? How it’s getting stored. What are the risks, um... being able to have a discussion about alcohol, to think about the calories. The empty calories in alcohol... And thinking about how alcohol impacts on the body.... It's supposed to be [visual tool depicting effects of smoking], one’s supposed to be an artery... The other one is, how, how smoking impacts, affects your lungs...and this is the tar of um, what does it say, a twenty a day smoker. So, it takes up to 400mg of tar a day, that’s a thick, brown, cancer causing tar inhaled into the lungs each year. (S3 Female, 40's, Nurse)</td>
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<td></td>
<td>... they [GP and SMI nurse] said, you know what’s gonna' happen, you can have stroke, you can have heart attack, you can have brain bleeding, you can, you know... You have to be careful what you’re eating. (P12, Female, 40’s, Bipolar)</td>
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<td></td>
<td>... my cholesterol, and she [nurse] said I am vegetarian and she said, vegetarian has higher cholesterol than the meat-eating people... I will have... in ten years’ time...heart attack, or... stroke... it helps me to prevent, uh, illness... Doing exercise and watching diet... (P9 Female, 50’s, Schizophrenia)</td>
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<td>...we worked out, in the course of a month, he spent, like, £800 between cigarettes, alcohol, cannabis, and coke... Spending a huge amount of money. And I think when it was quantified, they thought, blimey, you know, look at all this money, where it’s going. (S5 Female, 50's, Nurse)</td>
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<td></td>
<td>... with things like smoking, saying...you'll find you'll have quite a bit more money left if you're not smoking. (S16 Female, 30's, Doctor)</td>
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reducing these behaviours would result in them having more money.

| Information about emotional consequences (5.6) | Providing patients with information regarding how physical activity may positively impact emotion as well as how smoking may negatively affect anxiety. | …we spoke about how exercise…can impact…Your wellbeing. Um, through endorphins. Chemical changes. (S13 Male, 40's, Allied health professionals & other team roles)

I often use the idea about anxiety, about how people feel that by having cigarettes it actually reduces their anxiety at the time but then of course the evidence base is such that anxiety increases usually in people who smoke. That can be a helpful piece of information that often people don’t know about (S18 Male, 50's, Allied health professionals & other team roles) |

| 6. Comparison of behaviour | Demonstration of the behaviour (6.1) | Showing patients how to cook by demonstrating behaviour. | The OT could do cooking sessions with them. (S16 Female, 30's, Doctor)

…work with that person, um, actively through, um, one to one work in their home to facilitate their improved diet, their improved cooking skills. (S1, Male, 50's, Allied health professionals & other team roles) |

| 7. Associations | Associative learning (7.8) | Encouraging physical activity by pairing it with a type of physical activity that patients enjoy or helps to alleviate stress. | …you can link alleviation of the distress to something that they can enjoy doing or which they’ve always wanted to do, whether it’s a short term or long-term goal, it’s those two things hand in hand that… A goal that feels to them meaningful that really makes them excited in some way and at the same time alleviates something which they are currently really, really suffering with. If you can get those two things in place at the same time then you’re onto a winner. (S18 Male, 50's, Allied health professionals & other team roles)

One of the things she said she enjoyed was dancing, so I said, okay, and what
**8. Repetition and substitution**

<table>
<thead>
<tr>
<th>Behavioural practice/rehearsal (8.1)</th>
<th>Prompting patients to cook by cooking with them.</th>
<th>The OT could do cooking sessions with them. (S16 Female, 30’s, Doctor)</th>
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<tbody>
<tr>
<td>Behaviour substitution (8.2)</td>
<td>Encouraging the replacement of unhealthy behaviours with healthy behaviours.</td>
<td>…work with that person, um, actively through, um, one to one work in their home to facilitate their improved diet, their improved cooking skills (S1, Male, 50’s, Allied health professionals &amp; other team roles)</td>
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<td>Habit formation (8.3)</td>
<td>Embedding healthy behaviours into patient’s routine and prompting rehearsal of the behaviour by</td>
<td>I said, if you walked up that hill and that got the bus back, that’s one way of doing it… and obviously try and work out a routine. (S10, Male, 40’s, Allied health professionals &amp; other team roles)</td>
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<td>438</td>
<td>formulating a routine or repeating behaviour.</td>
<td>Um, and then it was, um, do you feel confident enough to maybe go for a walk to get the newspaper each morning? (S17 Female, 50’s, Allied health professionals &amp; other team roles)</td>
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<tr>
<td>Graded tasks (8.7)</td>
<td>Breaking down the behaviour into small manageable tasks and increasingly making the tasks more difficult whilst keeping them manageable until the behaviour occurs.</td>
<td>… you grade your approach. So, you start very close working with them there. Just go to see him, building up a rapport… get him to come out for a coffee. So, you’re grading it… you are slowly expanding his confidence… I continue to build those conversations to the point where, I’ve found somewhere that you can just kick a ball around and in a non-threatening manner. You’re not going to play in a football team, you’re going to kick a ball around. But he is going to play in a football team, um, and then that was the case. So, okay we got there, got him engaging and then I was hand holding there. Then slowly I would withdraw back, so bridging and grading. So, I’d bridge across and then back and he’s left there independent ideally and then he would stop… eventually we got him to a point where he would ask me when the next football is. (S1, Male, 50’s, Allied health professionals &amp; other team roles)</td>
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<tr>
<td>9. Comparison of outcomes</td>
<td>Pros and cons (9.2)</td>
<td>Asking and aiding patients to reflect and compare on the advantages and disadvantages of continuing with their unhealthy behaviours.</td>
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<tr>
<td>10. Reward and threat</td>
<td>Material incentive (behaviour) (10.2) and Non-specific incentive (10.6)</td>
<td>Promoting the incentives associated with attending physical activity groups which could either be material such as tickets to football matches or non-specific such as stadium tours.</td>
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<tr>
<td>Social Reward (10.4)</td>
<td>Verbally praising patients for being successful in terms of their progress with their goals and complimenting physical appearance.</td>
<td>...praising them for what they've achieved... celebrating success... well done, you've done very well... (S5 Female, 50's, Nurse)</td>
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<tr>
<td>15. Self-belief</td>
<td>Verbal persuasion about capability (15.1)</td>
<td>Encouraging patients that they can achieve their goals by emphasising their strengths and developing their</td>
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confidence when they have not achieved their goals.

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<tr>
<th>Focus on past success (15.3)</th>
<th>Asking patients to reflect on when they had previously been successful displaying healthy behaviours and identifying what principles they applied in the past and whether they can implement the same principles.</th>
<th>...if I know that somebody in the past, when they were in school, you know, were they playing football, were they a swimmer, did they do running? And if they did all that, trying to say, wow, that's really great that, you know, you were very good at that, and, you know, maybe could you begin to think about doing that again? Thinking back on those past strengths... if people have quit in the past, saying...that was great, what was going on then, that was brilliant that you stopped (S5 Female, 50's, Nurse)</th>
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<td>...if there’s been a time when they’ve not been drinking in the past, what was different about then? How could they work back towards that? (S15 Male, 30’s, Allied health professionals &amp; other team roles)</td>
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Publications

The following pages include four publications (peer-reviewed articles and meeting abstract) based on the findings from Chapters 3 and 5.

Publication 1: Based on Chapter 3
A primary care-led intervention to reduce cardiovascular disease risk in people with severe mental illness (PRIMROSE): a secondary qualitative analysis

Suzan Hassan, Jamie Ross, Louise Mancon, Alexandra Boston, David O’Shea, Ruth Wolfe
Exploring how health behaviours are supported and changed in people with severe mental illness: A qualitative study of a cardiovascular risk reducing intervention in Primary Care in England

Suzan Hassan\textsuperscript{1,*}, Jamie Ross\textsuperscript{1}, Louise Marston\textsuperscript{1}, Alexandra Burton\textsuperscript{2}, David Osborn\textsuperscript{2,3} and Kate Walters\textsuperscript{1}

\textsuperscript{1}Department of Primary Care and Population Health, University College London, UK
\textsuperscript{2}Division of Psychiatry, University College London, UK
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Objectives. This study explored how health behaviours were supported and changed in people with severe mental illness by primary health care professionals trained in delivering behaviour change techniques (BCTs) within a cardiovascular disease risk reducing intervention.

Design. Secondary qualitative analysis of 30 staff and patient interviews.

Methods. We mapped coded data to the BCT Taxonomy (version 1) to identify BCT application. Thematic analysis was conducted to explore the barriers and facilitators of supporting and changing health behaviours. Themes were then interpreted using the Capability, Opportunity, Motivation, and Behaviour model to gain greater explanation behind the processes.

Results. Twenty BCTs were identified. Staff and patients perceived that health behaviours were commonly affected by both automatic and reflective motivation, sometimes in turn affected by psychological capability, social, and physical opportunity. Staff and patients suggested that motivation was enhanced by both patient and staff ability to observe health benefits, in some cases patients’ health knowledge, mental health status, and social support networks. It was suggested that engaging in sustaining healthy behaviours was influenced by physical opportunities to engrav habits into routine.

Conclusions. According to staff and patients, health behaviour change in this population was driven by complex processes. It was suggested that capability, opportunity, and motivation were in some cases enhanced by BCTs, but variable. Behaviour change may be optimized by individualized behavioural assessments, identifying drivers of behaviour and applying a range of BCTs may help to target individual needs. Patient peer-led approaches, techniques to encourage awareness of visible success, and normalizing health behaviours may increase behaviour change.

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Statement of contribution

What is already known on this subject?

- Poorer health behaviours may contribute to early mortality rates in people with severe mental illness.
- Health care professionals are encouraged to target the uptake of healthy behaviours, but there is limited guidance on how.
- The processes that cause or inhibit health behaviour change within interventions that use behaviour change techniques by health care practitioners are unclear.

What does the study add?

- Staff and patients suggested that behaviour change techniques (BCTs) in some cases increased capability, opportunity, and motivation to engage in healthy behaviours, but in other cases had variable success.
- Staff and patients reported that in some cases motivation impacted health behaviour change and was in turn affected by psychological capability, social, and physical opportunity.
- Individualized behavioural assessment, flexible approaches to BCT application, involvement from patient peer support and different ways of targeting patient motivation may help to increase healthy behaviour changes in this population.

People with severe mental illness (SMI) are at greater risk of cardiovascular disease (CVD) and early mortality and the mortality gap between the general population and people with SMI continues to widen (Correll et al., 2017; Hayes, Marston, Walters, King, & Osborn, 2017). Although several factors contribute towards this health disparity, many of the main contributors are modifiable. Poorer health behaviours including physical inactivity, smoking, alcohol, and poorer dietary consumption are common in people with SMI (Dipasquale et al., 2013; Stubbs, Firth, et al., 2016; Stubbs, Williams, Gough, & Craig, 2016; Vancampfort et al., 2017a, 2017b).

Most interventions targeting health behaviours in people with SMI have reported mixed findings. Lifestyle interventions in some studies have reduced weight gain; however, many studies were reported as poor quality with short follow-up durations (Fernández-San-Martín et al., 2014; Naslund et al., 2017). Another recent study reported negative findings; a lifestyle education programme for people with SMI was not effective at reducing weight gain, and there were no changes to physical activity or dietary intake (Holt et al., 2019). Some earlier studies found sports and exercise-based interventions could reduce body mass index, psychiatric symptoms, and improve cardiorespiratory fitness (Soundy, Roskel, Stubbs, Probst, & Vancampfort, 2015; Vancampfort et al., 2017a, 2017b). However more recently, inconsistencies were identified regarding the effectiveness of interventions to change physical activity and sedentary behaviour and poor-quality evidence with varying follow-up durations (Ashdown-Franks et al., 2018). Varenicline and bupropion increased smoking quit attempts, but smoking cessation programmes were not effective in people with SMI in the medium or long term (Peckham, Brabyn, Cook, Tew, & Gilbody, 2017). In a recent behavioural and pharmacological smoking cessation trial for people with SMI, the intervention was not effective at increasing quitting at 12 months but effective at 6 months (Gilbody et al., 2019).

