Childhood socioeconomic position and food intake as a risk factor for eating disorders across adolescence

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Abstract

Socioeconomic position and its secondary impacts (e.g., food insecurity and dietary patterns) could be major determinants of health. However, their impact on eating disorders remains under-explored. Understanding the association between risk factors in childhood, prior to onset, and eating disorder symptoms throughout adolescence, will help inform preventative interventions.

I used data from the Avon Longitudinal Study of Parents and Children. My outcomes were adolescent eating disorder symptoms (any and individual disordered eating behaviours at 14, 16, and 18 years old, weight and shape concerns at 14 and 18 years old, and body dissatisfaction at 14 years old). I examined the association between multiple socioeconomic indicators measured between 32 weeks gestation to when the child was 2/3 years old and adolescent eating disorder symptoms (Chapter 2). I investigated the association between food insecurity and other financial insecurity indicators when the child was 7 years old and adolescent eating disorder symptoms (Chapter 3). I examined how different dietary patterns at age 7 were associated with adolescent eating disorder symptoms (Chapter 4). I used multilevel logistic and linear regression and linear regression models on an imputed dataset based on participants with complete exposure data as my main analyses.

All lower socioeconomic position indicators in childhood were associated with greater levels of eating disorder symptoms across adolescence, with greater financial hardship and lower parental educational attainment showing independent associations to adolescent eating disorder symptoms. Both greater levels food insecurity and other financial insecurity indicators were associated with greater levels of eating disorder symptoms across adolescence. I found little evidence that dietary patterns in childhood were associated with eating disorder symptoms.

These findings indicate that lower socioeconomic position can also potentially pose as a risk factor for eating disorders. Reducing socioeconomic inequalities may also reduce the incidence eating disorders in the population.

Declaration

I, Jane Sungmin Hahn, 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.

Acknowledgements

I would like to thank my supervisors Professor Francesca Solmi, Dr Amy Harrison, Professor Glyn Lewis, and Professor Eirini Flouri. This thesis would not have been possible without their insurmountable and continuous support. They also served as inspirations for my future career trajectory in academia, and I hope to reach their level of acumen and work ethic one day. I would like to thank my funder, Mental Health Research UK, for their financial support during my PhD, and participants from the ALSPAC cohort, who made it possible to conduct this research. Thank you to the many lived experience experts, who I know personally and professionally. They provided invaluable insight into this work. I hope that this research can give back to you somehow.

Thank you to my friends and colleagues that I have met on this journey. Nada Abou-Seif, Amy Campbell, Brian Ching, Freya Koutsoubelis, Merle Schlief, and Angela Song-Chase witnessed this journey ever since my MSc days; their loving support, encouragement, and shared passion for mental health and equality ignited and maintained my motivation to continue. My friends in the Division of Psychiatry, Nat Rich, Marie Mueller, Maddie Davies-Kellock, Sharon Eager, Ruby Jarvis, Quentin Dercon, Kate Merritt, and Talen Wright, have shared the burden of my woes and sorrows, and were able to see my strengths as a researcher, even at times when I could not see them myself. Thank you to the many staff members who, in my time in the Division of Psychiatry, answered all my silly, incessant questions with grace and generosity. Thank you to my friends outside of academia, Jae Jung and Toni Bronic, who made my homes a safe place to be while I toiled. It took a village to raise me as a researcher.

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Impact statement

Eating disorders are serious mental health conditions that are difficult to treat, associated with severe physical and mental health comorbidities, and associated with an elevated mortality rate compared to other mental health difficulties. Eating disorders typically start in adolescence; therefore, it is important to prevent these by targeting childhood risk factors.

From a research perspective, my project is the first to investigate the association between multiple indicators of socioeconomic position in childhood and eating disorder symptoms from across adolescence (14 to 18 years old). I found that adolescents from more deprived backgrounds were at highest risk of eating disorder symptoms, especially those whose parents reported difficulties in affording cost of essential material goods. These findings contradict 1) the common perception that eating disorders mostly affect those from higher socioeconomic groups and 2) the literature that show that diagnoses are more common in higher socioeconomic groups. I also found that higher levels of childhood food insecurity as well as other financial insecurity measures were associated with more eating disorder symptoms in adolescence, which suggests that general deprivation may play a role in the association between food insecurity and eating disorder symptoms observed in the current literature. Finally, my findings show that dietary pattern is not associated with eating disorder symptoms, contrary to the emerging narrative in the literature that foods that are highly processed, highly calorific, and low in fibre are a risk to eating disorders. I worked with young people with lived experience of eating disorders to ensure that this study uses terms for dietary patterns that do not reinforce food rules and hierarchies or moralise food items. This urges researchers in the field of eating disorders to use terms that are non-stigmatising to those with eating disorders.

From a public health perspective, my findings suggest that reducing socioeconomic inequalities could also help prevent eating disorders in the general population. Further, my results stand in stark contrast with register-based studies, which found that diagnosed eating disorders are more common in people from more affluent backgrounds. This suggests that there might be steep barriers in accessing eating disorder services for people from more deprived backgrounds, which need to be better understood.

I published one of the thesis chapters as a peer-reviewed journal article in *JAMA Network Open*. The findings of this study have been reported by 16 media outlets to date. The other thesis chapters are in preparation for publication. I presented my research in national and

international conferences, such as the Institute of Mental Health conference 2023, International Conference for Eating Disorders 2025, and KABRIS 2023 and 2024.

I also delivered a lecture on my thesis to medical students in UCL as a part of a self-selective course on eating disorders. I emphasised the importance of recognising eating disorders in individuals from lower socioeconomic backgrounds, in hopes that future medical professionals may consider different potential presentations for eating disorders.

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15th September 2025

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1 Introduction

This thesis will investigate the effects of childhood socioeconomic position, food insecurity, and dietary patterns on eating disorder symptoms throughout adolescence. The purpose of this introduction is to define the main potential risk factors and outcomes that I will investigate in my thesis as well as key terms and theories relating to their hypothesised association with eating disorder symptoms. I will review and critically appraise the literature relating to each of my study objectives in the background sections of chapters 2-4.

1.1 Eating disorders

1.1.1 Diagnoses

Eating disorders are severe psychiatric conditions which are characterised by unhealthy eating behaviours and excessive preoccupation with food, body weight, and shape. Eating disorder diagnoses include anorexia nervosa, bulimia nervosa, binge eating disorder, and other specified feeding or eating disorders (OSFED), all of which are characterised by a combination of behavioural and cognitive symptoms. According to the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) and the 11th revision of the International Classification of Disease (ICD-11),[1, 2] anorexia nervosa is characterised by extreme restrictive eating accompanied by the intense fear of gaining weight, disturbances in body image, and an undue influence of weight/shape on their self-evaluation. There are two subtypes of anorexia nervosa: anorexia nervosa binge-eating/purging type and anorexia nervosa restrictive type. Both subtypes of anorexia nervosa are characterised by severe restriction of food intake, but only the former is also accompanied by episodes of binge eating (I.e., eating large amounts of food in a short period time with a sense of loss of control) and purging (I.e., self-induced vomiting, using laxatives, and excessive exercise). To qualify for an anorexia nervosa diagnosis, a person must also have significantly low body weight in the context of age, sex, and developmental trajectory. The DSM-5-TR indicates severity of anorexia Nervosa by body mass index (BMI) and these categories include mild (>=17), moderate (16-16.99), severe (15-15.99), and extreme (<15). On the other hand, the ICD-11 indicates severe anorexia nervosa as severely underweight, rather than using BMI indicators for severity.

Bulimia nervosa is characterised by a cycle of recurrent binge eating episodes and compensatory behaviours, as well as experience of excessive influence of weight and

shape on their self-evaluation.[1-3] The DSM-5-TR criteria for bulimia nervosa include experiencing objective binge eating episodes (I.e., binge eating in usually around 2 hours), whereas, the ICD-11 also acknowledges subjective binge eating episodes (I.e. perceived overeating and loss of control) as a part of its criteria for bulimia nervosa. Binge eating episodes are often followed up with purging. According to the DSM-5-TR, binge eating and purging must occur once weekly for at least 3 months, whereas the ICD-11 elaborates that these symptoms only need to occur once weekly for at least one month. The DSM-5-TR also specifies severity of bulimia nervosa by its frequency, with mild, moderate, severe, and extreme bulimia nervosa being defined as 1-3, 4-7, 8-13, and 14 or more episodes per week respectively. The ICD-11 does not have severity indicators for bulimia nervosa.

Individuals with binge eating disorder experience at least three of the five associated features of binge eating.[1, 2] These include eating more rapidly than normal, eating until uncomfortably full, eating large amounts when not hungry, eating alone due to embarrassment, and feeling disgusted, depressed, or guilty after a binge eating episode. These behaviours must occur at least once a week for three months, be associated with marked distress, and occur without compensatory behaviours (e.g., purging). The ICD-11 has similar criteria as the DSM-5-TR but stipulates that these binge eating episodes need to occur at least once week over several months to receive a diagnosis. Both the DSM-5-TR and ICD-11 defines severity of binge eating disorder by frequency of binge eating episodes per week (mild: 1-3 episodes per week; moderate: 4-7 episodes per week; severe :8-13 episodes per week; extreme: more than 14 episodes per week).

OSFED, which was known as eating disorder not otherwise specified (EDNOS) in the fourth edition of the DSM,[4] is often given as a diagnosis to patients who do not meet all the diagnostic criteria for the aforementioned eating disorder diagnoses.[1, 2] Subtypes of OSFED include atypical anorexia (I.e., those with core symptoms of anorexia nervosa, but whose BMIs are over 17), sub-threshold bulimia nervosa or binge eating disorder (I.e., those with core symptoms of bulimia nervosa or binge eating disorder which occur at a lower frequency or shorter duration), purging disorder (I.e., purging without binge eating), and night eating syndrome (I.e., awakening to eat or excessive evening caloric intake). The DSM5 also include an additional residual eating disorder diagnostic category called Unspecified Feeding or Eating Disorders. This is a diagnosis given when an individual exhibits disordered eating behaviours causing distress or impairment, but when the clinician does not make a specific diagnosis or have sufficient information to make a specific classification.

1.1.2 Epidemiology

The Global Burden of Disease study estimated that in 2019, 13.6 million people worldwide had anorexia nervosa or bulimia nervosa,[5] and that 41.9 million had binge eating disorder or OSFED.[6] Globally, anorexia nervosa and bulimia nervosa are responsible for 2.9 million disability adjusted life years (DALYs),[5] whereas binge eating and OSFED are thought to be responsible for 3.8 million DALYs.[6] While eating disorders can develop throughout the lifespan, adolescence is a particularly vulnerable age for developing an eating disorder, as the average age of onset is around 15 years old.[7] In the UK, the prevalence of any eating disorders amongst those between 11-16 years old, 17 to 19 years old, and 20 to 25 years old were 2.6%, 12.5%, and 5.9% respectively in 2023, with female adolescents having a higher prevalence of eating disorders overall compared to male adolescents.[8] The estimated annual incidence of eating disorders of young people (aged between 11-24) between 2004 and 2014 were 100.1 per 100,000 person years at risk, with the incidence rates being highest in females (189.3 per 100,000 person years at risk) compared to males (17.7 per 100,000 person years at risk).[9] The incidence of eating disorder diagnoses amongst children and adolescents has increased during this time span in UK primary care.[9] This could reflect better detection of eating disorders over the years or true increase in the number of eating disorders amongst young people. The latter hypothesis would be consistent with findings from general population samples showing that the prevalence of possible eating disorder diagnoses, as indexed by screening positive on the SCOFF questionnaire, also has increased from 13% in 2007[10] to 28% in 2019[11] among 16- to 24 -year-olds in England.

1.1.3 Impact of eating disorders

In the UK, it is estimated the combined costs (healthcare, carer, personal financial , and lost productivity) of eating disorders equate to 9.4 billion pounds a year.[12] While government initiatives from 2016 to 2020 had reduced waiting times for access to treatment for young people with eating disorders, recent data indicated that a little over one-third of urgent cases and one-fifth of routine cases had to wait longer than expected waiting times to receive care.[13] Long waiting times to treatment may have serious implications for those with eating disorders, given that it is thought that the likelihood of recovering decreases with longer duration of untreated eating disorders.[14] People with eating disorders also often experience co-morbid mental health problems, such as depression, anxiety, and self-harm,[15] as well as medical complications, including cardiovascular problems, malnutrition, type 1 diabetes, bodily pain, and viral infections.[16] As a result of these physical and mental health comorbidities, individuals with eating disorders have elevated mortality rates, not only

compared to those without eating disorders,[17] but also compared to those with other mental health conditions.[18] An individual's eating disorder can also impact their families and carers. Caregiver burden is higher for eating disorders than it is for depression and schizophrenia[19] and many caregivers also experience mental health difficulties such as depression, anxiety, and high psychological distress.[20]

1.1.4 Eating disorder symptoms and epidemiology

While eating disorders are relatively uncommon in the population, their core transdiagnostic behavioural (e.g., disordered eating behaviours such as restrictive eating, binge eating, and purging) and cognitive symptoms (e.g., body dissatisfaction or preoccupation with weight and shape) are common in the population, with prevalence of symptoms ranging between 10 to 16% in the UK.[9, 21, 22] These symptoms also present similar comorbidities and risk profiles to those seen in people with eating disorder diagnoses. For example, those with disordered eating behaviours experience higher symptoms of depression, anxiety, self-harm [23] and also have greater metabolic abnormalities which are usually thought as markers of increased cardiovascular risk.[24] As such, eating disorder symptoms, like symptoms of other mental health diagnoses, can be conceptualised as occurring on a continuum of severity and have been used to study aetiological questions related to eating disorders in general population studies.[25] This approach offers several advantages. First, using self-reported eating disorder symptoms might reduce issues related to selection bias as a minority of people are detected and diagnosed by primary or secondary care.[26] On the other hand, it is possible to diagnose eating disorders in a general population study via clinical interviews, but this procedure can be time consuming. Second, investigating symptoms instead of diagnoses can help inform preventative strategies, as disordered eating behaviours, body dissatisfaction, and preoccupation with weight and shape are some of the strongest risk factors for developing a full eating disorder.[27] Consequently, preventative strategies that aim to reduce eating disorder symptoms could also lower the incidence of eating disorders, as well as their negative impacts. Even under the assumption that the risk factor for eating disorder symptoms and diagnoses are different, the disability associated with more common, but less individually severe, conditions can lead to more aggregate public health burden compared to less common conditions but severely disabling health conditions.[28] Therefore, my thesis will focus on investigating eating disorder symptoms rather than diagnoses.

Given that eating disorders often start in adolescence, it might be helpful for prevention strategies to target childhood. However, there is limited research into childhood risk factors that could be targeted by preventative interventions. The steady increase in the prevalence

and incidence of eating disorders among young people points to the increase of environmental risk factors, as genetic risk cannot change this rapidly. Therefore, there needs to be a broader understanding of modifiable factors in the environment to inform preventative strategies, especially in light of limited availability of eating disorder services[13] and low rates of recovery.[14] I will next discuss socioeconomic position and its impact on quantity and quality of food as potential risk factors for eating disorder symptoms.

1.2 Socioeconomic position

1.2.1 Conceptualisation and measurements

Socioeconomic position is a concept that places individuals, families, and households within stratified societal structures based on their ability to generate resources within systems of economic production and is a major determinant of health.[29-31] Socioeconomic position can be broadly categorised into objective vs. subjective indicators. Objective measures of socioeconomic position include, but are not limited to, income, education, material wealth, occupational status, and area-level deprivation. Each of these dimensions are theorised to have different roles in the health gradient.[31] Educational attainment may affect health behaviours and knowledge, but also influence future occupation and material resources which all affect health. Occupation may measure an individual's social standing, privilege, occupation-specific risk factors, and subsequent income that make a difference to individual health. Income may directly measure material resources that allow health-promotion. Area-level deprivation may contextualise individual's socioeconomic position in the neighbourhood. It may provide insight on how area-level risk factors (e.g., environment and social capital) affect health beyond the individual-level socioeconomic position.

Subjective socioeconomic position refers to an individual's perception of their own place in the socioeconomic ladder,[32] based on their current and past social circumstances, as well as future prospects and life chances. There are various ways to measure subjective socioeconomic position, including using items that ask respondents to indicate their socioeconomic standing on a ten-rung ladder or perception of financial constraints.[33] Previous studies have found that subjective socioeconomic position was the strongest predictor of health, even when accounting for objective measures, while revealing health patterns similar to objective measures of socioeconomic position.[32, 34] This may be because subjective socioeconomic position indicators capture a more nuanced, lived experience

aspect of socioeconomic position that cannot be measured with objective indicators of socioeconomic position or because there could be residual confounding by mental health.

In the UK, previous investigations of socioeconomic position and health focused on social class, based on the individual's occupation from census records. Increasingly, there has been an emphasis on measuring multiple dimensions of socioeconomic position, as they may capture different causal pathways between socioeconomic position and health outcomes. For example, lower income and educational attainment have been shown to be more consistently associated with higher depressive symptoms, whereas occupation seems to have a weaker association with depressive symptoms.[35] Eating disorder literature generally focuses on individual or composite measures of socioeconomic position instead of multiple socioeconomic position indicators (more information under 'Rationale' in chapter 2.1.1). Therefore, I will be investigating the association between multiple socioeconomic position indicators and eating disorders for my thesis.

1.2.2 Association between socioeconomic position and health

Lower socioeconomic position is associated with higher morbidity and mortality globally.[36] These effects have also been well-recorded in the UK. The seminal Black Report, published in the 1980s found that people from lower social classes had higher levels of mortality than those from higher social classes.[37] Since then, there is evidence that this health gap is widening.[38]

One in three children in the UK live in households with below average incomes, with increasing proportions living in households with less than 40% of median income after housing costs.[29, 39] Children from deprived households experience higher prevalence[40, 41] and earlier onset of mental health difficulties, which often persist until adulthood.[40] Both persistent and transitory experience of poverty in childhood can increase risk of mental health difficulties and long-standing illnesses in adolescence.[42] Therefore, childhood is a priority for both research and policy to inform preventative interventions,

1.2.3 Secondary impact of socioeconomic position

There are many putative risk factors that lie within the causal pathway of socioeconomic position and mental health outcomes. Two major theories have been proposed to explain how socioeconomic position can lead to mental health outcomes: the materialist theory and psychosocial theory.[43, 44] The materialist theory claims that adverse health outcomes stem from material deprivation that is caused by socioeconomic position. For example, housing

disadvantage in childhood (e.g., overcrowding, housing tenure, and eviction), which may be a result of material deprivation, was found to be associated with higher levels of common mental health difficulties and psychological distress later in life.[45] On the other hand, the psychosocial theory posits that psychological (e.g., distress) and social (e.g., social support) factors caused by socioeconomic position affect subsequent health behaviours as well as health outcomes. For example, parent-child communication may mediate the relationship between lower socioeconomic position and common mental health difficulties.[46] It is worth noting that while these theories may seem like they directly contrast one another, both pathways could have an impact on mental health; but proponents of the materialist theory claim that these risk factors 1) are rooted in material deprivation, 2) they occur prior to the occurrence of psychosocial risk factors in the causal pathway, and 3) emphasises the biological pathway linking lower socioeconomic position to health outcomes.[43]

In the context of eating disorders, there is evidence that psychosocial risk factors are important for the aetiology of eating disorders. For example, early mental health difficulties and adverse childhood events are thought to be more common in lower socioeconomic groups[40, 47] but also a risk factor for eating disorders.[48, 49] However, there are not many hypothesised mechanisms in terms of how material deprivation could affect eating disorders. This could be due to 1) the stereotypical perception that eating disorders are a "disease of affluence",[50] and 2) mixed evidence in terms of the socioeconomic distribution of eating disorders (more details can be found under 'Rationale' in chapter 2.1.1). However, recent eating disorder literature has started to focus on food-related material deprivation (e.g., food insecurity and obesogenic dietary patterns), perhaps because of its potential specificity to eating disorders (more details can be found under 'Rationale' in chapter 3.1.1 and 'Rationale in chapter 4.1.1 on the literature and hypothesised mechanisms). Because socioeconomic position takes a long time to improve in the general population, these mechanisms are important to investigate as feasible targets for smaller scale interventions. These next sections discuss definitions of food insecurity and dietary patterns in detail.

1.3 Food insecurity

1.3.1. Conceptualisation and measurements

Food insecurity is defined as limited access to both sufficient quantity and quality of food.[51] The Food and Agriculture Organization of the United Nations define food insecurity as a continuum that ranged from mild (e.g., currently have adequate access to food but may

be uncertain about future access), moderate (e.g. compromising food quality and quantity), and severe food insecurity (e.g., no food for a day or more).[52] Within research contexts, food insecurity can also be conceptualised based on three constructs: availability, access, and utilisation.[53-55] Availability focuses on macro-structural aspects of food insecurity such as production and stock level. It is often used to measure food insecurity on both international and national levels. Access is conditioned around the household's capacity to choose and afford food items based on what is available in their environment. Finally, utilisation refers to how an individual uses the food items that they can access, such as whether food items are nutritionally sufficient. In high income countries, most studies investigating food insecurity focus on access or utilisation, using individual-or household-level measures.[56] This is likely because availability measures do not necessarily capture unequal distribution of access and utilisation in these countries.[53] Therefore, this thesis will explore food insecurity in the context of access (difficulties in affording food items) and utilisation (dietary patterns) to investigate their risk to eating disorders.

1.3.2. Epidemiology of food insecurity

According to the Food and Agriculture Organization's definition of food insecurity, it is estimated that 28.9 percent of the global population experience moderate to severe food insecurity.[57] Prevalence is much lower in Northern America and Europe, with 8.7% of people in total experiencing moderate to severe food insecurity; however, there is evidence that moderate to severe food insecurity in this region has been on the rise since 2020.[57] These trends are reflected in the UK as well. As of 2022/2023, 17% of the total population of children lived in food insecure households,[58] with a 120-fold increase in households depending on emergency food parcels between 2008/2009 and 2023/2024.[59]

There is increasing evidence that food insecurity might be a modifiable risk factor for children and adolescent physical health difficulties, such as asthma,[60] and mental health difficulties, such as depression, stress, and anxiety.[61] There is also evidence to suggest that those who experience chronic food insecurity in childhood report lasting and persisting adverse health difficulties in adolescence.[62] However, there is also evidence that those who transition from food insecure to food secure in childhood have better health outcomes compared to children who experience persistent food insecurity.[62] Therefore, it is of utmost importance to address food insecurity in the population of children and young people. Lower socioeconomic position is associated with higher levels of food insecurity,[63] which emerging literature posits as a risk to eating disorders. The literature on the association between food insecurity and eating disorders will be discussed further under 'Rationale' in chapter 3.1.1.

1.4 Dietary patterns

1.4.1 Conceptualisation and measurement

Dietary intake can be defined as patterns of food or nutrients that one consumes. The two most common approaches to measuring diet are index-based approaches and data-driven approaches.[64] Index-based approaches assess compliance or level of adherence with dietary guidelines, measuring how closely an individual consumes food compared to various nutrient intake recommendations. Data-driven approaches use factor or cluster analyses to derive overall dietary patterns, thus attempting to describe the dietary patterns in the population. Both index-based and data-driven approaches have been shown to be helpful when investigating dietary risk for a number of physical health conditions, such as cardiovascular disease.[64] However, using data-driven approach to measure dietary patterns is more appropriate for identifying new hypotheses for associations between diet and health outcomes when there are no clear recommended guidelines for diet-disease relationships,[65] as it is the case for eating disorders. Therefore, I will use the data-driven approach when investigating the relationship between dietary intake and eating disorders.

Data-driven approaches produce categorisations of dietary patterns which can differ according to cultural context. Within the UK, previous studies have identified dietary patterns which have been broadly categorised into ‘healthy or health-conscious’ ‘traditional’, or ‘processed’ diets with some variations depending on the dataset used.[66, 67] Health-conscious dietary patterns usually indicate a higher consumption of fibre and nutrient dense foods such as fruits, vegetables, and whole grains. Traditional dietary patterns refer to diets that centre on consumption of food items that closely resemble traditional British diets including meat, roast potatoes, vegetables, and batter/pastry products. Processed dietary patterns include consumption of highly processed, highly calorific, and low fibre food items that are often regarded as ‘snack items.

1.4.2 Re-defining dietary intake with patient-public involvement

Commonly used labels for dietary patterns such as “processed” and “healthy” diets may be stigmatising to those with eating disorders, as they reinforce harmful food hierarchies in an eating disorder context (e.g., processed food often being regarded as “bad”, leading to avoidance of these food items). When conducting patient public involvement, young people with lived experience of eating disorders preferred terminology that avoided stigmatising

language around dietary patterns. They suggested using “varied-staple diets” as opposed to “health-conscious”, “convenience-oriented diets” as opposed to “processed or junk”, and “traditional British diet” as opposed to “traditional”, given that the latter might assume different meaning depending on the individual’s cultural background. Therefore, I have used these terms to describe these categories from hereafter. Further information on patient public involvement can be found under ‘Patient and public involvement activities’ in chapter 4.2.5.

1.4.3 Epidemiology of dietary patterns

The food processing industry has gone through rapid changes since the 1980s with the emergence of highly processed convenience-oriented food items. This rapid shift has been theorised to contribute to the global increase in convenience-oriented food consumption.[68] Recent global data of dietary patterns reveal that consumption of varied-staple and convenience-oriented food items both increased from 1990-2010.[69] This trend is also reflected in high income countries; however, these countries also have the highest consumption of convenience-oriented food in the world.[69]

In the UK, convenience-oriented foods accounted for a large portion of total energy intake for adolescents in the late 2000s.[70] There has been persistent concerns around children and young people’s excessive consumption of convenience-oriented foods and insufficient intake of varied-staple foods,[71] and researchers have hypothesised that this trend is associated with increased risk of physical and mental health problems.[72] Dietary patterns can vary greatly across childhood and adolescence, but habits from this period tends to stabilise into adulthood.[73, 74] Therefore, childhood is an important time period for preventative interventions if there are any associations between dietary pattern and eating disorders. Currently, researchers are hypothesising that dietary patterns may play a role in the aetiology of eating disorders, but there are a limited number of longitudinal studies to support this hypothesis. Further details of the literature on dietary patterns and eating disorders can be found under ‘Rationale’ in chapter 4.1.1.

1.5 Aim and objectives

The overall aim of this thesis is to understand the role of socioeconomic position and secondary impacts related to material deprivation (I.e., food insecurity and dietary patterns)

on eating disorder symptoms across adolescence. Chapters 2,3 and 4 include the main findings and I list the objectives within each chapter below:

Chapter 2: Longitudinal association between childhood socioeconomic position and eating disorders in adolescence

1) To investigate the association between childhood socioeconomic position and overall behavioural (I.e., disordered eating behaviours) and cognitive eating disorder symptoms (I.e., weight and shape concerns and body dissatisfaction) across adolescence
2) Investigate whether this association differs according to the age of the adolescents
3) Investigate the association between childhood socioeconomic position and individual behavioural eating disorder symptoms (I.e., purging, binge eating, restrictive eating)

Chapter 3: Longitudinal association between childhood food insecurity and adolescent eating disorder symptoms

4) To investigate the association between childhood food insecurity and overall behavioural and cognitive eating disorder symptoms across adolescence
5) Compare patterns of association between other financial insecurity indicators and overall behavioural and cognitive eating disorder symptoms across adolescence
6) Investigate the association between childhood food insecurity and individual behavioural eating disorder symptoms

Chapter 4: Longitudinal association between childhood dietary patterns and eating disorders across adolescence

7) To investigate the association between dietary patterns and overall behavioural and cognitive eating disorder symptoms across adolescence
8) Investigate the association between childhood dietary patterns and individual behavioural eating disorder symptoms

I will use the Avon Longitudinal Study of Parents and Children (ALSPAC),[75] a cohort that includes around 15,000 mother-child pairs followed-up from gestation and birth of the study child, to explore these aims and objectives (more details on ALSPAC can be found under ‘Sample’ of chapter 2.2.2)

2 Longitudinal association between childhood socioeconomic position and eating disorders in adolescence

A version of this chapter is published in JAMA Network Open.[76] The full manuscript is available in Appendix 1.

2.1 Background

2.1.1 Rationale

It is often shown that eating disorders are more common in young people with families from higher socioeconomic positions,[9, 41, 77] but evidence supporting this association is mixed. Most longitudinal register-based studies, where diagnoses are derived from clinical records, find a higher incidence of eating disorders in people whose parents had higher income and education, and who lived in more affluent areas.[9, 41, 77-82] However, this pattern is not universal, as two studies conducted in Spain did not find a difference in the socioeconomic distribution of eating disorder diagnoses.[83, 84] Conversely, cross-sectional[85-88] and longitudinal population studies [89-96] of both adolescents and adults either find no evidence of differences in the distribution of self-reported eating disorder symptoms by parental or individual socioeconomic position,[86, 90, 96] or increased risk of these symptoms in young people whose parents had lower educational attainment, experienced financial hardship, in receipt of public assistance, or were unemployed.[85, 87-95]

This literature has several limitations. Cross-sectional studies cannot account for reverse-causation wherein the individual's eating disorder may affect their own socioeconomic position or wherein a child's severe eating disorder affects family-level socioeconomic position, albeit unlikely.[85-88] Findings from longitudinal register-based studies may be affected by selection bias if people from more deprived backgrounds experience barriers in accessing eating disorder services.[97] Investigating self-reported symptoms in general population samples reduces the risk of selection bias but can inform on risk factors for eating disorders (refer to 'Eating disorder symptoms and epidemiology' under chapter 1.3.1.). Therefore, it is important to refer to studies investigating the association between socioeconomic position and eating disorders symptoms in general population samples.

However, the population-based, longitudinal studies investigating eating disorder symptoms do not include the peak time of eating disorder symptom onset (approximately 15 years old).[7] The studies investigating adults only measured body dissatisfaction[94] and lifetime bulimia and compulsive eating[95] when the participants were adults. The studies focusing on young people, measured eating disorder symptoms of the participants prior to the age of

14.[7, 89-91, 93, 96] This can affect findings if early or late onset cases are underpinned by aetiological mechanisms different from typical onset cases.[98] For example, it is plausible that lower socioeconomic position may affect early onset cases, as a previous study has shown that people from lower socioeconomic backgrounds are likely to experience earlier onset of mental health difficulties.[40] Therefore, it is important to investigate how this association may change across adolescence.

Most studies adjusted analyses for factors which are potentially on the causal pathway between family socioeconomic position and offspring eating disorder, such as adverse life experiences[95] or offspring's BMI,[90-92, 94, 95] which can bias results by removing any potential effects of eating disorder risk factors that could derive from socioeconomic position.

Finally, existing studies used either a single measure of socioeconomic position or composite indices rather than exploring a wide range of socioeconomic indicators. This obscures causal mechanisms between different dimensions of socioeconomic position, such as income, occupation, education, financial hardship, and area-level deprivation, and eating disorders (more detail under '*Conceptualisation and measurements*' in Chapter 1.2.1). Therefore, understanding which socioeconomic position indicators (if any) are important for eating disorders may be more helpful in developing future preventative strategies.

2.1.2 Objectives

My objectives were to investigate:

1) The longitudinal association between parental income, occupation, education, financial hardship, and area-level deprivation in early childhood and adolescent behavioural and cognitive eating disorder symptoms;
2) The interaction effect between childhood socioeconomic position and the adolescent's age on behavioural and cognitive eating disorder symptoms;
3) The longitudinal association between childhood socioeconomic position and individual behavioural eating disorder symptoms (I.e., restrictive eating, binge eating, and purging)

2.2 Methods

2.2.1 Study design

I used prospective cohort study design for all three objectives.

2.2.2 Sample

I used data from the Avon Longitudinal Study of Parents and Children (ALSPAC), an ongoing birth cohort study which recruited 14,541 pregnant women in the former region of Avon (UK) with expected delivery dates from 1st April 1991 to 31st December 1992. Of these pregnancies, 14,062 (96.1%) resulted in live births and 13,988 children (93.8%) were alive at one year.[75, 99] In this study, I included children from this original sample who had data available on all the exposures. In the case of twins, I retained one child at random to avoid potential over-estimation of associations due to clustering of environmental and genetic risk. The research ethics committee at the University of Bristol and the ALSPAC Ethics and Law Committee provided ethical approval for the study.

2.2.3 Outcomes

I used three different outcomes capturing behavioural (I.e., disordered eating behaviours) and cognitive symptoms (I.e., weight and shape concerns and body dissatisfaction) of eating disorders for my primary analyses (objective 1) and for my secondary analyses (objective 2). I defined disordered eating behaviours based on whether adolescents reported any binge eating, purging, excessive dieting, and fasting or none of these behaviours at least once a month in the previous 12 months. These behaviours were self-reported by adolescent respondents at 14, 16, and 18 years old, via the modified questions from the Youth Risk Behaviour Surveillance System questionnaire (YRBSS).[100] The YRBSS has high reliability, (Kappa =61-100%).[101] The questionnaire has been used to track and monitor public health on national levels[102, 103] and to assess eating disorders symptoms in previous literature.[91, 104-106] I used individual disordered eating behaviours (e.g., binge eating, restrictive eating, and purging) to investigate their independent associations with the different indicators of socioeconomic position (objective 3)

Binge eating

To assess the presence of binge eating, adolescents were asked “during the past year, how often did you go on an eating binge?” In the questionnaire, an eating binge was defined as eating “an amount of food that most people would consider to be very large, in a short period of time.” Possible responses were “never”, “less than once a month”, “1-3 times a month”, “once a week”, and “more than once a week”. As a follow-up question, adolescents were asked whether they felt out of control during these episodes of overeating. Responses included “no”, “yes, sometimes”, and “yes, usually”. Adolescents were classified as having experienced binge eating if they reported an eating binge at least “1-3 times a month”, and if they answered “yes sometimes” or “yes usually” in the follow-up question on loss of control.

Purging

To assess the presence of purging, adolescents were asked “during the past year, how often did you make yourself throw up (vomit) to lose weight or avoid gaining weight?”. Possible responses were “never”, “less than once a month”, “1-3 times a month”, “once a week”, “2-6 times a week”, and “everyday”. Adolescents were also asked whether they had used laxatives to lose or avoid gaining weight during the past year at age 14, whether they used laxatives/ other tablets/ medicine or medications to lose or avoid gaining weight in the past year at age 16, and whether they used laxatives/ other tablets to lose or avoid gaining weight at age 18. The responses were formatted the same as the question on vomiting. Respondents were classified as having experienced purging behaviours if they answered that they self-induced vomit or used laxatives/other tablets or medication to lose weight at least “1-3 times a month”.

Restrictive eating

Unlike previous literature that focused solely on fasting to represent restrictive type eating disorders,[25, 91, 104-106] I used both fasting and extreme dieting to code for restrictive eating. This is because the questionnaire item used for detecting fasting may exclude adolescents who eat at least one or multiple restricted meals a day, which could be an alternative presentation for restrictive type eating disorders.[107] Adolescents were asked “during the past year, how often did you fast (not eat for at least a day) to lose weight or avoid gaining weight?”. I classified adolescents as fasting if they indicated that they fasted at least “1-3 times a month” in the past year from responses “never”, “less than once a month”, “1-3 times a month”, “once a week”, and “more than once a week”. Adolescents were also asked “during the past year, did you go on a diet to lose weight or keep from gaining weight” with possible responses including “never”, “a couple of times”, “several times”, “often”, and “always on a diet”. I classified adolescents as extreme dieting if they answered “always on a diet” or “often” to the item on dieting. I coded the presence of restrictive eating behaviours based on respondents who fit these two criteria and who indicate their binge eating frequency as “less than once a month” because those who have restrictive subtypes of eating disorders still engage in occasional binge eating behaviour.[108]

Weight and shape concerns

Weight and shape concerns were measured when the respondents were 14 and 18 years old using two questions from the McKnight Risk Factor survey[109]: ‘in the past year’ 1) ‘How happy have you been with the way your body looks?’; and 2) ‘In the past year, how much has your weight made a difference to how you feel about yourself?’. Adolescents could respond on a Likert scale ranging from 0 (‘very unhappy’/’’a lot’) to 3 (‘very happy’/’not at

all'). I added these two items and reversed the scores. The scores ranged from 0-6 with higher scores indicating more concern over body weight and shape.

Body dissatisfaction

I measured body dissatisfaction using the body dissatisfaction scale which was reported when the adolescents were 14 years old.[110] Adolescents rated their satisfaction with nine body parts including weight, figure, stomach, waist, thighs, buttocks, hips, legs, face, and hair. Female adolescents were additionally asked about satisfaction with 'breasts' whereas males were asked about satisfaction with 'body build'. Potential responses included "extremely satisfied" (1), "moderately satisfied" (2), "can't decide" (3), "moderately dissatisfied" (4), "extremely dissatisfied" (5). Responses that indicated "can't decide" were coded as missing. Responses that indicated that the body part was "not an issue" were coded the same as those who were "extremely satisfied" with the body part. The total score ranged from 11 to 55 with a higher score indicating a higher level of dissatisfaction.

2.2.4 Exposures

For my exposures, I decided to investigate the earliest measurement of multiple socioeconomic position indicators available in the dataset. This was to ensure that 1) my exposures represent various socioeconomic dimensions which could be a risk to eating disorders, and 2) to maximise the number of respondents in my analysis.

Family income

Mothers were asked about net family income when the children were 33, 47, and 85 months old. In the questionnaire the net income of the family was recorded in five income bands (<£100, £100 to £199, £200 to £299, £300 to £399, >£400 per week). Income was averaged at 33 months and 47 months, equivalised as a part of a previous study using ALSPAC[111] – I.e., weighed by number of people within the household according to their age and estimated housing benefits – by using the OECD modified scale and split into fifths.[112]

Highest parental social class

Mothers reported their occupation and that of their partner via postal questionnaire at 32 weeks' gestation. From these, I derived a single highest parental social class variable. I grouped parental social class from standard categories measured by ALSPAC based on the Registrar General Social Class (unskilled, semi-skilled manual, skilled manual, skilled non-manual, managerial, and professional) into professional, managerial, skilled non-manual, skilled manual, and semiskilled/unskilled manual. I grouped semi-skilled and unskilled into one category due to small numbers in these categories. If either the mother or her partner

had missing social class data or was a single parent household, I used the available parental occupation position.

Highest parental education attainment

I derived highest parental educational attainment from maternal report of her educational attainment and that of her partner at 32 weeks' gestation. Potential responses were based on the Office for National Statistics categorisation: 'O-level/ general certificate of secondary education (GCSE)', 'Advanced-level (A-level)', and 'university degree'. O-level and GCSE indicate secondary school level education and A-levels indicate a subject-based education qualification. O-levels and GCSEs represented compulsory-level schooling from 1976 to 1997 and was therefore coded as 'compulsory education'. If one of the parents' educational attainments was missing or the mother was a single parent, I used the available educational attainment.

Financial hardship

At 32 weeks' gestation, mothers were asked "how difficult at the moment do you find it to afford" the following items: food, heating, clothing, rent or mortgage, and things for the baby/child. Possible responses were scored on a four-point Likert scale: "not difficult" (0), "slightly difficult" (1), "fairly difficult" (2), or "very difficult" (3). I added these individual items' score to derive a continuous total score ranging from 0 to 15 in which higher scores represented greater financial hardship.

Area-level deprivation

Mothers provided residential postcodes at 32 weeks' gestation. These were previously linked to Townsend deprivation index scores,[113] a measure of material deprivation obtained from the 1991 Census data for enumeration district.[114] Townsend index scores are calculated using standardised values of four indicators capturing percentage of: (i) households without a car, (ii) households who do not own their home; (iii) people aged 16 years or over who are economically inactive, and (iv) overcrowded households. I used the continuous z-scores where higher scores indicated higher levels of deprivation.

2.2.5 Confounders

I identified confounders based on literature-informed a-priori assumptions and using direct acyclic graphs to model my assumptions.

In main analyses, I mutually adjusted each exposure for all other indicators of socio-economic position given their interconnectedness and intergenerationality (**Figure 1**). I did

not include child characteristics, such as child mental health, as those might be on the causal pathway between socioeconomic position and eating disorder risk. I also hypothesised that maternal characteristics could be on the causal pathway between exposures and outcomes, as socioeconomic position in pregnancy could reflect earlier socioeconomic position and this could affect subsequent maternal socioeconomic indicators. (**Figure 2**)

I tested competing causal assumptions and confounding structures in the sensitivity analyses. First, I hypothesised that some socioeconomic indicators could affect others. For instance education could affect subsequent income (**Figure 3**).[115] Second, I hypothesised that maternal characteristics[116, 117] could affect subsequent socioeconomic position; for instance, maternal history of eating disorders could affect the mother's educational attainment since peak age onset of eating disorders coincides with adolescence (**Figure 4**).

Information on maternal characteristics were collected through postal questionnaires throughout pregnancy. I used maternal age at birth of study child as a continuous variable. Marital status during pregnancy was asked at 8-weeks' gestation and was coded as a binary variable indicating whether the mother was currently married or unmarried. For maternal depressive symptoms, I used the Edinburgh Post-Natal Depression Scale (EPDS)[118] at 12 weeks' of gestation, which ranges from 0 to 30 with higher scores indicating higher levels of depressive symptoms. [118] Maternal lifetime history of eating disorders at 12-weeks' gestation were recoded into a binary variable of indicating whether the mother had previously experienced either an eating disorder (anorexia nervosa, bulimia nervosa, or both) or not. Child's ethnicity was derived from an item administered to mothers at 32 weeks of gestation about their and their partner's ethnicity. Possible answers included "white", "black/Caribbean" "black/African", "black/other", "Indian", "Pakistani", "Bangladeshi", "Chinese", and "any other ethnic group". Given small numbers of children from ethnic minority backgrounds in the sample, ALSPAC provides a binary variable coding participants as either white or as having an ethnic minority background to prevent participant identification. Therefore, my analyses coded ethnicity as a binary measure.[115]

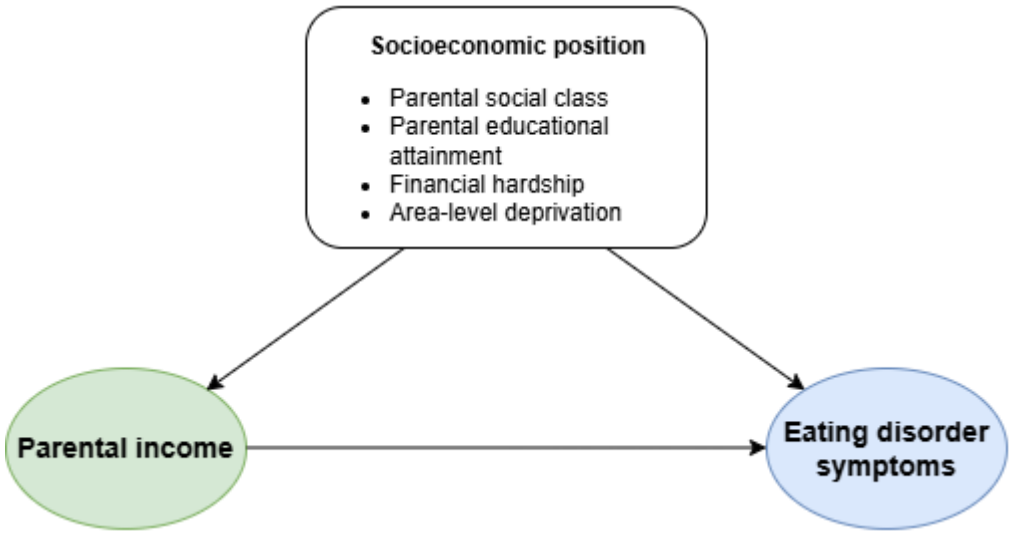

Figure 1: Simplified Direct Acyclic Graph hypothesising relationship between socioeconomic indicators for my main analysis. Green circle indicates the exposure, blue circle indicates the outcome, and white box indicates confounders observed in the dataset. Arrows indicate causal paths.

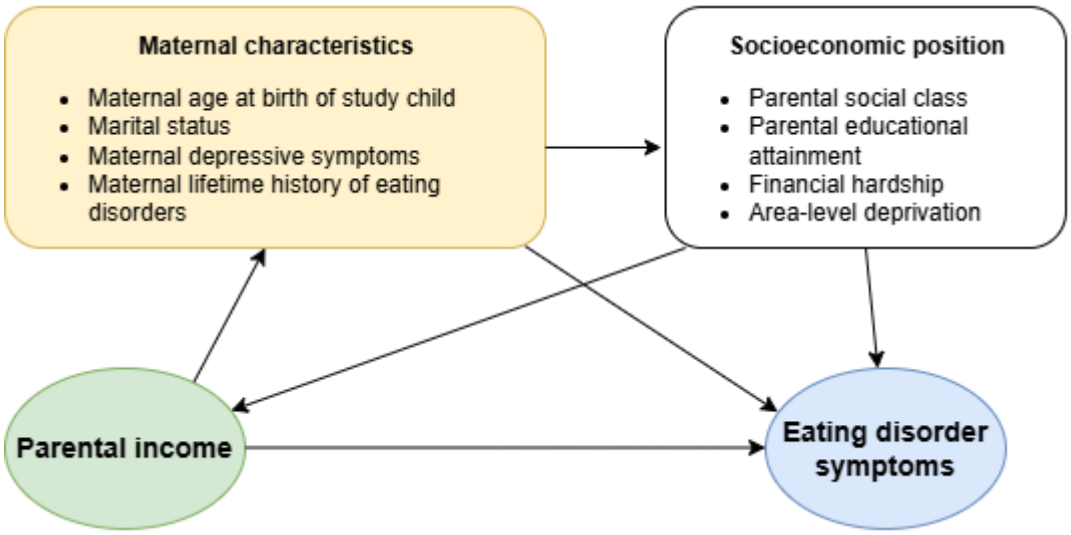

Figure 2: Simplified Direct Acyclic Graph hypothesising maternal characteristics mediating the relationship between socioeconomic position indicators in childhood and eating disorder symptoms in adolescence. Green circle indicates the exposure, blue circle indicates the outcome, yellow box indicates factors that could lie in the causal pathway between exposure and outcome, and white box indicates confounders observed in the dataset. Arrows indicate causal paths.

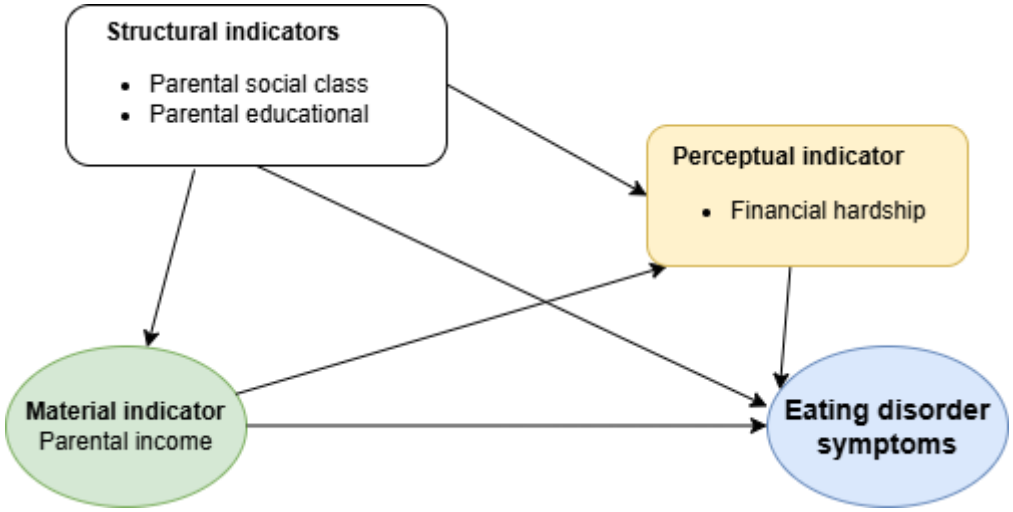

Figure 3: Simplified Direct Acyclic Graph hypothesising different relationships between socioeconomic position indicators. In this graph, structural indicators (education and occupation) affect material resource indicators (income), which in turn affect perceptual indicators. Green circle indicates the exposure, blue circle indicates the outcome, yellow box indicates factors that could lie in the causal pathway between exposure and outcome, and white box indicates confounders observed in the dataset. Arrows indicate causal paths.

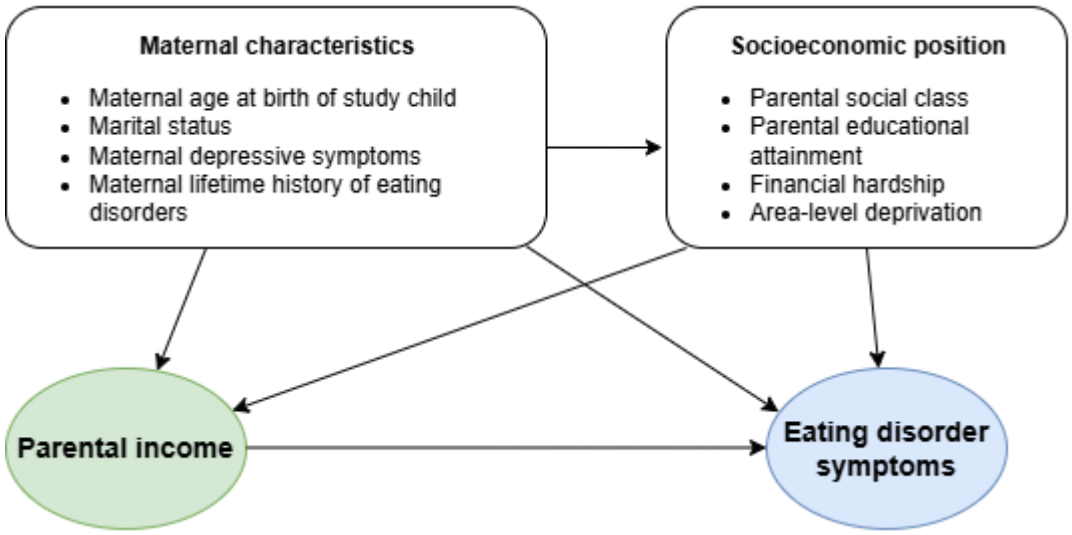

Figure 4: Simplified Direct Acyclic Graph hypothesising maternal characteristics confounding the relationship between socioeconomic position indicators in childhood and eating disorder symptoms in adolescence. Green circle indicates the exposure, blue circle indicates the outcome, and white box indicates confounders observed in the dataset. Arrows indicate causal paths.

2.2.6 Data analysis

I described sample characteristics overall and by levels of exposures using frequencies with proportions and means with standard deviations. For participants with complete exposure data, I compared the distribution of exposures and confounders between participants who had no missing outcome measures and participants who had missing outcome measures in the analytical sample.

To investigate the association between each socioeconomic indicator and eating disorder symptoms, I used univariable and multivariable multilevel logistic (any and each individual disordered eating behaviours) and linear (for weight and shape concerns) regression models with time of outcome assessment nested within individuals. First, I ran an unconditional model only including a mean-centred indicator of age at outcome measurements to describe how disordered eating behaviours and weight and shape concerns changed across adolescence. For disordered eating behaviours, where I had three measurements available, I also added a quadratic term for age to test for non-linear associations with age. I retained the linear- and quadratic-term for age in the respective models if there was evidence of an association. Subsequently, I ran a univariable model for each exposure and a multivariable model, adjusting each exposure for child ethnicity and all other indicators of socioeconomic position. In the fully adjusted model, I subsequently included an interaction between each exposure and age to investigate whether there were differential associations with the exposure based on timing of outcome measurement to assess how the association between socioeconomic position indicators and disordered eating behaviour and weight and shape concerns may change throughout adolescence. I stratified results by age where I found evidence of an interaction. To investigate associations with body dissatisfaction at age 14 years, as this was measured only at one time point, I used univariable and multivariable linear regression models mutually adjusting each socioeconomic indicators for all other indicators.

Complete case analysis may be biased by missing data, as the adolescent's experience of eating disorder symptoms may impact whether they are complete case.119 However, there were a limited number of auxiliary variables to predict missingness in the exposures in comparison to the outcomes. I also assumed that the missingness of the exposure were independent of the adolescent eating disorder outcomes conditional on confounders, which would not necessarily bias analyses restricting to respondents with complete exposures.[119] Therefore, I decided to restrict the analyses to complete-case exposure and imputed outcomes and confounders for my analyses. I imputed missing confounder and outcome data using multiple imputation by chained equations for participants with complete data on

exposure. I imputed 50 datasets on the assumption that the data were missing at random using all the variables included in the final models and auxiliary variables. Auxiliary variables included child's depressive symptoms at age 13, 14, and 18 years old measured with the Moods and Feelings Questionnaire,[120] child's internalising and externalising symptoms at ages 7, 9, and 11 years reported by the mother using the Strengths and Difficulties Questionnaire,[121] child's total, verbal, and performance IQ at age 8 years,[122] maternal smoking in pregnancy at 18 weeks' of gestation, and maternal pre-pregnancy body dissatisfaction at 18 weeks' of gestation, child's age and sex-standardised BMI at 7, 9, 10, 11, 14, 16, and 18 years old[123], eating behaviours using the Dutch Eating Behaviour Questionnaire (total of the restrictive, emotional, and external eating scales) at 14 years old,[124] relational and overt peer victimisation at 8 and 10 years old, autistic traits measured by the Social and Communication Disorders Checklist at 7, 11, 14, 16 years old.[125] Information on how maternal pre-pregnancy body dissatisfaction at 18 weeks gestation, child BMI at 7, 9, 10, 11, 14, 16, and 18 years old, child Strengths and Difficulties Questionnaire at 7, 9, and 11 years old, and Social and Communication Disorders Checklist at 7, 11, 14, and 16 years old was coded can be found under 'Confounders' in chapter 4.2.6. Information on how the rest of the auxiliary variables are coded can be found in Appendix 1.

I ran three sets of sensitivity analyses. First, I re-ran the main multivariable models adjusting parental occupation for parental education; family income for parental occupation and education; and financial hardship for family income and highest parental occupation and education to test the competing causal assumptions and confounding structures of socioeconomic position indicators (Figure 2). Second, I further adjusted the main multivariable models for maternal marital status, and history of eating disorders and depression to test whether treating maternal characteristics as a confounder would impact the effect sizes and estimates (Figure 4). Finally, to explore whether missing data patterns affected my effect sizes and estimates, I re-ran all my main analyses restricting the sample to participants with complete exposures and outcome (for body dissatisfaction) or at least one time-point of outcome measurement available (for disordered eating behaviours and weight and shape concerns). I used the likelihood ratio test to calculate p-values for categorical exposures (I.e., parental income, occupation, and educational attainment) in this restricted sample. I did not use these for the main analyses as it was not possible to run a likelihood ratio test for an imputed dataset in STATA 17.0.

2.3 Results

2.3.1 Sample characteristics

From the total sample of ALSPAC children alive at one-year (n=13,988), 7,824 (55.9%) had complete data on all exposures after removing one twin, and therefore, were included in the analytical sample.

A large proportion of participants' parents had a managerial occupation as their highest occupation (43.5%), had a compulsory education as their highest educational qualification (40.0%), and were in the highest fifth of income categories (21.8%). Most families did not experience financial hardship (76.4%) and lived in areas of low deprivation (73.7%) during pregnancy. (Table 1)

The distribution of participants in terms of sex assigned at birth was comparable across all socioeconomic position indicators. Parents of children from minoritised ethnic backgrounds had lower income, experienced more financial hardship, and lived in higher deprivation areas. A greater proportion of participants with unmarried mothers reported more deprivation across all indicators. Average levels of maternal depressive symptoms were progressively higher and mean maternal age progressively lower in categories denoting more deprived backgrounds. (**Table 1**)

Table 1: Characteristics of the analytical sample overall and by exposure level. Sample based on respondents with complete data on parental socioeconomic position

Participants' characteristics	Analytical sample	Early life socioeconomic indicators								
		Fifths of equivalised parental income					Financial hardship[a]		Area-level deprivation[b]	
		Highest	2	3	4	Lowest	No	yes	Low deprivation	High deprivation
	N (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Total	7824 (100.0)	1704 (21.8)	1670 (21.3)	1560 (19.9)	1535 (19.6)	1355 (17.3)	5981 (76.4)	1843 (23.6)	**5762 (73.7)**	**2062 (26.4)**
Participant's sex										
Male	4003 (51.1)	859 (21.4)	839 (21.0)	813 (20.3)	779 (19.5)	713 (17.8)	3.056 (76.3)	947 (22.7)	2,956 (73.8)	1,047 (26.2)
Female	3821 (48.9)	845 (22.1)	831 (21.7)	747 (19.6)	756 (19.8)	642 (16.8)	2,925 (76.5)	896 (23.5)	2,806 (73.4)	1,015 (26.6)
Ethnicity										
Minoritised ethnicity	294 (3.8)	63 (21.4)	53 (18.0)	47 (16.0)	56 (19.0)	75 (25.5)	193 (65.7)	101 (34.4)	151 (51.4)	143 (48.6)
White	7420 (96.2)	1632 (22.0)	1602 (21.6)	1491 (20.1)	1456 (19.6)	1239 (16.7)	5733 (77.3)	1687 (22.7)	5,539 (74.6)	1,881 (25.4)
Maternal history of eating disorders[c]										
No	7411 (96.4)	1625 (21.9)	1591 (21.5)	1491 (20.1)	1458 (19.7)	1246 (16.8)	5699 (76.9)	1712 (23.1)	1928 (26.0)	5483 (74.0)
Yes	277 (3.6)	64 (23.1)	60 (21.7)	43 (15.5)	46 (16.6)	64 (23.1)	197 (71.1)	80 (28.9)	87 (31.4)	190 (68.6)
Maternal marital status[d]										
Married	6208 (80.2)	1492 (24.0)	1435 (23.1)	1298 (20.9)	1164 (18.8)	819 (13.2)	4949 (79.7)	1259 (20.3)	1344 (21.6)	4864 (78.4)
Not married	1530 (19.8)	201 (13.1)	224 (14.7)	250 (16.3)	353 (23.1)	502 (32.8)	970 (63.4)	560 (36.6)	683 (44.6)	847 (55.4)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Maternal age at birth of study child	28.7 (4.6)	30.8 (3.8)	29.7 (4.2)	28.5 (4.3)	28.4 (4.5)	27.6 (5.0)	28.2 (5.0)	29.5 (4.2)	29.4 (4.4)	28.2 (4.6)
Maternal depressive symptoms[e]	6.59 (4.7)	5.44 (4.2)	6.09 (4.4)	6.34 (4.3)	6.66 (4.5)	7.77 (5.0)	5.81 (4.3)	8.33 (4.8)	6.07 (4.4)	7.15 (4.7)

For descriptive table purposes I defined: [a] Experiencing high financial hardship as scoring 5 or above (75th percentile of scores of the total sample) on the financial hardship scale. [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on maternal characteristics: [c] Maternal report at 12 weeks of pregnancy.[d] Maternal report at 8 weeks of pregnancy. [e] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy. Details on two-parental households with one parent's data missing: [f]9.7% of for occupation. [g]3.0% for education.

Table 1 continued

Participants' characteristics	Analytical sample	Early life socioeconomic indicators							
		Highest parental occupation[f]					Highest parental education[g]		
		Professional	Managerial	Skilled non-manual	Skilled manual	Semi-/unskilled manual	University degree	Advanced level	Compulsory education
	N (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Total	7824 (100.0)	1153 (14.7)	3404 (43.5)	1996 (25.5)	883 (11.3)	388 (5.0)	**1954 (25.0)**	**2743 (35.1)**	**3127 (40.0)**
Participant's sex									
Male	4003 (51.1)	593 (14.8)	1,731 (43.2)	1,036 (22.9)	452 (11.3)	191 (4.8)	989 (24.7)	1,402 (35.0)	1,612 (40.3)
Female	3821 (48.9)	560 (14.7)	1,673 (43.8)	960 (25.1)	431 (11.3)	197 (5.2)	965 (25.3)	1,341 (35.1)	1,515 (39.6)
Ethnicity									
Minoritised ethnicity	294 (3.8)	59 (20.1)	118 (40.1)	65 (22.1)	37(12.6)	15 (5.1)	93 (31.6)	92 (31.3)	109 (37.1)
White	7,420 (96.2)	1,086 (14.6)	3,257 (43.9)	1,895 (25.5)	830 (11.2)	352 (4.7)	1,850 (24.9)	2,626 (35.4)	2,944 (39.7)
Maternal history of eating disorders[c]									
Has not experienced eating disorders	7411 (96.4)	1100 (14.9)	3219 (43.4)	1909 (25.8)	822 (11.1)	361 (4.9)	1850 (25.0)	2603 (35.1)	2958 (39.9)
Has experienced eating disorders	277 (3.6)	38 (13.7)	139 (50.2)	55 (19.9)	30 (10.8)	15 (5.4)	84 (30.3)	101 (36.5)	92 (33.2)
Maternal marital status[d]									
Married	6208 (80.2)	1043 (16.8)	2808 (45.2)	1555 (25.1)	582 (9.4)	220 (3.5)	1700 (27.4)	2245 (36.2)	2263 (36.4)
Not married	1530 (19.8)	106 (6.9)	568 (37.1)	417 (27.3)	277 (18.1)	162 (10.6)	244 (16.0)	476 (31.1)	810 (52.9)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Maternal age at birth of study child	28.7 (4.6)	31.0 (3.8)	29.8 (4.3)	27.7 (4.3)	27.5 (4.7)	27.1 (4.9)	31.3 (3.7)	29.1 (4.2)	27.4 (4.4)
Maternal depressive symptoms[e]	6.59 (4.7)	5.58 (4.1)	6.21 (4.5)	6.49 (4.6)	7.3 (4.9)	7.72 (4.6)	5.8 (4.3)	6.3 (4.5)	6.8 (4.8)

For descriptive table purposes I defined: [a] Experiencing high financial hardship as scoring 5 or above (75th percentile of scores of the total sample) on the financial hardship scale. [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on maternal characteristics: [c] Maternal report at 12 weeks of pregnancy.[d] Maternal report at 8 weeks of pregnancy. [e] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy. Details on two-parental households with one parent's data missing: [f]9.7% of for social class. [g]3.0% for education.

2.3.2 Missing data

Based on the 7,824 participants who had completed data on exposures, all outcome measurements were more commonly missing among participants whose parents had compulsory education, had semi-skilled/unskilled occupation, were in the lowest 20% of income categories, experiencing financial hardship, and living in higher deprivation areas. Outcome measures were more commonly missing in children with younger, single mothers, and mothers with greater depressive symptoms. (Table 2)

Table 2: Characteristics of respondents with at least one available outcome measurement across timepoints or no available data on eating disorder outcomes among participants with complete exposure data (N=7,824)

	Disordered eating behaviours		Weight and shape concerns		Body dissatisfaction	
Parental socioeconomic position	No available measurements	At least one available measurement at age 14, 16, and 18	No available measurements	At least one available measurement at age 14 and18	No available measurements	Available body dissatisfaction data at age 14
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Total	2,802 (35.8)	5,022 (64.2)	3,133 (40.0)	4,691 (60.0)	6,838 (87.4)	986 (12.6)
Highest parental education						
University degree	434 (22.2)	1520 (77.8)	522 (26.7)	1432 (73.3)	1647 (84.3)	307 (15.7)
A-level	935 (34.1)	1808 (65.9)	1047 (38.2)	1696 (61.8)	2392 (87.2)	351 (12.8)
Compulsory education	1433 (45.8)	1694 (54.2)	1564 (50.0)	1563 (50.0)	2799 (89.5)	328 (10.5)
Highest parental social class						
Professional	260 (22.5)	893 (77.5)	305 (26.5)	848 (73.6)	967 (83.9)	186 (16.1)
Managerial	1108 (32.5)	2296 (67.5)	1268 (37.3)	2136 (62.8)	2964 (87.1)	440 (12.9)
Skilled non-manual	798 (40.0)	1198 (60.0)	874 (43.8)	1122 (56.2)	1770 (88.7)	226 (11.3)
Skilled manual	430 (48.7)	453 (51.3)	465 (52.7)	418 (47.3)	780 (88.3)	103 (11.7)
Semi-skilled/unskilled manual	206 (53.1)	182 (46.9)	221 (57.0)	167 (43.0)	357 (92.0)	31 (8.0)
Fifths of equivalised parental income						
Highest 20%	451 (26.5)	1253 (73.5)	525 (30.8)	1179 (69.2)	1446 (84.9)	257 (15.1)
2	513 (30.7)	1157 (69.3)	587 (35.2)	1083 (64.8)	1429 (85.6)	241 (14.4)
3	579 (37.1)	981 (62.9)	650 (41.7)	910 (58.3)	1361 (87.2)	199 (12.8)
4	609 (39.7)	926 (60.3)	663 (43.2)	872 (56.8)	1375 (89.6)	160 (10.4)
Lowest 20%	650 (48.0)	705 (52.0)	708 (52.3)	647 (47.8)	1226 (90.5)	129 (9.5)
Financial hardship*						
No (<5)	1981 (33.1)	4,000 (66.9)	2245 (37.5)	3736 (62.5)	5189 (86.8)	792 (13.2)
Yes (≥5)	821 (44.6)	1,022 (55.4)	888 (48.2)	955 (51.8)	1649 (89.5)	194 (10.5)

For descriptive table purposes I defined: [a] Experiencing high financial hardship as scoring 5 or above (75th percentile of scores of the total sample) on the financial hardship scale. [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on maternal characteristics: [c] Maternal report at 12 weeks of pregnancy.[d] Maternal report at 8 weeks of pregnancy. [e] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy

Table 2 continued

	Disordered eating behaviours		Weight and shape concerns		Body dissatisfaction	
Parental socioeconomic position	No available measurements	At least one available measurement at age 14, 16, 18	No available measurements	At least one available measurement at age 14, and 18	No available measurements	Available body dissatisfaction data at age 14
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Standardised area-level deprivation scores[b]						
High area level deprivation	916 (44.4)	1146 (55.6)	995 (48.3)	1067 (51.8)	1838 (89.1)	224 (10.9)
Low area level deprivation	1886 (32.7)	3876 (67.3)	2138 (37.1)	3624 (62.9)	5000 (86.8)	762 (13.2)
Maternal history of eating disorders						
Has not experienced eating disorders	2615 (35.3)	4796 (64.7)	2927 (39.5)	4484 (60.5)	6474 (97.4)	937 (12.6)
Has experienced eating disorders	101 (36.5)	176 (63.5)	117 (42.2)	160 (57.8)	240 (86.6)	37 (13.4)
Marital status						
Not married	672 (43.9)	858 (56.1)	731 (47.8)	799 (52.2)	1,369 (89.5)	161 (10.5)
Married	2077 (33.5)	4,131 (66.5)	2,343 (37.7)	3,865 (62.3)	5,389 (85.8)	819 (13.2)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Maternal age at birth of study child	27.8(4.7)	29.2 (4.4)	27.9 (4.7)	29.2 (4.4)	28.6 (4.6)	20.1 (4.4)
Maternal depressive symptoms	7.1 (4.8)	6.3 (4.5)	7.1 (4.8)	6.3 (4.5)	6.7 (4.7)	6.2 (4.4)

For descriptive table purposes I defined: [a] Experiencing high financial hardship as scoring 5 or above (75th percentile of scores of the total sample) on the financial hardship scale. [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on maternal characteristics: [c] Maternal report at 12 weeks of pregnancy.[d] Maternal report at 8 weeks of pregnancy. [e] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy

2.3.3 Prevalence of eating disorder symptoms

At age 14, 7.9% of participants experienced disordered eating behaviours. This proportion increased at age 16 (15.9%) and at age 18 (18.9%). Mean weight and shape concern score was 1.7 (SD=1.2) at age 14 and 2.0 (SD=1.5) at age 18. The mean body dissatisfaction score at age 14 was 25.6 (SD=10.3). (Table 3)

Table 3: Descriptives of eating disorder outcomes across age (N=7,824)

	Disordered eating behaviours	**Binge eating**	**Restrictive eating**	**Purging**	**Weight and shape concerns**	**Body dissatisfaction**
	N (%)	N (%)	N (%)	N (%)	M (SD)	M (SD)
Age						
14	338 (7.9)	93 (2.1)	238 (5.6)	28 (0.6)	1.6 (1.2)	24.6 (10.3)
16	574 (15.9)	213 (5.8)	337 (9.3)	117 (3.2)	-	-
18	462 (18.9)	195 (7.9)	245 (10.0)	97 (4.0)	2.0 (1.5)	-

2.3.4 Unconditional models

There was strong evidence of an association between age and any disordered eating behaviours (Odds ratio [OR]=1.37, 95% CI 1.31 to 1.45, p<.0001), binge eating (OR=1.50, 95% CI 1.38 to 1.62, <.0001), restrictive eating (OR=1.19, 95% CI 1.12 to 1.26, p<.0001), purging (OR=1.55, 95% CI 1.36 to 1.76, p<.0001), and weight and shape concerns (Coefficient=0.09, 95% CI 0.07 to 1.11, p<.0001) (Table 4). There also was a strong evidence of association between the quadratic term of age and any disordered eating behaviours (OR=0.92, 95% CI 0.89 to 0.96, p<.0001), binge eating (OR=0.89, 95% CI 0.83 to 0.96, p=0.001), restrictive eating (OR=0.95, 95% CI 0.91 to 0.99, p=0.038), and purging (OR=0.85, 95% CI 0.79 to 0.93, p<.0001) (Table 5). Therefore, I retained these two variables in subsequent models.

Table 4: Odds ratio for the association between age and eating disorder symptoms (14-18 years old). Sample based on participants with complete parental socioeconomic data and imputed eating disorder symptoms (N=7,824)

	Disordered eating behaviours	Binge eating	Restrictive eating	Purging	Weight and shape concerns
	OR (95% CI), p value	OR (95% CI), p value	OR (95% CI), p value	OR (95% CI), p value	MD (95% CI), p-value
Age	1.37 (1.31 to 1.45), <.0001	1.50 (1.38 to 1.62), <.0001	1.19 (1.12 to 1.26), <.0001	1.55 (1.36 to 1.76), <.0001	0.09 (0.07 to 1.11), <.0001

Table 5: Odds ratio for the association between age, age^2 and eating disorder symptoms (14-18 years old). Sample based on participants with complete parental socioeconomic data and imputed eating disorder symptoms (N=7,824)

	Disordered eating behaviours	Binge eating	Restrictive eating	Purging
	OR (95% CI), p value	OR (95% CI), p value	OR (95% CI), p value	OR (95% CI), p value
Age	1.40 (1.33 to 1.47), <.0001	1.56 (1.43 to 1.70), <.0001	1.20 (1.13 to 1.28), <.0001	1.66 (1.43 to 1.93), <.0001
Age^2	0.92 (0.89 to 0.96), <.0001	0.89 (0.83 to 0.96), 0.001	0.95 (0.91 to 0.99), 0.038	0.85 (0.79 to 0.93), <.0001

2.3.5 Objective 1: Early-life socioeconomic position and adolescent disordered eating behaviours, weight and shape concern, and body dissatisfaction

In univariable models, participants whose parents who had only an A-level education (OR=1.25, 95% CI 1.10 to 1.66, p=0.005) or only a compulsory education (OR=1.78, 95% CI 1.42 to 2.22, p<.0001) had higher odds of experiencing disordered eating behaviours compared to parents who had a university-level education. Children of parents who had a skilled non-manual (OR=1.55, 95% CI 1.16 to 2.07, p=0.003), skilled manual (1.54, 95% CI 1.06 to 2.22, p=0.022), or semi-skilled/unskilled occupation (OR = 2.11, 95% CI 1.28 to 3.59, p=0.004) had higher odds of disordered eating behaviours during adolescence compared to those from the highest social class. Adolescents whose parents' income was in the lowest fourth (OR = 1.34, 95% CI 1.02 to 1.74, p=0.032) and fifth of income distribution (OR = 1.37, 95% CI 1.02 to 1.83, p=0.037) had higher odds of experiencing disordered eating behaviours compared to adolescents whose parents were in the highest fifth of income distribution.

A one-point increase in financial hardship score (OR=1.07, 95% CI 1.04 to 1.10, p<.0001) and a standard deviation increase in area-level deprivation (OR=1.05, 95% CI 1.02 to 1.09, p=0.002) were associated with higher odds of experiencing disordered eating behaviours in adolescence. The effect sizes and estimates of these associations were similar once adjusting for child ethnicity.

When adjusting each exposure for all other indicators of socioeconomic position, there was still strong evidence that children whose parents only had an A-level education or compulsory education had higher odds of disordered eating behaviours compared to adolescents whose parents had university-level education (a-level education: OR=1.30, 95% CI 1.02 to 1.64, p=0.031; compulsory education: OR = 1.60, 95% CI 1.20 to 2.12, p=0.001) and that a one-point increase in financial hardship score was associated with 1.06 higher odds (95% CI 1.03 to 1.09, p<.0001) of disordered eating behaviours. Higher area-level deprivation was weakly associated with increased odds of disordered eating behaviours in the multivariable model (OR=1.03, 95% CI 0.99 to 1.07, p=0.061). There was no evidence of an association for lower parental social class and income with disordered eating behaviours. (Table 5)

In univariable models, a one-point increase in parental financial hardship score was associated with a 0.02-point increase (95% CI 0.01 to 0.03, p<.0001) in weight and shape concerns score and a 0.25-point increase (95% CI 0.10 to 0.40, p=0.001) in body dissatisfaction score (Table 6-7). Associations between financial hardship and weight and

shape concern (Coefficient= 0.02, 95% CI 0.01 to 0.03, p<.0001) and body dissatisfaction (Coefficient=0.26, 95% CI 0.11 to 0.41, p=0.001) remained similar after adjusting for ethnicity and subsequently, remaining socioeconomic position indicators (weight and shape concern: Coefficient=0.02 95% CI 0.01 to 0.04, p=0.001; body dissatisfaction: Coefficient=0.23, 95% CI 0.09 to 0.39, p=0.002).

In univariable models, children whose parents had managerial (Coefficient=0.11, 95% CI 0.001 to 0.21, p=0.047) and skilled non-manual occupation (Coefficient=0.12, 95% CI 0.01 to 0.24, p=0.041) had higher weight and shape concern scores compared to children whose parents had professional occupation. A standard deviation increase in area-level deprivation was associated with a 0.01-point increase (95% CI -0.002 to 0.03, p=0.081) in weight and shape concern scores. Children whose parents had compulsory education (Coefficient=1.27, 95% CI 0.11 to 2.44, p=0.033) and whose family income were categorised fourth of the income distributions (Coefficient=2.16, 95% CI 0.54 to 3.78, p=0.010) had higher body dissatisfaction scores compared to children of parents with university education and were of the highest income distribution respectively. These associations were completely attenuated in the adjusted analyses. There was no evidence of an association between the remaining socioeconomic positions and cognitive eating disorder symptoms.