There is limited evidence regarding how an intervention targeting health behaviours may or may not work to promote healthy behaviours in people with SMI in different settings. Understanding the underlying psychological processes by which interventions bring about health behaviour change could help inform future effective interventions and
explain the mixed evidence behind behaviour change interventions for people with SMI (Moore et al., 2015). Further, although guidelines advocate that health care professionals (HCPs) target health behaviours in people with SMI, there is limited guidance regarding how effective behaviour change strategies can be achieved and minimal detail on the application and value of behaviour change techniques (BCTs) in different health care settings for people with SMI (Department of Health, 2016; Public Health England, 2019).

Understanding the barriers and facilitators of changing health behaviours may help to establish ways of better supporting patients with SMI. Some of the barriers commonly reported include the following: mental health symptoms, social isolation, medication side effects, negative staff attitudes, lack of support, difficulties sustaining health behaviour changes, and unhealthy environments (Aschbrenner et al., 2015; Burton et al., 2015; Jimenez et al., 2015; Roberts & Bailey, 2011; Yarborough, Stumbo, Yarborough, Young, & Green, 2016). Facilitators include the following: staff and patient health knowledge, support from informal social support networks and staff, experiencing benefits to mental and physical health, positive reinforcement, motivation and planning, and cost savings for quitting smoking (Burton et al., 2015; Graham et al., 2014; Jimenez et al., 2015; Roberts & Bailey, 2011; Yarborough et al., 2016).

To our knowledge, none of these studies (1) explore the views and experiences of HCPs trained in delivering theoretically driven BCTs to facilitate health behaviour changes and how this worked in practice or (2) offer deeper insight explaining the process of health behaviour change and how the barriers and facilitators occurred. One model that may help to explain the process of supporting or changing health behaviours in people with SMI is the Capability, Opportunity, Motivation, and Behaviour (COMB) model of behaviour (Michie, Atkins, & West, 2014; Michie, van Stralen, & West, 2011). Although this model has been widely applied to explain different types of behaviour in different populations, to our knowledge it has not been applied to explain the process of supporting and/or changing health behaviours in people with SMI. We aimed to explore how health behaviours were supported and changed during a primary care led intervention specifically designed to include BCTs in the intervention to reduce CVD risk for people with SMI (Osborn et al., 2016; Osborn et al., 2018). We explored how BCTs were applied, the barriers and facilitators of supporting and changing health behaviours and used the COMB model to explain underlying processes.

Methods

Context and design

We conducted a secondary analysis of interview data originally collected to explore perspectives on the implementation of a CVD risk reducing intervention delivered by primary care HCPs who had received training in delivering BCTs to people with SMI (Osborn et al., 2016; Osborn et al., 2018). Training covered delivering eight strategies as part of the intervention: goal setting, setting an action plan, recording progress, reviewing progress, involving supportive others, providing positive feedback, coping with setbacks, and habit formation. The intervention aimed to improve the following health behaviours in people with SMI: physical activity, diet, smoking, and alcohol use as secondary outcomes. The findings showed that the secondary outcomes did not differ between those that received the intervention and those that did not at 12-month follow-up (Osborn et al., 2018). The primary qualitative findings suggested that though staff attempted to make the intervention accessible to people with SMI, patients were not always willing to engage with the intervention. This secondary analysis explores through a
theoretical behavioural lens how an intervention aimed at reducing CVD risk supported health behaviour change. This was not explored in the original analysis and addresses important gaps and limitations in the field.

Sample and data collection
Thirty patients and thirty-one staff were approached to take part in semi-structured interviews. All the original transcripts were analysed in the present study. Fifteen patients and fifteen staff took part. Staff were health care assistants (n = 6) and practice nurses (n = 9) working in primary care, all of which were female and White British. Staff were between 25 and 65 years of age, with 1–30 years’ experience. Patients ranged from 30 to 70 years of age and were mostly male (n = 9). Patients were White (n = 13) and Asian (n = 2) with a diagnosis of schizophrenia (n = 6), bipolar affective disorder (n = 7), and other psychosis (n = 2).

Interview topic guides were developed around the Theoretical Domains Framework and the COM-B model of behaviour of participants (Atkins et al., 2017; Michie et al., 2011). The interviews were conducted by two researchers (A.B. & S.H.), audio-recorded, transcribed, and checked for accuracy. All identifiable content was removed. The study was ethically approved by City Road & Hampstead Research Ethics Committee (01/03/2016: 12/LC/1934).

Data analysis
NVivo (version 11) was used to store and assist data analysis. The data were previously coded inductively by researchers involved in the trial for the original qualitative study and were used in the current study. Researchers had a background in qualitative research, health psychology, psychiatry, and mental health research. A researcher with a background in psychology (S.H.) with no prior involvement in the qualitative interviews led on the current analysis. S.H. coded the data inductively in relation to the current study aims. These codes were compared to the original coded data, and new codes specifically related to the current study were derived and merged with the previous coded data. This process was iterative, and codes were continuously adapted and discussed with the team (K.W. & J.R.) to ensure they reflected the data. In a second stage, S.H. mapped these inductively derived codes regarding how BCTs were applied using a deductive approach to the BCT Taxonomy (v1); this is a comprehensive list of methods, techniques, and tools applied to help facilitate behaviour change in behavioural science (Michie et al., 2013). In the analysis of barriers and facilitators to supporting and changing health behaviours, the coded data were analysed thematically using an inductive approach, discussed, and revised among the team (S.H., A.B., J.R., D.O., & K.W.) (Braun & Clarke, 2006). The themes were further analysed by mapping and interpreting them deductively in relation to the constructs of the COM-B model. Where possible, we attempted to gain more explanation regarding the process of behaviour change including why and how barriers and facilitators occurred in the data, through exploring links between components of the COM-B model. Descriptions of each of the components of the model are reported in Table 1. The process of mapping and interpreting data in relation to the BCT Taxonomy and COM-B model was iterative and conducted and adapted through discussion with the research team (K.W. & J.R.). Thus, data analysis was initially inductive during the stages of coding data and thematic analysis. This was then followed by a deductive approach, mapping the coded data and/or themes to the BCT Taxonomy and COM-B model.
Table 1. COM-B model components

| Sources of behaviour | Description*
|----------------------|--------------------------------------------------
| Capability           |                                                  |
| Physical capability  | Physical skills, strength, or stamina           |
| Psychological capability | Psychological skills, knowledge, strength, or stamina |
| Opportunity          |                                                  |
| Physical opportunity | Opportunity afforded by the environment including time, resource, location, and physical barriers |
| Social opportunity   | Opportunity afforded by interpersonal influences, social cues, cultural norms, etc. |
| Motivation           |                                                  |
| Reflective motivation| Self-conscious planning and evaluations, forming beliefs about what is 'good' or 'bad' |
| Automatic motivation | Emotional reactions, wants and needs, desires, impulses, and reflex responses |

*These descriptions are taken from Michie et al. (2014).

Results

Exploring how BCTs were applied

We identified the use of 20 BCTs in the staff and patients' reports of delivering and receiving the intervention (Table 2). Under broader BCT Taxonomy groupings, these BCTs fell within goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, repetition and substitution, reward and threat, antecedents, and self-belief.

Exploring barriers, facilitators, and processes of supporting and changing health behaviours

We identified five themes and eleven sub-themes in relation to barriers, facilitators, and processes of supporting and changing health behaviours (Table 3). When reporting themes, we also referred to both the individual constructs of the COM-B model and interlinking components (Table 1) where possible.

Proactive approaches and perceived benefits of health behaviours. Motivation had both a positive and negative impact on patient proactivity in taking ownership and responsibility for their health goals. Some examples of health goals included becoming more active, consuming a healthy diet, reducing cigarette use, and/or alcohol consumption. Patient motivation to continue engaging with healthy behaviour changes and staff motivation to support behaviour change were both influenced by the degree to which benefits of making behaviour changes were apparent.

The impact of motivation on proactivity – Staff commonly reported that patients, who took ownership, realized the need for ownership and responsibility for their goals and to be proactive, were more motivated.
...they had to take responsibility for their own health, we could point them in the right direction, we could meet with them regularly, but it was really up to them. Some were more motivated to make that change, based on... "it is up to me". (Staff 4, HCA, 50's)

This was also reflected in patient accounts. Patients who were committed to and took responsibility for achieving their goals were more motivated. In some cases, this commitment was based on believing that this was the right action to take (i.e., reflective motivation).

I just felt it was the right thing to do really yeah. If I commit myself to something, I do like to follow it through. (Patient 16, male, 60's, Schizophrenia)

The reverse was also observed among some patients. Some staff reported that those that were less motivated were less proactive to action advice. Staff often suggested that some patients lacked an awareness that achieving health goals was self-dependent.

... had a mixed half and half of people that were very, very invested and people who were hoping that they're miraculously lose some weight just by turning up every so often (Staff 6, HCA, 50's)

In a few cases, staff also reported a lack of proactivity and motivation when patients were required to self-monitor behaviours using health plans to monitor health goals. Staff suggested that patients who completed these were more likely to seem motivated and to progress with their health goals.

...the people that tracked definitely were the most successful. However, not everybody tracks. Some people, I didn't see that book again, after the very first time I gave it to them, or I saw it once or twice throughout the process... with those people there was no particular evidence that they'd been thinking about their goals in the meantime. (Staff 6, HCA, 50's)

Some patients held similar views, reporting that they did not utilize the tools they were provided with. Patients blamed their lack of productivity on their lack of desire (i.e., automatic motivation) rather than on staff and demonstrated an awareness for the need to be proactive to achieve health goals. This contrasted with staff perceptions that patients lacked awareness for the need to be proactive.

Other people can just give you advice, but at the end of the day, if you are not going to do anything about it, then it's not going to get anywhere... but that was nothing to do with [Anonymous] or [Anonymous, nurse 2]... I was supposed to do exercises and things... It's just the way I was feeling... I just couldn't be bothered. (Patient 112, Female, 50's, Other Psychosis)

**The impact of visible benefits on motivation** - Most staff suggested that patients who were able to observe the benefits of changing their health behaviours, such as improvements to physical appearance and health markers such as cholesterol, were motivated to continue to engage with healthy behaviours. It is possible that decisions to continue with health goals were informed by beliefs in the positive effects (i.e., reflective motivation) of engaging with healthy behaviours. Alternatively, succeeding with goals may have evoked a sense of pleasure and therefore increased patient motivation (i.e., automatic motivation).
... the couple that were motivated to come back was because ... they were losing weight ... their cholesterol level was going down, they were more active, they could see the improvements in their bodies because they were saying about their clothes ... were a bit buggy and things ... with all these, this was encouraging them to come back. (Staff 1, HCA, 40’s)

Patients frequently commented on the positive effects of changing their health behaviours including better overall physical health, greater mobility, and improved financial status.

Although I was skinny ... I couldn’t breathe very well when I was going up and down the stairs. That improved. My clothes were not smelly anymore. My purse ... my finances improved (Patient 112, Female, 50’s, Other Psychosis)

Staff reported that in some cases, patients stopped engaging with healthy behaviours when they were unable to see the benefits. Disengagement may have arisen from automatic motivation, whereby patients experienced disappointment because of lack of visible success or forming the belief that engaging in healthy behaviours did not result in any positive changes (i.e., reflective motivation).

Particularly with X, it was a weight loss thing and she lost interest when she realised she wasn’t actually losing any weight. Do you know what I mean? She disengaged a bit there. (Staff 14, Practice Nurse, 50’s)

Similarly, staff reported that their motivation to support patients to achieve healthy behaviours was influenced by their ability to observe patients’ progress. Staff commonly reported feeling achievement when patients succeeded with health goals, that is, automatic motivation.