Table 6: Multilevel logistic and linear regression models for disordered eating behaviours and weight and shape concerns at age 14, 16, and 18 years old according to parental socioeconomic position. Sample based on participants with complete exposure data and imputed confounders and eating disorder outcomes (N=7,824)

			Disordered eating
Parental socioeconomic position	1: Univariable model Odds ratios (95% CI), p-value	2: 1+ethnicity	3:2+remaining socioeconomic position indicators Odds ratios (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	1.25 (1.10 to 1.66), 0.005	1.35 (1.10 to 1.66), 0.004	1.30 (1.02 to 1.64), 0.031
Compulsory education	1.78 (1.42 to 2.22), <.0001	1.48 (1.42 to 2.22), <0.0001	1.60 (1.20 to 2.12), 0.001
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.28 (0.97 to 1.67), 0.076	1.28 (0.98 to 1.67), 0.075	1.05 (0.79 to 1.41), 0.730
Skilled non-manual	1.55 (1.16 to 2.07), 0.003	1.56 (1.16 to 2.08), 0.003	1.11 (0.78 to 1.57), 0.575
Skilled manual	1.54 (1.06 to 2.22), 0.022	1.53 (1.06 to 2.22), 0.022	1.00 (0.64 to 1.56), 0.990
Semi-skilled/unskilled	2.11 (1.28 to 3.59), 0.004	2.11 (1.28 to 3.49), 0.004	1.28 (0.75 to 2.20), 0.369
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	1.01 (0.79 to 1.28), 0.950	1.01 (0.79 to 1.28), 0.949	0.85 (0.67 to 1.09), 0.210
3	1.08 (0.83 to 1.39), 0.574	1.08 (0.83 to 1.39), 0.573	0.79 (0.60 to 1.04), 0.094
4	1.34 (1.02 to 1.74), 0.032	1.34 (1.02 to 1.74), 0.032	0.87 (0.65 to 1.18), 0.370
Lowest 20%	1.37 (1.02 to 1.83), 0.037	1.36 (1.02 to 1.83), 0.037	0.78 (0.55 to 1.07), 0.122
	OR (95% CI), p	OR (95% CI), p value	OR (95% CI), p
Financial hardship score	1.07 (1.04 to 1.10), <.0001	1.07 (1.04 to 1.10), <.0001	1.06 (1.03 to 1.09), <.0001
Standardised area-level deprivation score	1.05 (1.02 to 1.09), 0.002	1.05 (1.02 to 1.09), 0.002	1.03 (1.00 to 1.07), 0.061

Table 6 continued

Parental socioeconomic position			Weight and shape concerns
	1: Univariable model	2: 1+ethnicity	3:2+remaining socioeconomic position indicators
	Mean difference (95% CI), p-value	Mean difference (95% CI), p-value	Mean difference (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	0.06 (-0.03 to 0.15), 0.183	0.062 (-0.03 to 0.15), 0.171	0.02 (-0.08 to 0.12), 0.709
Compulsory education	0.08 (-0.02 to 0.18), 0.103	0.08 (-0.01 to 0.18), 0.097	0.03 (-0.10 to 0.15), 0.686
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	0.11 (0.001 to 0.21), 0.047	0.11 (0.003 to 0.22), 0.043	0.09 (-0.03 to 0.20), 0.137
Skilled non-manual	0.12 (0.01 to 0.24), 0.041	0.13 (0.01 to 0.25), 0.037	0.09 (-0.06 to 0.23), 0.242
Skilled manual	0.11 (-0.05 to 0.26), 0.188	0.11 (-0.05 to 0.26), 0.184	0.05 (-0.14 to 0.24), 0.630
Semi-skilled/unskilled	0.14 (-0.09 to 0.36), 0.225	0.14 (-0.09 to 0.36), 0.221	0.07 (-0.18 to 0.33), 0.573
Family income			
Highest 20%	Reference	Reference	Reference
2	0.02 (-0.09 to 0.12), 0.743	0.02 (-0.09 to 0.12), 0.734	-0.02 (-0.13 to 0.09), 0.693
3	0.07 (-0.04 to 0.18), 0.224	0.07 (-0.04 to 0.18), 0.219	-0.0003 (-0.12 to 0.12), 0.995
4	0.08 (-0.05 to 0.20), 0.217	0.08 (-0.05 to 0.20), 0.217	-0.02 (-0.16 to 0.12), 0.771
Lowest 20%	0.03 (-0.09 to 0.15), 0.595	0.03 (-0.09 to 0.15), 0.626	-0.11 (-0.35 to 0.03), 0.123
	Coefficient (95% CI), p-value	Coefficient (95% CI), p-value	Coefficient (95% CI), p-value
Financial hardship score	0.02 (0.01 to 0.03), <.0001	0.02 (0.01 to 0.03), <.0001	0.02 (0.01 to 0.04), 0.001
Standardised area-level deprivation score	0.01 (-0.002 to 0.03), 0.081	0.01 (-0.002 to 0.03), 0.103	0.01 (-0.01 to 0.03), 0.196

Table 7: Linear regression models for body dissatisfaction at age 14 according to parental socioeconomic position. Sample based on participants with complete parental socioeconomic data and imputed eating disorder outcomes (N=7,824)

			Body dissatisfaction
Parental socioeconomic position	1: Univariable model Mean difference (95% CI), p-value	2: 1+ethnicity Mean difference (95% CI), p-value	3:2+remaining socioeconomic position indicators Mean difference (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	0.34 (-0.77 to 1.45), 0.547	0.31 (-0.79 to 1.42), 0.579	0.02 (-1.12 to 1.16), 0.970
Compulsory education	1.27 (0.11 to 2.44), 0.033	1.25 (0.08 to 2.42), 0.036	0.78 (-0.78 to 2.34), 0.320
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	0.73 (-0.60 to 2.07), 0.279	0.70 (-0.63 to 2.03), 0.298	0.33 (-0.98 to 1.64), 0.616
Skilled non-manual	0.99 (-0.45 to 2.42), 0.175	0.95 (-0.48 to 2.38), 0.190	0.21 (-1.55 to 1.96), 0.813
Skilled manual	1.61 (-0.34 to 3.57), 0.104	1.60 (-0.36 to 3.55), 0.107	0.49 (-1.74 to 2.72), 0.659
Semi-skilled/unskilled	1.24 (-1.47 to 3.95), 0.365	1.22 (-1.49 to 3.93), 0.372	-0.08 (-2.83 to 2.67), 0.953
Family income			
Highest 20%	Reference	Reference	Reference
2	0.61 (-0.73 to 1.94), 0.371	0.59 (-0.74 to 1.93), 0.379	0.21 (-1.09 to 1.51), 0.745
3	-0.23 (-1.68 to 1.22), 0.756	-0.24 (-1.69 to 1.21), 0.744	-0.96 (-2.39 to 0.47), 0.184
4	2.16 (0.54 to 3.78), 0.010	2.16 (0.54 to 3.78), 0.010	1.08 (-0.67 to 2.84), 0.220
Lowest 20%	0.54 (-0.98 to 2.10), 0.484	0.58 (-0.95 to 2.10), 0.453	-0.96 (-2.66 to 0.74), 0.263
	Coefficient (95% CI), p-value	Coefficient (95% CI), p-value	Coefficient (95% CI), p-value
Financial hardship score	0.25 (0.10 to 0.40), 0.001	0.26 (0.11 to 0.41), 0.001	0.24 (0.09 to 0.39), 0.002
Standardised area-level deprivation score	0.12 (-0.07 to 0.32), 0.211	0.14 (-0.06 to 0.34), 0.157	0.09 (-0.12 to 0.29), 0.400

2.3.6 Objective 2: Interaction between early-life socioeconomic position and age for disordered eating behaviours and weight and shape concerns

When investigating interactions between each exposure and age of outcome measurements, I found evidence of an interaction between income (p-value for interaction=0.054), financial hardship (p-value for interaction=0.054), area-level deprivation (p-value for interaction=0.041). The age-stratified analyses presented in Table 8 suggests that children with parents in the fourth of income distribution have 1.12 higher odds (95% CI 0.78 to 1.59) and those from the lowest income distribution have 1.04 higher odds (95% CI 0.72 to 1.51) for developing an eating disorder at the age of 14 compared to children with parents from the highest parental income category. However, this association reversed by age 16, wherein children from all lower income categories have lower odds of disordered eating behaviours compared to the children in the highest income category. By age 18, children whose parents were in the lowest 20% of income distribution had 0.78 lower odds (95% CI 0.54 to 1.06) of experiencing disordered eating behaviour.

On the other hand, children who experienced higher levels of financial hardship and area-level deprivation have higher odds of reporting disordered eating behaviours throughout adolescence. The odds of developing disordered eating behaviour with one unit increase in financial hardship and a standard-deviation increase in area-level deprivation is higher at age 14 (financial hardship: OR=1.05, 95% CI 1.02 to 1.09; area-level deprivation: OR=1.05; 95% CI 1.01 to 1.08) compared to age 18 (financial hardship: OR=1.03, 95% CI 1.00 to 1.06; area-level deprivation: OR=1.01; 95% CI 0.98 to 1.05).

There was no evidence of an interaction between the quadratic term for age and any socioeconomic indicators for disordered eating behaviours and interactions between age and any socioeconomic position indicators for weight and shape concerns.

Table 8: Stratified odds ratio of adolescent disordered eating behaviours at age 14, 16, and 18 according to parental soceioconomic indicators. Sample based on participants with complete parental socioeconomic data and imputed eating disorder outcomes (N = 7,824)

			Disordered eating behaviours
Age	14	16	18
Parental socioeconomic position indicator	OR (95% CI)	OR (95% CI)	OR (95% CI)
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.94 (0.67 to 1.32)	0.84 (0.67 to 1.06)	0.92 (0.71 to 1.18)
3	1.10 (0.79 to 1.54)	0.80 (0.62 to 1.03)	0.78 (0.59 to 1.04)
4	1.12 (0.78 to 1.59)	0.93 (0.71 to 1.22)	0.81 (0.59 to 1.10)
Lowest 20%	1.04 (0.72 to 1.51)	0.78 (0.58 to 1.04)	0.78 (0.54 to 1.13)
Financial hardship	1.05 (1.02 to 1.09)	1.04 (1.02 to 1.07)	1.03 (1.00 to 1.06)
Standardised area-level deprivation score	1.05 (1.01 to 1.08)	1.03 (0.99 to 1.06)	1.01 (0.98 to 1.05)

2.3.7 Objective 3: Early-life socioeconomic position and individual behavioural eating disorder symptoms

I observed independent patterns of association between different parental socioeconomic position indicators and individual disordered eating behaviours (Table 9). In the unadjusted models for binge eating, children whose parents had only compulsory education had 1.48 higher odds (95% CI 1.06 to 2.07, p=0.022) of experiencing binge eating compared to children whose parents had university-level education. This association remained similar when adjusting for ethnicity (OR=1.48, 95% CI 1.06 to 2.06, p=0.022). However, this association completely attenuated in the fully adjusted analysis. A one-point increase in parental financial hardship score and a one standard deviation increase in area level deprivation were respectively associated with 1.07 (95% CI 1.02 to 1.11, p=0.002) and 1.07 (95% CI 1.02 to 1.13, p=0.005) higher odds of binge eating in adolescence. In the fully adjusted model, the effect size and estimates of the association between parental financial hardship (OR = 1.05, 95% CI 1.00 to 1.10, p=0.029), area level deprivation (OR = 1.06, 95% CI 1.00 to 1.12, p=0.048), and binge eating remained similar.

In the unadjusted model for restrictive eating, children whose parents who only had A-level or compulsory education had 1.31 higher odds (1.03 to 1.66, p=0.029) and 1.80 higher odds (95% CI 1.42 to 2.28, p=0.001) of restrictive eating behaviours respectively compared to children with university educated parents. This association completely attenuated for children whose parents had only A-levels after mutually adjusting for other socioeconomic indicators, and attenuated slightly for children whose parents had compulsory education (OR =1.61; 95% CI 1.19 to 2.19, p=0.002). Children whose parents had semi-skilled/non-manual (OR=1.66, 95% CI 1.21 to 2.26, p=0.002), skilled manual (OR=1.68, 95% CI 1.13 to 2.49, p=0.011), and skilled/unskilled manual occupations (OR=2.05, 95% CI 1.15 to 3.65, p=0.016) had higher odds of experiencing restrictive eating compared to children whose parents had professional occupation, although these association completely disappeared after adjusting for ethnicity and remaining socioeconomic position indicators.

Finally, a one-point increase in parental financial hardship score was associated with 1.06 higher odds (95% CI 1.03 to 1.09, p<.0001) of offspring restrictive eating; the magnitude and strength of this association remained largely unchanged in the fully adjusted model (OR = 1.05; 95% CI 1.02 to 1.08, p=0.003). There is very weak evidence that children whose parents were in the lowest 20% of income have 0.71 less odds (95% CI 0.49 to 1.03, p=0.072) of developing restrictive eating, but the upper estimates overlap with the null value. There was no evidence of an association between area-level deprivation and restrictive eating.

In the unadjusted models for purging behaviours, there was evidence that children whose parents had compulsory education (OR=1.87, 95% CI 0.79 to 2.80, p=0.220), semi-skilled/unskilled occupations (OR=3.14, 95% CI 1.06 to 9.28, p=0.039) had higher odds of developing purging, although this association disappeared once adjusting for ethnicity and remaining socioeconomic position indicators. On the other hand, there was evidence that with a one-point increase in financial hardship score and a standard deviation increase in area level deprivation, the odds of experiencing purging symptoms increased by 1.08 (95 CI 1.02 to 10.15, p=0.005) and 1.11 (95% CI 1.04 to 1.19, p=0.003), respectively. This association remained similar for financial hardship (OR = 1.07; 95% CI 1.00 to 1.13, p=0.041) and area level deprivation (OR = 1.10, 95% CI 1.02 to 1.19, p=0.014) in the fully adjusted models. Similar to restrictive eating, there was evidence that children whose parents are in the lowest 20% of income had 0.47 less odds of purging (95% CI 0.21 to 1.04, p=0.064) in adolescence, but the estimates were quite large and the upper estimate overlapped with the null value.

Table 9: Multilevel logistic regression models for binge eating, restrictive eating, and purging at 14, 16, and 18 years old and their association with parental socioeconomic position. Sample based on participants with complete parental socioeconomic data and imputed eating disorder symptoms (N=7,824)

			Binge eating
Parental socioeconomic position indicators	1: Univariable model OR (95% CI), p	2: 1+ ethnicity OR (95% CI), p	3: 2+ remaining socioeconomic position indicators OR (95% CI), p
Highest parental education			
University degree			
A-level	1.37 (0.97 to 1.94), 0.078	1.37 (0.96 to 1.93), 0.079	1.40 (0.95 to 2.07), 0.089
Compulsory education	1.48 (1.06 to 2.07), 0.022	1.48 (1.06 to 2.06), 0.022	1.38 (0.91 to 2.11), 0.133
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.16 (0.77 to 1.74), 0.473	1.16 (0.77 to 1.73), 0.478	0.95 (0.61 to 1.47), 0.814
Skilled non-manual	1.27 (0.83 to 1.95), 0.272	1.27 (0.83 to 1.94), 0.274	0.90 (0.53 to 1.54), 0.704
Skilled manual	1.24 (0.70 to 2.17), 0.460	1.23 (0.70 to 2.17), 0.461	0.77 (0.40 to 1.50), 0.440
Semi-skilled/unskilled	1.57 (0.77 to 3.20), 0.213	1.57 (0.77 to 3.20), 0.215	0.90 (0.40 to 2.04), 0.803
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.91 (0.64 to 1.30), 0.600	0.91 (0.64 to 1.30), 0.597	0.81 (0.56 to 1.16), 0.253
3	0.86 (0.58 to 1.23), 0.454	0.86 (0.58 to 1.27), 0.452	0.70 (0.46 to 1.06), 0.093
4	1.26 (0.86 to 1.85), 0.228	1.26 (0.86 to 1.85), 0.227	0.94 (0.60 to 1.47), 0.778
Lowest 20%	1.45 (0.95 to 2.21), 0.084	1.45 (0.95 to 2.22), 0.082	0.50 (0.56 to 1.62), 0.847
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.07 (1.02 to 1.11), 0.002	1.07 (1.03 to 1.11), 0.002	1.05 (1.00 to 1.10), 0.029
Standardised area-level deprivation scores	1.07 (1.02 to 1.13), 0.005	1.08 (1.02 to 1.13), 0.005	1.06 (1.00 to 1.12), 0.048

Table 9 continued

	Restrictive eating		
Parental socioeconomic position indicators	1: Univariable model OR (95% CI), p	2: 1+ ethnicity OR (95% CI), p	3: 2+ remaining socioeconomic position indicators OR (95% CI), p
Highest parental education			
University degree	Reference	Reference	Reference
A-level	1.31 (1.03 to 1.66), 0.029	1.30 (1.03 to 1.66), 0.029	.1,21 (0.93 to 1.58), 0.154
Compulsory education	1.80 (1.42 to 2.28), <.0001	1.80 (1.42 to 2.27), <.0001	1.61 (1.19 to 2.19), 0.002
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.31 (0.97 to 1.78), 0.083	1.31 (0.97 to 1.76), 0.083	1.12 (0.80 to 1.55), 0.516
Skilled non-manual	1.66 (1.21 to 2.26), 0.002	1.65 (1.21 to 2.26), 0.002	1.27 (0.87 to 1.84), 0.220
Skilled manual	1.68 (1.13 to 2.49), 0.011	1.67 (1.13 to 2.49), 0.011	1.23 (0.77 to 1.98), 0.383
Semi-skilled/unskilled	2.05 (1.15 to 3.65), 0.016	2.05 (1.15 to 3.65), 0.016	1.44 (0.76 to 2.76), 0.264
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	1.07 (0.80 to 1.44), 0.643	1.07 (0.80 to 1.44), 0.644	0.91 (0.67 to 1.23), 0.531
3	1.18 (0.88 to 1.56), 0.264	1.18 (0.88 to 1.56), 0.264	0.86 (0.63 to 1.16), 0.323
4	1.27 (0.94 to 1.72), 0.131	1.27 (0.93 to 1.72), 0.131	0.84 (0.60 to 1.17), 0.295
Lowest 20%	1.21 (0.89 to 1.66), 0.224	1.22 (0.89 to 1.66), 0.219	0.71 (0.49 to 1.03), 0.072
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.06 (1.03 to 1.09), <.0001	1.06 (1.03 to 1.09), <.0001	1.05 (1.02 to 1.08), 0.003
Standardised area-level deprivation score	1.02 (0.98 to 1.06), 0.289	1.03 (0.98 to 1.06), 0.275	1.00 (0.97 to 1.04), 0.911

Table 9 continued

			Purging
Parental socioeconomic position indicators	1: Univariable model Odds ratio (95% CI), p-value	2: 1+ ethnicity Odds ratio (95% CI), p-value	3: 2+ remaining socioeconomic position indicators Odds ratio (95% CI), p-value
Highest parental education			
University degree			
A-level	1.10 (0.68 to 1.78), 0.686	1.11 (0.69 to 1.79), 0.656	0.99 (0.59 to 1.66), 0.975
Compulsory education	1.78 (1.04 to 3.06), 0.037	1.79 (1.05 to 3.08), 0.034	1.49 (0.79 to 2.80), 0.220
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.58 (0.86 to 2.91), 0.142	1.59 (0.87 to 2.93), 0.133	1.40 (0.75 to 2.58), 0.288
Skilled non-manual	1.67 (0.81 to 3.46), 0.166	1.69 (0.82 to 3.49), 0.156	1.24 (0.57 to 2.67), 0.589
Skilled manual	1.58 (0.64 to 3.92), 0.316	1.59 (0.64 to 3.93), 0.311	1.05 (0.38 to 2.86), 0.928
Semi-skilled/unskilled	3.14 (1.06 to 9.28),0.039	3.15 (1.07 to 9.32), 0.038	1.94 (0.62 to 6.02), 0.252
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.85 (0.45 to 1.62), 0.616	0.85 (0.45 to 1.62), 0.620	0.70 (0.37 to 1.33), 0.279
3	1.33 (0.70 to 2.51), 0.381	1.33 (0.70 to 2.52), 0.376	0.92 (0.47 to 1.81), 0.816
4	1.51 (0.81 to 2.83), 0.197	1.51 (0.80 to 2.82), 0.199	0.87 (0.45 to 1.71), 0.688
Lowest 20%	1.06 (0.52 to 2.14), 0.879	1.04 (0.51 to 2.12), 0.911	0.47 (0.21 to 1.04), 0.064
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.08 (1.02 to 1.14), 0.005	1.08 (1.02 to 1.13), 0.007	1.07 (1.00 to 1.13), 0.041
Standardised area-level deprivation score	1.11 (1.04 to 1.19), 0.003	1.11 (1.03 to 1.19), 0.004	1.10 (1.02 to 1.19), 0.014

2.3.8 Sensitivity analyses: investigating an alternative causal structure of socioeconomic position

The effect sizes and estimates were similar for the association between socioeconomic position indicators and disordered eating behaviours, weight and shape concerns, body dissatisfaction, and individual disordered eating behaviours when adjusting associations between the outcomes and i) social class for education, ii) income for education and social class, and iii) financial hardship for education, social class, and income. (Table S1-S4). However, there was very weak evidence for the association between fourth of income distribution and body dissatisfaction (Coefficient=1.65, 95% CI -0.015 to 3.44, p=0.071). Further, I observed similar patterns of associations for interactions as well, wherein the association between income and financial hardship had stronger associations at age 14 compared to 18 for disordered eating behaviours. There was also very weak evidence of an interaction between semi-skilled/ unskilled parental occupation and the quadratic term for age for disordered eating behaviours symptoms (p=0.066). Subgroup analyses revealed that children whose parents had semi-skilled/unskilled occupation had 1.71 higher odds (95% CI 1.04 to 2.85) of developing disordered eating behaviours compared to children whose parents were from professional occupations at age 14. The odds of children whose parents were had semi-skilled/unskilled occupation developing disordered eating behaviours were still higher than children whose parents had professional occupation at age 16 (OR=1.09, 95% CI 0.67 to 1.79) and 18 (OR=1.27, 95% CI 0.77 to 2.08).

2.3.9 Sensitivity analyses: adjusting for maternal characteristics

When adjusting for maternal characteristics, most effect sizes and estimates were similar to my main analysis, albeit with some differences (Table S5-S8). For instance, I observed a weaker association between standardised area-level deprivation and disordered eating behaviours in the fully adjusted model including maternal characteristics (OR=1.03, 95% CI 0.99 to 1.06, p=0.142) compared to the fully adjusted model in the main analysis (Table S4). The effect and estimates only slightly overlap with the null value, which may indicate a loss of power. I also found that once adjusting for maternal characteristics, children in the lowest 20% of income have 0.73 lower odds of experiencing disordered eating behaviours (95% CI 0.52 to 1.02, p=0.064), although the upper estimates slightly overlapped with the null value.

The sensitivity analyses for the association between socioeconomic position and individual eating disorder symptoms yielded similar effect size and estimates to the main analyses. However, the sensitivity analyses revealed weak evidence of an association between purging and financial hardship in the fully adjusted model (OR=1.06, 95% CI 0.99 to 1.13, p=0.075) compared to the main analyses. Given that the lower estimates overlap only slightly with the null value, the results of the sensitivity analysis could be due to loss of power.

2.3.10 Sensitivity analyses: complete case analyses

The effect size and estimates for the complete case analyses on disordered eating behaviours, weight and shape concern, body dissatisfaction, and individual disordered eating behaviours were mostly similar to those of the main analyses (Table S9-S12). However, in complete case analyses the lower end of the 95% confidence interval for standardised area level deprivation and disordered eating behaviours slightly overlapped with the null value in the fully adjusted model (OR=1.03, 95% CI 0.99 to 1.07, p=0.097) compared to the main analysis.

In complete case analyses, I did not find evidence of an interaction between income (Pglobal=0.385), financial hardship (p=0.375) and area-level deprivation (p=0.265) and age in disordered eating behaviours unlike the main analysis. I found very weak evidence of an interaction between parental educational attainment and weight and shape concern (Pglobal=0.074).Children whose parents only had a compulsory education had lower weight and shape concerns compared to the children whose parents were university educated at age 14 (MD=-0.24, 95% CI -0.51 to 0.03) compared to age 18 (MD=-0.09, 95% CI -0.49 to 0.61). In comparison, children whose parents only had an A-level education had similar weight and shape concern score than children whose parents were university educated at age 14 (MD=-0.07, 95% CI -0.31 to 0.18), whereas the former had higher weight and shape concern score compared to the latter at age 18 (MD=0.25, 095% CI -0.11 to 0.61).

2.4 Discussion

2.4.1 Summary of findings

In this study, I found that children from lower socioeconomic backgrounds experienced greater eating disorder symptoms throughout adolescence. More severe financial hardship was associated with increased risk of disordered eating behaviours, weight and shape concerns, and body dissatisfaction. Lower parental educational attainment was strongly associated with increased odds of offspring's disordered eating behaviours in adolescence. Lower income was associated with higher odds of disordered eating behaviours at age 14, but these associations reversed when the adolescents were 16 and 18 years old. The associations for area-level deprivation or financial hardship and disordered eating behaviours were stronger at age 14 as opposed to age 18. More severe financial hardship was associated with increased risk of binge eating, purging, and restrictive eating. Higher area-level deprivation was associated with more binge eating and purging, while lower parental educational attainment and parental social class were associated with more restrictive eating.

2.4.2 Strengths and limitations

Chance

I used a large, longitudinal, general population sample; therefore, my findings can produce accurate estimates for my analyses on disordered eating behaviour, weight and shape concerns, and body dissatisfaction. However, I may have been underpowered to detect an association between my exposures and individual disordered eating behaviours, which are rarer compared to outcomes from objective 1, resulting in a Type II error. For example, less than 8% and 5% of adolescents in my sample experienced binge eating or purging in my analyses respectively, at any time point. This lack of power is apparent when observing the wider estimates for this outcome. For example, while there was evidence that children with parents of compulsory education had higher odds of binge eating compared to children with parents of university degrees in the unadjusted main analyses, the estimates became much wider after adjusting for remaining socioeconomic position. Further, there was generally weak evidence for the stratified interaction analyses, indicating a potential lack of power to detect an effect.

I attempted to reduce the risk of Type I errors by specifying and pre-registering my hypotheses a priori. Nevertheless, some findings may inevitably be a result of Type I error as I tested multiple associations in this chapter. For example, the lack of consistency between

the association of multiple indicators of socioeconomic position (e.g., income, financial hardship, and area-level deprivation) on disordered eating behaviours across different ages of the adolescent respondents across the main and sensitivity analyses may indicate that these could have been chance findings due to multiple testing.

Bias

There are high levels of attrition among ALSPAC respondents from lower socioeconomic backgrounds. This might have biased my results if those participants have differential risk of eating disorder symptoms. In order to compensate for this limitation, I used the earliest measurement of socioeconomic position available and imputed missing data on confounders and outcomes. The comparable results across complete record and imputed analyses for all eating disorder outcomes lends some reassurance that these observed patterns of association may not be due to missing data.

However, the imputed model may be biased if the assumptions made do not hold. For example, unmeasured predictors for missingness of the exposure could be associated with adolescent eating disorder outcome as well. This could mean that my findings are biased by selection which would distort the associations between socioeconomic position and eating disorders.

Using the data available for parental social class and educational attainment may have introduced bias in my associations if missingness patterns relate to both the exposure and the outcome. 9.7% of two-people households had data missing from one parent for social class and 3.0% for education.

Confounding

I employed multiple sensitivity analyses to test different causal assumptions and found similar patterns of associations across my main and sensitivity analyses, attesting to the robustness of the observed associations. However, there is still a chance that unobserved confounders might bias the associations under investigation. Previous research has shown that genetic susceptibility for a number of psychiatric conditions, including anorexia nervosa, is associated with increased probability of being born in more deprived environments – possibly as a result of intergenerational drift.[113] I adjusted my models for maternal mental health difficulties in sensitivity analyses. I was unable to robustly account for the potential for genetic confounding as polygenic risk scores currently explain limited phenotypical variance[126] and the sample did not allow other genetically-informed designs, such as twin studies. Another unobserved confounder could be the parents' experiences of adverse

childhood events. For example, the parent's adverse childhood events may have affected parent's socioeconomic position.[127] The former may also have downstream effects on their offspring's adverse childhood events (e.g., parent's experience of maltreatment in their childhood may lead to parent's maltreatment of their own children), which could increase eating disorder risk in the offspring.[128]

Measurement

I used the earliest measurement of socioeconomic position; therefore, I do not know whether changes in socioeconomic position throughout childhood may be associated with eating disorder symptoms. For example, there could be an increase in family income as childhood progresses. This could be seen as a non-differential exposure misclassification (I.e., unrelated to my eating disorder outcomes), therefore this may underestimate the true association between the exposure and outcome. However, I do find an association between multiple childhood socioeconomic position indicators and adolescent eating disorder symptoms; therefore, non-differential exposure misclassification is less of a concern for my findings.

My exposures could not assess the cumulative effect across multiple dimensions of socioeconomic position. It could be that the exposure in the unadjusted analyses represent combined effects of health inequality from different socioeconomic position measures. On the other hand, the adjusted analyses may underestimate the degree of socioeconomic inequality experienced by those from lower socioeconomic groups. Future research could consider how these individual socioeconomic position indicators may create cumulative effects on eating disorders.

I cannot draw comparisons of the associations across multiple socioeconomic position indicators because certain exposures are classified as crude categories while others are continuous scores. This could mean that the latter measures could represent larger socioeconomic gaps compared to the former, where fewer categories were available. Future research could use summary approaches of health inequality, such as ridit scores, to draw direct comparisons between multiple indicators of socioeconomic position.

I use only three timepoints of outcome measurement to test an interaction with socioeconomic position indicators on adolescent eating disorder symptoms, which may be insufficient to accurately estimate trajectories.[129] However, in the descriptive data, I found the prevalence of disordered eating behaviour increased drastically from 14 to 16 years old and remains stable from 16 to 18 years old, which may suggest that there is a non-linear pattern. Further, I did not find an interaction between the quadratic term for age and socioeconomic

position indicators on eating disorders - perhaps due to power; therefore, there is less of a concern for whether these quadratic terms have accurately estimated my trajectories.

While I used a validated measure for my outcomes, the Youth Risk Behaviour Surveillance System is not used as a specialised tool to assess eating disorders. For instance, my measurement of restrictive eating behaviours may not accurately capture extreme restrictive behaviours typical of anorexia nervosa, as these are uncommon in general-population samples. I combined an extreme measure (I.e., fasting) and a less extreme measure (I.e., dieting) to capture a more diverse presentation of restrictive eating disorders. However, the Youth Risk Behaviour Surveillance System does not define dieting in the item. Further, the responses for this item do not indicate exact frequency of dieting (e.g, “always” or “often on a diet”) compared to the responses for items on binge eating, fasting, and purging (e.g., purging “1-3 times a month”). Therefore, the item on dieting is subject to the adolescent’s interpretation. This in turn, may mean I captured young people with more common but less extreme restrictive eating behaviours which could have different patterns of associations with socioeconomic position – therefore these findings might not be generalisable to diagnosed anorexia nervosa. However, these restrictive behaviours also pose considerable distress on young people;[130] therefore, the findings could be meaningful in a clinical context as well, even if they may not perfectly represent anorexia nervosa.

2.4.3 Interpretation of findings and comparison with previous literature

My results find opposite associations from those of register-based studies[9, 41, 77-82] This could be due to aforementioned uncertainties around our outcome measurement, and how well they represent clinical diagnoses such as anorexia nervosa. Anorexia nervosa has a different pattern of association with socioeconomic position and are often over-represented in clinical samples.[77] However, register-based studies also find an association between high socioeconomic position and higher incidence of diagnosed bulimia nervosa and EDNOS,[77] which I should have captured more accurately with my outcome measures. I therefore hypothesise that the discrepancy between the socioeconomic patterning of clinical diagnoses and self-reported symptoms might be explained by inequalities in identification of eating disorders and access to services, rather than the aforementioned measurement issues.[131]

People from more deprived backgrounds experience greater difficulties in accessing healthcare.[26, 132-134] However, eating disorders are one of the few conditions where an association with deprivation is either not observed or reversed when using clinical registers,

suggesting that there might be eating disorder-specific barriers in access to care. First, those in lower socioeconomic groups with eating disorders could be less likely to seek help due to internalised, stigmatising beliefs that eating disorders are a "disease of affluence"[50, 135] or less perceived need for treatment.[136] Second, there is a known socioeconomic gradient in BMI, with those from deprived backgrounds having higher average BMIs.[137] Higher BMI is a known risk factor for eating disorders;[138] therefore, the fact that lower rates of diagnoses are observed in those from lower socioeconomic position compared to those from higher socioeconomic positoin, could suggest presence of specific barriers to eating disorder care. This is supported by a study that found that those with higher BMI are less likely to receive consultation for eating disorders.[139] There also may be higher weight stigma from medical professionals amongst this group of people, which could prevent adolescents with lower socioeconomic backgrounds from receiving proper eating disorder care.[140]

Expanding on previous studies using self-reported symptoms,[141] my findings suggest persistent effects of early-life deprivation extending into the period of greatest risk for eating disorders. Greater financial difficulties and lower parental educational attainment have the strongest associations with eating disorder symptoms, but mechanisms underpinning these associations remain unexplored. This association could be due to putative risk factors for eating disorders, such as higher child BMI,[138] increased food insecurity,[142-144] and greater experience of childhood adversities,[91, 145] being more commonly observed in those from lower socioeconomic positions.

The lack of evidence for an association between low parental education and cognitive eating disorder symptoms is surprising as the latter usually precede onset of behavioural symptoms.[27] I might not have been able to observe those associations due to low statistical power, although other studies with smaller sample sizes have observed an association between lower socioeconomic position and these symptoms.[92-94, 96] If these findings are true, they could suggest different risk mechanisms between parental education, disordered eating behaviours and cognitive eating disorder symptoms.

My findings also align with the literature showing that lower socioeconomic position is associated with earlier onset of mental health difficulties.[40] One plausible explanation for this is that adolescents from lower socioeconomic position experience puberty earlier than those from high socioeconomic positions,[146-148] and puberty is also thought to be associated with the onset of multiple mental health difficulties.[149, 150] However, these findings contrast with another study investigating depression incidence in the ALSPAC sample which found incidence of depression to be similar throughout adolescence for those from lower socioeconomic backgrounds.[151] Further, my results need to be interpreted with caution as 1)

I did not find a main effect between income and eating disorder symptoms, 2) estimates from the stratified analyses largely overlap with one another, and 3) the strength of evidence is very weak. Therefore, these results need to be replicated, ideally with a larger sample to sufficiently power interaction analyses.

One putative risk factor of binge eating and purging that could be common in highly deprived areas are density of highly palatable food outlets.[152, 153] While there were no studies done on how high density of palatable food outlets affect binge eating and purging, there is experimental evidence showing how women with binge eating disorder were more attentive to pictures of high calorie food items compared to lower calorie food items.[154] Therefore, the presence of highly palatable food outlets could be hypothesised to facilitate binge eating episodes, although the causal relationship between highly palatable food items and binge eating still needs to be investigated. On the other hand, lower parental social class, parental educational attainment, and higher financial hardship may affect restrictive eating due to lower health literacy and lack of safer weight loss resources in these families. This means that children whose parents are from lower social class, have only compulsory education, and experience financial hardship might be resorting to more drastic measures of weight loss including extreme dieting and fasting, although there is yet to be evidence supporting this association. In general, to corroborate these claims, there needs to be more research on specific mechanisms behind parental socioeconomic position and individual disordered eating behaviours in adolescents.

2.5.4 Implications

My findings identify an underappreciated form of health inequality. This not only adds to the extensive evidence base calling for a reduction in socioeconomic inequalities as part of population-wide, mental health prevention strategies but also calls for researchers to 1) validate these findings, 2) advocate for data structures that allow to monitor eating disorder trends across time in the context of socioeconomic position, and 3) evaluate how these socioeconomic contexts could be affecting eating disorders (e.g., investigating mediators of socioeconomic position and eating disorders). This will allow for a better understanding of preventative interventions for eating disorder symptoms. Further, identifying and addressing existing barriers that might prevent young people from deprived backgrounds from accessing eating disorder services should be a research and policy priority. Provision of comprehensive medical training might facilitate identification of a broader spectrum of eating disorder presentations in primary care, particularly in populations who are more likely to be missed.[155]

3 Longitudinal association between childhood food insecurity and adolescent eating disorder symptoms

3.1 Background

3.1.1 Rationale

There is mounting cross-sectional evidence from the US that people experiencing food insecurity are also more likely to present with eating disorder symptoms, although longitudinal evidence of this association is still limited.[143, 144] Cross-sectional evidence found that food insecure children,[156-158] adolescents,[158-163] and adults[164-176] experienced greater levels of eating disorder symptoms, binge eating, dietary restraint, purging, weight and shape concern, and body dissatisfaction. Food-insecure adults also have higher odds of meeting criteria for an eating disorder diagnosis compared to food-secure adults.[49, 172, 177-179] Mirroring these findings, longitudinal studies found that food-insecure adolescents[142, 180-183] and adults[164, 184] have higher odds of meeting the criteria for binge eating disorder and OSFED and experience more binge eating symptoms two to five years later. These longitudinal studies did not find any associations between food insecurity and other eating disorder symptoms, such as dietary restraint or purging behaviours.[142, 181]

Within the context of the US, where the government give out monthly allotments of benefits to supplement food purchase (e.g., the Supplemental Nutritional Assistance Programme), the main hypothesis that has been put forward to explain this association is that these programmes might lead to periods of intermittent food abundance and insecurity. This in turn, could cause food insecure individuals to experience a repeated cycle of food restriction and subsequent overconsumption, which results in binge eating disorder.[185] A recent study using an ecological momentary assessment design found that food insecure individuals were more likely to binge eat right after receiving food assistance, potentially corroborating this hypothesis.[186] These hypothesised mechanisms and associated findings have been especially alarming in the context of increasing food insecurity during COVID-19,[187, 188] although there is limited evidence that the association between food insecurity and eating disorders strengthened during this time.[189]

While this hypothesis is plausible, the current literature has not considered alternative causal pathways between food insecurity and eating disorders. For example, these studies have not attempted to disentangle the effect of food insecurity from that of broader financial hardship, which has an independent association with eating disorders symptoms,[142, 180-183] by only adjusting for broad socioeconomic position indicators.[180] Another alternative causal mechanism that could explain the association between food insecurity and eating disorder

symptoms is starvation. Starvation was found to be associated with greater levels of mental health difficulty,[190] and thus may have an impact on eating disorders on its own, even without intermittent food abundance from food supplement programmes.