I know that she’d made progress which is good for me. That was a bit of a sense of achievement for me to know that I’ve helped her achieve what she set out to do. (Staff 15, Practice Nurse, 60’s)

However, some staff reported feeling frustrated and therefore not motivated to support patients when patients experienced failure, that is, automatic motivation.

She hasn’t lost this vast amount of weight that she wanted to do ... because she was disengaged so much I think you start to lose her, disengage yourself a little as well, so I engage in that (Staff 14, Practice Nurse, 50’s)

*Health knowledge and perceptions.* A common finding was that healthy behaviour changes were affected by patients’ understanding of health (i.e., knowledge) and wanting/need (i.e., perceptions) to change health behaviours which both related to psychological capability. In some cases, patients’ understanding of the negative impact of their unhealthy behaviours (i.e., psychological capability) affected reflective motivation (i.e., the belief that certain behaviours were ‘good’ and ‘bad’). However, in other cases despite understanding the negative impact of unhealthy behaviours (i.e., psychological capability), behaviour was driven by automatic habitual processes. Further, health knowledge assisted staff in supporting patients with health goals.
Health behaviour change in people with SMI

The impact of knowledge – A minority of staff reported that one of the factors preventing some patients from modifying their health behaviours was their lack of knowledge about what was ‘healthy’. In some cases, staff found it difficult to change this understanding and challenge it.

...everyone would be, like...so I had a healthy day today, and then go through what their healthy day was, and it was so unhealthy it was unbelievable, and then you’d kind of realise you have to take it back and you start from the very beginning, baby steps, and that everyone’s understanding of health and health needs and what it is and what it means is so varied... It was challenging... a lack of knowledge and education of what we were doing. (Staff, HCA, 40’s)

In contrast, patients frequently described the knowledge they had gained within consultations, particularly in reference to the impact of food groups on weight gain (i.e., psychological capability). This understanding influenced patients’ reflective motivation to engage with healthy behaviours. Patients reflected and evaluated their behaviour through monitoring with staff, and consequently formed beliefs about ‘wrong’ behaviours based on their health knowledge.

Without hesitation. Because it made me sit with another person and identity the links between food groups that were obviously causing me to gain weight... what that allowed me to do, was to change my pattern of eating, which I’ve pretty much done 99% of the time since. (Patient, 47, Male, 40’s, Schizophrenia).

Nurses appeared to have more knowledge regarding health behaviours than health care assistants, subsequently influencing their ability to support patients.

Difficulties changing perceptions – A minority of staff described that they encountered difficulties when encouraging patients to engage with healthy behaviours. Staff suggested that some patients did not perceive the need to change due to a lack of understanding about the need to modify health behaviours (i.e., psychological capability). This was not identified in patient interviews. It was suggested that a lack of understanding may have influenced decisions in weighing up the risks and benefits of unhealthy behaviours (i.e., reflective motivation). Alternatively, it was hypothesised that patients potentially enjoyed unhealthy behaviours and therefore were not motivated to change (i.e., automatic motivation).

When they think they’re fine and they don’t understand why or even why you want to change anything, that’s was always a toughie... In hindsight he didn’t see a problem with what was going on, he enjoyed what we perceive as a bad lifestyle choice too much to want to give it up, and he couldn’t see the benefits outweighing any risks (Staff, 2, HCA, 50’s).

The link between psychological capability and motivation did not always apply. One patient was unwilling to eat healthily despite having the knowledge on how to achieve weight loss (i.e., psychological capability) and understanding the benefits of diet modification to increase weight loss (i.e., reflective motivation). This was due to the patients’ perception that she was ‘stubborn’. This suggested that she believed her unhealthy behaviour was habitual and therefore driven by automatic motivation.
... if I'm perfectly honest, it's guut I shouldn't have set because I know myself well enough to
know that... I've been on different diets... I've been to [weight reduction group] and had
some success with it, but at the end of the day I'm a bit reluctant to change that sort of
lifestyle... I'm fairly conscious of a healthy lifestyle... and how I do or don't fit into that... I'm
also bloody stubborn... I don't think I really identified anything I wanted to change, if that
makes sense... (Patient 18, Female, 60's, Bipolar Affective disorder)

Perceptions of patient capability. Staff commonly held the perception that mental
health status prevented patient engagement and concentration (i.e., psychological
capability) and subsequently motivation. In some cases, it was also suggested that physical
health problems (i.e., physical capability) restricted patient engagement with health
behaviours.

Mental health status - Staff suggested that some patients experienced stress and
became absorbed by their personal problems due to their mental health. Staff reported
that patients' mental status affected their cognitive skills such as concentration. It was
suggested that this affected their motivation levels.

Mental health patients... it's so difficult to get them to come off that and sort of engage and
concentrate... people with mental health illnesses do have a tendency to demotivate. Don't
necessarily want to engage on things other than what's occupying their minds and their
thought processes at that time. They become quite focused on their problems, understand-
ably. (Staff 14, Practice Nurse, 50's)

However, this rarely arose in patient interviews and only one patient expressed that
engaging with healthy behaviours was difficult due to their mental well-being.

... I find it hard to actually concentrate and be able to be, sort of, useful in what I'm supposed
to be doing... I get a bit anxious and all the rest of it... It's difficult. (Patient 9, Female, 50's,
Bipolar Affective Disorder)

Physical health status - A few patients and staff expressed that poor physical health
status affected some patients' physical capability to engage with healthy behaviours such
as physical activity.

With one particular patient... She had numerous health problems... it was going to be an
uphill struggle to achieve her goal of losing weight, which we did actually adapt to, sort of,
maintaining weight... one particular patient, who had not only a problem with obesity, but
she had pain, arthritis, and she couldn't really exercise... (Staff 4, HCA, 50's)

Social roles and influences. A common finding was that different social settings and
circumstances (i.e., social opportunity) both negatively and positively influenced health
behaviours. Social opportunity in the form of staff support increased motivation to engage
with healthy behaviours. Informal social networks were also important; patients engaged
in similar health behaviours to family and friends.

The role of staff - Patients reported that staff supportiveness including listening to and
discussing concerns facilitated their healthy behaviour changes. Some patients felt
pressure to achieve goals because of being monitored by staff. Some suggested that being monitored increased their motivation to engage with healthy behaviours.

... it felt a little bit like I was... I had somebody to answer to, which did, it began, at the beginning of the period of time I was coming in that did motivate me. (Patient 82, Female, 40's, Bipolar Affective Disorder)

In some cases, staff reported that the desire in patients to please staff and prevent their disappointment motivated patients to engage with healthy behaviours. This related to automatic motivation, whereby achieving health goals may have been related to the pleasure of gaining approval from staff.

... I think that person consciously wanted to do well for me... if that was a motivating factor, then it worked. (Staff 4, HCA, 50's)

The role of informal support networks - Patients commonly reported that friends and/or family would encourage and challenge them to engage in healthy behaviours and vice versa (i.e., social opportunity). Patients were establishing healthy social norms, whereby family and/or friends were engaging in similar healthy behaviours, helping them to change their behaviours. This perception was also supported among staff.

My partner also has been eating healthier and exercising more. She was quite overweight, and she's lost 2 stone as well by just supporting me and kind of changing the food that we buy. She's not vegan or anything like that though, but she's changed. We don't ask for any takeaways. (Patient 6, Female, 50's, Bipolar Affective Disorder)

A few staff also suggested that when patients were in social situations where members of their informal network were engaging in unhealthy behaviours, patients would also engage in similar behaviours. However, this perception was not apparent among patients.

One lady, suddenly her friends had come round, and she'd had a couple glasses of wine at lunch time, so there were things like that, so she would quite often, oh sorry, or she had friends round to stay... (Staff 7, HCA, 40's)

As part of the intervention, staff were encouraged to seek the involvement of informal supportive others in helping patients engage with healthy behaviours. However, in some cases, patients described having no access to support and being socially isolated. The same patients also reported difficulties in engaging with healthy behaviours. However, there was no indication within the interviews as to why nurses/HCAs did not explore this further and seek alternative forms of support.

I don't go out much, I don't socialise much, so I haven't had much support. I've been mostly on my own. My sister has been quite busy as well. She's got a full-time job and everything. She's tried to provide some support, but the majority of the time, I feel I've been on my own. (Patient 112, Female, 50's, Other Psychosis)

Environmental Level Influences. Staff commonly suggested physical opportunity in the context of the general practice (GP) environment, influenced their ability to support patients. Greater access to time increased the level of support (i.e., social opportunity)
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<th>Methods used to facilitate application</th>
<th>Illustrative quotes</th>
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<tbody>
<tr>
<td>Goals and planning</td>
<td>Goal setting (outcome and behaviour) (1.1, and 1.3)</td>
<td>Reviewing unhealthy habits in initial consultations and enabling patients to set targets to either help modify a behaviour or achieve a specific outcome such as reduction in cholesterol</td>
<td>The other patient’s chosen topic was to get off smoking… We had spoken about all the health behaviours and then the patient chose one health behaviour, so we explored that in more depth. (Staff 13, Health care assistant) The main concern was the weight and the cholesterol, these were the main concerns, because the weight wasn’t any… getting any lower, in fact it was getting higher and higher, and I wasn’t going out as much, I wasn’t active enough to bring the weight down, and diet wasn’t good enough. So we had to set goals to improve on that so that the cholesterol could be… helped, to bring the cholesterol down and bring the weight down as well. (Patient 112)</td>
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<tr>
<td>Action planning (1.4)</td>
<td>Breaking down goals into smaller manageable plans including what behaviour to carry out, how and when</td>
<td>It’s about, well, we need to make this a bit more manageable, something that will then achieve that goal. So we’re talking about food types and, well, we’re going to eat more of this and less of this, and which ones are you going to eat when, and this sort of thing, and making those kinds of goals… (Staff 6, Health care assistant) We did just stick to one thing, which was the exercise. And just something simple like going for a walk so many times a week. And sometimes, she was getting there. (Staff 8, Practice Nurse)</td>
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<td>Review behavioural goal(s) (1.5)</td>
<td>Using open-ended questions to jointly discuss progress within consultations including whether the person’s behaviour aligned with the goals set. Goals were adapted on the basis of feedback provided</td>
<td>… how easy did you find that goal, was it challenging, do you want to continue with that or try something else… then we’d carry on about how that was going to have an impact on his week, not just, okay, so we’re swapping it, but how he was, because he only had one arm, as well, so he had to think about the goals that were easy for him to be doing with one arm… changing to cereal because porridge was an idea but that’s really hard to make with one hand, apparently. (Staff 2, Health care assistant)</td>
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<td>Problem-solving (1.2)</td>
<td>Discussing with patients’ factors that may be affecting their behaviour and encouraging ways to overcome problems</td>
<td>‘We’d go through the booklet to see what I’d filled in, to see how I’d sort of kept up with the goals, and then we may amend them or we may just do the same thing for the following week. So we might adapt them slightly if something hadn’t worked. We’d adapt it, or we’d add something else in.’ (Patient 82)</td>
<td>‘… when they don’t perhaps achieve it, look at why. And then get them to see how they can change, turn that around’. (Staff 8, Practice Nurse)</td>
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<tr>
<td>Feedback and monitoring</td>
<td>Self-monitoring of behaviour (2.3)</td>
<td>Encourage use of health planning books to self-monitor behaviour provided as part of the intervention</td>
<td>‘… if they didn’t fill in their books, they wrote a note, or something, to themselves, on their phone, and then they told me about it when they came in… so they were tracking… the people that tracked definitely were the most successful.’ (Staff 6, Health care assistant)</td>
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<tr>
<td>Monitoring of behaviour and outcome (2.1 and 2.5)</td>
<td>Staff continuously checked progress through monitoring clinical measures, health planners and discussion with patients</td>
<td>‘… I would ask them how they’d got on, what they’d been up to, have a look in their little health plan book and see what they’d eaten’. (Staff 3, Practice Nurse)</td>
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<tr>
<td>Biofeedback (2.6)</td>
<td>Monitoring through clinical measures including weight, blood pressure and blood tests and communicating results to patients</td>
<td>‘...occasionally she'd weigh me, and she would then go through what I was, you know, eating on a daily basis.’ (Patient ID 81)</td>
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<tr>
<td>Feedback on behaviour (2.2)</td>
<td>When monitoring behaviour, staff would discuss with patients' progress and whether any improvements could be made</td>
<td>‘I kind of tried to make it fun for them by doing the blood pressure, the weight. We checked the cholesterol, perhaps once every month. I think I did their cholesterol, and so we got that once every three months and it was a bit like trying to encourage them. Oh, see what your weight is next time and I'll see what you've dieted next time.’ (Staff 1, Practice Nurse)</td>
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<tr>
<td>Social support</td>
<td>Staff displayed understanding, listening skills, and encouragement whilst promoting healthy behaviour changes</td>
<td>‘...they take your blood and weigh you and different things like that, you know. And we just have a talk, you know.’ (Patient 83)</td>
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<td>Social support</td>
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<td>‘We'd discuss what they'd eaten, what exercise they'd done, how they could do more exercise, how they could improve their diet.’ (Staff 3, Practice Nurse)</td>
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<td>Social support</td>
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<td>‘Well, I just see her, and she checks up on the sheets I fill in, and she checks me up and sees if I'm progressing, yes.’ (Patient ID 83)</td>
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<td>Social support</td>
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<td>‘I basically just really encouraged her and said well done, kept saying that to her, and I think that was how she came about as well and carried on the whole way through. Because just supporting that one appointment, just getting her through that and listening to what she was saying and how happy she was because she'd done it.’ (Staff 15, Practice Nurse)</td>
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<td>Social support</td>
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<td>‘...we had a good relationship. We had a good dialogue, it was...she supported me, but once...it's very good when somebody actually understands why things are happening. And then doesn't think well...you know you go to some people and they think you're lazy, you're not doing anything about your weight but &lt;practice nurse&gt; understood it.’ (Patient ID 12)</td>
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<td>Social support</td>
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<td>‘She did raise that I think that was obviously part of the project, to make sure that, you know, family and friends were brought into the equation if...’ (Patient ID 12)</td>
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<tr>
<td><strong>Shaping knowledge</strong></td>
<td>Instruction on how to perform behaviour (4.1)</td>
<td>Staff encouraged the involvement of family and friends in helping encourage healthy behaviours</td>
<td>possible. And she did ask that, you know, does your wife help you, does she support you? That was asked, you know, and when there were discussions about diet, does your wife get involved? Yes, it was mentioned on a regular basis. (Patient D81)</td>
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<td></td>
<td>Information about antecedents (4.2)</td>
<td>Sharing knowledge on different approaches to target behaviour whilst enabling patients to select their own preferred method</td>
<td>‘We’d discuss what they’d eaten, what exercise they’d done, how they could do more exercise, how they could improve their diet.’ (Staff, Practice Nurse)</td>
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<tr>
<td>Natural consequences</td>
<td>Information about health consequences (5.1)</td>
<td>Encouraging patients to record emotions when undesired behaviour occurred to provide information on emotions that caused unwanted behaviour</td>
<td>‘I wanted to lose a bit of weight and she discussed various ways I could do that.’ (Patient 16)</td>
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<td>‘So I came away with lots of sort of ideas, suggestions, not, do this, do that, do that. It was very much suggestions that we had kind of talked about between us.’ (Patient 17)</td>
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<td>‘And so I broke it down and said, just put key words in there [health plan diary]: sad, fed up, fat, angry, anything. Just a word to sum up how they felt even just one word a day: good, energetic. And then they could look back on that, and perhaps they might see a pattern, or they might see a barrier that perhaps they hadn’t identified themselves.’ (Staff, Health care assistant)</td>
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<td>‘Because I was keeping a diary of when did I feel good and when did I not. And so what was I eating and what was happening… And I learnt a lot about me and my relationship to food, my medication’s relationship to food. Because I’m… My medications were all… You know, made me crave sugar and I think it was about how I had to… I managed that.’ (Patient 17)</td>
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<tr>
<td>8. Repetition and substitution</td>
<td>Habit reversal (8.4)</td>
<td>Staff prompted the replacement of unwanted habits with healthier behaviour</td>
<td>'would come in. You’re drinking three or four bottles of wine a day, you are going to give yourself a heart attack. If you want some help I can help you now'. (Staff 5, Practice Nurse) 'I would try and always make sure I focussed on giving them a goal and trying to promote what that benefit might be' (Staff 7, Health care assistant) 'It made me sit with another person and identify links between food groups that were obviously causing me to gain weight'. (Patient 17) '...I encouraged her to take her mind of wanting cigarettes by doing something different, and she got back into playing her guitar and keyboard and playing music and making music. So I think that helped and she was a lot more relaxed. When she wanted a cigarette she’d go and play her guitar...'. (Staff 15, Practice Nurse) '...there was things I was taking out, I took snacks out, for example. Because she said, look, you’re a KitKat, you’ve had this, why don’t you just stop them? So, and also eating late at night. I don’t eat late at night, now. I have a meal. I might go and have a drink, but I don’t eat late at night, you know'. (Patient 81) 'And having that, you know, that recognition of, you know, of losing two pound or whatever, that was really positive. But it wasn’t done in a take way or, “well done”. It was actually “that’s brilliant”, it was genuinely meant’. (Patient 17) 'I’d praise him on the stuff that went really, really well...'. (Staff 2, Health care assistant)</td>
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<tr>
<td>10. Reward and threat</td>
<td>Social reward (10.4)</td>
<td>Staff delivering the intervention displayed praise to patients</td>
<td>'I think we, we looked at it as a whole, so we were looking at where he was eating, obviously with one arm, convenience food a lot, so instead of always going to KFC let’s try something else, and then he found a friend that went to this other cafe, so then he had someone to go and socialise,</td>
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<td>11. Antecedents</td>
<td>Restructuring the physical and social environment (12.1 and 12.2)</td>
<td>Changing physical and social environments with replacement of positive social and healthy contexts</td>
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<td>15. Self-belief</td>
<td>Verbal persuasion about capability (15.1)</td>
<td>Encouragement displayed by staff delivering intervention</td>
<td>so it wasn’t just about going to get food anymore… We’ve found little things like his friend goes to this café, he found that out, so now he goes there every week and that gets him out of the house for something else’. (Staff 2, Health care assistant) …with the guy that wasn’t doing as well as we would’ve thought, just by saying, don’t set yourself targets that are too hard to achieve; just even the smallest of changes can make a difference, and don’t be afraid of coming back and saying, I haven’t been able to do it, for whatever reason. There’s always a next time, as long as you don’t give up, and I think that’s the main thing, just giving them that encouragement to feel that you’re not being judged by the fact that you haven’t been successful in what you’re trying to do’ (Staff 10, Practice Nurse) …she was really nice and kind and wasn’t judgemental or anything like that. And all what I said, I had a week where I hadn’t managed to do what I said for a couple of weeks. She was like, Oh, don’t worry about it. It’s fine we can try this week. So it was really good’. (Patient ID 6)</td>
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Table 3. Themes and sub-themes related to barriers, facilitators, and processes of changing and supporting health behaviours

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-themes</th>
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<tr>
<td>Proactive approaches and perceived benefits of health behaviours</td>
<td>The impact of motivation on proactivity</td>
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<td>The impact of visible benefits on motivation</td>
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<tr>
<td>Health knowledge and perceptions</td>
<td>The impact of knowledge</td>
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<td>Difficulties changing perceptions</td>
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<td>Perceptions of patient capability</td>
<td>Mental health status</td>
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<td>Physical health status</td>
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<td>Social roles and influences</td>
<td>The role of staff</td>
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<td>The role of informal support networks</td>
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<td>Environmental-level influences</td>
<td>Access to time</td>
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<td>Access to resource</td>
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<td>Making use of existing tools</td>
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staff were able to provide. Access to appropriate resource was also important in helping support behaviour change. However, both time and resource were not always accessible. Patients who made use of existing features of their environment reported that this helped them engage in as well as maintain healthy behaviours.

Access to time – Some staff suggested consultations requiring discussion of health behaviour change required time. Given the lack of access to time, staff felt they were unable to support some patients adequately.

Following up, probably if I had more time to follow-up it probably would have been more successful here. But it is like running a race when you are here (Staff 10, Practice Nurse, 40’s).

Access to resource – As part of the intervention, staff were required to signpost patients to specialists services to help facilitate behaviour change. However, as the study was conducted in different geographical regions in England, the availability of services in different areas varied (i.e., physical opportunity). This potentially indicated differences between deprived and affluent areas. Staff with access to services were better able to support patients to engage with health behaviours as compared to staff with limited access.

Well, that lady joined a weight loss group and gave up smoking. She was seeing her GP regularly, so I think that clinical care and guidance helped. Another person was referred to a dietician. As I said, that was in regard to his cholesterol, and he was referred to a specialist… (Staff 4, HCA, 50’s)

Making use of existing ‘tools’ – Patients made use of their physical environment (i.e., physical opportunity) including making use of stairs rather than lifts, walking more between bus stops and using the bus less, open spaces for walking, shopping, and cycling. Patients were embedding behaviours into their routine and therefore normalized their health behaviours (i.e., automatic motivation).

I think the main goals were kind of like exercising, it was just kind of like getting off the bus a couple of stops early before uni and walking the rest of the way in... Because I’d been doing it for such a long time, I kind of managed to maintain it. (Patient 6, Bipolar disorder, 30’s)
Discussion
Patients and staff (nurses/HCAs) reported using a range of BCTs within a CVD risk reducing intervention for people with SMI delivered in primary care. These related to goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, repetition and substitution, reward and threat, antecedents, and self-belief. Numerous factors affected the process of supporting and changing health behaviours. Patient proactivity to action staff advice varied depending on their motivation to engage in healthy behaviours. Motivation was influenced by the ability to perceive the visible benefits of engaging with health behaviours and patients' health knowledge, but health perceptions were sometimes difficult to change. It was also suggested by staff that mental health symptoms negatively impacted patient motivation. Social factors including involvement from staff and informal support networks both motivated and prevented health behaviour change. Patients, who made use of existing opportunities in their environment to exercise, engaged in and sustained healthy behaviours. Access to time and resources in the context of primary care was important for supporting patients and discussed in greater detail in our primary qualitative paper.

Our findings are partly consistent with previous research that health knowledge including understanding healthy behaviours and how they are achieved facilitates patient engagement in healthy behaviours (Roberts & Bailey, 2011). We found patients reported healthy changes in some cases where staff discussed information about health consequences, and reviewed health behaviours and health plans. However, despite having health knowledge and awareness, some patients were still not motivated, and in some cases, health perceptions were difficult to change. This is consistent with quantitative work reporting that although people with SMI had health behaviour knowledge, this was not associated with their self-reported health behaviours (Happel, Stanton, Hoey, & Scott, 2014). Although health knowledge may facilitate behaviour change in some people with SMI, for others, more work and/or skills may be needed to uncover and implement techniques that generate strong enough desires and impulses to drive behaviour.

Emotional support and practical support from informal social networks were reported as both barriers and facilitators to health behaviour change in people with SMI in previous work (Aschbrenner et al., 2013; Burton et al., 2015; Jimenez et al., 2015; Roberts & Bailey, 2011; Yarborough et al., 2016). This was also mirrored in our findings; involving supportive others as part of the intervention facilitated health behaviour change, but lack of access to informal support and unhealthy social environments may have prevented change. This may support the value of peer-support interventions in this area, particularly where patients lack access to healthy social environments. A peer-led intervention to increase chronic disease self-management in people with SMI was associated with improvements in mental and physical health scores (Druss et al., 2010). The value of HCPs in supporting patients should also be recognized. Previous work reported that staff holding patients accountable for their actions facilitated behaviour change (Jimenez et al., 2015). We also found in some cases patients were motivated to achieve health goals because of the anticipated pleasure of gaining staff approval, possibly arising from the positive and trusting relationships formed. The importance of such relationships is further supported in other work reporting that negative staff attitudes prevented behaviour change in patients (Burton et al., 2015; Roberts & Bailey, 2011).