This points to the need to investigate this association in different geographical, political, or historical contexts. For example, in the UK, prior to the 2000s, there were no major provisions specifically for food supplements. This means young people who experienced food insecurity from the 90s and 00s in the UK may have experienced its consequences differently from young people in the US. Therefore, observing an association between food insecurity and binge eating behaviours in the absence of major food supplement programmes, could suggest that there might be other causal mechanisms to explain food insecurity other than 'feast and famine' cycles.

There are further methodological limitations in the current literature. Cross-sectional evidence runs the risk of reverse causation, albeit possibly in more severe presentations (e.g., eating disorder symptoms affecting ability to afford food). There is also risk of recall bias, as participants may be recalling past food insecurity. therefore, it is important to use longitudinal designs to minimise this possibility. Most longitudinal studies investigate the association between food insecurity and disordered eating behaviours during adolescence and early adulthood. Since eating disorders have peak onset in mid-adolescence,[7] it is important to look at childhood as a developmental stage important for primary prevention.[144] This is especially the case since children as young as five to six years old have an awareness of food insecurity and also manage food resources within the household alongside their parents[191, 192] but also are protected from food insecurity to a greater extent compared to older children.[193] Third, none of the existing studies control for important confounders such as parental mental health problems, which could affect both their ability to afford food[194] and eating disorder symptoms in the offspring.[105]

3.1.2 Objectives

My main objectives were to investigate:

4) The association between food insecurity at age 7 and disordered eating behaviours, weight and shape concerns, and body dissatisfaction across adolescence (I.e., at age 14, 16, and 18 years)
5) Whether this association is also observed for other indicators of financial insecurity.

6) The association between food insecurity at age 7 and individual disordered eating behaviours across adolescence.

3.2 Methods

3.2.1 Study design

I used a prospective cohort design for all objectives.

3.2.2 Sample

I used data from the Avon Longitudinal Study of Parents and Children (ALSPAC). Information on the ALSPAC cohort is available under '*Sample*' in chapter 2.2.2. For the main analyses, I drew my participants from the total ALSPAC sample of 15,454 mother-child pairs, which included the core sample and the additional sample. The core sample consisted of 14,541 pregnant women recruited between 1991 and 1992. The additional sample consisted of 913 eligible participants, who did not join the study at its start, but were recruited when the study child was approximately 7 years of age as an attempt to bolster the core sample. This sample differed from my previous chapter as For the main analyses, I restricted the sample to participants with data available on food insecurity and four other financial hardship items on clothing, fuel, housing, and other essential goods (hereafter: other financial insecurity indicators), chosen as the exposure at age 7. If the study children were twins, I retained one child at random to avoid potential clustering due to shared genetic and environments. I imputed any missing confounder and outcome data.

In sensitivity analyses, I restricted analyses to participants with complete records on food and other financial insecurity indicators at age 7 and confounders. For each outcome, I further restricted the sample to participants who had complete body dissatisfaction data at 14 years, at least one available measurement of weight and shape concerns at age 14 and 18 years, and at least one available measurement of any and individual disordered eating behaviours at age 14, 16, and 18 years, respectively. Therefore, the sample size differed for each outcome in the sensitivity analysis.

3.2.3 Outcomes

The outcomes for objectives 4 and 5 were a composite binary measure indicating the presence or absence of any restrictive eating, binge eating, or purging behaviours (I.e., disordered eating behaviours), and weight and shape concern, and body dissatisfaction. The outcomes for objective 6 were presence of restrictive eating, binge eating, and purging as

individual outcomes. Further information on how these outcomes were derived can be found under 'Outcomes' in chapter 2.2.3.

3.2.4 Exposures

Food insecurity

Food insecurity was assessed with one item from a self-reported multi-item questionnaire on financial hardship which was completed by mothers at 32 weeks of gestation and when the child was 21, 33, and 85 months old. For the main analyses, I used the food insecurity item from a nine-item financial hardship questionnaire at 85 months (approximately 7 years of age) because there is evidence that children at this age are cognisant of family food insecurity.[192]

Mothers were asked "How difficult at the moment do you find it to afford food?" The responses were scored on a four-point scale ("Very difficult" (3), "quite difficult" (2), "bit difficult" (1), or "not difficult" (0)). I recoded these answers to create three categories of food insecurity: "no food insecurity" (score of 0), "slight food insecurity" (score of 1), and "moderate to severe food insecurity" (score of 2 and above). I collapsed moderate and severe food insecurity because numbers in these categories were small.

Other financial insecurity indicators

Of the remaining eight indicators (I.e., difficulties affording rent, clothing, items for children, heating, education, medical/dental care, childcare and any other expenses for children), I used four indicators assessing difficulties affording rent (hereafter: housing insecurity), clothing (hereafter: clothing insecurity), items for children (hereafter: other essential goods insecurity), and heating (hereafter: fuel insecurity) as other indicators of financial insecurity. I chose these four items to be compared with food insecurity as they are considered essential goods and are not involved in the same putative mechanism implicated in the association between food insecurity and disordered eating behaviours (I.e., the "feast-famine" cycle) but share other potential putative risk factors that may come with deprivation. Using a selection of items would also reduce the potential for Type I error arising from multiple testing.

The response format of the questionnaire was the same as that of the item on food insecurity previously described and was coded as "no insecurity" (insecurity score 0), "mild insecurity" (insecurity score 1), and "moderate to severe insecurity" (insecurity score of 2 and above) combining scores of 2 or above because numbers in these two categories were relatively small.

3.2.5 Confounders

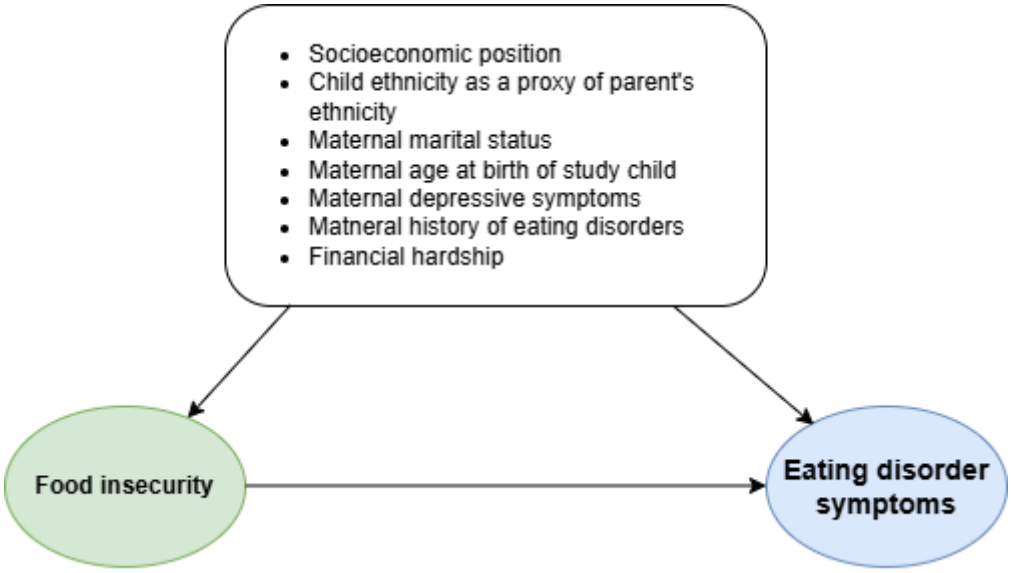

Figure 5: Simplified Direct Acyclic Graph on the association between food insecurity at age 7 and eating disorder symptoms across adolescence. Green circle indicates the exposure, blue circle indicates the outcome, and white box indicates confounders observed in the dataset. Arrows indicate causal paths.

I used Direct Acyclic Graphs based on literature-informed a priori assumptions to select my confounders. Potential confounders included child ethnicity,[21, 136, 195] indicators of family socioeconomic position (average equivalised parental income at 33 months and 44 months, highest parental educational attainment at 32 weeks' gestation, highest parental social class at 32 weeks' gestation, and area-level deprivation at 32 weeks' gestation), [89, 91, 93] maternal age at birth of study child,[196] lifetime history of maternal eating disorders at 12-week gestation, [197, 198] and marital status at 8 weeks of gestation.[145] Description of how these variables were coded is provided in under 'Confounders' in chapter 2.2.5.

I also adjusted analyses for self-reported maternal depressive symptoms when their child was 5 years old. [105, 199, 200] Depressive symptoms were measured using the Edinburgh post-natal depression scale. [201] The scale consisted of ten items (possible answers were a four-point Likert scale of 0 = "not at all" to 3 = "yes, most of the time"). Total score ranged from 0 to 30, with higher scores indicating higher levels of depressive symptoms.

Finally, I adjusted my models for the sum of all financial hardship items except the item being used as an exposure in the model (hereafter: sum of remaining financial hardship items). This was to explore whether overall financial hardship could explain the association between financial insecurity and the outcome, as opposed to there being an independent effect. I omitted difficulties affording childcare and any other expenses for children from the total summed score as there were large amounts of missing data for these two items. I

created a total sum of all items other than food insecurity. The total score ranged from 0-18, with 18 indicating greatest financial hardship. For the analyses using other financial insecurity indicators, I adjusted for total financial hardship score which was created in the same way but excluding items that are being used as the exposure in the analysis and, this time, including the food insecurity item.

3.2.6 Data analysis

I described sample characteristics using frequency and proportions and means and standard deviations to summarise 1) the overall distribution of exposures and confounders and 2) the distribution of confounders by levels of exposure in the analytical sample. I also compared the distribution of exposures and confounders between the total sample and the analytical sample as well as patterns of missing outcome of the analytical sample (I.e., those with at least one outcome variable available compared to those with no outcome variable available among participants with complete exposure) by exposures and confounders using frequencies and proportions.

Prior to conducting my main analysis, I conducted a polychoric correlation analysis to check whether financial insecurity items might be highly collinear. The analysis showed that food insecurity and other financial insecurity indicators are highly correlated with one another (Table 22). I decided to run the model according to the pre-registered protocol, but relegated this to the supplementary materials due to high correlations between financial insecurity measures. To investigate the association between food insecurity and any and individual disordered eating behaviours and weight and shape concerns, I used multilevel logistic and linear regressions, respectively, with random intercepts on study child. There was strong evidence of an association between age of outcome measurement and my outcome in unconditional models (details under '*Unconditional models*' in chapter 2.3.3), for disordered eating behaviours outcomes and weight and shape concerns. Therefore, I fit a mean-centred age and a quadratic term for mean-centred age for any models investigating disordered eating behaviours and age for any models investigating weight and shape concerns. I ran a univariable model with any or individual disordered eating behaviours or weight and shape concerns as the outcome, food insecurity as the exposure, and age variables (Model 1). I progressively adjusted analyses for: parental income, social class, educational attainment, and area-level deprivation (Model 2); child ethnicity (Model 3); maternal age at birth of study child, marital status, maternal depressive symptoms and lifetime history of eating disorders (Model 4), and, lastly, for the sum of remaining financial hardship items (Model 5).

To investigate the association between food insecurity and body dissatisfaction, I used univariable and multivariable linear regression models. I subsequently adjusted for confounders for each exposure as previously described in the models for any and individual disordered eating behaviour and weight and shape concern (Models 2-5).

In order to investigate whether estimates of the food insecurity analyses were capturing the effects of financial insecurity, I compared the estimates of the food insecurity analyses with the models using other financial insecurity measures as the exposure. These analyses mirrored those investigating the association between food insecurity in childhood and any and individual disordered eating behaviours, weight and shape concerns, and body dissatisfaction in adolescence as previously described. In the final model, I adjusted for the sum of remaining financial hardship indicators minus the one under investigation as exposure .

I presented all analyses as both a categorical (no insecurity, mild insecurity, moderate/severe insecurity) and linear exposure (continuous score for 0-2).

Based on missing at random assumptions, I imputed missing data on confounders and outcome variables for participants with complete exposures. I imputed 50 datasets using multiple imputation with chained equations using exposure, outcome, confounder, and auxiliary variables that are associated with missingness. The rationale for missing data strategy and list of auxiliary variables and how they were coded are provided under ‘Data analysis’ in chapter 2.2.6.

Sensitivity analysis

To investigate how missing data patterns may have impacted my analyses, I compared results of regression models based on the sample with imputed data with those of regression models based on the sample with complete exposure data, confounders, and at least one available measurement for each eating disorder outcome across timepoints.

Table 10: Polychoric correlation between mother-reported financial hardship items when study child was age 7

	Food insecurity	Clothing insecurity	Fuel insecurity	Housing insecurity	Other essential goods insecurity
Food insecurity	1.00				
Clothing insecurity	0.87	1.00			
Fuel insecurity	0.88	0.82	1.00		
Housing insecurity	0.80	0.72	0.88	1.00	
Item insecurity	0.85	0.89	0.84	0.77	1.00

3.3 Results

3.3.1 Sample characteristics

Of the 14,541 children recruited in ALSPAC in the initial sample, N=13,770 (94.6%) were alive at one year after having excluded one twin at random from a pair. This initial sample was combined with the additional sample (N=905), resulting in 14,675 children in the total sample. Of these, 7,184 (49.0%) participants with exposure variables available were included in the final analytical sample. (Table 11)

Characteristics of the analytical sample can be found in Table 23. Most respondents in the sample did not experience any food insecurity (87.6%), with 9.4% experiencing mild food insecurity and 2.9% experiencing moderate to severe food insecurity. A higher proportion of adolescents from minoritised ethnic backgrounds experienced mild (13.9%) and moderate to severe (5.3%) food insecurity compared to white adolescents (mild food insecurity: 9.1%; moderate to severe food insecurity: 2.7%). A higher proportion of adolescents whose parents were from lower socioeconomic positions experienced mild to moderate or severe food insecurity compared to their highest socioeconomic counterparts. A higher proportion of adolescents with mothers who had a history of eating disorders, experienced depressive symptoms, were younger at birth of study child, and who were not married experienced milder to severe food insecurity compared to adolescents compared to their counterparts.

Table 11: Characteristics of the analytical sample overall and by exposure level. Sample based on respondents with complete data on financial hardship items (N=7,184)

Participants' characteristics	Analytical sample[a]	Food insecurity when the study child is seven years old		
		No food insecurity	Mild food insecurity	Moderate to severe food insecurity
	N(%)	n (%)	n (%)	n (%)
Overall	7,184 (100)	6,295 (87.6)	678 (9.4)	211 (2.9)
Child's Sex				
Female	3,733 (52.0)	2,355 (87.2)	363 (9.7)	115 (3.1)
Male	3,442 (48.0)	3,033 (88.1)	313 (9.1)	96 (2.8)
Child's ethnicity				
Minoritised ethnicity	244 (3.5)	197 (80.7)	34 (13.9)	13 (5.3)
White	6,671 (96.4)	5,884 (88.2)	610 (9.1)	177 (2.7)
Financial hardship score when study child is age 7[b]				
Greater financial hardship	1,407 (19.6)	1,189 (84.5)	158 (11.2)	60 (4.3)
Lower financial hardship	5,777 (80.4)	5,106 (88.4)	520 (9.0)	151 (2.6)
Equivalised parental income when study child is three to four years old				
Highest 20%	1,546 (23.3)	1,482 (95.9)	51 (3.3)	13 (0.8)
2	1,497 (22.5)	1,379 (92.1)	96 (6.4)	22 (1.5)
3	1,399 (21.0)	1,227 (87.7)	134 (9.6)	38 (2.7)
4	1,259 (18.9)	1,046 (83.1)	162 (12.9)	51 (4.1)
Lowest 20%	948 (14.3)	681 (71.8)	189 (19.9)	78 (8.2)
Highest parental educational attainment at 32 weeks gestation[c]				
University degree	1,848 (27.0)	1,731 (93.7)	90 (4.9)	27 (1.5)
A-level	2,484 (36.4)	2,181 (87.8)	240 (9.7)	63 (2.5)
Compulsory	2,498 (36.6)	2,095 (83.9)	303 (12.1)	100 (4.0)
Highest parental social class at 32 weeks gestation[c]				
Professional	1,088 (16.2)	1,033 (94.9)	55 (5.0)[f]	
Managerial	3,013 (44.7)	2,696 (89.5)	244 (8.1)	73 (2.4)
Skilled non-manual	1,694 (25.2)	1,436 (84.8)	195 (11.5)	63 (3.7)
Skilled manual	689 (10.2)	552 (80.1)	103 (15.0)	34 (4.9)
Semi-skilled/unskilled manual	251 (3.7)	208 (82.9)	373 (17.1)[f]	
Area-level deprivation at 32 weeks gestation[d]				
Higher deprivation	2,250 (31.4)	1,919 (85.3)	239 (10.6)	92 (4.1)
Lower deprivation	4,934 (68.6)	4,376 (88.7)	439 (8.9)	119 (2.4)
Maternal lifetime of eating disorders at 12 weeks of pregnancy				
Absent	6,769 (96.5)	5,941 (87.8)	633 (9.4)	195 (2.9)
Present	242 (3.5)	207 (85.5)	26 (10.7)	9 (3.7)

For descriptive table purposes I defined: [a]Column percentages [b]Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [c]High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the

UK in 1990. Details on two-parental households with one parent's data missing: [d]9.7% of for social class. 3.0% for education Details on maternal characteristics: [e]Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13. Collapsed cells: [f]The frequencies and proportion of these columns have been collapsed due to small cell counts and to prevent respondents from being identifiable.

Table 11 continued

Participants' characteristics	Analytical sample[a]	Food insecurity when the study child is seven years old		
		No food insecurity	Mild food insecurity	Moderate to severe food insecurity
	N(%)	n (%)	n (%)	n (%)
Maternal depressive symptoms when study child is five years old[e]				
Absent	5,999 (90.9)	5,343 (89.1)	518 (8.6)	138 (2.3)
Present	559 (9.1)	422 (75.5)	88 (15.7)	49 (8.8)
Maternal age at birth of study child in years				
15-19	118 (1.6)	96 (81.4)	22 (18.7)[f]	
20-25	1,381 (31.3)	1,173 (84.9)	151 (10.9)	57 (4.1)
26-35	5,104 (71.1)	4,494 (88.1)	475 (9.3)	135 (2.6)
36-44	579 (8.1)	530 (91.5)	34 (5.9)	15 (2.6)
Maternal marital status at 8 weeks of gestation				
Married	5,880 (83.3)	5,212 (88.6)	520 (8.8)	148 (2.5)
Not married	1,183 (16.7)	983 (83.1)	143 (12.1)	57 (4.8)

For descriptive table purposes I defined: [a] Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on two-parental households with one parent's data missing: [c] 9.7% of for social class. [c] 3.0% for education Details on maternal characteristics: [d] Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13. Collapsed cells: [f] The frequencies and proportion of these columns have been collapsed due to small cell counts and to prevent respondents from being identifiable.

3.3.2 Missing data

Of the participants with complete exposure data (n=7,184), 2,108 (29.3%), 2,455 (34.2%) and 6,192 (86.2%) did not have data on disordered eating behaviours, weight and shape concerns and body dissatisfaction, respectively (Table 12-13).

A higher proportion of those who experienced mild and moderate to severe food insecurity had no available outcome measurements compared to those who did not experience food insecurity. The proportion of missing outcome data was higher in those from lower compared to higher socioeconomic position backgrounds. A higher proportion of adolescent whose mothers who had higher depressive symptoms, were younger at birth of study child, and were unmarried had no available measurements for every eating disorder outcome.

A similar proportion of children from minoritised and white ethnicity had missing measurements for disordered eating behaviours and weight and shape concerns, but a higher proportion of adolescents from minoritised ethnic backgrounds had missing body dissatisfaction data (Table 13). The proportion of participants with missing outcome data did not differ by maternal history of lifetime eating disorder

Table 12: Participant characteristics in full cohort vs. analytical sample

Participant characteristic	Total sample (N=15,454)	Analytical sample (N=7,184)
	N(%)	N(%)
Food insecurity when the study child is 7 years old		
No food insecurity	6,993 (86.2)	6,295 (87.6)
Mild food insecurity	833 (10.3)	678 (9.4)
Moderate to severe food insecurity	287 (3.5)	211 (2.9)
Child sex		
Female	7,468 (51.0)	3,733 (52.0)
Male	7,181 (49.0)	3,442 (48.0)
Child's ethnicity		
Minoritised ethnicity	599 (3.0)	244 (3.5)
White	11,302 (95.0)	6,671 (96.5)
Equivalised parental income when study child is three to four years old		
Highest 20%	1,989 (20.3)	1,546 (23.3)
2	1,954 (20.0)	1,497 (22.5)
3	1,945 (19.9)	1,399 (21.0)
4	1,942 (19.8)	1,259 (18.9)
Lowest 20%	1,960 (20.0)	948 (14.3)
Highest parental educational attainment at 32 weeks gestation[b]		
University degree	2,604 (22.5)	1,848 (27.1)
A-level	2,891 (33.6)	2,484 (36.4)
Compulsory	5,090 (43.9)	2,498 (36.6)
Highest parental social class at 32 weeks gestation[b]		
Professional	1,509 (13.3)	1,088 (16.2)
Managerial	4,733 (31.8)	3,013 (44.7)
Skilled non-manual	2,893 (25.5)	1,694 (25.2)
Skilled manual	1,526 (13.5)	689 (10.2)
Semi-skilled/unskilled manual	671 (5.9)	251 (3.7)
Maternal marital status at 8 weeks gestation		
Married	9,661 (74.9)	5,880 (83.2)
Not married	3,236 (25.1)	1,183 (16.8)
Maternal lifetime of eating disorders at 12 weeks of pregnancy		
Absent	11,821 (96.3)	6,769 (96.6)
Present	454 (3.7)	242 (3.4)
	M (SD)	M (SD)
Area-level deprivation at 32 weeks gestation	-0.9 (3.03)	-1.4 (2.7)
Sum of remaining financial insecurity items at 7 years old	2.0 (3.1)	2.0 (3.1)
Maternal age at birth of study child in years	27.9 (5.0)	29.0 (4.5)
Maternal depressive symptoms when study child is five years old	6.0 (5.0)	5.8 (4.8)

For descriptive table purposes I defined: [a] Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on two-parental households with one parent's data missing: [c] 9.7% of for social class. [c] 3.0% for education Details on maternal characteristics: [d] Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13.

Table 13: Characteristics of respondents with at least one available or no available eating disorder outcome across timepoints based on sample with complete exposure (N=7,184)

Outcome	Disordered eating behaviours		Weight and shape concerns		Body dissatisfaction	
	No available measurements	At least one available measurement	No available measurements	At least one available measurement	No available measurements	Complete measurement
Participant characteristics	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Overall	2,108 (29.3)	5,076 (70.7)	2,455 (34.2)	4,729 (65.8)	6,192 (86.2)	992 (13.8)
Food insecurity when the study child is seven years old						
No food insecurity	1,800 (28.6)	4,495 (71.4)	2,100 (33.4)	4,195 (66.6)	5,412 (86.0)	883 (14.0)
Mild food insecurity	233 (34.4)	445 (65.6)	272 (40.1)	406 (59.9)	592 (87.3)	86 (12.7)
Moderate to severe food insecurity	75 (35.6)	136 (64.5)	83 (39.3)	128 (60.7)	188 (89.1)	23 (10.9)
Child ethnicity						
Minoritised ethnicity	1,919 (28.8)	4,752 (71.2)	2,230 (33.4)	4,441 (66.6)	221 (90.6)	947 (14.2)
White	71 (29.1)	173 (70.9)	86 (35.3)	158 (64.8)	5,624 (85.8)	23 (9.43)
Financial hardship score when study child is age 7[a]						
Higher financial hardship	522 (37.1)	885 (62.9)	585 (41.6)	822 (58.4)	1,233 (87.6)	174 (12.4)
Lower financial hardship	1,585 (27.5)	4,191 (72.6)	1,870 (32.4)	3,907 (67.6)	4,959 (85.8)	818 (14.2)
Equivalised parental income when study child is three to four years old						
Highest 20%	339 (21.9)	1,207 (78.1)	411 (26.6)	1,135 (73.4)	1,299 (84.0)	247 (16.0)
2	371 (24.8)	1,126 (75.2)	438 (29.3)	1,059 (70.7)	1,263 (84.4)	234 915.6)
3	409 (29.2)	990 (70.8)	480(34.3)	919 (65.7)	1,196 (85.5)	203 (14.5)
4	206 (23.3)	873 (67.8)	464 (36.9)	795 (63.2)	1,120 (89.0)	129 (11.0)
Lowest 20%	355 (27.5)	593 (62.6)	404 (42.6)	544 (57.4)	835 (88.1)	113 (11.9)
Highest parental educational attainment at 32 weeks gestation						
University degree	324 (17.5)	1,524 (82.5)	415 (22.5)	1,433 (77.5)	1,545 (83.6)	303 (16.4)
A-level	701 (28.2)	1,783 (71.8)	800 (32.2)	1,684 (67.8)	2,125 (85.6)	359 (14.5)
O-level/GCSE	927 (37.1)	1,571 (62.9)	1,056 (42.3)	1,442 (57.7)	2,206 (88.3)	293 (11.7)

For descriptive table purposes I defined: [a] Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on two-parental households with one parent's data missing: [c]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d] Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13. Collapsed cells: The frequencies and proportion of these columns have been collapsed due to small cell counts and issues around identifiability.

Table 13 continued

Outcome	Disordered eating behaviours		Weight and shape concerns		Body dissatisfaction	
Participant characteristics	No available measurements	At least one available measurement	No available measurements	At least one available measurement	No available measurements	Complete measurement
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Highest parental social class at 32 weeks gestation						
Professional	208 (19.1)	880 (80.9)	254 (23.4)	834 (76.7)	905 (83.2)	183 (16.8)
Managerial	775 (25.7)	2,238 (74.3)	928 (30.8)	2,085 (69.2)	2,566 (85.2)	447 (14.8)
Skilled non-manual	548 (32.3?)	1,146 (67.7)	620 (36.6)	1,074 (63.4)	1,483 (87.5)	211 (12.5)
Skilled manual	285 (41.4)	404 (58.6)	311 (45.1)	378 (54.9)	602 (87.4)	87 (12.6)
Semi-skilled/unskilled manual	111 (44.2)	140 (55.8)	122 (48.6)	129 (51.4)	227 (90.4)	24 (9.56)
Area-level deprivation at 32 weeks gestation						
Higher deprivation	803 (35.7)	1,447 (64.3)	907 (40.3)	1,343 (59.7)	1,966 (87.4)	284 (12.6)
Lower deprivation	1,305 (26.5)	3,629 (73.5?)	1,548 (31.4)	3,386 (68.6)	4,226 (85.7)	708 (14.4)
Maternal lifetime eating disorders at 12 weeks of pregnancy						
Has not experienced eating disorders	1,943 (28.7)	4,826 (71.3)	2,264 (33.5)	4,505 (66.6)	5,819 (86.0)	950 (14.0)
Has experienced eating disorders	73 (30.2)	169 (69.8)	88 (36.4)	154 (63.6)	213 (88.0)	29 (12.0)
Maternal depressive symptoms when study child is five years old						
No depression	1,636 (27.3)	4,363 (72.7)	1,920 (32.0)	4,079 (68.0)	5,141 (85.7)	858 (14.3)
Experiences depression	174 (31.1)	385 (68.9)	206 (36.9)	353 (63.1?)	491 (87.8)	68 (12.2)

For descriptive table purposes I defined: [a] Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on two-parental households with one parent's data missing: [c]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d] Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13.

Table 13 continued

Outcome	Disordered eating behaviours		Weight and shape concerns		Body dissatisfaction	
Participant characteristics	No available measurements	At least one available measurement	No available measurements	At least one available measurement	No available measurements	Complete measurement
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Maternal age at birth of study child in years						
15-19	66 (55.9)	52 (44.0)	72 (61.0)	46 (39.0)	111 (94.1)	7 (5.93)
20-25	492 (35.6)	889 (64.4)	564 (40.8)	817 (50.2)	1,222 (88.5)	159 (11.5)
26-35	1,422 (27.9)	3,682 (72,1)	1,659 (32.5)	3,445 (67.5)	4,358 (85.4)	746 (14.6)
36-44	127 (21.9)	452 (78.1)	159 (27.5)	420 (72.5)	499 (86.2)	80 (13.8)
Maternal marital status at 8 weeks gestation						
Married	1,633 (27.8)	4,247 (72.2)	1,909 (32.5)	3,971 (67.5)	5,038 (85.7)	842 (14.3)
Not married	418 (35.3)	765 (64.7)	460 (40.6)	703 (59.4)	1,046 (88.4)	137 (11.6)

For descriptive table purposes I defined: [a] Lower financial hardship is defined as scores lower than and higher financial hardship is defined as higher-or equal to average financial hardship at age 7 (2.03). [b] High area-level deprivation, as having a standardised Townsend score equal or lower than 0.36 which was the average deprivation score in the UK in 1990. Details on two-parental households with one parent's data missing: [c] 9.7% of for social class. [c] 3.0% for education Details on maternal characteristics: [d] Total Edinburgh Postnatal Depression Scale score. Mothers with depressive symptoms EPDS≥13.

3.3.3 Objective 4: The association between food and other financial insecurity indicators at age 7 and eating disorder symptoms across adolescence

In the unadjusted model, a one-unit increase in food insecurity scores at age 7 was associated with 1.47 higher odds (95% Confidence Intervals [CI] 1.21 to 1.77, p<.001) of experiencing disordered eating behaviours, a 0.18-point increase in weight and shape concern scores (95% CI 0.09 to 0.27, p<.001), and 1.43-point increase in body dissatisfactions score (95% CI 0.38 to 2.46, p=0.008). (Table 14) These estimates remained similar when adjusting for socioeconomic position and child ethnicity.

Associations between food insecurity and disordered eating behaviours (OR=1.27, 95% CI 1.04 to 1.55, p=0.019), weight and shape concern (Coefficient=0.14, 95% CI 0.05 to 0.23, p=0.003), and body dissatisfaction (Coefficient=1.19, 95% CI 0.09 to 2.30, p=0.034) were slightly attenuated when subsequently adjusting maternal characteristics in the model. When I adjusted the model for the sum of remaining financial insecurity indicators, I no longer observed an association between food insecurity and disordered eating behaviours, weight and shape concerns, and body dissatisfaction. Further details on the findings of these analyses can be found in Table S13.

Table 14: Association between food insecurity at age 7 and eating disorder symptoms at age 14, 16, and 18. Sample based on respondents with complete financial hardship data, imputed confounders, and outcomes (N=7,184)

				Disordered eating behaviour
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	1.51 (1.13 to 2.01), 0.005	1.37 (1.02 to 1.84), 0.035	1.38 (1.03 to 1.85), 0.033	1.28 (0.95 to 1.72), 0.106
Moderate to severe food insecurity	2.06 (1.31 to 3.23), 0.002	1.83 (1.16 to 2.91), 0.010	1.85 (1.17 to 2.92), 0.009	1.60 (1.01 to 2.53), 0.045
Food insecurity Linear exposure	1.47 (1.21 to 1.77), <.001	1.36 (1.12 to 1.66), 0.002	1.37 (1.12 to 1.67), 0.002	1.27 (1.04 to 1.55), 0.019
				Weight and shape concerns[b]
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	0.20 (0.06 to 0.34), 0.005	0.20 (0.58 to 0.34), 0.006	0.20 (0.06 to 0.34), 0.006	0.16 (0.02 to 0.30), 0.025
Moderate to severe food insecurity	0.32 (0.11 to 0.54), 0.003	0.33 (0.11 to 0.54), 0.003	0.32 (0.11 to 0.54), 0.004	0.26 (0.04 to 0.47), 0.020
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Food insecurity Linear exposure	0.18 (0.09 to 0.27), <.001	0.18 (0.09 to 0.27), <.001	0.18 (0.08 to 0.27), <.001	0.14 (0.05 to 0.23), 0.003

Analyses conducted: [a]Multilevel logistic regression model. [b]Multievel linear regression model. [c]Linear regression model.

Table 14 continued

				Body dissatisfaction[c]
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	1.89 (0.43 to 2.25), 0.012	1.80 (0.28 to 3.32), 0.021	1.83 (0.32 to 3.35), 0.018	1.65 (0.08 to 3.21), 0.040
Moderate to severe food insecurity	2.16 (-0.91 to 5.22), 0.165	2.04 (-1.04 to 5.12), 0.191	2.09 (-0.95 to 5.14), 0.175	1.74 (-1.32 to 4.81), 0.261
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Food insecurity Linear exposure	1.43 (0.38 to 2.46), 0.008	1.35 (0.27 to 2.43), 0.015	1.38 (0.31 to 2.44), 0.012	1.19 (0.09 to 2.30), 0.034

Analyses conducted: [a] Multilevel logistic regression model. [b] Multilevel linear regression model. [c] Linear regression model

3.3.4 Objective 5: The association between other financial insecurity indicators at age 7 and eating disorder symptoms across adolescence

The patterns of associations between other financial insecurity indicators and eating disorder symptoms were similar to those of the associations observed between food insecurity and eating disorder symptoms. (Table 15-17)

Participants had higher odds of experiencing disordered eating behaviours with a one-unit increase in clothes (OR =1.30, 95% CI 1.14 to 1.48, p<.0001), fuel (OR =1.51, 95% CI 1.27 to 1.80, p<.0001), housing (OR = 1.51, 95% CI 1.29 to 1.76, p<.0001), and other essential goods insecurity (OR = 1.33, 95% CI 1.15 to 1.54, p<.0001).

A one-unit increase in clothes (Coefficient=0.08, 95% CI 0.03 to 0.13, p=0.003), fuel (Coefficient=0.19, 95% CI 0.11 to 0.26, p<.0001), housing (Coefficient=0.12, 95% CI 0.06 to 0.19, p<.0001), and other essential goods insecurity (Coefficient=0.13, 95% CI 0.07 to 0.19) was associated with higher weight and shape concern scores in the unadjusted models. These associations were similar, albeit slightly attenuated, when adjusting for socioeconomic position, child ethnicity, and maternal characteristics.

Finally, participants had higher body dissatisfaction scores with one-unit increase in clothes (Coefficient=1.40, 95% CI 0.68 to 2.13, p<.001), fuel (Coefficient=1.56, 95% CI 0.48 to 2.63, p=0.005), housing (Coefficient=1.06, 95% CI 0.04 to 2.08, p=0.042), and other essential goods insecurity (Coefficient=1.21, 95% CI 0.43 to 2.00, p=0.003), and most estimates remained similar when adjusting for socioeconomic position, child ethnicity, and maternal characteristics. However, the association between housing insecurity and body dissatisfaction completely attenuated when adjusting for maternal characteristics (Coefficient=0.90, 95% CI -0.20 to 2.01, p=0.108).

Adjusting the model for the sum of remaining hardship indicators yielded similar patterns of association as my analyses on food insecurity and eating disorder symptoms (Table S13).