Positive reinforcement in the form of being able to identify progress with goals through health indicators or physical appearance has also been reported as a motivating factor.
We found similar findings when staff provided feedback to patients in terms of progress and biofeedback. However, we also found that not experiencing visible positive results decreased motivation in both staff and patients, suggesting that care should be taken when applying these techniques. Our earlier analysis of factors affecting implementation found that staff skill-set workability to support patients varied, and knowledge and experience in mental health, physical health training additional peer support, were perceived as important. Other work has also shown the knowledge and personal attributes of staff influenced health behaviour change in people with SMI (Burton et al., 2015; Roberts & Bailey, 2011).

It is commonly reported that mental health symptoms prevent patients engaging with healthy behaviours (Roberts & Bailey, 2011; Yarborough et al., 2016). Though this was not identified in patient interviews, staff suggested this as a barrier to behaviour change. The reason for these opposing views may be due to negative staff attitudes and stigma (Burton et al., 2015). However, people with SMI commonly experience a lack of motivation as part of their symptoms (Albrecht, Waltz, Frank, & Gold, 2018). Having a good understanding of mental health symptoms and BCTs when delivering behaviour change interventions could help patients to overcome the potential impact of mental health symptoms on their ability to change behaviours. Access to interdisciplinary teams with behavioural psychologists and mental health practitioners may also help to overcome such challenges, and the lack of motivation staff experienced when patients did not achieve their goals as discussed earlier. Further, it could be that patients did not perceive their health behaviours as a priority compared to mental health. This may provide reasoning why in some cases patients reported a lack of proactivity or action staff advice, staff reported difficulties changing some health perceptions and may be supported where staff reported problems of poor physical health, the time, and resource required to support health behaviour change in this population.

We found that participants who made use of existing opportunities to exercise within their environments perceived this as helpful for continuing and normalizing their behaviours. However, it is important to acknowledge that such opportunities may vary based on environmental factors such as area-level deprivation, access to green space, the costs associated with eating healthily, and the availability of fast food. This was supported in our findings where staff reported that the availability of resource across different areas of England limited the extent to which they were able to refer patients to receive specialist services. Although this was not apparent in patient interviews, it is possible that researchers had not prompted further discussion of the impact of socio-economic factors on health behaviours as this was not the original aim of the study.

Habit formation was one of the eight key intervention strategies. However, we were unable to identify any instances where patients and/or staff reported that staff were prompting patients to rehearse or repeat behaviours in the same context continuously. Although we identified that patients reported making use of their environment such as getting off the bus early and walking more which helped normalize behaviour, there was no suggestion that rehearsal or repetition in such contexts was prompted by staff. This may be that habit formation was not specifically explored in interviews or that this BCT was not explored by staff.

**Strengths and limitations**

To our knowledge, this is the first study to explore the perspectives of primary care nurses and HCA's delivering BCTs to change health behaviours in people with SMI and how these
worked in practice using theoretical reasoning. We also compared both staff and patient experiences therefore capturing a broad range of perspectives and gaining a comprehensive understanding of staff and patient experiences of behaviour change. Using the COM-B model and acknowledging the links between the different sources of behaviour facilitated a deeper understanding behind the processes affecting health behaviour change.

This was an analysis of data from a subsample of those receiving delivering a CVR risk-reducing intervention as part of a the PRIMROSE trial, and participants may not therefore be representative of all people with SMI (e.g., those with limited ethnic diversity) or primary care nurses/HCPs. It may be that people with SMI who took part were more motivated to change their unhealthy behaviours than those who did not, and that HCPs had more interest and/or confidence in this topic than those not participating. The samples were, however, generally representative of staff and patients who took part in the trial. The trial was pragmatic in design, with the intervention delivered in a clinical setting (primary care) by existing staff who were trained in behaviour change. Those responsible for data collection were also involved in the trial. Prior contact with staff may have influenced staff responses in terms of social desirability and/or how researchers collected the data. However, the data were analysed with other members in the research group and a third researcher with no involvement in the trial or data collection led the current secondary analysis. As this was a secondary analysis of qualitative data, it was not always possible to distinguish BCTs and barriers and facilitators for different health behaviours as the data were not always available, particularly when staff discussed various patients and patients discussed various health goals. It may not be ideal to explore the range of health behaviours together as it is possible that different BCTs were applied for different health behaviours and there may have been different barriers and facilitators associated with each health behaviour. Nevertheless, when staff and patients discussed specific health behaviours, there were similarities in terms of the BCTs, barriers, and facilitators reported across the range of health behaviours.

**Implications for practice**

We identified from our findings a range of strategies to optimize healthy behavioural changes in people with SMI. Future interventions should consider the following: (1) conducting individualized behavioural assessments (including what may be causing a lack of change), applying flexible approaches and a range of BCTs to suit individual requirements, (2) peer-led approaches or providing practical social support, in particular for those who lack social support or are influenced by unhealthy social environments, (3) strategies that increase patient motivation, whilst considering individual drivers of motivation based on behavioural assessments, (4) the use of techniques designed to encourage awareness of visible success (e.g., biofeedback, feedback on behaviour, and/or outcome), but with care in their application, in line with this, setting achievable goals so that success is experienced early and can reinforce behaviours, and (5) embedding changes into patient routines to maintain behaviours.

**Conclusions**

Overall, our findings suggest that health behaviour change in people with SMI was variable. Patients and staff suggested that in some cases, BCTs helped facilitate behaviour change through increasing capability, opportunity, and motivation, but in
other cases did not. The perception that BCTs helped improve health behaviours for some suggests that some people with SMI may be able to change their health behaviours with support from primary health care professionals. This may be important in terms of the role primary health care professionals might have in helping to reduce CVD risk in this population. However, given staff and patient perceptions that health behaviour change in some cases is difficult, more work should be conducted to optimize the effectiveness of interventions for people with SMI in different health care settings. Future interventions should consider individual needs, the role of social support, strategies to target motivation, and ways of normalizing healthy behaviours.

Acknowledgements
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Conflicts of interest
All authors declare no conflict of interest.

Author contributions
Suzan Hassan (Data curation; Formal analysis; Investigation; Methodology; Project administration; Validation; Writing – original draft; Writing – review & editing) Jamie Ross (Conceptualization; Data curation; Formal analysis; Methodology; Supervision; Writing – review & editing) Louise Marson (Conceptualization; Methodology; Supervision; Writing – review & editing) Alexandra Burton (Data curation; Formal analysis; Investigation; Supervision; Writing – review & editing) David Osborn (Formal analysis; Investigation; Methodology; Supervision; Writing – review & editing) Kate Walters (Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Writing – review & editing)

Data availability statement
The research data are not shared. The data are not publicly available due to privacy and ethical restrictions.

References


Vancampfort, D., Firth, J., Schuch, F. B., Rosenbaum, S., Mugisha, J., Hallgren, M., . . . , Stubbs, B. (2017a). Sedentary behavior and physical activity levels in people with schizophrenia, bipolar


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A qualitative study exploring the barriers and facilitators of implementing a cardiovascular disease risk reducing intervention for people with severe mental illness into primary care contexts across England: the ‘PRIMROSE’ trial

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Abstract

Background: People with severe mental illness (SMI) are at greater risk of earlier mortality due to physical health problems including cardiovascular disease (CVD). There is limited work exploring whether physical health interventions for people with SMI can be embedded and/or adopted within specific healthcare settings. This information is necessary to optimise the development of services and interventions within healthcare settings. This study explores the barriers and facilitators of implementing a nurse delivered intervention (PRIMROSE) designed to reduce CVD risk in people with SMI in primary care, using Normalisation Process Theory (NPT), a theory that explains the dynamics of embedding or ‘normalising’ a complex intervention within healthcare settings.

Methods: Semi-structured interviews were conducted between April–December 2016 with patients with SMI at risk of CVD who received the PRIMROSE intervention, and practice nurses and healthcare assistants who delivered it in primary care in England. Interviews were audio recorded, transcribed and analysed using thematic analysis. Emergent themes were then mapped on to constructs of NPT.

(Continued on next page)
Background

It is well established that people with a diagnosis of severe mental illness (SMI) are at greater risk of early mortality compared to the general population due to physical health problems. One of the physical health problems that people with SMI experience includes cardiovascular disease (CVD) [1, 2], and the mortality gap between people with SMI and the general population is widening [3]. The causes of this health disparity are multifactorial and interrelated [2]. Higher cholesterol, blood pressure, blood glucose and obesity are apparent in people with SMI as well as unhealthy behaviours such as smoking, excessive alcohol intake, poor diet and physical inactivity [2]. Restricted access to appropriate healthcare has also been reported as a potential contributing factor, with barriers to access including difficulties around patients attending appointments, knowledge, stigma, lack of interpersonal skills displayed by healthcare professionals (HCPs) and lack of continuity in HCPs for their care rather than the same HCPs [4–7]. Current clinical guidance in the United Kingdom (UK) states that both primary and secondary care services should take a more active role in detecting and preventing health problems in people with SMI [8].

There is an emerging body of research investigating the effects of different interventions to reduce physical health problems in people with SMI. Systematic reviews have reported nutrition interventions to be effective at preventing and treating weight gain, hypoproteinaemia and use of varenicline to be effective at improving smoking quit rates in the medium and long term, and inconsistencies in the literature on interventions aimed at improving sedentary behaviour and physical activity levels [9–11]. It is however unclear whether these interventions are replicable, can be embedded and/or adopted within different healthcare contexts and whether factors related to setting may impact the effectiveness of interventions.

There is limited existing research on factors that affect the delivery of physical healthcare for people with SMI in healthcare settings overall and in particular primary care. Two studies conducted in Australia; one in both community mental health settings and primary care settings and the other only in community mental health settings [12, 13]. These studies reported that the availability of services, geographic location, waiting time, staffing levels mental health stigma amongst staff, lack of role responsibility, lack of training, lack of primary care links and increased workload all affect delivery [12, 13]. Research in the UK with mental and physical health staff has reported that having appropriate mental and physical health knowledge and skills amongst staff, prioritising physical health, information sharing systems, access to time and shared agreement of roles and responsibilities were important [14]. Factors preventing healthcare delivery from the perspectives of both primary care and community mental health professionals included challenges accessing General Practitioner (GP)
and community-based services, challenges adopting healthy behaviours, patients not attending appointments and a lack of awareness among HCPs of CVD risk in people with SMI [15]. We identified no studies that explored factors affecting delivery of physical health care to people with SMI in primary care settings alone.

We developed a pragmatic behavioural intervention (PRIMROSE) delivered by primary care nurses and healthcare assistants (HCAs) in primary care practices across England to people with SMI to reduce their CVD risk [16, 17]. In UK primary care settings, 98% of the UK population is registered with a GP. In this setting nurses and HCAs provide a range of care to registered patients including, for example, routine health checks, screening services, reviews of long-term conditions (e.g. diabetes, pre-diabetes, asthma), immunisations, wound care, contraceptive services, weight management etc. They would not normally provide specific care for people with SMI, but might provide care for other health conditions for people with SMI. To our knowledge, in current primary care contexts in the UK there are no interventions where a manual is provided to guide primary HCPs to target CVD risk in people with SMI. The PRIMROSE intervention comprised of behaviour change components designed to improve health behaviours such as physical activity, diet, alcohol use and smoking in people with SMI and encourage the uptake of physical health medications such as statins to reduce CVD risk in people with SMI. This is described further in the supplementary material. The findings from the cluster randomised trial of the PRIMROSE intervention in 76 practices has been published [16, 17]. There was no effect on the primary outcome (total cholesterol) or other secondary outcomes compared to usual treatment. However, it was associated with fewer costs due to reduced psychiatric admissions. It is unclear whether this was a result of the problems related to the implementation of the intervention into primary care. It is therefore important to understand factors that impeded and/or assisted intervention implementation into primary care contexts to further elucidate findings, as well as further inform the implementation of other physical health interventions more broadly in primary care other than CVD risk reducing interventions alone. Research in this area is limited and more evidence is needed to help inform future services, clinical guidelines and commissioning groups working to implement physical health interventions for people with SMI in primary care settings.

Qualitative methods are advocated to explore the implementation of complex interventions [18]. Additionally, the use of theory is thought to strengthen knowledge and explanations regarding why interventions may or may not work well within specific contexts [18, 19]. One theory that explains the dynamics of embedding or ‘normalising’ a complex intervention within settings is Normalisation Process Theory (NPT) [20, 21]. NPT was developed to address the difficulties of implementing new interventions and/or care into healthcare settings, and to provide greater explanation behind these processes. NPT has been applied widely in different populations and healthcare settings but not yet to a physical health primary care intervention for people with SMI. The purpose of the current study was to explore the barriers and facilitators of implementing the PRIMROSE intervention into primary care across England, applying NPT to facilitate a deeper understanding of the factors that affected implementation.

Methods

Participants and recruitment

Patients were eligible for inclusion for the PRIMROSE study if they were aged 30-75 years old, on the GP practice mental health register with a diagnosis of SMI (schizophrenia, persistent delusional disorder, schizoaffective disorder, bipolar disorder, psychosis, psychotic depression or other psychotic disorder), a total cholesterol level above or including 5.0 mmol/l or raised total cholesterol/ HDL cholesterol ratio above and including 4 and one or more of the following: BMI ≥30 kg/m², current smoker, blood pressure ≥140 mmHg systolic and/or ≥90 mmHg diastolic, HbA1c ≥42 to 47 mmol/mol (6.0 to 6.4%) and/or impaired fasting glucose ≥5.5 to 6.9 mmol/L, diagnosis of diabetes, diagnosis of hypertension. Staff delivering the intervention had to be working within a recruited GP practice as either a nurse or HCA [17].

A random 20% sample of practices randomised to deliver the PRIMROSE intervention in the trial were identified (n = 43/50, from which thirty patients and or patients receiving the PRIMROSE intervention were invited to participate. Staff were selected if they had delivered at least one PRIMROSE session, attended PRIMROSE training and were not part of the internal PRIMROSE pilot phase (n = 31/41 health providers). Staff and patients were approached for participation by researchers (SH2 and AJB) via email and letter. Ethical approval for the study was granted by the London - City Road & Hampstead Research Ethics Committee NRES committee, REC ref. 12/LO/1934.

Data collection

Face-to-face semi-structured interviews were conducted with participants by two members of the research team (SH2 and AJB). None of the researchers had any prior contact with patients. There was prior contact between researchers and staff in terms of training and answering queries or concerns related to the PRIMROSE trial.
Staff interviews took place between April – August 2016, approximately 6–18 months after conducting the final appointment with their last PRIMROSE patient. Patient interviews took place between October – December 2016, approximately 6–9 months after their final intervention appointment. Interviews took place in primary care practices.

Two topic guides aimed at patients and staff were used to guide interviews (see supplementary material). These contained open-ended questions on the impact of the intervention on patients, benefits and disadvantages of the intervention, fitting the intervention into current roles and primary care contexts and factors impacting this. Corresponding prompts were added to questions to gain more clarity or detail regarding responses.

Questions in staff and patient topic guides were developed through discussion with the core research team (S.H2, A.B, K.W and D.O). The topic guide was piloted on members of the research team and an HCP to check the relevance of topics and legibility of questions and adapted accordingly.

Before the start of the interview, researchers explained the purpose of the study and encouraged participants to share both negative and positive experiences of receiving and delivering the PRIMROSE intervention. Staff were required to complete a form to ascertain demographic details, whilst patient characteristics were collected during the PRIMROSE trial [16, 17].

All interviews were audio-recorded and transcribed verbatim by an external transcription company. The transcripts were checked against audio-recordings for accuracy by the researchers. Researchers anonymised transcripts by removing all identifiable content.

Data analysis
Anonymised and corrected transcripts were stored and analysed on NVivo (Version 11) software. The analysis was conducted by researchers with a background in qualitative research, health psychology, psychiatry and mental health research. In the initial analysis researchers (S.H2, A.B, R.B and T.M) familiarised themselves with the data by reading the transcripts and then coded the data descriptively to represent emerging topics. The codes were developed through discussion with the research team (S.H2, A.B, R.B, T.M, D.O and K.W). This process was iterative and researchers continually revised and adapted codes until they felt satisfied that the codes represented the data. Once coded, the data were then analysed thematically [22] by S.H2 and A.B. Two further researchers (S.H1 & J.R) with an interest in mental health research, process evaluations and implementation science were involved in further developing the themes. These researchers had previously not been involved with the trial or data collection. Themes were identified inductively by searching for commonalities, discordant views and underlying meanings behind the derived codes. The themes were derived iteratively through discussion with the research team (S.H1, J.R, A.B, S.H2, K.W and D.O).

Following agreement on themes, NPT was applied to move the analysis beyond description and toward explanation. The four main constructs include coherence (i.e., sense-making of the intervention), cognitive participation (i.e., commitment to and engagement with intervention), collective action (i.e., the work that is conducted to facilitate delivery) and reflexive monitoring (i.e., an evaluation of the costs and benefits). Each construct contains sub-components, however, we were particularly interested in the sub-components of collective action, including interactional workability, contextual integration, skill-set workability and relational integration as this is one of the most defined and used of the subconstructs and particularly helpful in explaining the work that is done around intervention implementation [20, 21]. Further, the sub-constructs related to other domains of the NPT appeared to overlap and it was not possible to map these to the sub-constructs without repeating themes in multiple areas. However, when mapping the themes to sub-constructs of collective action, there was greater distinction between the themes and sub-components that they were mapped to. One researcher (S.H1) mapped the inductively derived themes to NPT constructs. Details regarding how the NPT constructs were operationalised are provided in Table 1. The mapping process was iterative, moving backward and forward between the emergent themes and the NPT definitions. The mapping process was discussed among researchers (S.H1, J.R, A.B and K.W) and revised iteratively until we were satisfied that the themes had been mapped correctly onto the NPT constructs.

Study integrity
We ensured that various steps were taken to maximise the integrity of the study findings. Two researchers (A.B & S.H2) were involved in collecting the data which allowed them to engage and observe participants and their responses. These researchers were also involved in the analysis process and their familiarity with the data allowed the wider team to interpret data in the context in which it was collected. We also collected data from two sources, including patients and staff. We triangulated patient and staff responses, which allowed us to compare both perspectives, thereby gaining a comprehensive picture of the implementation of the intervention overall. We also discussed the coding strategy, development of themes and mapping of NPT between ourselves. As discussed previously, we have a multidisciplinary background with specialists in different
subject areas. This allowed us to consider the interpretation of data in various ways. We also actively identified both common typical themes as a way of ensuring as much as possible that different perspectives were taken into consideration.

Results

Participant characteristics
Thirty participants, including 15 nurses and HCAs who delivered PRIMROSE (from 31 approached) and 15 patients with SMII who received it (from 30 approached), took part in the current study. Six patients did not give a reason for not wanting to take part, however other reasons included inability to gain contact (n = 3) and not feeling well enough to take part (n = 2). Nine staff did not respond to the invitation to take part and reasons for non-participation included: not interested (n = 3), lack of time (n = 2) and not yet finished delivering the intervention (n = 2).

The characteristics of staff are presented in Table 2 compared to the characteristics of the staff delivering PRIMROSE. The sample comprised of both practice nurses and HCAs of different age ranges (25–65 years) with varying degrees of professional experience (from 1 to 30 years). Staff were all White British ethnicity and female. Most staff were previously not involved in research. The sample in the present study was mostly comparable to the rest of the staff delivering PRIMROSE in terms of age, length of experience and previous research experience, but did not capture the perspectives of the few ethnic minority groups, male participants, those delivering 0–1 or 20–35 PRIMROSE intervention appointments or the only GP delivering PRIMROSE.

The characteristics of the patients in the present study are listed in Table 3 compared to the characteristics of the rest of the PRIMROSE trial participants. The sample in the present study comprised of participants who were diagnosed with either bipolar disorder or schizophrenia. The age of patients ranged from 30 to 70 years. Patients were mostly male and White ethnicity. The characteristics of the patient sample were similar to those in the overall PRIMROSE trial sample in terms of gender, age group and diagnosis. However, the sample in the present study did not capture the perspectives of the few ethnic minority groups in PRIMROSE, the minority of those that were separated, divorced or widowed as well as those that received either 0 or 1 PRIMROSE intervention appointment.

Findings

The themes derived from the data are provided in Table 4. These are presented alongside the NPT constructs that themes were mapped to. The themes were discussed with specific reference to, and organised by, the NPT constructs in the written presentation of findings. Some themes mapped on to more than one NPT construct. In these instances, the relevance of the theme regarding different NPT constructs were discussed within each NPT heading. When comparing themes across staff and patients, it was apparent that in some cases themes arose in both staff and patient interviews but in other cases may have arisen only in staff or patient interviews.

Coherence

The intervention was mostly perceived by patients as coherent in terms of the aim of the intervention. Both staff and patients reported a shared understanding of the benefits of the intervention.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Qualitative Staff Sample (n = 40)</th>
<th>All PRIMROSE Staff (n = 41)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>25–30</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>30–40</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>40–50</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>50–60</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>39</td>
</tr>
<tr>
<td>Male</td>
<td>–</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>White Other</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>Asian Other</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td><strong>Provider role</strong></td>
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<td></td>
</tr>
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<tr>
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<td>13</td>
</tr>
<tr>
<td>Research Nurse</td>
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<td>3</td>
</tr>
<tr>
<td>GP</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td><strong>Length of experience as a nurse/HC (years, months)</strong></td>
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<td></td>
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<td>1</td>
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</tr>
<tr>
<td>6 to 10 years</td>
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<td>10</td>
</tr>
<tr>
<td>11 to 15</td>
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<td>5</td>
</tr>
<tr>
<td>16 to 20</td>
<td>1</td>
<td>6</td>
</tr>
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<td>21 to 30</td>
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</tr>
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<tr>
<td><strong>Previous experience of search</strong></td>
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</tr>
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<td><strong>Number of PRIMROSE intervention appointments delivered</strong></td>
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</tr>
<tr>
<td>0–1</td>
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<td>3</td>
</tr>
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</tr>
<tr>
<td>51–55</td>
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<td>2</td>
</tr>
</tbody>
</table>
Table 3 Patient characteristics compared to the characteristics of the patient intervention sample

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Qualitative patient Sample (n= 18)</th>
<th>All patients allocated to the PBRMOSE Intervention (n= 130)</th>
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<td>Gender</td>
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</tr>
<tr>
<td>40–69</td>
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<td>45</td>
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<tr>
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<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizophrenia/schizoaffective disorder</td>
<td>6</td>
<td>54</td>
</tr>
<tr>
<td>Bipolar affective disorder</td>
<td>7</td>
<td>71</td>
</tr>
<tr>
<td>Other Psychosis</td>
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<td>30</td>
</tr>
<tr>
<td>Number of PBRMOSE intervention appointments attended (over 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>15</td>
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<tr>
<td>2–5</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>≥6</td>
<td>12</td>
<td>73</td>
</tr>
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</table>

Clarity of purpose
A common theme among patients was a clear understanding of the purpose of the intervention, acknowledging the focus on health improvement in people with SMI to reduce CVD risk. Patients reported that their understanding was facilitated by staff who provided relevant information sheets and explained the purpose.