Table 15: Multilevel logistic regression models for disordered eating behaviours at age 14, 16, and 18 and its association to other financial insecurity indicators at age 7. Sample based on respondents with complete financial hardship data, imputed confounders, and disordered eating behaviour outcomes (N=7,184)

			Disordered eating behaviours	
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p
Clothing insecurity Categorical exposure				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.34 (1.10 to 1.63), 0.004	1.24 (1.01 to 1.53), 0.042	1.24 (1.01 to 1.53), 0.042	1.17 (0.95 to 1.44), 0.150
Moderate to severe clothing insecurity	1.65 (1.25 to 2.19), 0.001	1.48 (1.09 to 1.99), 0.011	1.48 (1.10 to 2.00), 0.011	1.30 (0.96 to 1.77), 0.092
Clothing insecurity Linear exposure	1.30 (1.14 to 1.48), <.001	1.22 (1.06 to 1.41), 0.005	1.22 (1.06 to 1.41), 0.005	1.15 (0.99 to 1.32), 0.058
Fuel insecurity Categorical exposures				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.60 (1.21 to 2.11), 0.001	1.46 (1.10 to 1.94), 0.009	1.47 (1.11 to 1.95), 0.008	1.36 (1.02 to 1.81), 0.036
Moderate to severe fuel insecurity	2.15 (1.41 to 3.29), <.001	1.94 (1.26 to 3.00), 0.003	1.97 (1.27 to 3.04), 0.002	1.73 (1.11 to 2.68), 0.015
Fuel insecurity Linear exposure	1.51 (1.27 to 1.80), <.001	1.42 (1.18 to 1.70), <.001	1.43 (1.19 to 1.71), <.001	1.33 (1.11 to 1.60), <.003
Housing insecurity Categorical exposures				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	1.48 (1.16 to 1.89), 0.002	1.38 (1.08 to 1.77), 0.010	1.38 (1.08 to 1.77), 0.010	1.30 (1.01 to 1.67), 0.038
Moderate to severe housing insecurity	2.31 (1.61 to 3.33), <.001	2.12 (1.46 to 3.09), <.001	2.14 (1.47 to 3.12), <.001	1.91 (1.30 to 2.81), 0.001
Housing insecurity Linear exposure	1.51 (1.29 to 1.76), <.001	1.43 (1.22 to 1.68), <.001	1.44 (1.23 to 1.69), <.001	1.36 (1.15 to 1.60), <.001

Table 15 continued

	Disordered eating behaviours			
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.26 (1.01 to 1.56), 0.041	1.16 (0.93 to 1.45), 0.199	1.16 (0.93 to 1.45), 0.197	1.09 (0.87 to 1.37), 0.464
Moderate to severe other essential goods insecurity	1.87 (1.36 to 2.58), <.001	1.67 (1.19 to 2.35), 0.004	1.68 (1.19 to 2.37), 0.003	1.47 (1.04 to 2.08), 0.031
Other essential goods insecurity Linear exposure	1.33 (1.15 to 1.54), <.001	1.24 (1.06 to 1.45), 0.007	1.25 (1.06 to 1.46), 0.006	1.17 (0.99 to 1.37), 0.062

Table 16: Multilevel linear regression models for weight and shape concerns at age 14 and 18 and its association to other financial insecurity indicators at age 7. Sample based on respondents with complete financial hardship data and imputed confounders and weight and shape concern outcome (N = 7,184)

				Weight and shape concern
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Clothing insecurity Categorical exposure				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	0.08 (-0.003 to 0.160, 0.062	0.08 (-0.01 to 0.16), 0.088	0.08 (-0.01 to 0.16), 0.087	0.05 (-0.03 to 0.14), 0.222
Moderate to severe clothing insecurity	0.16 (0.04 to 0.27), 0.008	0.16 (0.04 to 0.283), 0.010	0.16 (0.04 to 0.28), 0.010	0.11 (-0.02 to 0.23), 0.101
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Clothing insecurity Linear exposure	0.08 (0.03 to 0.13), 0.003	0.08 (0.02 to 0.14), 0.006	0.08 (0.02 to 0.14), 0.006	0.05 (-0.004 to 0.11), 0.071
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Fuel insecurity Categorical exposure				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	0.20 (0.08 to 0.34), 0.001	0.21 (0.08 to 0.03), 0.001	0.20 (0.08 to 0.33), 0.001	0.17 (0.04 to 0.29), 0.009
Moderate to severe fuel insecurity	0.36 (0.16 to 0.56), <.001	0.37 (0.17 to 0.57), <.001	0.37 (0.17 to 0.57), <.001	0.32 (0.11 to 0.52), 0.002
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Fuel insecurity Linear exposure	0.19 (0.11 to 0.26), <.001	0.19 (0.11 to 0.28), <.001	0.19 (0.11 to 0.277), <.001	0.16 (0.08 to 0.24), <.001

Table 16 continued

	Weight and shape concern			
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Housing insecurity Categorical exposure				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	0.09 (-0.04 to 0.21), 0.158	0.09 (-0.04 to 0.21), 0.168	0.09 (-0.04 to 0.21), 0.172	0.06 (-0.07 to 0.19), 0.351
Moderate to severe housing insecurity	0.29 (0.12 to 0.45), 0.001	0.29 (0.13 to 0.46), 0.001	0.29 (0.12 to 0.45), 0.001	0.24 (0.07 to 0.40), 0.005
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Housing insecurity Linear exposure	0.12 (0.06 to 0.19), <.001	0.013 (0.06 to 0.19), <.001	0.12 (0.06 to 0.19), <.001	0.10 (0.03 to 0.16), 0.004
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	0.14 (0.05 to 0.23), 0.002	0.14 (0.05 to 0.24), 0.002	0.14 (0.05 to 0.24), 0.002	0.12 (0.02 to 0.21), 0.014
Moderate to severe other essential goods insecurity	0.24 (0.11 to 0.38), 0.001	0.26 (0.12 to 0.41), <0.001	0.26 (0.11 to 0.40), 0.001	0.20 (0.05 to 0.35), 0.010
Other essential goods insecurity Linear exposure	0.13 (0.07 to 0.19), <.001	0.14 (0.07 to 0.20), <.001	0.13 (0.07 to 1.20), <.001	0.11 (0.04 to 0.17), 0.001

Table 17: Linear regression models for the association between other financial insecurity indicators at age 7 and body dissatisfaction at age 14. Sample based on respondents with complete financial hardship data and imputed confounders and body dissatisfaction outcomes (N=7,184)

				Body dissatisfaction
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Clothing insecurity Categorical exposure				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.59 (0.51 to 2.68), 0.004	1.63 (0.52 to 2.74), 0.005	1.62 (0.51 to 2.74), 0.005	1.54 (0.42 to 2.66), 0.008
Moderate to severe clothing insecurity	2.66 (1.02 to 4.39), 0.002	2.75 (0.95 to 4.55), 0.003	2.78 (0.99 to 4.57), 0.003	2.56 (0.73 to 4.39), 0.007
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Clothing insecurity Linear exposure	1.40 (0.68 to 2.13), <.001	1.45 (0.64 to 2.25), <.001	1.45 (0.65 to 2.26), 0.001	1.35 (0.53 to 2.17), 0.002
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Fuel insecurity Categorical exposure				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.80 (0.10 to 3.50), 0.038	1.76 (-0.03 to 3.55), 0.054	1.80 (0.01 to 3.58), 0.049	1.61 (-0.23 to 3.46), 0.085
Moderate to severe fuel insecurity	2.83 (0.75 to 5.59), 0.044	2.81 (-0.05 to 5.68), 0.054	2.92 (0.11 too 5.73), 0.042	2.64 (-0.19 to 5.47), 0.067
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Fuel insecurity Linear exposure	1.56 (0.48 to 2.63), .005	1.54 (0.37 to 2.71), 0.011	1.58 (0.44 to 2.73), 0.007	1.43 (0.24 to 2.61), 0.019

Table 17 continued

				Body dissatisfaction
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Housing insecurity Categorical exposure				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	0.56 (-0.83 to 1.95), 0.422	0.50 (-0.91 to 1.91), 0.482	0.52 (-0.89 to 1.93), 0.463	0.38 (-1.08 to 1.84), 0.610
Moderate to severe housing insecurity	2.63 (-0.83 to 1.95), 0.046	2.52 (-0.16 to 5.20), 0.065	2.61 (-0.04 to 5.27), 0.054	2.34 (-0.35 to 5.02), 0.087
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Housing insecurity Linear exposure	1.06 (0.04 to 2.08), 0.042	1.01 (-0.74 to 2.09), 0.067	1.04 (-0.03 to 2.11), 0.056	0.90 (-0.20 to 2.01), 0.108
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.09 (-0.04 to 2.22), 0.059	1.07 (-0.11 to 2.24), 0.075	1.07 (-0.10 to 2.25), 0.073	0.94 (-0.22 to 2.11), 0.111
Moderate to severe other essential goods insecurity	2.58 (0.62 to 4.54), 0.010	2.65 (0.53 to 4.78), 0.015	2.72 (0.63 to 4.81), 0.011	2.43 (0.30 to 4.57), 0.026
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Other essential goods insecurity Linear exposure	1.21 (0.43 to 2.00), 0.003	1.23 (0.35 to 2.11), 0.007	1.25 (0.38 to 2.12), 0.005	1.11 (0.23 to 1.99), 0.014

3.3.5 Objective 6: Food insecurity and its association with individual disordered eating behaviours across adolescence

In the unadjusted models, a one-unit of increase in food insecurity at age 7 was associated with 1.51 higher odds (95% CI 1.12 to 2.04, p=0.007) of experiencing binge eating in adolescence and 1.29 higher odds (95% C 1.06 to 1.58, p=0.013) of experiencing restrictive eating (Table 18). The estimates for the association between food insecurity and binge eating remained similar when adjusting for socioeconomic position and ethnicity but attenuated when adjusting for maternal characteristics (OR=1.32, 95% CI 0.98 to 1.79, p=0.071). On the other hand, the association between food insecurity and restrictive eating slightly attenuated when adjusting for socioeconomic position and child ethnicity and completely attenuated when adjusting for maternal characteristics (OR=1.15, 95% CI 0.93 to 1.42, p=0.182). There were no associations detected for food insecurity and purging behaviours in both unadjusted (OR=1.43, 95% CI 0.93 to 2.22, p=0.106) and the adjusted models. These patterns of association for individual disordered eating behaviours were similar to those observed in analyses using other financial insecurity measures as the exposure. (Table 19)

Findings from the models adjusting for the sum of remaining financial insecurity indicators can be found in Table S14.

Table 18: Multilevel logistic regression models for binge eating, restrictive eating, and purging at age 14, 16, and 18 and its association to food insecurity at age 7. Sample based on respondents with complete financial hardship data, confounders, and at least one available measurement of any disordered eating behaviour across timepoints (N=7,184)

				Binge eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	1.58 (1.03 to 2.43), 0.036	1.48 (0.96 to 2.28), 0.076	1.49 (0.96 to 2.29), 0.072	1.37 (0.89 to 2.09), 0.151
Moderate to severe food insecurity	2.14 (1.03 to 4.44), 0.040	1.95 (0.93 to 4.10), 0.078	1.96 (0.93 to 4.13), 0.075	1.67 (0.80 to 3.49), 0.173
Food insecurity Linear exposure	1.51 (1.12 to 2.04), 0.007	1.43 (1.05 to 1.95), 0.023	1.43 (1.06 to 1.96), 0.022	1.32 (0.98 to 1.79), 0.071
				Purging
	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	1.70 (0.86 to 3.37), 0.127	1.21 (0.91 to 1.62), 0.185	1.53 (0.77 to 3.08), 0.225	1.48 (0.73 to 3.01), 0.278
Moderate to severe food insecurity	1.56 (0.50 to 4.85), 0.436	1.48 (0.88 to 2.51), 0.142	1.39 (0.44 to 4.40), 0.570	1.32 (0.41 to 4.20), 0.638
Food insecurity Linear exposure	1.43 (0.93 to 2.22), 0.106	1.33 (0.84 to 2.09), 0.222	1.33 (0.84 to 2.09), 0.221	1.28 (0.80 to 2.05), 0.292

Table 18 continued

				Restrictive eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure				
No food insecurity	Reference	Reference	Reference	Reference
Mild food insecurity	1.32 (0.99 to 1.74), 0.051	1.54 (0.77 to 3.08), 0.225	1.22 (0.91 to 1.62), 0.178	1.15 (0.86 to 1.53), 0.347
Moderate to severe food insecurity	1.62 (0.96 to 2.72), 0.068	1.39 (0.44 to 4.43), 0.570	1.49 (0.88 to 2.53), 0.136	1.33 (0.79 to 2.25), 0.277
Food insecurity Linear exposure	1.29 (1.06 to 1.58), 0.013	1.22 (0.99 to 1.50), 0.068	1.22 (0.99 to 1.51), 0.064	1.15 (0.93 to 1.42), 0.182

Table 19: Multilevel logistic regression models between other financial insecurity indicators at age 7 and binge eating, restrictive eating, and purging at age 14, 16, and 18. Sample based on respondents with complete financial hardship data, imputed confounders, and outcomes (N=7,184)

				Binge eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Clothing insecurity Categorical exposure				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.29 (0.97 to 1.72), 0.085	1.24 (0.92 to 1.67), 0.165	1.24 (0.91 to 1.67), 0.167	1.16 (0.86 to 1.57), 0.330
Moderate to severe clothing insecurity	1.34 (1.10 to 1.63), 0.004	1.67 (1.06 to 2.62), 0.027	1.67 (1.06 to 2.63), 0.027	1.44 (0.92 to 2.26), 0.112
Clothing insecurity Linear exposure	1.34 (1.10 to 1.63), 0.004	1.28 (1.04 to 1.57), 0.019	1.28 (1.04 to 1.57), 0.019	1.19 (0.97 to 1.46), 0.092
Fuel insecurity Categorical exposure				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.30 (0.82 to 2.08), 0.266	1.20 (0.74 to 1.94), 0.459	1.20 (0.75 to 1.95), 0.444	1.08 (0.67 to 1.74), 0.740
Moderate to severe fuel insecurity	2.27 (1.19 to 4.33), 0.013	2.04 (1.07 (3.89), 0.031	2.07 (1.08 to 1.95), 0.029	1.75 (0.92 to 3.35), 0.089
Fuel insecurity Linear exposure	1.44 (1.11 to 1.88), 0.007	1.35 (1.03 to 1.78), 0.029	1.36 (1.04 to1.79), 0.026	1.25 (0.95 to 1.63), 0.110
Housing insecurity Categorical exposure				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	1.30 (0.91 to 1.85), 0.150	1.23 (0.85 to 1.77), 0.267	1.23 (0.86 to 1.78), 0.258	1.14 (0.79 to 1.64), 0.488
Moderate to severe housing insecurity	2.03 (1.16 to 3.54), 0.013	1.84 (1.05 to 3.23), 0.035	1.86 (1.06 to 3.27), 0.032	1.61 (0.92 to 2.85), 0.097
Housing insecurity Linear exposure	1.39 (1.09 to 1.76), 0.008	1.32 (1.03 to 1.69), 0.028	1.33 (1.04 to 1.70), 0.025	1.23 (0.96 to 1.58), 0.099

Table 19 continued

				Binge eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.21 (0.88 to 1.66), 0.245	1.15 (0.83 to 1.59), 0.413	1.14 (0.83 to 1.59), 0.408	1.07 (0.77 to 1.49), 0.689
Moderate to severe other essential goods insecurity	1.94 (1.14 to 3.28), 0.014	1.75 (1.02 to 3.01),0.042	1.77 (1.03 to 3.04), 0.039	1.50 (0.88 to 2.56), 0.135
Item insecurity Linear exposure	1.14 (1.07 to 1.65), 0.010	1.26 (1.01 to 1.58), 0.041	1.27 (1.01 to 1.59), 0.039	1.17 (0.94 to 1.47), 0.162

Table 19 continued

Exposure	1: Univariable analysis OR (95% CI), p	2:1+socioeconomic position OR (95% CI), p	3:2+ethnicity OR (95% CI), p	Restrictive eating 4:3+maternal characteristics OR (95% CI), p
Clothing insecurity Categorical exposures				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.22 (1.00 to 1.49), 0.049	1.14 (0.93 to 1.41), 0.209	1.14 (0.93 to 1.41), 0.210	1.08 (0.87 to 1.34), 0.468
Moderate to severe clothing insecurity	1.33 (1.00 to 1.76), 0.051	1.21 (0.89 to 1.65), 0.217	1.22 (0.89 to 1.66), 0.211	1.10 (0.80 to 1.49), 0.560
Clothing insecurity Linear exposure	1.17 (1.03 to 1.33), 0.015	1.11 (0.97 to 1.28), 0.137	1.11 (0.97 to 1.28), 0.134	1.06 (0.91 to 1.22), 0.452
Fuel insecurity Categorical exposures				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.62 (2.30 to 2.19), 0.002	1.52 (1.11 to 2.09), 0.009	1.53 (1.12 to 2.10), 0.009	1.45 (1.06 to 1.99), 0.022
Moderate to severe fuel insecurity	1.61 (0.98 to 2.67), 0.062	1.52 (0.91 to 2.56), 0.113	1.54 (0.92 to 2.59), 0.101	1.41 (0.84 to 2.37), 0.191
Fuel insecurity Linear exposure	1.39 (1.14 to 1.69), 0.002	1.33 (1.07 to 1.65), 0.009	1.34 (1.08 to 1.66), 0.008	1.28 (1.03 to 1.58), 0.026
Housing insecurity Categorical exposure				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	1.47 (1.10 to 1.96), 0.008	1.41 (1.05 to 1.88), 0.020	1.41 (1.06 to 1.88), 0.020	1.35 (1.01 to 1.81), 0.044
Moderate to severe housing insecurity	1.96 (1.34 to 2.88), 0.001	1.88 (1.26 to 2.79), 0.002	1.90 (1.27 to 2.83), 0.002	1.75 (1.17), 0.007, 0.007
Housing insecurity Linear exposure	1.42 (1.21 to 1.68), <.0001	1.38 (1.16 to 1.64), <.0001	1.39 (1.17 to 1.65), <.0001	1.33 (1.12 to 1.59), 0.002

Table 19 continued

				Restrictive eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.18 (0.94 to 1.48), 0.155	1.10 (0.86 to 1.40), 0.460	1.10 (0.86 to 1.40), 0.457	1.04 (0.81 to 1.34), 0.735
Moderate to severe other essential goods insecurity	1.46 (1.05 to 2.05), 0.027	1.34 (0.94 to 1.93), 0.108	1.36 (0.94 to 1.94), 0.098	1.22 (0.85 to 1.76), 0.285
Item insecurity Linear exposure	1.20 (1.03 to 1.39), 0.016	1.14 (0.96 to 1.34), 0.128	1.14 (0.97 to 1.34), 0.120	1.08 (0.91 to 1.28), 0.358

Table 19 continued

				Purging
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p
Clothing insecurity Categorical exposure				
No clothing insecurity	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.87 (1.13 to 3.12), 0.016	1.70 (1.01 to 2.89), 0.048	1.70 (1.00 to 2.88), 0.047	1.66 (0.98 to 2.81), 0.060
Moderate to severe clothing insecurity	1.91 (1.00 to 3.65), 0.050	1.73 (0.88 to 3.42), 0.112	1.73 (0.88 to 3.42), 0.113	1.67 (0.83 to 3.35), 0.151
Clothing insecurity Linear exposure	1.49 (1.12 to 1.98), 0.006	1.41 (1.04 to 1.91), 0.031	1.40 (1.03 to 1.91), 0.031	1.37 (1.00 to 1.89), 0.048
Fuel insecurity Categorical exposure				
No fuel insecurity	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.60 (0.85 to 3.01), 0.140	1.44 (0.77 to 2.72), 0.253	1.45 (0.77 to 2.72), 0.252	1.41 (0.75 to 2.66), 0.281
Moderate to severe fuel insecurity	2.66 (1.0 to 6.82), 0.043	2.43 (0.92 to 6.37), 0.072	2.43 (0.92 to 6.42), 0.074	2.30 (0.87 to 6.09), 0.092
Fuel insecurity Linear exposure	1.63 (1.11 to 2.31), 0.014	1.53 (1.02 to2.31), 0.041	1.53 (1.02 to 2.31), 0.042	1.50 (0.99 to 2.26), 0.055
Housing insecurity Categorical exposure				
No housing insecurity	Reference	Reference	Reference	Reference
Mild housing insecurity	1.07 (0.53 to 2.13), 0.852	0.97 (0.48 to 1.96), 0.924	0.97 (0.48 to 1.95), 0.925	0.95 (0.47 to 1.92), 0.876
Moderate to severe housing insecurity	3.01 (1.28 to 7.09), 0.852	2.79 (1.16 to 6.73), 0.023	2.79 (1.15 to 6.80), 0.024	2.67 (1.09 to 6.54), 0.032
Housing insecurity Linear exposure	1.54 (1.03 to 2.31), 0.035	1.46 (0.96 to 2.23), 0.076	1.46 (0.96 to 2.23), 0.078	1.43 (0.93 to 2.19), 0.099

Table 19 continued

				Purging
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Other essential goods insecurity Categorical exposure				
No other essential goods insecurity	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.55 (0.99 to 2.44), 0.055	1.31 (0.89 to 2.24), 0.141	1.41 (0.89 to 2.24), 0.141	1.37 (0.86 to 2.16), 0.183
Moderate to severe other essential goods insecurity	2.07 (0.95 to 4.50), 0.066	1.89 (0.83 to 4.28), 0.128	1.89 (0.83 to 4.28), 0.128	1.80 (0.79 to 4.09), 0.157
Item insecurity Linear exposure	1.48 (1.08 to 2.04), 0.016	1.39 (0.98 to 1.97), 0.062	1.39 (0.98 to 1.97), 0.062	1.26 (0.96 to 1.92), 0.084

3.3.6 Sensitivity analyses: complete case analyses

Results for complete case analyses can be found in Tables S15-S19. Overall, these analyses yielded similar patterns of results as the main analyses, albeit with some small differences. For instance, while there was evidence of a linear association between food insecurity and disordered eating behaviours in the main analyses, there was no evidence of an association between mild food insecurity and disordered eating behaviours in the unadjusted models in complete case ones (OR=1.43, 95% CI 0.84 to 6.11, p=0.223). Likewise, there was also no association between mild clothing (OR=1.15, 95% CI 0.87 to 1.52, p=0.338), fuel (OR=1.40, 95% CI 0.88 to 2.23, p=0.151), housing (OR=1.41, 95% CI 0.095 to 2.10, p=0.089), and other essential goods insecurity (OR=1.16, 95% CI 0.86 to 1.56, p=0.332) and disordered eating behaviours in the unadjusted models of complete case analyses. Further, I found no evidence of an association between food (Coefficient=-0.17, 95% CI -2.36 to 2.02, 0.882), clothing (Coefficient: 1.03, 95% CI -0.20 to 2.27), fuel (Coefficient=0.51, 95% CI -1.59 to 2.61, 0.635), housing (Coefficient=0.16, 95% CI -1.56 to 1.91, 0.856), and other essential goods insecurity (Coefficient=0.74, 95% CI -0.71 to 2.18, p=0.316) and body dissatisfaction in the unadjusted model. I observed an attenuated effect sizes for food insecurity and binge eating (OR=1.46, 95% CI 0.95 to 2.23, p=0.083) in the unadjusted model.

3.4 Discussion

3.4.1 Summary of findings

I found evidence of an association between food insecurity and disordered eating behaviours, weight and shape concerns, and body dissatisfaction when adjusting for child ethnicity, family socioeconomic position, and maternal characteristics and mental health. I found that other financial insecurity indicators were similarly with associated eating disorder symptoms. When investigating individual disordered eating behaviours, I found similar patterns of associations for food insecurity and restrictive eating and binge eating to those seen for the primary outcome. There was no evidence of associations between food insecurity and purging.

3.4.2 Strengths and limitations

To the best of my knowledge, this is the first longitudinal study of the association between childhood food insecurity and eating disorder symptoms in adolescence to have been conducted in a UK sample, highlighting differences in associations that may arise due to different food policy contexts. However, my results are not generalisable to modern day UK adolescents, when considering the historical changes to food bank use and the benefits system. First, food supplement programmes were not as common in the late 90s and early 2000s as they are now in the 2020s. Second, my sample would have received weekly/fortnightly allotments of various benefits (e.g., income support, child support, and job-seeker's allowance) which were paid separately. This was changed to a combined universal credit which was allotted monthly from 2013 onward.[202] The contextual changes means that the observed association may be different with a more recent sample of children and young people.

Chance

While my study has a large sample, I may not have been able to find an association between food insecurity and purging behaviours due to a Type II error. Only 2.9% of families experienced moderate to severe food insecurity and less than 5% of adolescents experienced purging throughout adolescence. The low prevalence of purging, especially when disaggregated by levels of food insecurity, may mean that my analysis was not sufficiently powered to detect an effect. Even though I specified my analysis a priori, I cannot exclude the possibility of Type I error. This could explain the associations found between housing and clothing insecurity with eating disorder symptoms, although, 1) one could argue housing insecurity could indicate extreme forms of deprivation and thus being a risk for eating disorders and 2) the confidence intervals do not overlap with the null value.

Bias

There may be an attrition bias in the ALSPAC dataset as those from lower socioeconomic position are more likely to drop out of the study as it progresses.[76] Lower socioeconomic position, maternal characteristics, and maternal depressive symptoms are associated with food insecurity and also with higher levels of eating disorder symptoms, therefore, it is likely that those who dropped out of the study had differential risks to my sample. Nevertheless, the overall similarities between my imputed model and complete case model reduced concerns surrounding the impact of missing data patterns, albeit the small differences in findings.

Confounding

My findings have appropriately adjusted for parental mental health, unlike previous studies. This means that my effects and estimates should be less affected by confounding biases than its predecessors. However, there is still a chance that residual confounders bias my associations, especially the aforementioned genetic confounders under '*Strengths and limitation*' in Chapter 2.4.2.

The high collinearity between my exposure and general deprivation may have led to associations between food insecurity and eating disorder symptoms being attenuated in the model adjusting for the sum of remaining financial insecurity indicators. Therefore, I cannot conclude with certainty that food insecurity does not have an independent association with eating disorder symptoms in this sample. However, the fact that 1) there is evidence of an association between greater levels of food insecurity and eating disorder symptoms in the absence of major food supplementary programmes and 2) other financial insecurity indicators are also associated with eating disorder symptoms may potentially suggest that the association between food insecurity and eating disorders capturing the effects of general deprivation.

Measurement

There are several limitations with the measurement of food insecurity. First, while the items from the financial hardship scale have been used in multiple empirical studies assessing the association between material deprivation and health outcomes,[91, 111, 203] it has not been designed to measure food insecurity specifically. My exposure may not be picking up important constructs of food insecurity that are available in other scales such as the Household Food Insecurity Access scale[204] or the Food Insecurity Experience Scale[205, 206] which have items on the level of hunger and anxieties around affording a sufficient quantity

or quality of food. This may have ultimately weakened or distorted the observed association between food insecurity and eating disorders in this study.

Further, it could be that my exposure is picking up parent's experiences of food insecurity but not necessarily children's experience of food insecurity. Even if parents are financially struggling, children may be protected to a certain degree from food insecurity.[193] In instances when children are not fully protected from food insecurity, they may relate to it differently than their parents, as children might experience the consequences of food insecurity (e.g., strained familial relationships) and scarcity in resources (e.g., levels of hunger) while parents may also experience these things, their experience centres around the lack of economic resources within the household.[207] Therefore, by not directly measuring child food insecurity, I may not be able to capture specific causal mechanisms like hunger or starvation via my exposure.

3.4.3 Interpretation of findings and comparison with previous literature

My findings replicate those in previous longitudinal literature, despite the absence of major food supplement programmes. Given all other financial insecurity indicators were also associated with greater degree of eating disorder symptoms, my findings suggest that food insecurity might share a common causal pathway with all other measures of financial insecurity in this sample. These risk factors could be anything from strains in family dynamics[208] childhood adversities [209] to chronic stress.[210]

However, I cannot entirely exclude the possibility that feast-famine cycles from major food supplement programmes would impact eating disorders from this study. There may have been an independent association between food insecurity and eating disorder symptoms alongside the effects of deprivation if a similar analyses was done on a sample that relies on food supplement programmes. Nevertheless, food insecurity is still associated with eating disorder symptoms despite the lack of any major food supplement programme in this sample, which still points to the potential effects of deprivation in general.

3.4.4 Implications

My findings call for future researchers to assess the importance of feast-famine cycle relative to other causal mechanisms that commonly occur with food insecurity. Another avenue of research could be investigating the association between food insecurity and eating disorder symptoms in more recent policy contexts. If future studies find an association between food insecurity and eating disorders after the instatement of universal credit unlike my study, it may inform policy makers about optimal allotment periods of various benefits.

Regardless, my study reinforces the idea that struggling to afford material goods overall is important for eating disorder risk. This points to the strong effect of deprivation and the importance of designing policies to reduce deprivation in all of its forms.

4 Longitudinal association between childhood dietary patterns and eating disorders across adolescence

4.1 Background

4.1.1. Rationale

Researchers have hypothesised that the rise in the consumption of highly processed foods might be responsible for the increasing incidence of eating disorders in the last couple of decades.[211-213] There are two proposed mechanisms of this association: processed food might 1) alter an individual's reward signalling[214, 215] and 2) increase individual's risk of weight gain,[216, 217] which are known risk factors for eating disorders.[218-220]

Three cross sectional general population studies and two case-control studies ('case' defined as people with anorexia nervosa and bulimia nervosa) tested the association between dietary patterns and eating disorders. Three of the studies indicated that those with a higher consumption of processed food also reported greater levels of possible eating disorder diagnoses or eating disorders.[221-223] On the other hand, those who consumed more high fibre, nutrient dense foods reported experiencing less eating disorders,[222, 224] although one cross-sectional study found the opposite pattern of association.[225] However, cross sectional and case-control studies cannot rule out reverse causation,[221, 222, 225] as eating disorders may influence food preference (e.g., individuals with binge eating disorders preferring convenience-oriented food items).[226] Further, existing case-control studies relied on clinical samples, which may have introduced selection bias. These studies also assessed past dietary habits at the time of clinical presentation, which could have led to recall bias.[223, 224]

To date, there is only one longitudinal study which found that consuming larger amounts of saturated fat, legumes, cereal, fruits, nuts, vegetables and fish in one's diet was associated with lower incidence of self-reported anorexia nervosa and bulimia nervosa in adults, although this association disappeared once excluding participants who were diagnosed with anorexia or bulimia nervosa up to two years after the baseline.[227] However, this study has a number of methodological limitations. The researchers accounted for diagnoses at baseline but did not consider any previous disordered eating behaviours or cognitive symptoms,[227] which means they cannot rule out reverse causation. The study has not considered how factors such as socioeconomic position may confound this association.[76, 228]

The study focuses on one type of dietary pattern, and it is yet unknown how various dietary patterns are associated with eating disorders. For example, meat-heavy diets (e.g., traditional British diets) may have a plausible causal pathway to eating disorders, as it has

been linked to depression[229] and obesity,[230] which are both considered risk factors for eating disorders.[48, 138] Further, studying one single type of diet may overlook the influence of other dietary habits that could confound the observed association.[231]

The sample of this study fully consists of adults, therefore there is little insight into how childhood dietary patterns may affect eating disorders in adolescence. Dietary patterns are often established in childhood,[74] therefore this time-period could be key for setting up preventative interventions. Further, studies investigating childhood dietary patterns could account for factors such as parental body dissatisfaction, maternal history of eating disorders, and worries surrounding child feeding as well.[197, 232]

4.1.2 Objectives

Therefore, my objectives were to investigate:

7) The longitudinal association between child's varied-staple diet, convenience-oriented diet, and traditional British diet at age 7 and cognitive and behavioural eating disorder symptoms across adolescence.
8) The longitudinal association between child's varied-staple diet, convenience-oriented diet, and traditional British diet at age 7 and specific behavioural eating disorder symptoms (restrictive eating, binge eating, and purging behaviours) across adolescence.

4.2 Methods

4.2.1 Study design

I used a prospective cohort study design for both objectives.

4.2.2. Sample

I used data from the Avon Longitudinal Study of Parents and Children (ALSPAC). A description of the cohort can be found under *'Sample'* in Chapter 3.2.2. In the case of twins, I retained one twin at random to avoid over-estimation of associations due to clustering of various risks from shared genetics and family environment. For the main analyses, the analytical sample comprised of respondents with complete exposures, for whom I imputed missing confounder and outcome data. For my sensitivity analyses, I used three complete case samples with complete exposures and complete confounders, but differing on availability for each outcome (e.g., one available measurement across 14 to 18 years for

disordered eating behaviours and weight and shape concern scores, and complete body dissatisfaction scores).

4.2.3 Outcome

My primary outcomes were behavioural and cognitive eating disorder symptoms. Behavioural eating disorder symptoms were defined as a binary measure of disordered eating behaviours, indicating whether adolescents had experienced any restrictive eating, binge eating, or purging behaviours at least once a month in the previous year at the age of 14, 16, and 18 years. Cognitive eating disorder symptoms were two continuous measures of weight and shape concerns (measured when the adolescents were 14 and 18 years old) and body dissatisfaction (measured when the adolescents were 14 years old).

Secondary outcomes were three binary measures of individual disordered eating behaviours such as restrictive eating (I.e., fasting or dieting without binge eating), purging behaviours (I.e., vomiting or using laxatives), and binge eating (I.e., eating large amounts of food in a short amount of time accompanied by feelings of losing control). Further information on all these outcomes can be found under ‘*Outcomes’* in Chapter 2.2.3.

4.2.4 Exposures

In ALSPAC, child’s dietary patterns were measured at 54 months and 81 months. In this study, I used dietary patterns at 81 months (approximately age 7). I chose this measure and timepoint because there is evidence that higher adherence to convenience-oriented diet at age 7 in ALSPAC is strongly associated with subsequent adiposity compared to younger ages,[233] which would reflect the risk pathways hypothesised the literature. There is also evidence that dietary patterns at this age are associated with changes in reward signalling relevant to food consumption in another sample.[214] However, this risk pathway has not been explored using the measures of dietary pattern in ALSPAC. Both of these are putative factors in linking diet to eating disorder symptoms in adolescence.[219, 234] Further, food fussiness is a risk factor for eating disorders[235] and more common in younger children compared to children age 7.[236] Therefore, I chose dietary patterns at age 7 years as I hypothesized that at this age, my exposure might be less likely to be affected by food fussiness.

Mothers were asked to indicate how often their child consumed a variety of food items at home, I.e., excluding school meals, when their child was 7 years of age, using the Food Frequency Questionnaire.[237] For each food item, responses included (1) never/rarely; (2) once in 2 weeks; (3) one to three times per week; (4) four to seven times per week; (5) more

than once per day. Food items included in the Food Frequency Questionnaire are included in Appendix 2.

I used three continuous standardised scores of dietary patterns derived by Northstone, Emmett, and colleagues. The researchers combined 90 original food/drink items to represent 57 food drink types.[67, 228] Then, the researchers conducted a principal component analysis with varimax rotation on these standardised items of food type. Children who were missing 10 dietary items or more were excluded from the PCA; otherwise, missing items were considered to mean no consumption of these food items.[228] Three distinct dietary patterns emerged at age 7 which the authors labelled as 'processed', 'health conscious', and 'traditional'.[228] The 'processed' food pattern included food with high fat and sugar content and processed and convenience foods. The 'traditional' pattern included food items such as meat, poultry, potatoes, and vegetables. The 'health conscious' pattern included food items such as salads, fruits, vegetables, fish, pasta, and rice. Higher scores indicated higher adherence to the specific dietary pattern.

4.2.5 Patient and Public Involvement Activities

I conducted patient and public involvement activities with five young people with lived experience of eating disorders to 1) identify important factors to consider when investigating the relationship between childhood dietary patterns and eating disorder symptoms and 2) discuss how to competently communicate messages about dietary patterns in the context of eating disorder research. This is because titles such as "processed" and "healthy" diets may reinforce certain food rules in people with eating disorders, but this is rarely considered in eating disorder research and the wider literature.

I reached out to these young people via the McPin foundation. I made sure to recruit those who have experiences of eating disorder symptoms. Respondents did not necessarily need an eating disorder diagnosis to apply for the position. I recruited five young people (ethnically and gender-diverse backgrounds; aged 18-25 years old) to join an hour online session, which was recorded. I referred to the recording to take notes on key points from the session.

After a brief presentation explaining the background, aims, and objectives of the research project, I asked the following questions for the first objective: 1) "What are your initial thoughts [about the project]?", 2) "What influences what people eat", 3) "Do you think the food an individual consumes growing up has an impact on eating disorders in adolescence?"

Young people thought of factors that may explain the relationship between dietary patterns and eating disorders. From the suggested factors, I chose confounders that were 1) available in the ALSPAC dataset and 2) had evidence of an association in the literature.

These are detailed in the following section. Some of the confounders that were suggested but not included due to lack of available variables in ALSPAC were: severe transition from one food group to another and restrictions around “junk food” in childhood.

For the second objective, I conducted an exercise in which young people labelled dietary patterns that were available in the ALSPAC dataset based on the food items that were most associated with the dietary pattern. Following this, I asked “How do we convey this in a competent manner that is aware of people with eating disorders?”

Young people preferred terminology that avoided stigmatising language around dietary patterns. They suggested using “varied-staple diets” as opposed to “health-conscious”, “convenience-oriented diets” as opposed to “processed or junk”, and “traditional British diet” as opposed to “traditional”, given that the latter might assume different meaning depending on the individual’s cultural background. I used these newly devised labels to refer to dietary patterns in this project instead of the original labels for the variable.

4.2.6 Confounders

I chose confounders using DAGs based on a-priori, literature-based assumptions and hypothesised risk mechanisms posed by lived experience experts (Figure 6). Whenever possible, I chose measures that occurred before the exposure to avoid adjusting for factors that could potentially be on the causal pathway between exposure and outcome.

Family socioeconomic position

I used a battery of parental socioeconomic position indicators which included categories of equivalised parental income averaged at 33 months/47 months as well as highest parental educational attainment (compulsory, a-level, university degree) and social class (semi-skilled/unskilled manual, skilled manual, skilled non-manual, managerial, and professional) measured at 32-weeks gestation. I also included a continuous measure of area-level deprivation of the parental residential address measured at 32 weeks of gestation. Details of how these were coded can be found under ‘*Confounders*‘ in chapter 2.2.5.

Maternal mental health and BMI

I adjusted for maternal depressive symptoms when their child was 5 years old,[105, 199, 200] self-report of lifetime history of eating disorders at 12 weeks of gestation,[197, 198] maternal pre-pregnancy BMI at 12 weeks of gestation, and maternal pre-pregnancy body dissatisfaction at 18 weeks of gestation[197, 238]

I used a continuous score of maternal depressive symptoms using the self-reported Edinburgh Postnatal Depression Scale when the study child was age 5. Details of this

measure can be found under '*Confounders*' in chapter 2.2.5. Maternal BMI (kg/ m^2) was derived using mothers' height and pre-pregnancy weight both of which they self-reported at 12 weeks of gestation. I derived a continuous score of maternal pre-pregnancy body dissatisfaction using the mother-reported Image Perception questionnaire[239] administered at 18 weeks of gestation. This questionnaire includes 10 items asking about how often the mothers were dissatisfied with their own bodies. Responses were on a three-point Likert scale ((0) "not at all", (1) "yes occasionally" (2) "yes most of the time") and scores ranged from 0 to 20, with higher scores indicating higher levels of pre-pregnancy body dissatisfaction. Information on how I derived a categorical measure of self-reported maternal history of eating disorders (none, anorexia nervosa, bulimia nervosa, both anorexia nervosa and bulimia nervosa) at 12 weeks of gestation is provided in '*Confounders*' in chapter 2.2.5.

Child characteristics, mental health, and BMI

I also adjusted for child ethnicity,[21, 136, 240] sex assigned at birth, autistic traits at age 7 years,[25, 241] internalising and externalising symptoms at age 4 years,[48, 72, 98, 242] BMI at 7 years old[243, 244] as potential confounders of the association between dietary patterns and eating disorder symptoms.

Child sex was coded as 'male' and 'female' based on study children's assigned sex at birth. Ethnicity was coded as 'minoritised ethnic group' and 'white'. The rationale behind the coding of this variable can be found in '*Confounders*' in chapter 2.2.5.