"...I thought it was to get an insight into how I was going from time to time, seeing people you know, getting weighted, taking blood pressure and things like that...I got the original pamphlet and I read that and that kind of told me everything I wanted to know." (Patient 12, female, 60’s)

An atypical view among patients was confusion regarding the purpose of the intervention. One patient believed that the intervention was designed to improve mental health outcomes rather than physical health. The lack of understanding appeared to be caused by the GP’s description of the intervention.

"As I understood it, it was basically, with early intervention or regular intervention, by your local GP practice, the nurse, normally, that it can offer stability and assistance so people like myself don’t relapse...I was approached by the GP practice, basically saying, would I be happy to take part in a project related to mental health." (Patient 81, male, 60’s)

Value of intervention
The intervention was perceived as valuable by patients and staff. Staff reported that they understood the intervention could prevent patients from experiencing later
Table 1 Inductively derived themes mapped to NPT constructs

<table>
<thead>
<tr>
<th>Themes identified in the raw data</th>
<th>Resultant NPT constructs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherence</td>
<td>Coherence</td>
</tr>
<tr>
<td>Cognitive participation</td>
<td>Cognitive participation</td>
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<tr>
<td>Skill-set workability (Collective action)</td>
<td>Skill-set workability (Collective action)</td>
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<td>Skill-set workability (Collective action)</td>
<td>Skill-set workability (Collective action)</td>
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<td>Interactional workability</td>
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<td>Interactional workability</td>
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<tr>
<td>Contextual integration (Collective action)</td>
<td>Contextual integration (Collective action)</td>
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Health problems and increase quality of life, as well as reduce financial burden for future health services.

"I think it would benefit people because it's a positive thing, and it's working towards improving people's health and their lifestyles." (Staff 8, Nurse, 50's)

A common theme among patients was that the intervention would provide an opportunity to make changes and improvements to their health.

"I thought it would be a good idea to just look at my healthcare and try and make some necessary adjustments so that my health can be improved..." (Patient 112, female, 50's)

Cognitive participation

Although most staff and patients understood the purpose and value of the intervention (i.e., coherence), the extent to which staff were cognitively willing to participate, engage and commit to the intervention varied. Mental health stigma in some cases resulted in negative perceptions among staff of their ability to implement the intervention. In some cases, an understanding (i.e., coherence) of the value of the intervention in terms of helping patients become healthier, motivated staff to deliver the intervention. In other cases, difficulties arising from the contextual environment (collective action/contextual integration) affected cognitive participation.

Mental health stigma

Staff held different views regarding their preconceptions of mental health. There were some prior concerns regarding working with people with SMI. Some staff anticipated problems around the impact of mental health symptoms on attendance and engagement difficulties.

"We can deal with somebody with diabetes and all of that, and we can tell them this, that and the other, but somebody with mental health, when they've got that problem they may not have that understanding. They may not engage for a long period of time. It's really very difficult... I prefer people who can engage with me." (Staff 5, Nurse, 40's)

However, other staff felt positive about working with patients with SMI and in some cases prior experience within nursing roles enabled staff to feel open toward delivering the intervention.

"I think you have to be open-minded, as a nurse, to be a good nurse. So I wasn't intimidated at all, initially" (Staff 4, HCA, 50's)

Motivation to engage

Despite some negative attitudes towards mental illness in some individuals, it was clear that most staff had the motivation and desire to help patients achieve their goals and therefore engage with the intervention. This appeared to stem from the understanding of its purpose and potential benefits (i.e., coherence).
"I think probably knowing that you could be a part of helping them, I think that probably influenced us as well, and knowing that if you just gave them that little bit of help then they could improve, I think that's probably the motivation in itself." (Staff 15, Nurse, 60s)

**Compatibility with existing practice**

Some issues related to cognitive participation were also underpinned by difficulties related to contextual integration (discussed later). Some staff questioned the applicability of the intervention to real-world contexts (cognitive participation) and suggested that the intervention would not fit in within a busy GP practice which subsequently affected their willingness to deliver the intervention going forward.

"I'm not sure how it would fit in easily in a surgery that's already quite packed. We've got ever-growing lists, so whether it could be done in more of a mental health environment, it may be more appropriate..." (Staff 13, Nurse, 30s)

**Collective action**

Several barriers surrounding the work that was needed to facilitate delivery of the intervention were identified. There were some problems related to intersectoral workability, contextual integration, skill-set workability and, in some cases, relational integration.

**Intersectoral workability**

Staff made substantial efforts to encourage patient engagement by facilitating accessibility to the intervention. This finding was also reported by patients and staff arranged appointments to suit their preferences. However, staff faced barriers regarding patient engagement. Additionally, both staff and patients found some of the intervention written materials including the use of written health plans difficult and time-consuming to implement. However, patients expressed mixed views about the use of health plans. It was also difficult to operationalise the intervention into routine practice due to the need for adequate time to facilitate engagement and accessibility.

**Accessibility of intervention**

Staff acknowledged that intervention appointments would sometimes take longer than the time they had available. Difficulties were centred mainly on fitting appointments around additional responsibilities. Despite these difficulties however, staff demonstrated flexibility and scheduled appointments accordingly to increase accessibility.

"Something, finding slots when we're so busy, that would be a thing as well, so sometimes you think to yourself, well, you know, this patient needs extra time, but actually we haven't got a slot to fit her in." (Staff 1, HCA, 40s)

The flexibility in scheduling appointments was also reported by patients who suggested that staff would arrange appointments when it would suit them and were understanding even if patients did not attend.

"She suggested dates on the telephone, and sometimes I would phone and say, I'm not available on that day, so an alternative appointment was made, so it had to be mutually convenient for both of us. Obviously, she has other jobs... in the surgery to do as well, so it had to be convenient for her as well." (Patient 112, female, 50s)

**Engagement with intervention**

Despite attempts to make the intervention accessible to patients through flexible appointment scheduling, staff reported difficulties related to patient attendance. Staff commonly reported being disappointed when patients were disengaged from the intervention given the time invested to facilitate accessibility.

"...it was the patients that didn't come. You just get frustrated, you put all of this time and effort into the first appointment and then you never saw them again." (Staff 10, Nurse, 40s)

**Intervention materials**

Staff reported that the materials designed for the intervention including the health plans, in some cases acted as barriers to providing the intervention. Some staff reported that patients sometimes struggled in terms of understanding and completing the required documentation and reported it was time-consuming and negatively impacted on the consultation process.

"I think using the book for something like that, you do need a lot of time to go through it with them...I think maybe the book made it feel too formal. I don't think the book has a very user friendly, so I think that was almost a stumbling block. Maybe I didn't understand the book particularly and the patients didn't particularly find it helpful." (Staff 11, Nurse, 60s)

Patients' views regarding the value of health plans were mixed. Some patients reported that they were sometimes problematic to use in practice. It was suggested that documents were repetitive and were sometimes difficult to
fill in. Conversely, others reported that the health plans helped them keep track of the changes they had made.

“That was okay. A bit repetitive at times because, you know, you were... obviously, the food for four weeks, you tended to be writing a little bit of the same thing...” (Patient 9, female, 50’s)

“...That booklet or a personal diary would help, because sometimes you can’t remember exactly what have you done a week ago, two weeks ago, so it’s good to write down some notes. But it’s difficult sometimes. One of the difficulties, I found it’s difficult to do it on the day sometimes.” (Patient 112, female, 50’s)

Compatibility with existing practice Staff were concerned about patient engagement issues with intervention appointment attendance. As a result, they suggested that the practicalities of getting patients with SMB to engage within a GP practice would be difficult. They also suggested there would be a need for additional nurse time to facilitate engagement and accessibility. However, the availability of additional nurse time was questionable.

“I think if we were going to deliver that care in that format and at that intensity, I think it would be quite difficult. Not so much the face-to-face time, but certainly the getting people in... Ringing them once wasn’t a problem... Raising them again and again... if that was going to be part of how we would deliver the care, that could provide difficulties if it was done to me” (Staff 10, Nurse, 40’s)

The difference between GP and intervention appointments was further highlighted by patients. Patients expressed that more time was available in intervention appointments with care that felt holistic compared to GP appointments. However, this perception may have been influenced by the fact that patients were aware that the care they were receiving was part of an intervention and not usual care.

“This was totally different. This was very patient-centred... From my view is that it’s very much based on a holistic approach of the patient. So it’s patient-centric and in looking at everything whereas a normal GP appointment is five minutes and it’s transactional...” (Patient 17, male, 40’s)

One staff member questioned the structured nature of the intervention and reported that it sometimes felt unnatural.

“...we need to follow these questions... and we need to do it this way but that’s not real life and that’s not how we would speak to our ordinary patients that don’t have a mental health illness... you had to follow this stream of questioning...and that didn’t work... It wasn’t comfortable because that’s not the norm of working...” (Staff 5, Nurse, 40’s)

Relational integration Relationships between practice staff and staff delivering the intervention and patients were considered as important in the implementation of the intervention. The availability of team support within some practices facilitated intervention delivery, whilst the lack of availability hindered progress. A positive relationship between patient and staff members encouraged confidence and trust in staff members to deliver the intervention.

The level of ‘in-house’ support Staff suggested that they required support from team members within practices to deliver the intervention. There was a need for access to health advice for difficult cases when staff were unsure. However, there was a variation between the level of teamwork within different practices to facilitate intervention delivery. This sometimes acted as a barrier to providing the intervention, particularly in cases where permission was required for prescribing medications and senior staff members were unavailable.

“I did feel as if I was on my own a little bit in the surgery... There was just not support as in, I’m worried about this patient, but it was maybe just reading consultation notes, that sort of thing.” (Staff 10, Nurse, 40’s)

The differences between team working across different practices were apparent when other staff reported that senior members within their practice were willing to provide advice regarding patients, which facilitated intervention delivery.

“I’ve always got backup, I wouldn’t have hesitation in asking any of the senior and the qualified staff, I think that’s why we’ve got the backup here to do a really good job.” (Staff 14, Nurse, 50’s)

Patient – staff alliance It was apparent that some patients and staff had formed close therapeutic relationships. Staff were aware that in order to ensure that patients felt comfortable engaging with the intervention, and instill confidence in their ability of providing it, it was important to establish connections with patients.
"Making them feel comfortable by making a relationship with them to start with... And that is making a relationship with them to come back and encouraging them in their own way." (Staff 11, Nurse, 60's)

As a result of the relationships patients had formed with staff, most patients felt positive about interacting with staff and found that this increased their willingness to engage with the intervention.

"...we had a good relationship, she's very supportive and I think she understood about me personally, obviously having my medical record, that it was the medication that stopped me losing weight..." (Patient 12, female, 70's)

**Skill set workability**

Staff knowledge regarding mental health were both barriers and facilitators to intervention delivery. Most staff appeared knowledgeable regarding physical health. Once staff had received the PRIMROSE study intervention training it was clear that they developed valuable skills that aided intervention delivery.

**Knowledge** Staff reported a lack of experience working with patients with mental health problems resulting in a lack of knowledge in this area. As a result, they felt anxious about delivering the intervention. One staff member suggested that the intervention was not in keeping with her knowledge and therefore it would be more appropriate that patients were seen in mental health settings.

"I just think better in a mental health environment, with the nurses that already have that knowledge of conditions. Because they were very limited on what knowledge we do know about mental health." (Staff 13, Nurse, 50's)

This theme was atypical among patients but demonstrated that patients had noticed that staff appeared to be lacking in confidence providing the intervention.

"... she was kind of pausing in the dark in some degree... the impression I got is that, you know, she was just given a pile of information and she had to do her best to interpret." (Patient 81, male, 60's)

In contrast, staff with prior experience with mental health patients were more knowledgeable about interacting with people with mental health and less anxious delivering the intervention. In some cases, this prior experience facilitated their knowledge on delivering the intervention to this population.

"Maybe I was using the tools and the skills I used for really poorly mentally ill patients that were having to be put on a ward for their own safety." (Staff 14, Nurse, 50's)

Whilst there was a mixture of staff that had knowledge of mental health, it was clear that most staff had some form of knowledge of physical health as a result of their prior experience.

"...I do the NHS health checks here, if their risk is high and their total cholesterol is high or their ratio is high, I will actually go and initiate a start on the total statin 20mg...if the patient was coming to me wanting to lower their cholesterol or lower their blood pressure, then I have the tools that I can advise them on that." (Staff 14, Nurse, 50's)

**Training** Staff reported that the training delivered prior to the intervention was essential in increasing their knowledge of how the intervention could be delivered. In most cases staff reported that the training increased their confidence and prepared them in terms of how to engage with people with SMI.

"...the training you gave us was amazing, very helpful, I wouldn't have been able to do it without it. Just as a background of the different illnesses and going back to basics for us...And also we had some training on communication and body language and things like that, which was a good refresher, because you forget." (Staff 2, HCA, 50's)

However, not all patients believed that staff had been trained adequately. One patient felt that HCAs had less training and were consequently unable to deliver the intervention and staff commonly suggested further training would be beneficial.

"We had to use Health Care Assistants, who maybe didn't have quite as much training..." (Patient 17, male, 40's)

"...it seemed to sort of suit what we had to do but, like you say, perhaps something in the interim would be good." (Staff 12, HCA, 30's)

**Skills** Patients reported on the skills that staff members used when delivering the intervention. It was evident
that staff provided advice when necessary, displayed patience when interacting with patients, were clear, encouraging and positive.

"...sometimes I wasn't sure, but then <practice nurse> would kind of give me a bit of hand with ideas, and then we'd kind of come up with it together...it was good..." (Patient 6, female, 30's)

This was in some cases supported in staff accounts. Staff commonly reported attempts to make appointments engaging by interacting with patients and providing guidance when required. This demonstrated staff interpersonal skills.

"...when a patient comes in, I try to make it as much fun as possible as well, because doing that...it makes it more comfortable for the patient, I think." (Staff 1, HCA, 40's)

Contextual integration
The integration of the intervention into practice contexts contained challenges. Resources including time were required to successfully implement the interventions and the availability and time taken to identify this in some cases acted as a barrier to delivering the intervention.

Resource availability and benefits
Staff described that one of the main intervention functions involved searching for available local services that patients could be referred to for additional support in reducing physical health problems. However, one of the barriers to implementing the intervention was finding the time required to look for such resources as well as the lack of availability of local services.

"...part of the Primrose it was to look what was available in the area, and to be perfectly honest I didn’t have time. We did some of it but you just don’t... you haven’t always got time to sit and read through a directory of things and see what’s around in the city." (Staff 5, Nurse, 40’s)

The need for external resources to implement the intervention was highlighted where staff had successfully located resources. They suggested that this facilitated easier access to resources which appeared to help patients achieve specific health goals.

"Another person was referred to a dietician. As I said, that was in regard to his cholesterol, and he was referred to a specialist, as well. And I think that probably happened a bit more quickly than it might have done... I think we're quite lucky, out here, that you can refer people on different groups, clints..." (Staff 4, HCA, 50's)

Reflective monitoring
When evaluating ways to adapt the intervention, it was suggested that there was a need for a PRIMROSE designated clinic within future practices and technology to make the intervention more workable.

Modifiability through accessibility
It is also been reported within interactional workability (accessibility) that staff made necessary adjustments to fit intervention appointments into routine practice in settings where there was limited. Some staff suggested that a designated timeslot could be developed for patients within GP surgeries to better integrate the intervention and allow more time for appointments.

"...rather than have the appointments scattered, have an actual little clinic for it, and then let, let people know what day that you're running and to come in..." (Staff 1, HCA, 40's)

Resource availability and benefits
Some patients suggested that there was a need for current digital technology in order to track their progress during the intervention. However, the intervention did not facilitate access to these types of tools, and GP practices in routine settings do not have access to such facilities.

"I have an apple iPhone and I track my weight and my BMI and all my measurements on my phone. And I would have liked something like that could have tracked it, not necessarily that it was always on paper." (Patient 17, male, 40's)

Discussion
This was one of the first qualitative studies to explore the implementation of a CVD-risk reducing intervention in primary care using the NPT. Staff and patients both reported several barriers and facilitators to implementing PRIMROSE into primary care, which are important for the implementation of future interventions of this kind for people with SMI in primary care. A common finding in the literature is that mental health stigma negatively impacts the delivery and implementation of physical healthcare to patients with SM1 [12, 15]. We also found that mental health stigma influenced cognitive participation and therefore staff willingness to deliver PRIMROSE (i.e. cognitive participation), which subsequently influenced confidence to deliver the intervention. This appeared to stem from skill-set workability and a lack of
knowledge in mental health. This suggests that more work is needed to instil confidence in primary care professionals in terms of engaging with people with SMI and tackling stigma. This notion was further supported where staff reported that prior experience and knowledge in mental health meant that they were more willing to deliver the intervention, and PRIMROSE training further increased confidence. Thus, mental health-specific training for primary care professionals (practice nurses and health care professionals) could help to facilitate the implementation of physical health interventions in people with SMI. Recent work supports the value of training primary care professionals in mental health, with findings suggesting improvements to knowledge, attitudes and practice [23]. We also found that skill-set workability in terms of physical health knowledge played an important role in facilitating implementation, which mirrored previous findings, however patients in the present study thought that HCA’s had less physical health knowledge than nurses [13–15]. This may be explained by the fact that HCA’s training in the UK covers basic nursing skills and involves obtaining the Care Certificate (level 2 Certificate in Healthcare Support Services and level 3 Diploma in Healthcare Support) which can be earned through apprenticeships. HCA training is much shorter than nurses who are educated to degree level. Therefore, training of primary care teams in both physical and mental health-specific knowledge could facilitate the implementation of physical health interventions in people with SMI but HCAs may require more training than nurses to deliver this type of intervention.

Previous work reported that patients with SMI find it difficult to access appointments in primary care, consequently affecting the uptake of physical health interventions [7, 19]. In the present study, problems related to interactional workability influenced collective action, where despite staff efforts to increase accessibility to appointments, there was a perceived lack of patient engagement with the intervention, which subsequently negatively impacted implementation. This was consistent with previous work that suggested that lack of engagement with appointments impeded physical health intervention delivery [16]. Other reasons for lack of patient engagement despite improve scheduling were not discussed in interviews. However, this lack of engagement was reported from the perspective of staff and patients that were interviewed did not report this. This is possibly due to the notion that this sub-sample were more engaged with the intervention as they mostly attended 6 or more sessions.

It was previously reported that a lack of interpersonal skills displayed by HCPs and lack of continuity of care between different HCPs impacted access to and implementation of physical health interventions for people with SMI [6, 7, 14, 15]. We also found that relational integration, in terms of the relationships formed between staff and patients was particularly integral to the implementation of the PRIMROSE intervention. There was a continuity of care for those that did attend appointments frequently which subsequently facilitated positive relationships with staff. It is possible that one-to-one contact with the same HCP enabled patients to feel more comfortable, more trusting of primary care professionals and therefore more likely to engage with the intervention. The value of continuity of care for people with SMI is supported in other work where engaging personal relationships with family, friends and different healthcare professionals facilitate trust and are central for mental health recovery [24, 25]. This may explain findings from the trial that the PRIMROSE intervention was associated with lower costs due to reduced psychiatric admissions [16].

A common finding was that staff questioned the contextual integration of the intervention; most staff did not perceive the intervention as applicable to real-world practice, because there was a lack of access to resources, time, and relational integration in terms of staff support required for implementation into primary care. These findings are well cited in previous work where the lack of availability of services, appointment waiting times, staffing levels and challenges surrounding increased workload affect the delivery and implementation of physical health care for people with SMI [12–14]. Conversely, we found that when staff did have access to specialist resources and designated PRIMROSE appointment slots, the facilitation of delivery. In fact, staff and patients engaged in reflective monitoring and suggested the intervention could be further developed including having a designated time slot. However, primary care is often an over-stretched service and if interventions of this kind are to be implemented in such settings, more consideration must be given to the resources required to facilitate successful delivery.

Implications for practice
To summarise, our findings suggest that training in physical health, mental health knowledge, positive relationships with patients, designated clinics in primary care and extra resources including additional staff are important to facilitate implementation. We therefore recommend that the following should be taken into account when implementing physical health interventions specific to reducing CVD risk and/or more broadly related to health promotion for people with SMI in primary care: a) training should cover physical and mental health; b) application of interpersonal skills when engaging with patients; and access to the same HCPs to
minimise continuity and trust and c) increasing accessibility to resources including specialist services, more staff and designated time-slots for people with SMI in primary care settings.

Limitations and strengths

Overall the sample that took part in the current study captured the variation of characteristics of both staff and patients that took part in the PRIMROSE study, in terms of age, gender (participants), years of experience (staff) and mental health diagnosis (patients). It is however likely that participants may have been more engaged with the intervention as the majority of the sample attended and delivered many appointments. It is possible that less engaged participants may have expressed opposing views. The views of participants from different ethnic groups (both groups) and gender (staff) may have also not been captured adequately. Staff and patients were also interviewed sometime after the last intervention appointment (an average of 8 months in staff and 11 in patients). Staff were however in most cases able to recall events related to PRIMROSE as reflected in the rich data that was captured.

Further, the researchers (S.H2, A.B) had prior involvement in PRIMROSE and prior contact with staff delivering PRIMROSE as well as conducted the present staff interviews and coded transcripts. It is possible that researchers’ pre-conceptions of staff and knowledge about PRIMROSE may have influenced their interpretation of findings as well as the way in which data were collected. For example, social desirability and/or previous negative experiences between researchers and staff may have played a role. However, we minimised this by discussing themes with the wider team, explaining to staff and patients that both negative and positive views were encouraged and involved two other researchers (S.H2 & J.B) in the interpretation of data not involved in the PRIMROSE trial or data collection.

Finally, a further strength is that the use of the NPT helped to further explain factors related to successful and unsuccessful implementation in primary care. We applied the NPT using an inductive data-driven approach, whereby themes were identified in the raw data first and then mapped to NPT constructs. We also utilised the expertise of an implementation scientist (J.B) to well support the wider team to interpret the NPT in relation to themes accurately.

Conclusions

To our knowledge, this is one of the first studies to explore the implementation of a behavioural physical health intervention delivered by primary care staff to patients with SMI in primary care practices using NPT.

Successful implementation hinged on staff preconceptions, experience and knowledge of mental health, training, physical health knowledge, continuity of care and relationships between staff and patients, in turn, personal skills displayed by staff and contextual factors including resource. Our findings should be used as a basis for informing the implementation of future interventions into primary care settings.

Supplementary information

Supplementary information accompanies this paper at https://doi.org/10.1186/s12913-020-0656-3.

Additional file 1.

Abbreviations

CVD: Cardiovascular disease; DM: Severe mental illness; HCA: Healthcare assistant; HC: Healthcare professional; NPT: Normalisation process theory; UK: United Kingdom; PRIMROSE: Prevention and management of cardiovascular disease risk for people with severe mental illnesses; A research programme and tool in primary care; GP: General Practitioner.

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Authors’ contributions

CO and K.M. conceived the study. CO, KW, S.H2 and A.B. developed the protocol. S.H2 and A.B. collected and independently coded the data. TM and A.B coded the data. S.H1 wrote the paper, analysed the data in terms of thematic, interpretation and mapped themes to NPT constructs. The following authors discussed the data, the thematic interpretation and mapping of the themes to the NPT: S.H1, S.H2, J.B, D.O and K.M. All authors read and approved the manuscript.

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Availability of data and materials

The data are not publicly available as they contain confidential information.