Child autistic traits at age 7 were measured using the mother-reported Social and Communication Disorders Checklist.[125] Mothers answered 12 items on the child's reciprocal social interactions and communication skills on a three-point scale: "not true" (0), "quite or sometimes true" (1), and "very or often true" (2). Answer scores were added to create a total score ranging from 0 to 24, with higher scores indicating higher levels of autistic social traits. I captured child mental health difficulties (internalising and externalising symptoms) at 4 years old using the mother-reported Strengths and Difficulties Questionnaire (SDQ).[121] The SDQ consists of 20 questions divided into five scales of five items, covering hyperactivity-inattention, emotional symptoms, conduct problems, peer problems, and the pro-social behaviour in the previous 6 months. The responses were on a three-point scale: "not true" (0), "somewhat true" (1), and "certainly true" (2). Scores of internalising (emotional symptoms + peer problem scales) and externalising (conduct problems + hyperactivity scales) symptoms were added together and ranged from 0 to 40 each, with higher scores indicating more severe psychopathological symptoms.

For child BMI at age 7, I used age- and sex- standardised z-scores for BMI based on World Health Organization (WHO) growth charts.[245] There are self-reported height and weight

measurements that could be used to derive BMI at age 5, which would have been more appropriate as a confounder; however, these measurements have a high number of missing values (90.6% of the total sample missing either height or weight or both). Therefore, I used child BMI at 7 years old as a confounder to avoid introducing further biases from missing data patterns in the analyses.

Child meal-time patterns

I also controlled for child feeding difficulties, maternal worries about feeding,[235, 246] and child meal skipping[224, 247, 248] – all measured when the child was 5 years old.

Feeding difficulties were measured with a single item asking mothers whether they felt they had any difficulties feeding their child in the previous year. Possible responses were “yes, great difficulty” (3), “yes, some difficulty” (2), “yes, occasional difficulty” (1), “no, no difficulty” (0). I treated these responses as a continuous variable to maximise statistical power. Maternal worries about child feeding difficulties were measured with five items asking how worried mothers were that their child had: not eaten enough in the past year, refused the right food, overeaten, and had difficulty in getting into an eating routine in the past year. Possible answers were “no/did not happen” (0), “not worried” (1), “a bit worried” (2), and “greatly worried” (3). These items were summed to create a total, composite continuous score ranging from 0 to 15, with higher scores indicating higher degree of worry about feeding difficulties. Based on WHO recommendations to feed children above 23 months three to four main meals a day,[249] I coded children whose parents indicated that they had two or less meals a day as “skipping meals” and those who indicated that they had three or more meals a day as “not skipping meals”.

Remaining dietary pattern scores

I included all other dietary patterns at age 7 to parse the independent effects of each dietary pattern on eating disorders symptoms. However, it is difficult to establish the temporality between individual dietary patterns with the measurement available as they were measured at the same time-point. Therefore, I also conducted a sensitivity analysis adjusting for remaining dietary patterns at age 4 instead of age 7 based on the assumption that dietary patterns at age 4 may be able to emulate the temporality of individual dietary patterns within one time-point of measurement.

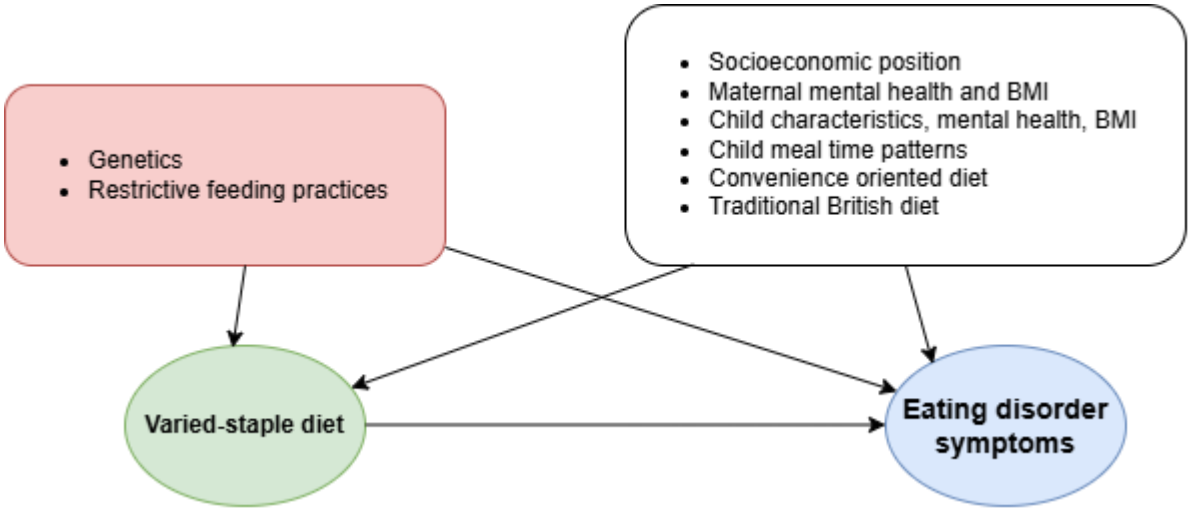

Figure 6: Simplified Direct Acyclic Graph investigating the relationship between dietary patterns, eating disorder symptoms in adolescence, and various confounders. Green circle indicates the exposure, blue circle indicates the outcome, white box indicates confounders observed in the dataset, and red box indicates confounders that are unobserved in the dataset. Arrows indicate causal paths.

4.2.7 Data analysis

I explored sample characteristics by tabulating the thirds of dietary pattern scores (whereby the highest third and lowest third meant children adhered most and least to the specific dietary pattern respectively) by distribution of confounders using means and standard deviations for continuous variables and frequency and proportion for categorical variables. I explored missing data patterns by comparing the distribution of confounders in the whole cohort and in the analytical sample using frequency and proportions.

To investigate the association between each of the three dietary patterns (one unit of increase in dietary pattern scores meaning more likely to adhere to a specific dietary pattern) and any and individual disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18, I used multilevel logistic (disordered eating behaviours outcomes) and linear regression models (weight and shape concerns). There was strong evidence that the outcome became more common throughout adolescence (details under '*Unconditional models*' in chapter 2.3.3) for disordered eating behaviours and weight and shape concerns. Therefore, I fit models with mean-centred age and a quadratic term for mean-centred age for disordered eating behaviours. For weight and shape concerns, I fit the models with the adolescent's mean-centred age for when the outcomes were measured.

For each exposure, I ran a univariable model between exposures and outcome, only including the age variables (Model 1). I subsequently adjusted for child's sex and ethnicity (Model 2); area-level deprivation, parental income, educational attainment, social class, and financial hardship (Model 3); maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and depressive symptoms (Model 4); child autistic traits and mental health difficulties (Model 5); child's age- and sex-standardised BMI (Model 6); child feeding difficulties, parental feeding worries, and child meal skipping (Model 7). Finally, I adjusted for the remaining dietary patterns at age 7 (Model 8a).

To investigate the association between body dissatisfaction and the three dietary patterns, I used a univariable and multivariable linear regression model. I first tested the univariable association between each dietary pattern and body dissatisfaction. (Model 1) Then I adjusted subsequent models for confounders using the same model specifications as described above. (Models 2-8a)

Based on missing at random assumptions, I imputed missing confounder and outcome data using Multiple Imputation with Chained Equations for participants with complete exposures. I imputed 50 datasets using all exposure, outcome, and confounder variables included in the main models as well as a number of auxiliary variables that I hypothesised would be associated with missingness and the outcome. More details on rationale for missing data strategy and auxiliary variables can be found under '*Data analysis'* in chapter 2.2.6.

Sensitivity analysis

To investigate how missing data patterns may have affected my analyses, I replicated my main analysis, restricting the sample to those with complete exposures, confounders, and at least one outcome measurement available for each of the eating disorder outcomes.

To explore previously mentioned assumptions about temporality between dietary pattern variables, I adjusted all analyses for remaining dietary patterns at age 4 instead of dietary patterns at age 7 for model 8 (Model 8b).

4.3 Results

4.3.1 Sample characteristics

Of the total sample (N=14,675), 8,163 (58.4%) children had available data on all three dietary patterns exposures at age 7 years.

Sample characteristics can be found in Table 20.

The majority of children in the analytical sample were white, had parents with a managerial occupation and who only completed compulsory education. Mothers on average reported little to no financial hardship and families lived in areas that were less deprived. The majority of mothers had not experienced an eating disorder, and mothers scored on average below the clinical criterion for depression (EPDS<13). Mother's average BMI were within range of average BMI for adult women according to the WHO core health indicators (BMI 18.4-22.4).[123] Children on average scored below the clinical criteria for autism (SCDC<8).

A higher proportion of female children adhered to traditional British diets (36.1%) than male children (30.6%). A higher proportion of minoritised ethnic children adhered to convenience-oriented diets (44.6%) and varied-staple diets (51.7%) compared to white children (highest third of convenience-oriented food items: 33.0%, highest third of varied-sample food items: 32.7% respectively).

A higher proportion of children from the lowest socioeconomic category for parental income (39.5%), education (43.3%), social class (45.8%) adhered the most to convenience-oriented food items and least to varied-staple food items compared to those in the highest socioeconomic categories.

Compared to children with mothers who did not have a lifetime history of eating disorders, a higher proportion of those with mothers with a lifetime history of eating disorder adhered to varied-staple diets (32.8% vs 45.3%). Proportionally more children who skipped meals, compared to those who did not, adhered to convenience-oriented (41.9% vs 30.3%) and varied-stapled (40.7% vs 31.5%) diets.

Children who adhered the most to convenience-oriented diets had higher standardised BMIs (Mean=0.03, Standard deviation [SD]=1.0) than those who adhered the least to this dietary pattern (Mean=-0.03, SD=0.9). Children who adhered the most to varied-staple diets had the lowest standardised BMI (Mean=-0.03, SD=1.0) compared to those who adhered the least to varied-staple diets (Mean=0.01, SD=1.0) The rest of the variables were similar in frequency and proportion and means and standard deviation across thirds of dietary patterns.

Table 20: Sample characteristics according the thirds of dietary patterns. Sample based on respondents with complete data on dietary pattern items (N=8,163)

Participant characteristics	Analytical sample N(%)	Dietary patterns[a]								
		Convenience-oriented diet			Varied-staple diet			Traditional diet		
		Lowest n (%)	Middle n (%)	Highest n (%)	Lowest n (%)	Middle n (%)	Highest n (%)	Lowest n (%)	Middle n (%)	Highest n (%)
	8,163 (100.0)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)	2,721 (33.3)
Child sex										
Female	4187 (51.4)	1,381 (34.9)	1,321 (33.3)	1,262 (31.8)	1,254 (31.6)	1,365 (34.4)	1,345 (33.9)	1,210 (30.5)	1,324 (33.4)	1,430 (36.1)
Male	3964 (48.6)	1,337 (31.9)	1,399 (33.4)	1,451 (34.7)	1,463 (34.9)	1,354 (32.3)	1,370 (32.7)	1,508 (36.0)	1,396 (33.3)	1,283 (30.6)
Child ethnicity										
Minoritised ethnicity	256 (3.8)	132 (44.6)	81 (27.4)	83 (28.0)	57 (19.3)	86 (29.1)	153 (51.7)	102 (34.5)	86 (29.0)	108 (36.5)
White	7536 (96.2)	2,490 (33.0)	2,529 (33.6)	2,517 (33.4)	2,555 (33.9)	2,513 (33.4)	2,468 (32.7)	2,514 (33.4)	2,518 (33.4)	2,504 (33.2)
Parental income										
Highest 20%	1654 (22.0)	721 (43.6)	548 (33.1)	385 (23.3)	404 (24.4)	584 (35.3)	666 (40.3)	532 (32.1)	599 (36.2)	523 (31.6)
2	1601 (21.3)	599 (37.4)	530 (33.1)	472 (29.5)	494 (30.9)	538 (33.6)	569 (35.5)	491 (30.7)	570 (35.6)	540 (33.7)
3	1537 (20.4)	441 (28.7)	546 (35.5)	550 (35.8)	548 (35.7)	529 (34.4)	460 (29.9)	512 (33.3)	509 (33.1)	516 (33.6)
4	1455 (19.4)	384 (26.4)	511 (35.1)	560 (38.5)	450 (35.4)	415 (32.6)	407 (32.0)	455 (35.8)	396 (31.1)	421 (33.1)
Lowest 20%	1272 (16.9)	376 (29.6)	393 (30.9)	503 (39.5)	450 \ (35.4)	415 (32.6)	407 (32.0)	455 (35.8)	396 (31.1)	421 (33.1)

For descriptive table purposes, I defined: [a]Dietary pattern scores as thirds, wherein the lowest category means participants at the lowest third of adherence to food items in the specific dietary pattern to the dietary pattern and highest category means the participants at the highest third of adherence of food items in the specific dietary pattern. Details on two-parental households with one parent's data missing: [b]9.7% of for occupation. [c]3.0% for

education Details on maternal characteristics: [d]Total Image Perception Questionnaire score. [e]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics: [f]Total Strengths and Difficulties Questionnaire score.[g]Total Social and Communication Disorder Checklist.

Table 20 continued

Participant characteristics	Analytical sample N(%)	Dietary patterns[a]								
		Convenience-oriented diet			Varied-staple diet			Traditional diet		
		Lowest n (%)	Middle n (%)	Highest n (%)	Lowest n (%)	Middle n (%)	Highest n (%)	Lowest n (%)	Middle n (%)	Highest n (%)
Highest parental social class[b]										
Professional	1187 (15.6)	555 (46.7)	377 (31.8)	255 (21.5)	250 (21.1)	382 (32.1)	555 (46.8)	421 (35.5)	401 (33.8)	365 (30.8)
Managerial	3322 (43.7)	1,211 (36.5)	1,136 (34.2)	975 (29.4)	971 (29.2)	1,136 (34.2)	1,215 (36.6)	1,098 (33.1)	1,117 (33.6)	1,107 (33.3)
Skilled non-manual	1919 (25.3)	492 (25.6)	646 (33.7)	781 (40.7)	808 (42.1)	648 (33.8)	463 (24.1)	605 (31.5)	652 (34.0)	662 (34.5)
Skilled manual	824 (10.9)	210 (25.5)	369 (32.7)	345 (41.9)	353 (42.8)	258 (31.3)	213 (25.9)	279 (33.9)	248 (30.1)	297 (36.0)
Semi-skilled/unskilled manual	345 (4.5)	79 (22.9)	108 (31.3)	158 (45.8)	148 (42.9)	108 (31.3)	89 (25.8)	122 (35.4)	121 (35.1)	102 (29.6)
Highest parental educational attainment[c]										
University degree	2006 (26.0)	999 (49.8)	660 (32.9)	347 (17.3)	349 (17.4)	634 (31.6)	1,023 (51.0)	721 (35.9)	680 (33.9)	605 (30.2)
A level	2749 (35.7)	902 (32.8)	922 (33.5)	925 (33.7)	911 (33.1)	957 (34.8)	881 (32.1)	860 (31.3)	914 (33.3)	975 (35.5)
Compulsory education	2954 (38.3)	701 (23.7)	974 (33.0)	1,279 (43.3)	1,277 (43.2)	981 (33.2)	696 (23.6)	982 (33.2)	968 (32.8)	1,004 (34.0)

For descriptive table purposes, I defined: [a]Dietary pattern scores as thirds, wherein the lowest category means participants at the lowest third of adherence to food items in the specific dietary pattern to the dietary pattern and highest category means the participants at the highest third of adherence of food items in the specific dietary pattern. Details on two-parental households with one parent's data missing: [b]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d]Total Image Perception Questionnaire score. [e]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics: [f]Total Strengths and Difficulties Questionnaire score.[g]Total Social and Communication Disorder Checklist.

Table 20 continued

Participant characteristics	Analytical sample N(%)	Dietary patterns[a]								
		Convenience-oriented diet			Varied-staple diet			Traditional diet		
		Lowest n (%)	2 n (%)	Highest n (%)	Lowest n (%)	2 n (%)	Highest n (%)	Lowest n (%)	2 n (%)	Highest n (%)
Maternal history of eating disorders										
Present	298 (3.7)	108 (36.2)	93 (31.2)	97 (32.6)	71 (23.8)	92 (30.8)	135 (45.3)	102 (34.2)	93 (31.2)	103 (34.6)
Absent	7,666 (96.3)	2,569 (33.5)	2,557 (33.4)	2,540 (33.1)	2,593 (33.8)	2,556 (33.3)	2,517 (32.8)	2,555 (33.3)	2,568 (33.5)	2,543 (33.1)
Child feeding difficulties										
Present	587 (7.8)	145 (24.7)	206 (35.1)	236 (40.2)	256 (43.6)	181 (30.8)	150 (25.6)	379 (64.6)	134 (22.8)	74 (12.6)
Absent	6,967 (92.2)	2,403 (34.5)	2,321 (33.3)	2,243 (32.2)	2,276 (32.7)	2,328 (33.4)	2,363 (33.9)	2,161 (31.0)	2,391 (34.3)	2,415 (34.7)
Skipping meals										
Present	1,545 (20.8)	413 (26.7)	485 (31.4)	647 (41.9)	629 (40.7)	497 (32.2)	419 (27.1)	647 (41.9)	486 (31.5)	412 (26.7)
Absent	5,886 (79.2)	2,098 (35.6)	2,002 (34.0)	1,786 (30.3)	1,855 (31.5)	1,978 (33.6)	2,053 (34.9)	1,845 (31.4)	2,001 (34.0)	2,040 (34.7)

For descriptive table purposes, I defined: [a]Dietary pattern scores as thirds, wherein the lowest category means participants at the lowest third of adherence to food items in the specific dietary pattern to the dietary pattern and highest category means the participants at the highest third of adherence of food items in the specific dietary pattern. Details on two-parental households with one parent's data missing: [b]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d]Total Image Perception Questionnaire score. [e]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics: [f]Total Strengths and Difficulties Questionnaire score.[g]Total Social and Communication Disorder Checklist.

Table 20 continued

Participant characteristics	Analytical sample M (SD)	Dietary patterns[a]								
		Convenience-oriented diet			Varied-staple diet			Traditional diet		
		Lowest M (SD)	2 M (SD)	Highest M (SD)	Lowest M (SD)	2 M (SD)	Highest M (SD)	Lowest M (SD)	2 M (SD)	Highest M (SD)
Financial hardship	2.6 (3.3)	2.4 (3.3)	2.6 (3.3)	2.8 (3.4)	2.7 (3.3)	2.5 (3.3)	2.5 (3.5)	2.7 (3.5)	2.4 (3.2)	2.6 (3.3)
Area-level deprivation	-1.3 (2.8)	-1.3 (2.8)	-1.4 (2.7)	-1.1 (2.9)	-1.2 (2.8)	-1.5 (2.7)	-1.1 (2.8)	-1.1 (2.8)	-1.4 (2.8)	-1.4 (2.8)
Maternal pre-pregnancy body dissatisfaction[d]	4.7 (3.1)	4.6 (4.1)	4.7 (4.1)	4.7 (4.2)	4.7 (4.2)	4.6 (4.0)	4.7 (4.2)	4.9 (4.3)	4.6 (4.0)	4.5 (4.1)
Maternal depressive symptoms[e]	5.9 (4.9)	5.8 (4.9)	5.9 (4.8)	6.1 (5.1)	5.8 (4.9)	5.9 (5.0)	6.0 (4.9)	6.1 (5.0)	5.8 (4.8)	5.8 (5.0)
Maternal BMI	22.9 (3.8)	22.58 (3.6)	22.9 (3.7)	23.3 (4.0)	23.2 (3.9)	22.9 (3.8)	22.6 (3.4)	22.9 (3.8)	22.9 (3.7)	22.9 (3.8)

For descriptive table purposes, I defined: [a]Dietary pattern scores as thirds, wherein the lowest category means participants at the lowest third of adherence to food items in the specific dietary pattern to the dietary pattern and highest category means the participants at the highest third of adherence of food items in the specific dietary pattern. Details on two-parental households with one parent's data missing: [b]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d]Total Image Perception Questionnaire score. [e]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics: [f]Total Strengths and Difficulties Questionnaire score.[g]Total Social and Communication Disorder Checklist.

Table 20 continued

Participant characteristics	Analytical sample M (SD)	Dietary patterns[a]								
		Convenience-oriented diet			Varied-staple diet			Traditional diet		
		Lowest M (SD)	2 M (SD)	Highest M (SD)	Lowest M (SD)	2 M (SD)	Highest M (SD)	Lowest M (SD)	2 M (SD)	Highest M (SD)
Child internalizing and externalizing symptoms[f]	22.7 (7.2)	22.6 (6.9)	22.8 (7.0)	22.8 (7.6)	22.4 (7.2)	22.9 (7.1)	22.9 (7.3)	22.6 (6.9)	22.8 (7.1)	22.7 (7.5)
Child autistic social traits[g]	2.8 (3.6)	2.7 (3.7)	2.8 (3.5)	2.9 (3.7)	2.9 (3.7)	2.7 (3.6)	2.7 (3.6)	3.0 (3.9)	2.7 (3.6)	2.6 (3.5)
Child BMI	-0.01 (0.9)	-0.03 (0.9)	-0.02 (1.0)	0.03 (1.0)	0.01 (1.0)	-0.01 (0.9)	-0.03 (1.0)	-0.02 (1.0)	-0.02 (1.0)	0.02 (1.0)
Worries about child feeding	12.6 (2.0)	12.9 (1.9)	12.6 (2.0)	12.5 (2.2)	12.6 (2.1)	12.7 (2.0)	12.7 (2.0)	12.1 (2.3)	12.8 (1.9)	13.1 (1.8)

For descriptive table purposes, I defined: [a]Dietary pattern scores as thirds, wherein the lowest category means participants at the lowest third of adherence to food items in the specific dietary pattern to the dietary pattern and highest category means the participants at the highest third of adherence of food items in the specific dietary pattern. Details on two-parental households with one parent's data missing: [b]9.7% of for social class. [c]3.0% for education Details on maternal characteristics: [d]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics: .[e]Total Strengths and Difficulties Questionnaire score.[f]Total Social and Communication Disorder Checklist.

4.3.2 Missing data

Compared to the full sample, the analytical sample had more white children (95.0% vs. 96.2%). In the analytical sample smaller proportions of participants had parents from the lowest 20% of parental income (16.9% vs 20.0%) and compulsory education as the highest educational attainment (28.3% vs 38.9%) compared to those of the full ALSPAC cohort. Participants in the analytical sample lived in least deprived areas (Mean=-1.3, SD=2.8) compared to the whole ALSPAC sample (Mean=-0.9, SD=3.0). (Table 21)

Children in the analytical sample, compared to the full ALSPAC sample had higher level of mental health difficulties (Mean=22.7, SD=7.2 vs Mean=16.3, SD=12.0 respectively) and parent's worries about child feeding scores (Mean=11.6, SD=2.9 vs Mean=7.5, SD=6.4 respectively).There were no differences between the full cohort and the analytical sample in terms of other variables.

Table 21: Participant characteristics of the whole vs. analytical sample.

Participant characteristics	Whole sample (n=13,988) N (%)	Analytical sample (n=8,163) n (%)
Child sex		
Female	7,181 (49.0)	3,964 (48.6)
Male	7,468 (51.0)	4,187 (51.4)
Child ethnicity		
Minoritised ethnicity	599 (5.0)	296 (3.8)
White	11,302 (95.0)	7,536 (96.2)
Equivalised parental income		
Highest 20%	1,989 (20.3)	1,654 (22.0)
2	1,954 (20.0)	1,601 (21.3)
3	1,945 (19.9)	1,537 (20.4)
4	1,942 (19.8)	1,455 (19.4)
Lowest 20%	1,960 (20.0)	1,272 (16.9)

Details on two-parental households with one parent's data missing: [a]9.7% of for social class. [b]3.0% for education Details on maternal characteristics: [c]Total Image Perception Questionnaire score. [d]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics [e]Total Strengths and Difficulties Questionnaire score.[f]Total Social and Communication Disorder Checklist

Table 21 continued

Participant characteristics	Whole sample (n=13,988) N (%)	Analytical sample (n=8,163) n (%)
Highest parental social class[a]		
Professional	1,509 (13.3)	1,187 (15.6)
Managerial	4,733 (31.8)	3,322 (43.7)
Skilled non-manual	2,893 (25.5)	1,919 (25.3)
Skilled manual	1,526 (13.5)	824 (10.9)
Semi-skilled/unskilled manual	671 (5.9)	345 (4.5)
Highest parental education[b]		
University degree	2,604 (22.5)	2,006 (26.0)
A level	3,891 (33.6)	2,749 (35.7)
Compulsory education	5,090 (43.9)	2,954 (38.3)
Maternal eating disorder history		
Experienced eating disorder	454 (3.7)	298 (3.7)
Has not experienced eating disorder	11,821 (96.3)	7,666 (96.3)
Meal skipping		
Not skipping meals	6,778 (78.2)	5,886 (79.2)
Skipping meals	1,892 (21.8)	1,545 (20.8)

Details on two-parental households with one parent's data missing: [a]9.7% of for social class. [b]3.0% for education Details on maternal characteristics: [c]Total Image Perception Questionnaire score. [d]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics [e]Total Strengths and Difficulties Questionnaire score.[f]Total Social and Communication Disorder Checklist.

Table 21 continued

Participant characteristics	Whole sample (n=13,988) M (SD)	Analytical sample (n=8,163) M (SD)
Financial hardship	2.9 (3.5)	2.6 (3.3)
Standardised area-level deprivation	-0.9 (3.0)	-1.3 (2.8)
Maternal BMI	22.9 (3.9)	22.9 (3.8)
Maternal pre-pregnancy body dissatisfaction[c]	4.7 (4.3)	4.7 (4.1)
Maternal depressive symptoms[d]	6.0 (5.0)	5.9 (4.9)
Child mental health difficulties[e]	16.3 (12.0)	22.7 (7.2)
Child autistic traits[f]	2.8 (3.7)	2.8 (3.6)
Child BMI	0.0 (1.0)	-0.008 (1.0)
Child feeding difficulties	2.1 (1.0)	2.1 (1.0)
Parent's worries about child feeding scores	7.5 (6.4)	11.6 (3.9)

Details on two-parental households with one parent's data missing: [a]9.7% of for social class. [b]3.0% for education Details on maternal characteristics: [c]Total Image Perception Questionnaire score. [d]Total Edinburgh Postnatal Depression Scale score. Details on child characteristics [e]Total Strengths and Difficulties Questionnaire score.[f]Total Social and Communication Disorder Checklist.

4.3.3 Objective 7: Association between dietary patterns at age 7 and behavioural and cognitive eating disorder symptoms across adolescence

When investigating the association between dietary patterns at 7 years old and disordered eating behaviours across adolescence (Table 22), I found no evidence of an association between disordered eating behaviours and varied-staple diets (Odds ratio for one-unit increase in dietary pattern scores [OR] = 1.00, 95% Confidence Interval [CI] 0.92 to 1.09, p=0.959), convenience-oriented diets (OR=1.05, 95% CI 0.96 to 1.14, p=0.282), and traditional-British diets (OR=1.04, 95% CI 0.96 to 1.13, p=0.363) in the unadjusted models. The association were similar in model 8a between varied-staple diets (OR=1.06, 95% CI 0.97 to 1.15, p=0.198), convenience-oriented diets (OR=0.97, 95% CI 0.89 to 1.06; p=0.482), and traditional British diets (OR=1.02, 95% CI 0.93 to 1.11, p=0.696) and disordered eating behaviours.

Similarly, I found no evidence of an association between greater adherence to varied staple diets (Coefficient=-0.02, 95% CI -0.05 to 0.02, p=0.368), convenience-oriented diet (Coefficient=0.005, 95% CI -0.03 to 0.04, p=0.807), traditional British diet (Coefficient=0.03, 95% CI -0.01 to 0.07, p=0.120) and weight and shape concerns in the unadjusted model. (Table 39) There was no further evidence of association in the fully adjusted models between varied staple diets (Coefficient=-0.01, 95% CI -0.05 to 0.02, p=0.534), convenience-oriented diets (Coefficient -0.01, 95% CI -0.05 to 0.03, p=0.621), and traditional British diets. (Coefficient=0.03, 95% CI -0.01 to 0.07, p=0.108) and weight and shape concerns.

Finally, there was no evidence of an association between dietary patterns at age 7 and body dissatisfaction in the unadjusted (varied staple: Coefficient=-0.42, 95% CI -0.96 to 0.12, p=0.127 ; convenience oriented diet: Coefficient=0.29, 95% CI -0.22 to 0.81, p=0.261; traditional British diet: Coefficient=-0.01, 95% CI -0.43 to 0.45, p=0.967) and in the fully adjusted model (varied staple: Coefficient=-0.37, 95% CI -0.91 to 0.18, p=0.183; convenience oriented diet: Coefficient=0.17, 95% CI -0.36 to 0.70, p=0.519; traditional British diet: Coefficient=0.03, 95% CI -0.44 to 0.50, p=0.904). (Table 23)

Table 22: Multilevel logistic regression models for disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18 and their association with dietary patterns at age 7. Sample based on respondents with complete data on dietary patterns and imputed confounders and outcomes (N=8,163)

	Disordered eating behaviours	Weight and shape concerns
Dietary pattern	**OR (95% CI), p-value**	**Coefficient (95% CI), p value**
Varied-staple diet		
Model 1	1.00 (0.92 to 1.09), 0.959	-0.02 (-0.05 to 0.02), 0.368
Model 2	1.00 (0.92 to 1.08), 0.909	-0.02 (-0.06 to 0.01), 0.191
Model 3	1.06 (0.97 to 1.15), 0.211	-0.02 (-0.05 to 0.02), 0.333
Model 4	1.05 (0.97 to 1.14), 0.225	-0.02 (-0.05 to 0.02), 0.386
Model 5	1.05 (0.97 to 1.14), 0.243	-0.02 (-0.05 to 0.02), 0.376
Model 6	1.05 (0.97 to 1.14), 0.227	-0.02 (-0.05 to 0.02), 0.357
Model 7	1.05 (0.97 to 1.14), 0.226	-0.01 (-0.05 to 0.02), 0.497
Model 8a	1.06 (0.97 to 1.15), 0.198	-0.01 (-0.05 to 0.02), 0.534
Model 8b	1.08 (0.98 to 1.19), 0.124	-0.01 (-0.05 to 0.03), 0.577

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 22 continued

Dietary pattern	Disordered eating behaviours OR (95% CI), p-value	Weight and shape concerns Coefficient (95% CI), p value
Convenience-oriented diet		
Model 1	1.05 (0.96 to 1.14), 0.282	0.005 (-0.03 to 0.04), 0.807
Model 2	1.06 (0.98 to 1.16), 0.138	0.01 (-0.03 to 0.05), 0.500
Model 3	0.99 (0.91 to 1.08), 0.851	0.003 (-0.04 to 0.05), 0.877
Model 4	0.98 (0.90 to 1.07), 0.707	-0.002 (-0.04 to 0.04), 0.931
Model 5	0.98 (0.90 to 1.07), 0.671	-0.002 (-0.04 to 0.04), 0.921
Model 6	0.98 (0.89 to 1.07), 0.585	-0.005 (-0.05 to 0.04), 0.821
Model 7	0.97 (0.89 to 1.06), 0.570	-0.01 (-0.05 to 0.03), 0.611
Model 8a	0.97 (0.89 to 1.06), 0.482	-0.01 (-0.05 to 0.03), 0.621
Model 8b	0.98 (0.89 to 1.07), 0.212	-0.01 (-0.05 to 0.03), 0.593

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 22 continued

Dietary pattern	Disordered eating behaviours OR (95% CI), p-value	Weight and shape concerns Coefficient (95% CI), p value
Traditional British diet		
Model 1	1.04 (0.96 to 1.13), 0.363	0.03 (-0.01 to 0.07), 0.120
Model 2	1.01 (0.93 to 1.11), 0.742	0.02 (-0.02 to 0.06), 0.334
Model 3	1.01 (0.93 to 1.10), 0.786	0.02 (-0.02 to 0.06), 0.316
Model 4	1.02 (0.94 to 1.11), 0.638	0.02 (-0.02 to 0.06), 0.284
Model 5	1.03 (0.94 to 1.12), 0.562	0.02 (-0.02 to 0.06), 0.271
Model 6	1.02 (0.93 to 1.11), 0.641	0.02 (-0.02 to 0.06), 0.329
Model 7	1.02 (0.93 to 1.11), 0.704	0.03 (-0.01 to 0.07), 0.110
Model 8a	1.02 (0.93 to 1.11), 0.696	0.03 (-0.01 to 0.07), 0.108
Model 8b	1.01 (0.91 to 1.12), 0.844	0.04 (0.001 to 0.09), 0.041

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 23: Linear regression models for body dissatisfaction at 14 years old and dietary patterns at 7 years old. Sample based on respondents with complete data on dietary patterns and imputed confounders and outcomes (N=8,163)

	Body dissatisfaction
Dietary pattern	**Coefficient (95% CI), p value**
Varied-staple diet	
Model 1	-0.42 (-0.96 to 0.12), 0.127
Model 2	-0.42 (-0.94 to 0.11), 0.118
Model 3	-0.37 (-0.91 to 0.18), 0.185
Model 4	-0.35 (-0.90 to 0.21), 0.217
Model 5	-0.36 (-0.91 to 0.20), 0.206
Model 6	-0.36 (-0.91 to 0.19), 0.199
Model 7	-0.35 (-0.90 to 0.19), 0.203
Model 8a	-0.37 (-0.91 to 0.18) 0.183
Model 8b	-0.32 (-0.97 to 0.32), 0.319

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 23 continued

Dietary pattern	Body dissatisfaction Coefficient (95% CI), p value
Convenience-oriented diet	
Model 1	0.29 (-0.22 to 0.81), 0.261
Model 2	0.34 (-0.18 to 0.86), 0.195
Model 3	0.24 (-0.27 to 0.76), 0.354
Model 4	0.19 (-0.32 to 0.70), 0.455
Model 5	0.18 (-0.33 to 0.69), 0.478
Model 6	0.15 (-0.36 to 0.67), 0.548
Model 7	0.14 (-0.39 to 0.67), 0.599
Model 8a	0.17 (-0.36 to 0.70), 0.519
Model 8b	0.12 (-0.41 to 0.65), 0.643

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 23 continued

Dietary pattern	Body dissatisfaction Coefficient (95% CI), p value
Traditional British diet	
Model 1	-0.01 (-0.43 to 0.45), 0.967
Model 2	-0.07 (-0.51 to 0.38), 0.768
Model 3	-0.05 (-0.50 to 0.40), 0.823
Model 4	-0.03 (-0.47 to 0.41), 0.902
Model 5	-0.002 (-0.44 to 0.44), 0.991
Model 6	-0.03 (-0.46 to 0.41), 0.895
Model 7	0.03 (-0.44 to 0.50), 0.892
Model 8a	0.03 (-0.44 to 0.50), 0.904
Model 8b	-0.003 (-0.56 to 0.56), 0.991

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

4.3.4 Objective 8: The association between dietary patterns at age 7 and individual disordered eating behaviours

When investigating the association between dietary patterns at age 7 and binge eating behaviours, I found no evidence of an association for varied staple diets (OR=1.02, 95% CI 0.90 to 1.15, p=0.809), convenience-oriented diets (OR=1.09, 95% CI 0.96 to 1.24, p=0.193), and traditional-British diets (OR=1.02, 95% CI 0.88 to 1.18, p=0.794) and binge eating in the unadjusted and fully adjusted models (varied staple diets: OR=1.02, 95% CI 0.89 to 1.17, p=0.791; convenience-oriented diets: OR=1.04, 95% CI 0.91 to 1.20, p=0.515; traditional British diets: OR=1.04, 95% CI 0.90 to 1.20, p=0.622) (Table 24).

I found no evidence in the univariable model for the association between varied staple diets at age 7 (OR=1.00, 95% CI 0.90 to 1.10, p=0.928), convenience oriented diets (OR=0.98, 95% CI 0.89 to 1.08, p=0.666) and traditional British diets (OR=1.02, 95% CI 0.93 to 1.11, p=0.746) and restrictive eating in the unadjusted model. The fully adjusted model showed similar results for varied-staple diets (OR=1.07, 95% CI 0.97 to 1.18, p=0.162) or traditional British diets (OR=0.98, 95% CI 0.89 to 1.07, p=0.611). However, once I adjusted for child sex, child ethnicity, socioeconomic position, maternal characteristics, I found weak evidence that a one-unit increase in adherence to convenience-oriented diets led to 0.91 lower odds (95% CI 0.81 to 1.01, p=0.088) of restrictive eating. Both magnitude and strength of this association remained similar when adjusting for child autistic traits, child mental health difficulties, child BMI, child feeding difficulties, parental feeding worries, and skipping meals (OR=0.91, 95% CI 0.82 to 1.01, p=0.076). The final model showed that a one-unit increase in the adherence of convenience-oriented diets was associated with 0.90 lower odds (95% CI 0.81 to 1.00, p=0.054) of developing restrictive eating.

I did not find any evidence to support the presence of an association between varied-staple diets at age 7 and purging for unadjusted models (OR=1.12, 95% CI 0.93 to 1.35, p=0.237). Once I adjusted for child sex, ethnicity, and socioeconomic positions I found that those with one unit increase in the adherence of varied-staple diets at age 7 was moderately associated with 1.19 higher odds of purging in adolescents (95% CI 1.00 to 1.43, p=0.056). However, the association between varied-staple diets and purging was completely attenuated in the fully adjusted model (OR=1.16, 0.96 to 1.39, p=0.116). The estimates slightly overlapping with the null value suggests that this may be due to a loss of power. I also found no evidence of convenience-oriented diets and purging in the unadjusted model (OR=1.16, 95% CI 0.97 to 1.39, p=0.103). While there was weak evidence of an association between convenience-oriented diets and purging once adjusting for sex (OR=1.18, 95% CI 0.99 to 1.41, p=0.071), this association disappeared in the fully adjusted models (OR=1.06,

95% CI 0.88 to 1.27, p=0.555). There was no evidence of an association between traditional British diets and purging in both unadjusted (OR=1.20, 95% CI 0.67 to 1.50, p=0.108) and fully adjusted models (OR=1.13, 95% CI 0.91 to 1.43).

Table 24: Multilevel logistic regression models for binge eating, restrictive eating, and purging at age 14, 16, and 18 and its association with dietary patterns at age 7. Sample based on respondents with complete data on dietary patterns and imputed confounders and outcomes (N=8,163)

	Binge eating	Restrictive eating	Purging
Dietary pattern	**OR (95% CI), p-value**	**OR (95% CI), p-value**	**OR (95% CI), p-value**
Varied-staple diet			
Model 1	1.02 (0.90 to 1.15), 0.809	1.00 (0.90 to 1.10), 0.928	1.12 (0.93 to 1.35), 0.237
Model 2	1.01 (0.89 to 1.15), 0.886	0.99 (0.90 to 1.10),0 .861	1.11 (0.91 to 1.34), 0.276
Model 3	1.03 (0.90 to 1.18), 0.665	1.06 (0.96 to 1.17), 0.251	1.19 (1.00 to 1.43), 0.056
Model 4	1.02 (0.89 to 1.17), 0.768	1.06 (0.96 to 1.17), 0.223	1.18 (0.99 to 1.41), 0.071
Model 5	1.02 (0.89 to 1.16), 0.796	1.06 (0.96 to 1.17), 0.233	1.18 (0.98 to 1.41), 0.076
Model 6	1.02 (0.89 to 1.17), 0.784	1.06 (0.96 to 1.17), 0.221	1.18 (0.99 to 1.41), 0.067
Model 7	1.01 (0.89 to 1.17), 0.735	1.06 (0.96 to 1.17), 0.243	1.17 (0.97 to 1.42), 0.094
Model 8a	1.02 (0.89 to 1.17), 0.791	1.07 (0.97 to 1.18), 0.162	1.16 (0.96 to 1.39), 0.116
Model 8b	0.96 (0.81 to 1.13), 0.623	1.15 (1.03 to 1.29), 0.015	1.16 (0.93 to 1.46), 0.195

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 24 continued

Dietary pattern	Binge eating OR (95% CI), p-value	Restrictive eating OR (95% CI), p-value	Purging OR (95% CI), p-value
Convenience-oriented diet			
Model 1	1.09 (0.96 to 1.24), 0.193	0.98 (0.89 to 1.08), 0.666	1.16 (0.97 to 1.39), 0.103
Model 2	1.11 (0.97 to 1.26), 0.135	0.99 (0.90 to 1.10), 0.903	1.18 (0.99 to 1.41), 0.071
Model 3	1.06 (0.93 to 1.22), 0.363	0.92 (0.83 to 1.03), 0.134	1.10 (0.89 to 1.31), 0.426
Model 4	1.06 (0.93 to 1.21), 0.384	0.91 (0.82 to 1.02), 0.092	1.08 (0.89 to 1.31), 0.461
Model 5	1.06 (0.93 to 1.21), 0.401	0.91 (0.82 to 1.01), 0.088	1.07 (0.88 to 1.30), 0.470
Model 6	1.06 (0.92 to 1.21), 0.419	0.91 (0.81 to 1.01), 0.068	1.07 (0.88 to 1.30), 0.487
Model 7	1.05 (0.92 to 1.20), 0.486	0.91 (0.82 to 1.01), 0.076	1.08 (0.90 to 1.32), 0.401
Model 8a	1.04 (0.91 to 1.20), 0.515	0.90 (0.81 to 1.00), 0.054	1.06 (0.88 to 1.27), 0.555
Model 8b	1.06 (0.93 to 1.21), 0.384	0.90 (0.81 to 1.01), 0.065	1.11 (0.92 to 1.34), 0.293

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

Table 24 continued

Dietary pattern	Binge eating OR (95% CI), p-value	Restrictive eating OR (95% CI), p-value	Purging OR (95% CI), p-value
Traditional British diet			
Model 1	1.02 (0.88 to 1.18), 0.794	1.02 (0.93 to 1.11), 0.646	1.20 (0.96 to 1.50), 0.108
Model 2	1.00 (0.87 to 1.15), 0.988	1.00 (0.91 to 1.09), 0.946	1.18 (0.94 to 1.48), 0.152
Model 3	1.00 (0.87 to 1.15), 0.987	0.99 (0.90 to 1.08), 0.836	1.18 (0.93 to 1.48), 0.143
Model 4	1.02 (0.88 to 1.17), 0.832	0.99 (0.91 to 1.09), 0.900	1.19 (0.95 to 1.49), 0.120
Model 5	1.03 (0.89 to 1.17), 0.772	1.00 (0.91 to 1.09), 0.946	1.20 (0.96 to 1.50), 0.112
Model 6	1.02 (0.89 to 1.17), 0.803	0.99 (0.91 to 1.08), 0.844	1.19 (0.95 to 1.48), 0.124
Model 7	1.04 (0.90 to 1.20), 0.606	0.97 (0.89 to 1.07), 0.588	1.15 (0.91 to 1.45), 0.240
Model 8a	1.04 (0.90 to 1.20), 0.622	0.98 (0.89 to 1.07), 0.611	1.13 (0.91 to 1.43), 0.256
Model 8b	1.07 (0.90 to 1.27), 0.447	0.96 (0.86 to 1.06), 0.413	1.08 (0.85 to 1.37), 0.535

Model 1: univariable, Model 2: 1+ sex, child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8a: 7+remaining dietary patterns at age 7; Model 8b: 7+remaining dietary patterns at age 4

4.3.5 Sensitivity analyses: complete case analysis

In analyses restricted to participants with complete data on all variables included in the analyses, the associations were similar as my main analysis. (Table S20-S22) The main difference was that the association between convenience-oriented diets and restrictive eating had wider estimates (OR=0.91, 95% CI 0.78 to 1.07, p=0.272) in the complete case analysis compared to the main analyses. The upper confidence interval slightly overlapped with the null value, although the odds ratio of the complete case analysis remained similar to the main analysis.

4.3.6 Sensitivity analyses: adjusting for dietary patterns at age 4

In the sensitivity analyses adjusting for remaining dietary patterns at age 4 instead of dietary patterns at age 7 (Table 22-24), I found similar effect sizes and estimates in the final model as my main analysis. However, there were a few discrepancies. I found that a one-unit increase in the adherence to traditional British diets was associated with a 0.04 point increase in weight and shape concern (95% CI 0.0001 to 0.09, p=0.041) when adjusting for remaining dietary patterns at age 4; whereas, there is no evidence of this association in the main analyses adjusting for remaining dietary patterns at age 7. I also found that a one-unit increase in adherence to varied-staple diets was associated with 1.15 higher odds (95% CI 1.03 to 1.29, p=0.015) of restrictive eating when adjusting for remaining dietary patterns at age 4.

4.4 Discussion

4.4.1 Summary of findings

In this study, I did not find evidence of an association between childhood dietary patterns and disordered eating behaviours, weight and shape concerns, and body dissatisfaction across adolescence in both unadjusted and adjusted models.

When investigating individual eating disorder symptoms, increased adherence to convenience-oriented diets was associated with lower odds of restrictive eating in both the main analyses and sensitivity analyses adjusting for dietary patterns at age 4. I also found that those who adhered more to varied-staple diets had greater odds of restrictive eating and purging behaviours when adjusting for dietary patterns at age 4 in the sensitivity analyses; however, evidence of this association was not present in the main analysis. There was no evidence of an association between any other dietary patterns and individual disordered eating behaviours.

4.4.2 Strengths and limitations

Chance

As mentioned under '*Strengths and limitation*' in chapter 2.4.2, there was a relatively small number of those who experienced individual disordered eating behaviour, subjecting the findings to potential Type II error. Further, I cannot exclude the possibility that the evidence for the association between convenience-oriented diets and restrictive eating was a Type I error arising from multiple testing, as the strength of evidence was weak in the main analyses.

Bias

However, my results may be biased due to attrition from long periods of follow-up. There were smaller proportion of people from lower socioeconomic positions in my analytical sample compared to my whole sample. Those from lower socioeconomic backgrounds - particularly children whose parents have lower educational attainment - who have dropped out are more likely to adhere to convenience-oriented diets[67] and may have differential risk for eating disorders to my sample.[76] I used an imputed dataset to explore my claims and was reassured by the similarity of effect sizes and associations between the imputed and complete case analyses. However, I did not find evidence of an association between convenience-oriented diet and restrictive eating disorders in the complete case analyses, which casts uncertainty into how missing data patterns may have impact my findings.

Confounding

The longitudinal study design establishes temporality between the exposure and the outcome, which previous cross-sectional and case-control studies could not account for.[221, 222, 225] Given the rarity of eating disorders at age 7,[7] it is unlikely that my findings are affected by unobserved confounding by pre-existing eating disorder symptoms, which may not have been detected in a study investigating diagnosis in an adult sample.[227]

I adjusted for an array of confounders such as maternal body dissatisfaction, lifetime history of eating disorders, and children's mental health difficulties, unlike previous literature.[221-224, 227] However, I cannot exclude the possibility of unmeasured and residual confounders biasing my association. For instance, I could not adjust for potential confounders such as restrictive feeding practices, which have been shown to be associated with less consumption of energy dense food items[250] and disordered eating behaviours.[251] Restrictive feeding practices was also mentioned as an important factor that could explain the relationship between dietary patterns and eating disorders by young people with lived experience of eating disorders. Further, I could not adjust for genetic confounders, as ALSPAC did not have sufficient information to run a genetically-informed design such as twin studies, and the polygenic risk scores, which are available in ALSPAC, only explains a small variance of phenotypes in this dataset.

Measurement

A strength of the dietary pattern's variable in ALSPAC encompasses potential interaction between different food items. Therefore, this broader approach to diet may reflect real life food consumption better and often lead to more tangible changes in health outcome when targeted, as opposed to singling out micro or macro-nutrients or energy intake.[65] As dietary patterns were derived from the mother-reported food frequency consumption, exposure variables are less prone to recall bias unlike previous studies which retrospectively collected information on childhood dietary patterns in an adult sample with diagnosed eating disorders.[223, 224]

However, my exposure has some crucial limitations. First, dietary pattern measures like the Food Frequency Questionnaire are still prone to random measurement errors,[252] as it can still be difficult for participants to accurately recall their dietary intake in a week. These measurement errors can lead to greater attenuation of effect sizes and estimates,[253] which is why I may not find an association between dietary patterns and eating disorder symptoms. Second, there may be differential biases in reporting food frequency. For example, if the mother experienced shame and guilt around consumption of convenience-oriented food items, this may lead to under-reporting the intake of convenience-oriented food items; this attitude could, in turn, affect offspring's eating disorder symptoms. Third, there is some

uncertainty on whether the dietary pattern variable in ALSPAC captures risk pathways that are related to reward signalling, as hypothesised in the literature. This may be another reason I do not find an association between my exposure and outcome. Finally, the dietary pattern variable from ALSPAC omit children who had 10 or more items missing from the food frequency questionnaire. For respondents with less than 10 items missing from their food frequency questionnaire, the researchers considered missing food frequency questionnaire items to be mean that the children did not consume that food item.[228]. Therefore, it uncertain how missing data patterns from the derived variable may have impacted my effect sizes and estimates.

4.4.3 Interpretation of findings and comparison with previous literature

My findings do not support the cross-sectional evidence that higher adherence to convenience-oriented diets is associated with more eating disorder symptoms.[221-224] On the other hand, I found that higher adherence to convenience oriented diets was associated with less restrictive eating in adolescence, which may be due to chance. However, if these findings are true, it directly contrasts the longitudinal study which found no association between specific varied-staple food items and eating disorder diagnoses once accounting for eating disorder diagnoses at baseline.[227]

While these findings do not show an association between adherence to certain dietary patterns and eating disorder symptoms, there are other factors surrounding diet that could be important for eating disorders. For example, young people with lived experience of eating disorder symptoms indicated that changes in dietary patterns throughout childhood (e.g., drastic transitions into a more restrictive diet during childhood) could be an important risk factor for eating disorders; however, this putative risk factor has yet to be explored in the context of eating disorders. Persistent overeating and undereating were found to be associated with higher risk of binge eating and anorexia nervosa respectively.[235] Further, eating disorder literature has emphasised the importance of family interactions during meal time (e.g., mealtime conflicts and meal time structure) for the aetiology of eating disorders.[254] These may not have been captured by the exposure measure in this study, but remain important avenues of exploration for future research.

While the mechanism for the association between convenience-oriented dietary patterns and restrictive eating is unclear, there are multiple possible explanations. Higher adherence to convenience-oriented diets in childhood could lead to increased levels of satiety responsiveness,[214] and in turn may lead to decreased odds of restrictive eating behaviours in adolescence.[219]

Alternatively, the observed association could be due to residual confounding. For instance, parents who have more lenient attitudes towards convenience-oriented foods may lead to offspring adolescents engaging less with restrictive eating behaviours.[255] Another explanation to this observed association is children who have a genetic preference for convenience-oriented food may be less likely to engage in restrictive eating behaviours as well. Further research adjusting for these potential confounders must be conducted to confirm or exclude the possibility of these mechanisms

4.4.4 Implications

There is increasing concerns around how convenience-oriented food may increase eating disorders in eating disorder literature, which these findings negate. These findings may encourage researchers to 1) consider the direction of causality when investigating dietary patterns and eating disorders, especially given many of the literature around ultra-processed foods and eating disorders are cross-sectional, and 2) investigate factors outside of, but related to, broad dietary patterns that could be a risk to eating disorders. The lived experience input also cautions researchers from using stigmatising labels for food items, and instead, opting for more neutral ways to describe dietary patterns.

While the finding on convenience-oriented diets and restrictive eating disorder symptoms is interesting from a public health perspective, these findings will likely need to be replicated with better data structures and improvements in design. However, if these findings are replicated in the literature, it may inform public health messages on the consumption of convenience-oriented food items in relation to eating disorders, so long as moderate consumption of these food items are not associated with increased risk of other health outcomes.

5 Discussion

In this chapter, I will summarise my main findings and discuss their theoretical, research, and policy implications.

5.1 Summary of objectives and main findings

The objectives of the first chapter were to investigate the longitudinal association between multiple childhood socioeconomic position indicators and adolescent behavioural and cognitive eating disorder symptoms (hereafter: eating disorder symptoms); 2) differences in the association between childhood socioeconomic position and eating disorder symptoms at age 14, 16, and 18 years; and 3) the longitudinal association between childhood socioeconomic position and restrictive eating, binge eating, and purging. **For objective 1**, I found that, across all socioeconomic position indicators, those from lower socioeconomic positions reported more eating disorder symptoms compared to their higher socioeconomic counterparts. Greater-levels of financial hardship was independently associated with greater-levels of all eating disorder symptoms, and lower educational attainment was associated with more disordered eating behaviour. **For objective 2**, I found that the association between parental income, financial hardship, or area-level deprivation and disordered eating behaviours was strongest at age 14 years old. For **objective 3**, I found that higher area-level deprivation was associated with more binge eating and purging while parental educational attainment and social class were associated with more restrictive eating throughout adolescence. These findings show that eating disorder symptoms are greater for those from lower socioeconomic position.

For the second chapter, my objectives were to investigate 4) the associations between food insecurity at age 7 and eating disorder symptoms across adolescence; 5) the comparative associations between other financial insecurity indicators and eating disorder symptoms across adolescence to explore whether this association is independent from financial insecurity; and 6) the association between food insecurity at age 7 and individual disordered eating behaviours across adolescence. **For objective 4**, I found evidence of an association between higher levels of food insecurity and more disordered eating behaviours, higher weight and shape concerns, and higher body dissatisfaction. **For objective 5**, higher levels of other financial insecurity indicators were associated with greater levels of eating disorder symptoms. **For objective 6,** I found evidence of an association between higher levels of food insecurity and binge eating and restrictive eating in the unadjusted model. I found no evidence of an association between food insecurity and purging behaviours. These findings

overall emphasise that the association between food insecurity and eating disorders observed in the literature may be capturing the effects of poverty or causal mechanisms other than the proposed feast-famine cycles.

The objectives of the third chapter were to investigate 7) the longitudinal associations between child's varied-staple, convenience-oriented, and traditional British diets at age 7 and eating disorder symptoms across adolescence; and 8) the association between these different dietary patterns age 7 and individual disordered eating behaviour across adolescence. **For objective 7**, I found no evidence of an association between any dietary patterns and disordered eating behaviours, weight and shape concerns, and body dissatisfaction. For **objective 8**, I found weak evidence that higher levels of adherence to convenience-oriented diets in childhood was associated with reduced reports of restrictive eating throughout adolescence in the fully adjusted models. This finding negates the hypothesis that the increase in convenience-oriented diets or an increase in varied-staple diets are, respectively, a risk to or protective for eating disorders.

5.2. Strengths and limitations

The overall strength of my thesis is that it is the first to investigate the association between multiple indicators of socioeconomic position in childhood and trajectories of eating disorder symptoms throughout adolescence. My findings challenge pre-conceptions around eating disorders being a disease of affluence.[50] This may prompt more eating disorder researchers to consider this health outcome in the context of health inequalities, as with other health outcomes. Further, my findings provide the distribution of eating disorder symptoms by each socioeconomic position indicator and lend to hypotheses about causal mechanisms surrounding deprivation and eating disorder symptoms.

Chance

My sample size is large compared to most studies in the literature examining socioeconomic position, food insecurity, and dietary patterns in the literature. This makes it suitable for detecting small effect sizes within the population and produces more accurate estimates. However, I may have been underpowered to detect an association between my exposures and individual disordered eating behaviours resulting in a Type II error. For example, while there was evidence that children with parents of compulsory education had higher odds of binge eating compared to children with parents of university degrees in the unadjusted main analyses, the estimates became much wider after adjusting for remaining socioeconomic position.

I attempted to reduce risk of Type I errors by specifying my analyses a priori. The fact that my findings are congruent with the literature lends some reassurance that my results are not a false positive. However, because I tested multiple associations in this thesis, some findings may inevitably be a result of Type I error. For example, in Chapter 4, I found no association between childhood dietary patterns and any disordered eating behaviours, but I found an association that a higher adherence to convenience-oriented diets in childhood were associated with reduced odds of experiencing restrictive eating. While these associations are plausible, there are no examples in the literature that support these associations. Therefore, these results need to be interpreted cautiously and replicated in future research to exclude the possibility of a Type I error.

Bias

While there are many similarities between children from ALSPAC and those in the rest of Great Britain, ALSPAC is not representative of the population of Great Britain in 1991. At recruitment, families from ALSPAC were more likely to live in owner occupied accommodations, have more cars in households, and come from a White background as opposed to an minoritised ethnic background compared to the whole of Great Britain.[75] Therefore, my findings may be impacted by sampling bias and thus may not be generalisable to those living in Great Britain. Future research needs to replicate these findings in more representative cohorts.

My findings may have been affected by attrition bias as those from lower socioeconomic position are more likely to be lost at follow-up. If these specific respondents also have differential risk to eating disorders, my findings may be biased. However, I did find similar associations across my main imputed analyses and my sensitivity analyses in all three cases. Therefore, this lends some reassurance that findings may have been similar if those from lower socioeconomic position had not been lost at follow-up.

Confounding

I carefully considered multiple confounders that may affect the association between childhood socioeconomic position, food insecurity, or dietary patterns and adolescent eating disorder symptoms. Further, I used sensitivity analyses to test for multiple causal assumptions, in cases I could not parse the temporality between exposure and confounder. The overall similarity between my main and sensitivity analyses points to the robustness of my analyses.

However, there is still a chance that my findings were impacted by residual confounding. Most unobserved confounders that could theoretically impact the observed associations in this thesis were unavailable in ALSPAC. For example, restrictive feeding practices could have affected childhood dietary patterns but also affect the presence or absence of eating disorders in the offspring. In these cases, I tried to include as many proxy variables as possible. For instance, while I could not adjust for restrictive feeding practices, I included maternal pre-pregnancy body dissatisfaction, history of an eating disorder, and worries surrounding feeding, which may reflect the attitude behind these feeding practices to a certain extent. Genetic confounders were available in ALSPAC. However, ALSPAC cannot differentiate between different subtypes of eating disorders, which may have vastly different polygenic scores. Instead, I included parental phenotypic information, such as maternal mental health, where relevant. Future research may want to consider including these confounders to examine whether they impact these observed associations.

Measurement

There is potential of misclassification of restrictive eating disorder symptoms. In ALSPAC, fasting indicates a more severe form of restriction, wherein the respondent fasts multiple times a month for approximately 24 hours. This measure does not include respondents with restrictive type eating disorders who may still consume food every day but restrict it to the extreme. Therefore, I included anyone who also indicated that they were always on a diet for the purpose of losing weight. However, there is a risk of being over inclusive with this measure as adolescents may interpret the responses options for dieting differently. Therefore, my findings may not be appropriately representing severe forms of restriction, typical of anorexia nervosa.

Generalisability

My findings from the ALSPAC study cannot be generalised to present day children and adolescents. Most of the data was collated around the late 90s and throughout the 2000s. Therefore, social and economic contexts would have been different from the time of data collection to present day. For example, changes in economic contexts such as the global recession of 2008 and the recent cost-of-living crisis may mean that socioeconomic position may have a different association with eating disorders for those who were children and adolescents around this time. Further, the differences in food supplement and benefit policies for children in my sample compared to children in the 2020s may mean that the observed associations may be different for present day children and adolescents. Therefore,

future researchers need to replicate these analytic approaches using a more recent sample to establish whether the patterns observed in this thesis persist across time.

Patient and public involvement activities

The absence of patient and public involvement activities for investigations on childhood socioeconomic position, food insecurity, and adolescent eating disorder symptoms is another limitation of this thesis. Further, I could only conduct one patient and public involvement session for the methods of my chapter on childhood dietary pattern and adolescent eating disorders. Therefore, the research question, methods, and interpretation of findings in Chapter 2 and 3 and the interpretation of findings in Chapter 4 may not necessarily reflect the lived experiences of young people with eating disorders, especially those from marginalised or underserved contexts. Future research on health inequalities and eating disorders should incorporate patient and public involvement activities. This would ideally involve incorporating lived experience insight into all aspects of the research, which would lead to findings that closely align with the priority and experiences of the stakeholders.

5.3 Socioeconomic position and theory of material deprivation

My findings align with theories on social determinants of health,[30] wherein those from lower socioeconomic groups are at higher risk of health difficulties. This also seems to be the case for eating disorders symptoms, even though eating disorder diagnoses are recorded in health services more frequently for those from higher socioeconomic positions. The causal pathways between socioeconomic position and eating disorder symptoms are less clear. Based on the findings of this thesis, it seems that food-related material deprivation may not pose as a risk factor to eating disorder symptoms.

Other forms of material-deprivation could be hypothesised to be a risk factor for eating disorders. For example, those from lower socioeconomic categories also have lower health literacy and resources.[256] The association between health literacy and lack of access to health resources has not been thoroughly examined in the context of eating disorders. However, it could be theorised that young people from lower socioeconomic position may not have access to safer measures for weight loss, such as nutrition education and weight management counselling programmes facilitated by health professionals.[257] Therefore, adolescents from this background may resort to more extreme, maladaptive measures to lose weight. This would make sense in terms of my findings, wherein adolescents whose parents had lower educational attainment, and thus potentially lower health literacy at a family-level, reported more disordered eating behaviours. Another form of deprivation that could be on the causal pathway between socioeconomic deprivation and eating disorders

could be housing insecurity. Housing insecurity has been associated with higher levels of common mental health difficulties,[45] therefore it would be plausible that the former shares a risk pathway with eating disorders as well. This is also partially corroborated by my finding, wherein housing insecurity was the only financial insecurity item that was independently associated with eating disorder symptoms. However, there is a possibility this is a chance finding from multiple testing, therefore, this finding needs to be replicated by other studies where housing insecurity is the main exposure.

On the other hand, it could be that psychosocial mechanisms are relatively more important in the causal pathway between socioeconomic position and eating disorders. This would align with my findings, where subjective financial struggles had the strongest association with eating disorder symptoms. Some notable examples of risk factors that occur more commonly for people in lower socioeconomic backgrounds, but also could be a risk factor to eating disorders, include strains in family functioning,[49, 208, 258] adverse childhood experiences,[47, 49] and early mental health difficulties such as childhood internalising and externalising symptoms.[48, 258, 259]

One psychosocial risk factor for eating disorders that also may be relevant to socioeconomic position is appearance-based comparison amongst peers.[260] For example, those from lower socioeconomic positions, with higher BMIs on average,[261] may be comparing themselves to those from higher socioeconomic positions, who have lower BMI on average,[261] leading to greater eating disorder symptoms to lose or prevent gaining weight. However, whether appearance-based comparison mediates the relationship between socioeconomic position and eating disorders have not been explored in the literature. Other than appearance-based comparisons, adolescents could also compare relative deprivation, which may heighten distress around perceived socioeconomic position. There is already evidence of this in other mental health difficulties, with higher levels of area-level and income inequality being associated with higher incidences of psychosis[262] and more depressive symptoms.[263] More research needs to be conducted to see whether this is the case for individuals with eating disorders as well.

5.4 Clinical and policy implications

5.4.1 Barriers to treatment

My findings suggest that those from lower socioeconomic position may experience barriers to receiving treatment. This is because more people from lower socioeconomic position

experience eating disorder symptoms, but more people from higher socioeconomic position receive eating disorder diagnoses in the UK.[9] Further, while those from lower socioeconomic position tend to experience barriers to mental health care in general, eating disorders are the only mental health disorders that show an opposite pattern of socioeconomic distribution compared to most mental health difficulties like mood disorders, schizophrenia, and substance use disorders.[264] Therefore, there is a need to understand and identify the specific barriers to eating disorder diagnosis and treatment for those from lower socioeconomic backgrounds. Two US-based studies have investigated potential barriers for diagnosis and treatment in eating disorders, which could inform strategies to reduce barriers for those from lower socioeconomic positions in the UK. First, those from lower socioeconomic positions had less perceived need for eating disorder treatment[136] and were also less likely to seek treatment,[265] despite reporting the same-level or more disordered eating behaviours symptoms compared to those from higher socioeconomic backgrounds.

Based on these findings, one potential strategy that could increase engagement to services for those from lower socioeconomic groups could be increasing mental health literacy around eating disorders, its presentations, and access to treatments. While there are many strategies for increasing eating disorder awareness (e.g., campaigns), there is limited evidence that these interventions work.[266] The most effective strategy to date is first aid training for eating disorders, with evidence showing improved problem recognition and understanding appropriate mental health first aid strategies amongst college students, even six-months after the intervention.[267] Current first aid strategies do not evaluate whether those from lower socioeconomic position engage differently with these programmes compared to those from higher socioeconomic position. It is likely that these programmes will have to be tailored, especially around barriers specific to those from lower-socioeconomic positions such as the associated treatment costs. Schools, public health bodies, or educational psychologists could use the insights in this thesis to design targeted interventions (e.g., targeting those who come from financially deprived backgrounds).

Nevertheless, increased engagement from those from lower socioeconomic position may be insufficient in reducing barriers to healthcare,[268] if detection levels do not improve at a service-level. This is because this specific population may have different eating disorder presentations than what is considered “typical”, such as a higher average BMI,[261] which often is a barrier for receiving eating disorder treatment.[139] Further, a study using a clinical sample from the US found that higher proportion of those who were from lower socioeconomic backgrounds were diagnosed with OSFED compared to those from higher socioeconomic positions,[269] and being diagnosed with a non-specific eating disorder also

acted as a barrier to treatment.[270] Some examples of service-level interventions could include expanding medical training to incorporate wider presentations of eating disorders.[155] This may entail 1) de-emphasising BMI during diagnosis, 2) learning about more nuanced presentations for those who may not fit the mould of specific eating disorder diagnoses,[52, 155] and 3) strongly challenging stereotypes that eating disorders mainly affect affluent young people. There could also be changes in diagnostic criteria as well, which would allow clinicians to more readily recognise those with eating disorders. For example, instead of having low weight or BMI criteria, diagnostic manuals could encourage medical professionals to focus on disordered eating behaviours, cognitive symptoms, and psychological distress associated with these symptoms.

However, even with better detection, there needs to be adequate resources at a service level to provide diagnoses and treatments for a wider presentation of eating disorders.[267, 271] US based studies showed that there was shortage of available services, long waitlists, and personal and financial costs associated with treatment, such as travel costs or the burden of affording appropriate nutrition for eating disorder care (e.g., purchasing dietary supplements).[270, 272] While there are no studies investigating barriers to eating disorder services and treatment in the UK, it could be plausible that food insecure and fuel insecure individuals experience difficulties in adhering to nutrition plans or accessing eating disorder services, especially with more eating disorder patients being placed in out-of-area care.[273] In the UK, there is evidence that there are more available healthcare services in affluent areas compared to deprived areas,[274] despite demand for these services being higher in areas with higher levels of unemployment and poverty.[275] There have been efforts to increase access to eating disorder services in the UK. For example, NHS England aimed to expand early intervention services for eating disorders, alongside other mental health difficulties, as a part of the NHS Long Term Plan.[276] While there was an improvement in reducing waiting time to access services, there remains a large gap in service provision, with a sizable proportion of children and young people having to wait beyond target waiting time to receive care for their eating disorder.[13] This suggests that efforts to reduce health inequalities need to occur beyond healthcare services to observe meaningful impact.

5.4.2 Reducing socioeconomic inequalities

According to the findings of this thesis, some of the more important policies to prevent eating disorders could be those targeting educational attainment and financial hardship. The causal strength of this evidence is still to be determined, particularly around any unobserved

confounders affecting these associations. There also needs to be an understanding of precisely what aspects of educational attainment and financial hardship might have a causal relationship with eating disorders, if any.[277]

Under the assumption that there may be a causal relationship between financial hardship, educational attainment and eating disorders, one potential suggestion to policy would be improving educational attainment. There has already been concerted effort to improve educational attainment in the UK, such as the student loan system which was introduced in 1988. Perhaps due to this, approximately 50% of the adult population in the UK had entered higher education in 2024,[278] compared to 33% in the early 2000s.[279] There is also evidence that demonstrates how education may also play a role in buffering the effects of income inequality on mental health difficulties.[280] This may suggest that improvements in educational attainment within the population may lead to better mental health outcomes alongside reducing eating disorder incidence. However, there is quasi-experimental evidence to suggest that simply increasing the number of years of mandatory education is not sufficient for improving health outcomes.[281] Further, while there has been increase in educational attainment since 1988, eating disorders also have increased in incidence over decades.[9, 282] Therefore, there needs to be further understanding in which aspect of education may be important for eating disorders.

Government surveys seem to suggest that increasingly more people are falling below the ‘poverty line’ (defined as under 50% of median after housing cost income) from 1994-2022.[29, 39] This could potentially be attributed to the 2008 global recession, nearly a decade of government austerity programmes, and the cost-of-living crisis in 2021. If the rising incidence of eating disorders are attributable to such increasing levels of financial hardship, potential strategies for alleviating financial hardship could be promoting labour markets or supplementing income through benefits and welfare. There has been some evidence to suggest that increased government expenditure in active labour market programmes may be able to mitigate the association between unemployment and higher suicide rates in EU countries[283] or that increased social expenditure coincides with better mental health outcomes.[284] However, these findings can be highly heterogenous and context dependent. For example, there has been some evidence that prevalence of clinically significant psychological distress was higher for people who have been introduced to Universal Credit,[285] possibly due to the difficulties in transition from one benefit structure to another.[286] Further research is required not only to understand the impacts of these policy changes in financial hardship and how they correspond with mental health in general, let alone eating disorders.

5.5 Implications for future research

Based on the findings of this thesis, eating disorder literature can consider methods and approaches in the broader health inequality literature. These could include how temporal changes in inequality may be associated with eating disorder symptoms in the population. To further understand the causal relationship between socioeconomic position and eating disorder symptoms, researchers could test for potential genetic confounding using genome-wide association studies or twin studies. There could be further analyses exploring putative mediators between socioeconomic position and eating disorder symptoms. These associations should be supported and further elaborated by qualitative research.

Another avenue of research could be investigating how changes in socioeconomic position throughout the life course could have different effects on eating disorders in adolescence. While this thesis shows that lower socioeconomic position during gestation and early childhood is associated with greater eating disorder symptoms throughout adolescence, there is very little information on whether these effects reverse if socioeconomic position alleviates over time or whether lower childhood socioeconomic position have persistent associations during adulthood as well. Having an understanding around the life course approach to this question would give policy makers an idea of the best time to intervene.

These analyses could be replicated in more recent, nationally representative datasets. This is because, families from ALSPAC were more likely to live in owner occupied accommodation, have more cars in households, and come from a White background as opposed to an minoritised ethnic background compared to the whole of Great Britain at the time. Further, there is evidence of a growing wealth gap since the 90s[38] and increased use in food supplement programmes;[59] therefore, researchers may observe different patterns of associations in a present-day sample of children and young people.

Varying political and health systems may impact access to eating disorder diagnosis and treatment differently. For example, those in the US pointed to a lack of insurance coverage as a deterrent to receiving diagnosis and treatment;[270] however, the UK has a publicly funded healthcare system, so those from lower socioeconomic position experiencing eating disorder symptoms would not necessarily experience this barrier. Therefore, future research should investigate UK-specific barriers for diagnosis and treatment pathways for individuals from lower socioeconomic backgrounds, which would better inform service-level interventions. This could be done through mixed methods studies using cohort datasets linked to electronic health records to investigate 1) the treatment pathway of individuals from lower socioeconomic position who report disordered eating behaviours and 2) which factors

could act as a barrier to accessing treatment. Qualitative work should accompany quantitative work to investigate the lived experiences of young people with eating disorders from disadvantaged backgrounds.

Finally, future research should strive to conduct intervention trials to prevent eating disorder symptoms, targeting those from lower socioeconomic position. This could include testing whether early nutrition or school-based interventions buffer the risk that lower socioeconomic position poses on eating disorder symptoms.

5.6 Conclusion

The overarching goal of this thesis was to assess the role of childhood socioeconomic position and its secondary impacts on adolescent eating disorder symptoms. I found that eating disorders symptoms were more prevalent in those from lower socioeconomic position across all indicators. Out of the different socioeconomic indicators, financial hardship and parental educational attainment had independent associations with eating disorders and thus may be the strongest contributors to eating disorder aetiology. My findings on food insecurity highlight that researchers cannot ignore the role of deprivation when assessing the role of food insecurity in eating disorder aetiology. There is very little evidence that dietary patterns are a risk for or protective against eating disorder symptoms. These are important first steps into understanding preventative intervention for eating disorders.

These findings highlight the socioeconomic inequalities that are present in the population with eating disorders. These findings are important even if they may not examine diagnosed cases of eating disorders, as disordered eating behaviours, weight and shape concerns, and body dissatisfaction are not only risk factors for developing eating disorders[27] but also could have lasting mental and physical health impacts amongst young people.[23] Addressing this hidden dimension of health inequality could reshape prevention, widen clinical awareness, and ultimately reduce the individual, social, and public infrastructural burden of eating disorders in future generations.

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Supplementary materials

Table S1: Multilevel logistic and linear regression models for disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18 according to parental socioeconomic position, with varied adjustments for socioeconomic position indicators. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

			Disordered eating behaviour
	1: ethnicity and education	2: 1+ social class	3: 2+ income
Parental socioeconomic position indicators	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.06 (0.79 to 1.42), 0.690		
Skilled non-manual	1.14 (0.81 to 1.61), 0.445		
Skilled manual	1.10 (0.71 to 1.70), 0.659		
Semi-skilled/unskilled	1.47 (0.88 to 2.45), 0.143		
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.90 (0.70 to 1.16), 0.417	0.90 (0.70 to 1.15), 0.382	
3	0.88 (0.66 to 1.16), 0.349	0.86 (0.65 to 1.13), 0.286	
4	1.05 (0.79 to 1.39), 0.724	1.02 (0.77 to 1.36), 0.884	
Lowest 20%	1.03 (0.76 to 1.40), 0.836	0.99 (0.72 to 1.36), 0.944	
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.06 (1.03 to 1.09), <.0001	1.06 (1.03 to 1.09), <.0001	1.06 (1.03 to 1.09), <.001

Table S1 continued

			Weight and shape concerns
	1: ethnicity and education	2: 1+ social class	3: 2+ income
Parental socioeconomic position indicators	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	0.09 (-0.02 to 0.21), 0.103		
Skilled non-manual	0.10 (-0.04 to 0.24), 0.153		
Skilled manual	0.08 (-0.11 to 0.26), 0.398		
Semi-skilled/unskilled	0.11 (-0.14 to 0.36), 0.377		
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.004 (-0.10 to 0.11), 0.945	-0.003 (-0.11 to 0.10), 0.950	
3	0.04 (-0.07 to 0.16), 0.471	0.03 (-0.09 to 0.15), 0.594	
4	0.05 (-0.08 to 0.17), 0.461	0.04 (-0.10 to 0.17), 0.598	
Lowest 20%	-0.004 (-0.13 to 0.12), 0.943	-0.02 (-0.15 to 0.11), 0.789	
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	0.02 (0.01 to 0.03), 0.001	0.02 (0.01 to 0.3), 0.001	0.02 (0.01 to 0.04), 0.001

Table S2: Linear regression models for body dissatisfaction at age 14 according to parental socioeconomic position, with varied adjustments for socioeconomic position indicators. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

			Body dissatisfaction
Parental socioeconomic position indicators	1: ethnicity and education Mean differences (95% CI), p-value	2: 1+ social class Mean differences (95% CI), p-value	3: 2+ income Mean differences (95% CI), p-value
Highest parental social class			
Professional	Reference	-	-
Managerial	0.44 (-1.00 to 1.89), 0.543	-	-
Skilled non-manual	0.42 (-1.48 to 2.32), 0.663	-	-
Skilled manual	0.99 (-1.34 to 3.32), 0.401	-	-
Semi-skilled/unskilled	0.50 (-2.44 to 3.45), 0.735	-	-
Fifths of equivalised family income			
Highest 20%	Reference	Reference	-
2	0.42 (-0.96 to 1.81), 0.546	0.39 (-0.98 to 1.77), 0.672	-
3	-0.58 (-2.11 to 0.94), 0.449	-0.64 (-2.17 to 0.90), 0.412	-
4	1.73 (-0.08 to 3.54), 0.061	1.65 (-0.15 to 3.44), 0.071	-
Lowest 20%	0.04 (-1.67 to 1.74), 0.967	-0.06 (-1.74 to 1.62), 0.946	-
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	0.24 (0.09 to 0.38), 0.002	0.24 (0.09 to 0.38), 0.002	0.24 (0.09 to 0.40), 0.003

Table S3: Stratified odds ratio of adolescent disordered eating behaviours at age 14, 16, and 18, with varied adjustments for socioeconomic position indicators. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

			Disordered eating behaviours
Age	14	16	18
Parental socioeconomic position indicator	OR (95% CI)	OR (95% CI)	OR (95% CI)
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.03 (0.73 to 1.46)	1.16 (0.90 to 1.50)	0.96 (0.71 to 1.30)
Skilled non-manual	1.11 (0.76 to 1.63)	1.15 (0.84 to 1.58)	1.06 (0.74 to 1.53)
Skilled manual	1.21 (0.75 to 1.95)	1.23 (0.84 to 1.79)	0.88 (0.55 to 1.41)
Semi-skilled/unskilled	1.71 (1.04 to 2.85)	1.09 (0.67 to 1.79)	1.27 (0.77 to 2.08)
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.99 (071 to 1.39)	0.87 (0.70 to 1.09)	0.94 (0.73 to 1.21)
3	1.21 (0.87 to 1.68)	0.66 (0.66 to 1.10)	0.82 (0.62 to 1.08)
4	1.32 (0.93 to 1.87)	1.05 (0.80 to 1.36)	0.87 (0.64 to 1.19)
Lowest 20%	1.36 (0.96 to 1.94)	0.94 (0.72 to 1.24)	0.89 (0.63 to 1.25)
Financial hardship score	1.06 (1.02 to 1.09)	1.04 (1.02 to 1.07)	1.03 (1.00 to 1.06)

Table S4: Multilevel logistic regression models for binge eating, restrictive eating, and purging at age 14, 16, and 18, with varied adjustments for socioeconomic position indicators. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

			Binge eating
	1: ethnicity and education	2: 1+ social class	3: 2+ income
Parental socioeconomic position indicators	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	0.97 (0.63 to 1.49), 0.884		
Skilled non-manual	0.98 (0.58 to 1.64), 0.930		
Skilled manual	0.94 (0.50 to 1.75), 0.837		
Semi-skilled/unskilled	1.18 (0.55 to 2.53), 0.676		
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.85 (0.59 to 1.22), 0.366	0.85 (0.59 to 1.22), 0.379	
3	0.76 (0.50 to 1.14), 0.182	0.76 (0.51 to 1.15), 0.200	
4	1.10 (0.73 to 1.66), 0.655	1.11 (0.73 to 1.71), 0.623	
Lowest 20%	1.25 (0.79 to 1.98), 0.333	1.27 (0.78 to 2.07), 0.343	
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.06 (1.02 to 1.10), 0.006	1.06 (1.02 to 1.11), 0.008	1.05 (1.01 to 1.10), 0.021

Table S4 continued

			Restrictive eating
Parental socioeconomic position indicators	1: ethnicity and education OR (95% CI), p	2: 1+ social class OR (95% CI), p	3: 2+ income OR (95% CI), p
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.11 (0.80 to 1.54), 0.538		
Skilled non-manual	1.25 (0.86 to 1.81), 0.237		
Skilled manual	1.23 (0.78 to 1.96), 0.376		
Semi-skilled/unskilled	1.45 (0.78 to 2.71), 0.239		
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.95 (0.70 to 1.29), 0.739	0.94 (0.69 to 1.27), 0.676	
3	0.94 (0.69 to 1.28), 0.694	0.91 (0.67 to 1.23), 0.534	
4	0.97 (0.70 to 1.35), 0.869	0.92 (0.66 to 1.29), 0.634	
Lowest 20%	0.89 (0.63 to 1.25), 0.501	0.83 (0.58 to 1.18), 0.295	
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.04 (1.01 to 1.07), 0.005	1.04 (1.01 to 1.07), 0.008	1.05 (1.02 to 1.09), 0.003

Table S4 continued

			Purging
Parental socioeconomic position indicators	1: ethnicity and education Odds ratio (95% CI), p-value	2: 1+ social class Odds ratio (95% CI), p-value	3: 2+ income Odds ratio (95% CI), p-value
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.43 (0.76 to 2.70), 0.267		
Skilled non-manual	1.33 (0.61 to 2.93), 0.472		
Skilled manual	1.22 (0.45 to 3.33), 0.695		
Semi-skilled/unskilled	2.29 (0.75 to 7.05), 0.146		
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.77 (0.40 to 1.47), 0.431	0.76 (0.40 to 1.44), 0.393	
3	1.10 (0.56 to 2.16), 0.781	1.07 (0.55 to 2.08), 0.845	
4	1.19 (0.62 to 2.26), 0.601	1.13 (0.59 to 2.15), 0.712	
Lowest 20%	0.77 (0.37 to 1.61), 0.487	0.71 (0.34 to 1.510, 0.378	
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.06 (1.01 to 1.12), 0.025	1.06 (1.00 to 1.12), 0.039	1.07 (1.00 to 1.14), 0.029

Table S5: Multilevel logistic and linear regression models for disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18 according to parental socioeconomic position, adjusted for maternal characteristics. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

	Disordered eating behaviours		Weight and shape concerns	
Parental socioeconomic position	1: Adjusted for maternal characteristics Odds ratios (95% CI), p-value	2: 1+ adjusted for socioeconomic position indicator Odds ratios (95% CI), p-value	1: Adjusted for maternal characteristics Mean difference (95% CI), p	2: 1+ adjusted for ethnicity, socioeconomic position indicator Mean difference (95% CI), p
Highest parental education				
University degree	Reference	Reference	Reference	Reference
A -level	1.25 (1.01 to 1.54), 0.037	1.26 (0.99 to 1.59), 0.059	0.06 (-0.04 to 0.15), 0.227	0.03 (-0.08 to 0.13), 0.615
Compulsory	1.54 (1.21 to 1.95),<.0001	1.52 (1.13 to 2.03), 0.006	0.07 (-0.04 to 0.17), 0.209	0.034 (-0.09 to 0.16), 0.697
Highest parental social class				
Professional	Reference	Reference	Reference	Reference
Managerial	1.18 (0.90 to 1.54), 0.235	1.03 (0.78 to 1.38), 0.833	0.10 (-0.01 to 0.20), 0.073	-0.02 (-0.13 to 0.08), 0.670
Skilled non-manual	1.33 (0.99 to 1.79), 0.056	1.07 (0.75 to 1.52), 0.716	0.11 (-0.01 to 0.23), 0.072	-0.001 (-0.12 to 0.12), 0.992
Skilled manual	1.24 (0.85 to 1.82), 0.261	0.94 (0.60 to 1.48), 0.803	0.08 (-0.08 to 0.24), 0.332	-0.02 (-0.16 to 0.12), 0.742
Semi-skilled/unskilled	1.64 (0.99 to 2.71), 0.056	1.20 (0.70 to 1.06), 0.512	0.10 (-0.12 to 0.32), 0.373	-0.12 (-0.26 to 0.02), 0.103
Fifths of equivalised family income				
Highest 20%	Reference	Reference	Reference	Reference
2	0.95 (0.75 to 1.21), 0.681	0.84 (0.66 to 1.08), 0.184	0.01 (-0.10 to 0.11), 0.881	0.08 (-0.03 to 0.20), 0.153
3	0.97 (0.75 to 1.25), 0.796	0.78 (0.59 to 1.03), 0.078	0.05 (-0.06 to 0.16), 0.342	0.09 (-0.06 to 0.23), 0.242
4	1.16 (0.88 to 1.52), 0.297	0.86 (0.64 to 1.16), 0.320	0.05 (-0.07 to0.18), 0.413	0.04 (-0.15 to 0.23), 0.648
Lowest 20%	1.07 (0.79 to 1.44), 0.657	0.73 (0.52 to 1.02), 0.064	-0.02 (-0.14 to 0.11), 0.806	0.07 (-0.19 to 0.32), 0.605
	OR (95% CI), p	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.05 (1.02 to 1.08), 0.001	1.05 (1.02 to 1.09), 0.003	0.02 (0.003 to 0.03), 0.011	0.02 (0.004 to 0.03), 0.014
Standardised Area-level deprivation score	1.03 (0.99 to 1.07), 0.062	1.03 (0.99 to 1.06), 0.142	0.01 (-0.004 to 0.03), 0.182	0.01 (-0.01 to 0.03), 0.199

Table S6: Linear regression models for body dissatisfaction at age 14 according to socioeconomic indicators, adjusted for maternal characteristics. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

		Body dissatisfaction
	1: Adjusted for maternal characteristics	2: 1+ adjusted for socioeconomic position indicator
Parental socioeconomic position indicators	Mean differences (95% CI), p-value	Mean differences (95% CI), p-value
Highest parental education		
University degree	Reference	Reference
A -level	0.25 (-0.87 to 1.38), 0.656	0.06 (-1.20 to 1.32), 0.925
Compulsory	1.06 (-0.25 to 2.38), 0.110	0.81 (-0.88 to 2.51), 0.343
Highest parental social class		
Professional	Reference	Reference
Managerial	0.58 (-0.78 to 1.94), 0.398	0.28 (-1.16 to 1.72), 0.699
Skilled non-manual	0.74 (-0.80 to 2.27), 0.342	0.17 (-1.72 to 2.06), 0.857
Skilled manual	1.22 (-0.83 to 3.27), 0.240	0.42 (-1.95 to 2.79), 0.725
Semi-skilled/unskilled	0.72 (-1.97 to 3.40), 0.596	-0.21 (-3.08 to 2.66), 0.885
Equivalised family income		
Highest 20%	Reference	Reference
2	0.47 (-0.88 to 1.82), 0.488	0.19 (-1.22 to 1.59), 0.794
3	-0.44 (-1.94 to 1.05), 0.558	-0.98 (-2.53 to 0.58), 0.214
4	1.82 (0.14 to3.51), 0.035	1.04 (-0.82 to 2.90), 0.269
Lowest 20%	-0.05 (-1.71 to 1.60), 0.950	-1.09 (-2.94 to 0.73), 0.246
	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	0.17 (0.02 to 0.33), 0.027	0.17 (0.01 to 0.33), 0.036
Standardised Area-level deprivation score	0.08 (-0.12 to 0.29), 0.421	0.08 (-0.14 to 0.30), 0.456

Table S7: Stratified odds ratio of adolescent disordered eating behaviours at age 14, 16, and 18 according to parental soceioconomic indicators, adjusted for maternal characteristics. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N = 7,824)

			Disordered eating behaviours
Age	14	16	18
Parental socioeconomic position indicator	OR (95% CI)	OR (95% CI)	OR (95% CI)
Parental highest educational attainment			
University degree	Reference	Reference	Reference
A-level	1.44 (1.04 to 1.99)	1.08 (0.97 to 1.34)	1.15 (0.90 to 1.48)
Compulsory	1.48 (1.05 to 2.10)	1.17 (0.90 to 1.52)	1.46 (1.08 to 1.98)
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.94 (0.69 to 1.32)	0.83 (0.66 to 1.04)	0.92 (0.71 to 1.18)
3	1.09 (0.78 to 1.53)	0.78 (0.60 to 1.01)	0.78 (0.59 to 1.04)
4	1.11 (0.78 to 1.58)	0.91 (0.69 to 1.20)	0.80 (0.58 to 1.10)
Lowest 20%	1.01 (0.70 to 1.47)	0.74 (0.55 to 1.00)	0.76 (0.52 to 1.10)
Financial hardship	1.05 (1.01 to 1.08)	1.03 (1.00 to 1.06)	1.03 (0.99 to 1.06)
Standardised area-level deprivation score	1.04 (1.00 to 1.08)	1.02 (0.99 to 1.06)	1.00 (0.97 to 1.04)

Table S8: Multilevel logistic regression models for binge eating, restrictive eating, and purging at age 14, 16, and 18 and their association with parental socioeconomic position, adjusted for maternal characteristics. Sample based on participants with complete parental socioeconomic data and imputed confounders and eating disorder outcomes (N=7,824)

		Binge eating
Parental socioeconomic position indicators	1: Adjusted for maternal characteristics Odds ratio (95% CI), p-value	2: 1+ adjusted for socioeconomic position indicator Odds ratio (95% CI), p-value
Highest parental education		
University degree	Reference	Reference
A -level	1.31 (0.92 to 1.87), 0.130	1.42 (0.96 to 2.11), 0.081
Compulsory	1.35 (0.94 to 1.93), 0.104	1.40 (0.91 to 2.16), 0.121
Highest parental social class		
Professional	Reference	Reference
Managerial	1.07 (0.72 to 1.61), 0.726	0.92 (0.59 to 1.42), 0.702
Skilled non-manual	1.14 (0.73 to 1.77), 0.573	0.88 (0.52 to 1.51), 0.650
Skilled manual	1.02 (0.56 to 1.83), 0.955	0.73 (0.37 to 1.91), 0.358
Semi-skilled/unskilled	1.22 (0.58 to 2.56), 0.593	0.84 (0.37 to 1.91), 0.675
Fifths of equivalised family income		
Highest 20%	Reference	Reference
2	0.88 (0.62 to 1.25), 0.465	0.81 (0.56 to 1.16), 0.247
3	0.82 (0.55 to 1.21), 0.312	0.70 (0.46 to 1.07), 0.100
4	1.14 (0.77 to 1.67), 0.521	0.93 (0.59 to 1.46), 0.749
Lowest 20%	1.17 (0.74 to 1.83), 0.500	0.90 (0.52 to 1.53), 0.684
	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.04 (0.99 to 1.08), 0.086	1.42 (0.96 to 2.10), 0.081
Standardised Area-level deprivation score	1.05 (1.00 to 1.11), 0.042	1.40 (0.91 to 2.16), 0.121

Table S8 continued

		Restrictive eating
Parental socioeconomic position indicators	1: Adjusted for maternal characteristics Odds ratio (95% CI), p-value	2: 1+ adjusted for socioeconomic position indicator Odds ratio (95% CI), p-value
Highest parental education		
University degree	Reference	Reference
A -level	1.19 (0.93 to 1.51), 0.161	1.14 (0.87 to 1.49), 0.337
Compulsory	1.53 (1.19 to 1.96), 0.001	1.47 (1.07 to 2.00), 0.016
Highest parental social class		
Professional	Reference	Reference
Managerial	1.22 (0.90 to 1.64), 0.198	1.11 (0.80 to 1.54), 0.540
Skilled non-manual	1.42 (1.04 to 1.95), 0.031	1.22 (0.83 to 1.77), 0.306
Skilled manual	1.39 (0.93 to 2.07), 0.112	1.17 (0.73 to 1.88), 0.509
Semi-skilled/unskilled	1.66 (0.92 to 2.98), 0.089	1.37 (0.72 to 2.62), 0.335
Fifths of equivalised family income		
Highest 20%	Reference	Reference
2	1.00 (0.75 to 1.35), 0.980	0.89 (0.66 to 1.21), 0.467
3	1.04 (0.78 to 1.38), 0.804	0.83 (0.61 to 1.13), 0.243
4	1.09 (0.80 to 1.48), 0.577	0.82 (0.59 to 1.15), 0.242
Lowest 20%	0.97 (0.70 to 1.33), 0.850	0.68 (0.47 to 0.99), 0.042
	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.04 (1.01 to 1.07), 0.006	1.04 (1.01 to 1.08), 0.008
Standardised Area-level deprivation score	0.99 (0.96 to 1.04), 0.957	1.00 (0.59 to 1.03), 0.791

Table S8 continued

	Purging	
Parental socioeconomic position indicators	1: Adjusted for maternal characteristics Odds ratio (95% CI), p-value	2: 1+ adjusted for socioeconomic position indicator Odds ratio (95% CI), p-value
Highest parental education		
University degree	Reference	Reference
A -level	1.03 (0.64 to 1.65), 0.906	0.97 (0.58 to 1.61), 0.895
Compulsory	1.57 (0.90 to 2.75), 0.112	1;43 (0.76 to 2.71), 0.267
Highest parental social class		
Professional	Reference	Reference
Managerial	1.46 (0.80 to 2.66), 0.220	1.37 (0.74 to 2.53), 0.313
Skilled non-manual	1.45 (0.70 to 3.01), 0.312	1.20 (0.56 to 2.59), 0.639
Skilled manual	1.31 (0.53 to 3.25), 0.553	1.01 (0.37 to 2.77), 0.981
Semi-skilled/unskilled	2.54 (0.84 to 7.65), 0.098	1.88 (0.60 to 5.83), 0.274
Fifths of equivalised family income		
Highest 20%	Reference	Reference
2	0.80 (0.42 to 1.53), 0.500	0.70 (0.37 to 1.32), 0.267
3	1.21 (0.64 to 2.28), 0.563	0.92 (0.47 to 1.80), 0.803
4	1.32 (0.71 to 2.46), 0.377	0.87 (0.45 to 1.70), 0.679
Lowest 20%	0.83 (0.39 to 1.78), 0.634	0.45 (0.20 to 1.02), 0.057
	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.06 (1.00 to 1.13), 0.041	1.06 (0.99 to 1.13), 0.075
Standardised Area-level deprivation score	1.10 (1.02 to 1.18), 0.011	1.10 (1.02 to 1.18), 0.018

Table S9: Multilevel logistic and linear regression models for disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18 according to parental socioeconomic position. Sample based on participants with complete parental socioeconomic data, confounders, and at least one available measurement across timepoints of eating disorder outcome

	Disordered eating behaviours (N=4,970)			Weight and shape concerns (N=4,640)		
Parental socioeconomic position	1: Univariable model Odds ratio (95% CI), p-value	2: 1+ Ethnicity Odds ratios (95% CI), p-value	3: 2+ remaining socioeconomic position indicator Odds ratios (95% CI), p-value	1: Univariable model Mean difference (95% CI), p-value	2: 1+ Ethnicity Mean difference (95% CI), p	3: 2+ remaining socioeconomic position indicator Mean difference (95% CI), p
Highest parental education						
University degree	Reference	Reference	Reference	Reference	Reference	Reference
A -level	1.25 (0.98 to 1.59)	1.25 (0.99 to 1.59)	1.21 (0.92 to 1.58)	0.05 (-0.03 to 0.13)	0.05 (-0.03 to 0.13)	0.01 (-0.08 to 0.10)
Compulsory	1.64 (1.29 to 2.09)	1.64 (1.29 to 2.09)	1.48 (1.09 to 2.00)	0.04 (-0.04 to 0.13)	0.04 (-0.04 to 0.13)	-0.01 (-0.11 to 0.10)
	p=0.0003	p=0.0003	p=0.042	p=0.412	p=0.399	p=0.916
Highest parental social class						
Professional	Reference	Reference	Reference	Reference	Reference	Reference
Managerial	1.12 (0.86 to 1.47)	1.12 (0.86 to 1.47)	1.00 (0.74 to 1.34)	0.11 (0.01 to 0.20)	0.11 (0.02 to 0.20)	0.10 (0.004 to 0.20)
Skilled non-manual	1.50 (1.11 to 2.02)	1.50 (1.11 to 2.02)	1.18 (0.83 to 1.68)	0.12 (0.02 to 0.22)	0.12 (0.02 to 0.22)	0.11 (-0.01 to 0.24)
Skilled manual	1.57 (1.06 to 2.31)	1.57 (1.06 to 2.31)	1.11 (0.71 to 1.95)	0.10 (-0.03 to 0.24)	0.10 (-0.03 to 0.24)	0.09 (-0.07 to 0.24)
Semi-skilled/unskilled	1.56 (0.88 to 2.75)	1.56 (0.88 to 2.75)	1.05 (0.57 to 1.95)	0.04 (-0.16 to 0.24)	0.04 (-0.17 to 0.24)	0.02 (-0.20 to 0.24)
	p=0.020	p=0.020	p=0.784	p=0.153	p=0.144	p=
Fifths of equivalised parental income						
Highest 20%	Reference	Reference	Reference	Reference	Reference	Reference
2	0.97 (0.74 to 1.28)	0.97 (0.74 to 1.29)	0.84 (0.63 to 1.11)	0.02 (-0.07 to 0.12)	0.02 (-0.07 to 0.12)	-0.80 (-2.66 to 1.07)
3	1.05 (0.78 to 1.41)	1.05 (0.78 to 1.41)	0.78 (0.57 to 1.06)	0.06 (-0.04 to 0.16)	0.06 (-0.04 to 0.16)	-1.95 (-4.02 to 0.11)
4	1.23 (0.92 to 1.65)	1.23 (0.92 to 1.65)	0.81 (0.58 to 1.12)	0.03 (-0.07 to 0.13)	0.03 (-0.07 to 0.13)	0.33 (-1.99 to 2.54)
Lowest 20%	1.29 (0.93 to 1.78)	1.29 (0.93 to 1.78)	0.74 (0.51 to 1.07)	-0.0004 (-0.11 to 0.11)	-0.002 (-0.11 to 0.11)	-1.56 (-4.08 to 0.96)
	p=0.318	p=0.322	p=0.480	p=0.829	p=0.972	p=0.177

Table S9 continued

	Disordered eating behaviours (N=4,970)			Weight and shape concerns (N=4,640)		
Parental socioeconomic position	1: Univariable model Odds ratio (95% CI), p-value	2: 1+ Ethnicity Odds ratios (95% CI), p-value	3: 2+ remaining socioeconomic position indicator Odds ratios (95% CI), p-value	1: Univariable model Mean difference (95% CI), p-value	2: 1+ Ethnicity Mean difference (95% CI), p	3: 2+ remaining socioeconomic position indicator Mean difference (95% CI), p
	Odds ratio (95% CI), p-value	Odds ratios (95% CI), p-value	Odds ratios (95% CI), p-value	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.08 (1.04 to 1.11), p<.0001	1.08 (1.04 to 1.11) p<.0001	**1.07 (1.03 to 1.10), <.0001**	0.02 (0.01 to 0.03), p<.0001	0.02 (0.01 to 0.030) p<.0001	0.31 (0.08 to 0.53) p=0.006
Standardised area-level deprivation score	1.05 (1.01 to 1.09), p=0.007	1.05 (1.01 to 1.09) p=0.010	**1.03 (0.99 to 1.07), 0.097**	0.01 (-0.002 to 0.02), p=0.113	0.01 (-0.003 to 0.02) p=0.138	0.04 (-0.22 to 0.29) 0.772

Table S10: Linear regression models for body dissatisfaction at age 14 according to parental socioeconomic position. Sample based on participants with complete parental socioeconomic data, confounders, and at least one available measurement of eating disorder outcome across timepoints (N=973)

			Body dissatisfaction
	1: Univariable model	2: 1+ Ethnicity	3: 2+ remaining socioeconomic position indicator
Parental socioeconomic position indicators	Odds ratios (95% CI), p-value	Odds ratios (95% CI), p-value	Odds ratios (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	0.31 (-1.27 to 1.90)	0.28 (-1.30 to 1.87)	0.17 (-1.65 to 2.00)
Compulsory education	1.54 (-0.08 to 3.16)	1.52 (-0.10 to 3.14)	0.98 (-1.10 to 2.06)
	p=0.138	p=0.140	p=0.564
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	0.16 (-1.62 to 1.94)	0.15 (-1.62 to 1.93)	-0.39 (-1.99 to 1.91)
Skilled non-manual	0.75 (-1.26 to 2.76)	0.73 (-1.28 to 2.74)	0.20 (-2.21 to 2.62)
Skilled manual	3.54 (1.05 to 6.03)	3.51 (1.02 to 6.00)	2.52 (-0.45 to 5.49)
Semi-skilled/unskilled	-0.34 (-4.37 to 3.69)	-0.36 (-4.39 to 3.67)	-1.73 (-6.13 to 2.66)
	p=0.040	p=0.042	p=0.195
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	-0.29 (-2.11 to 1.53)	-0.33 (-2.16 to 1.49)	-0.81 (-2.67 to 1.07)
3	-0.84 (-2.75 to 1.08)	-0.84 (-2.75 to 1.08)	-1.95 (-4.02 to 0.11)
4	2.14 (0.09 to 3.18)	2.11 (0.06 to 4.15)	0.33 (-1.99 to 2.64)
Lowest 20%	0.48 (-1.71 to 2.68)	0.42 (-1.78 to 2.62)	-1.56 (-4.08 to 0.96)
	p=0.080	p=0.084	p=0.177

Table S10 continued

			Body dissatisfaction
Parental socioeconomic position indicators	1: Univariable model Coefficient (95% CI), p-value	2: 1+ Ethnicity Coefficient (95% CI), p-value	3: 2+ remaining socioeconomic position indicator Coefficient (95% CI), p-value
Financial hardship score	0.35 (0.15 to 0.55) p=0.001	0/34 (0.14 to 0.54) p=0.001	0.31 (0.09 to 0.53) p=0.006
Standardised Area-level deprivation score	0.14 (-0.10 to 0.38) p=0.247	0.13 (-0.11 to 0.37) p=0.299	0.04 (-0.22 to 0.29) 0.772

Table S11: Stratified coefficient of adolescent weight and shape concerns at age 14 and 18 according to parental soceioconomic indicators. Sample based on participants with complete parental socioeconomic data, confounders, and at least one available measurement of weight and shape concerns across timepoints

		Weight and shape concerns
Age	14 (N=4,289)	18 (N=2,423)
Parental socioeconomic position indicator	Mean difference (95% CI)	Mean difference (95% CI)
Highest parental educational attainment		
University level	Reference	Reference
A-level	-0.07 (-0.31 to 0.18)	0.25 (-0.11 to 0.61)
Compulsory education	-0.24 (-0.51 to 0.03)	-0.09 (-0.49 to 0.61)

Table S12: Multilevel logistic regression models for binge eating, restrictive eating, and purging and their association with parental socioeconomic position at age 14, 16, and 18. Sample based on participants with complete parental socioeconomic data, confounders, and at least one available measurement of any disordered eating behaviours across timepoints (N=4,970)

			Binge eating
	1:Univariable model	2: 1+adjusted for ethnicity	3: 2+adjusted for ethnicity and socioeconomic position
Parental socioeconomic position indicators	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	1.30 (0.94 to 1.78)	1.29 (0.94 to 1.77)	1.37 (0.95 to 1.97)
Compulsory	1.24 (0.89 to 1.72)	1,24 (0.89 to 1.72)	1.23 (0.81 to 1.87)
	p=0.232	p=0.236	p=0.226
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.03 (0.72 to 1.45)	1.02 (0.72 to 1.45)	0.92 (0.62 to 1.35)
Skilled non-manual	1.11 (0.75 to 1.66)	1.11 (0.75 to 1.66)	0.92 (0.57 to 1.49)
Skilled manual	1.24 (0.74 to 2.10)	1.25 (0.74 to 2.10)	0.94 (0.51 to 1.72)
Semi-skilled/unskilled	1.08 (0.47 to 2.40)	1.09 (0.49 to 2.41)	0.79 (0.33 to 1.90)
	p=0.917	p=0.915	p=0.986
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.85 (0.59 to 1.24)	0.85 (0.59 to 1.23)	0.77 (0.53 to 1.13)
3	0.85 (0.57 to 1.27)	0.85 (0.57 to 1.27)	0.72 (0.47 to 1.10)
4	1.08 (0.73 to 1.60)	1.08 (0.73 to 1.60)	0.86 (0.55 to 1.33)
Lowest 20%	1.19 (0.78 to 1.83)	1.20 (0.78 to 1.83)	0.88 (0.53 to 1.46)
	p=0.476	p=0.467	p=0.556
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Financial hardship score	1.05 (1.01 to 1.09)	1.05 (1.01 to 1.09)	1.04 (1.00 to 1.09)
	p=0.019	p=0.018	p=0.056
Standardised Area-level deprivation score	1.04 (1.00 to 1.10)	1.05 (1.00 to 1.10)	1.04 (0.99 to 1.09)
	p=0.071	p=0.060	p=0.126

Table S12 continued

	Restrictive eating		
	1:Univariable model	2: 1+adjusted for ethnicity	3: 2+adjusted for ethnicity and socioeconomic position
Parental socioeconomic position indicators	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	1.21 (0.91 to 1.60)	1.21 (0.91 to 1.60)	1.10 (0.80 to 1.52)
Compulsory	1.85 (1.29 to 2.45) p<0.0001	1.85 (1.39 to 2.45) p<0.0001	1.57 (2.23
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.18 (0.86 to 1.63)	1.18 (0.86 to 1.63)	1.06 (0.75 to 1.50)
Skilled non-manual	1.78 (1.26 to 2.52)	1.78 (1.25 to 2.52)	1.41 (0.93 to 2.14)
Skilled manual	1.78 (1.13 to 2.79)	1.78 (1.13 to 2.79)	1.30 (0.77 to 2.19)
Semi-skilled/unskilled	1.74 (0.90 to 3.34) p=0.003	1.74 (0.90 to 3.35) p=0.003	1.21 (0.59 to 2.48) p=0.374
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	1.09 (0.79 to 1.51)	1.09 (0.79 to 1.51)	0.92 (0.66 to 1.28)
3	1.18 (0.84 to 1.66)	1.18 (0.84 to 1.66)	0.83 (0.57 to 1.19)
4	1.27 (0.90 to 1.79)	1.27 (0.90 to 1.79)	0.79 (0.54 to 1.16)
Lowest 20%	1.33 (0.91 to 1.94) p=0.531	1.33 (0.91 to 1.95) p=0.525	0.72 (0.46 to 1.12) p=0.623
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.07 (1.04 to 1.12) p<0.0001	1.07 (1.04 to 1.11) p<.001	1.06 (1.03 to 1.10) p=0.001
Standardised Area-level deprivation score	1.04 (0.99 to 1.08) p=0.088	1.04 (1.00 to 1.08) p=0.079	1.02 (0.97 to 1.06) p=0.464

Table S12 continued

			Purging
	1:Univariable model	2: 1+adjusted for ethnicity	3: 2+adjusted for ethnicity and socioeconomic position
Parental socioeconomic position indicators	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value	Odds ratio (95% CI), p-value
Highest parental education			
University degree	Reference	Reference	Reference
A -level	1.00 (0.63 to 1.60)	1.01 (0.63 to 1.61)	0.90 (0.53 to 1.53)
Compulsory	1.12 (0.69 to 1.81)	1.12 (0.69 to 1.82)	0.90 (0.49 to 1.66)
	p=0.867	p=0.866	p=0.919
Highest parental social class			
Professional	Reference	Reference	Reference
Managerial	1.15 (0.67 to 1.97)	1.15 (0.67 to 1.98)	1.25 (0.70 to 2.25)
Skilled non-manual	1.27 (0.69 to 2.32)	1.28 (0.70 to 2.34)	1.42 (0.69 to 2.91)
Skilled manual	1.59 (0.73 to 3.45)	1.57 (0.72 to 3.41)	1.78 (0.73 to 4.36)
Semi-skilled/unskilled	2.55 (0.90 to 7.24)	2.50 (0.88 to 7.08)	3.03 (0.95 to 0.67)
	p=0.427	p=0.454	p=0.421
Fifths of equivalised family income			
Highest 20%	Reference	Reference	Reference
2	0.78 (0.45 to 1.36)	0.78 (0.45 to 1.36)	0.70 (0.39 to 1.23)
3	1.29 (0.74 to 2.25)	1.29 (0.74 to 2.24)	1.03 (0.57 to 1.88)
4	1.06 (0.59 to 1.89)	1.06 (0.59 to 1.89)	0.72 (0.37 to 1.39)
Lowest 20%	0.59 (0.29 to 1.22)	0.58 (0.28 to 1.20)	**0.33 (0.14 to 0.75)**
	p=0.216	p=0.206	**p=0.031**
	Coefficient (95% CI), p value	Coefficient (95% CI), p value	Coefficient (95% CI), p value
Financial hardship score	1.05 (0.99 to .1.11)	1.05 (0.98 to 1.11)	1.05 (0.98 to 1.12)
	p=0.126	p=0.150	p=0.135
Standardised Area-level deprivation score	1.08 (1.00 to 1.15)	1.07 (0.99 to 1.15)	1.08 (1.00 to 1.16)
	p=0.041	p=0.065	p=0.052

Table S13: Association between food and other financial insecurity at age 7 and eating disorder symptoms at age 14, 16, and 18, adjusted for all confounders and the sum of remaining hardship indicators. Sample based on respondents with complete financial hardship data, imputed confounders, and outcomes (N=7,184)

			Fully adjusted model[a]
	Disordered eating behaviour[b]	Weight and shape concerns[c]	Body dissatisfaction[d]
Exposures	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Categorical exposure			
No food insecurity	Reference	Reference	Reference
Mild food insecurity	1.07 (0.76 to 1.50), 0.707	0.08 (-0.09 to 2.58), 0.349	0.15 (-1.73 to 2.03), 0.873
Moderate to severe food insecurity	1.12 (0.61 to 2.05), 0.714	0.10 (-0.17 to 0.37), 0.482	-1.25 (-4.81 to 2.31), 0.487
	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Food insecurity Linear exposure	1.06 (0.81 to 1.39), 0.664	0.06 (-0.07 to 0.19), 0.339	-0.30 (-1.76 to 1.16), 0.684
	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Clothing insecurity Categorical exposure			
No clothing insecurity	Reference	Reference	References
Mild clothing insecurity	1.03 (0.82 to 1.29), 0.815	-0.03 (-0.13 to 0.07), 0.527	1.25 (-0.09 to 2.58), 0.066
Moderate to severe clothing insecurity	0.88 (0.55 to 1.41), 0.584	-0.16 (-0.34 to 0.03), 0.091	1.65 (1.02 to 4.32), 0.221
	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Clothing insecurity Linear exposure	0.98 (0.80 to 1.19), 0.807	-0.05 (-0.13 to 0.03), 0.190	1.01 (-0.18 to 2.20), 0.093
	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Fuel insecurity Categorical exposure			
No fuel insecurity	Reference	Reference	Reference
Mild fuel insecurity	1.23 (0.89 to 1.68), 0.208	0.12 (-0.03 to 0.27), 0.116	0.51 (-1.87 to 2.90), 0.669
Moderate to severe fuel insecurity	1.40 (0.77 to 2.51), 0.266	0.22 (-0.05 to 0.49), 0.109	0.33 (-3.56 to 4.22), 0.865
	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Fuel insecurity Linear exposure	1.20 (0.93 to 1.55), 0.165	0.11 (-0.01 to 0.23), 0.064	0.30 (-1.54 to 2.14), 0.748
	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Housing insecurity Categorical exposure			
No housing insecurity	Reference	Reference	Reference
Mild housing insecurity	1.27 (0.95 to 1.69), 0.104	-0.003 (-0.15 to 0.14), 0.958	-0.58 (-2.26 to 1.11), 0.498
Moderate to severe housing insecurity	1.80 (1.07 to 3.02), 0.027	0.08 (-0.13 to 0.30), 0.454	0.036 (-3.31 to 3.38. 0.983

	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Housing insecurity Linear exposure	1.32 (1.04 to 1.66), 0.020	0.02 (-0.07 to 0.12), 0.630	-0.20 (-1.65 to 1.24), 0.781
	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Other essential goods insecurity Categorical exposure			
No other essential goods insecurity	Reference	Reference	Reference
Mild other essential goods insecurity	0.92 (0.70 to 1.21), 0.557	0.06 (-0.05 to 0.16), 0.294	0.08 (-1.39 to 1.54), 0.919
Moderate to severe other essential goods insecurity	0.091 (0.51 to 1.62), 0.747	0.02 (-0.23 to 0.27), 0.875	-0.09 (-3.18 to 3.01), 0.956
	OR (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Other essential goods insecurity Linear exposure	0.94 (0.72 to 1.21), 0.607	0.04 (-0.06 to 0.13), 0.459	0.03 (-1.31 to 1.36), 0.986

Model adjustments: a.Model adjusted for socioeconomic position, ethnicity, maternal characteristics, and sum of remaining financial insecurity indicators. Analyses conducted: [b]Multilevel logistic regression model. [c]Multievel linear regression model. [d]Linear regression model.

Table S14: Association between food and other financial insecurity at age 7 and binge eating, restrictive eating, and purging at age 14, 16, and 18, adjusted for all confounders and the sum of remaining financial insecurity indicators. Sample based on respondents with complete financial hardship data, imputed confounders, and outcomes (N=7,184)

			Fully adjusted model[a]
	Binge eating	Restrictive eating	Purging
Exposures	OR (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Categorical exposure			
No food insecurity	Reference	Reference	Reference
Mild food insecurity	0.96 (0.40 to 2.30), 0.930	0.99 (0.71 to 1.40), 0.977	1.24 (0.73 to 2.10), 0.422
Moderate to severe food insecurity	0.56 (0.13 to 2.37), 0.426	1.00 (0.52 to 1.94), 0.994	1.38 (0.52 to 3.67), 0.518
Food insecurity Linear exposure	1.20 (0.77 to 1.87), 0.411	1.00 (0.75 to 1.33), 0.999	0.84 (0.43 to 1.61), 0.589
Clothing insecurity Categorical exposure			
No clothing insecurity	Reference	Reference	References
Mild clothing insecurity	1.10 (0.78 to 1.53), 0.592	0.94 (0.74 to 1.21), 0.648	1.43 (0.81 to 2.55), 0.217
Moderate to severe clothing insecurity	1.20 (0.60 to 2.42), 0.600	0.72 (0.43 to 1.20), 0.206	1.06 (0.40 to 2.78), 0.906
Clothing insecurity Linear exposure	1.10 (0.81 to 1.48), 0.539	0.89 (0.71 to 1.11), 0.304	1.19 (0.77 to 1.84), 0.435
Fuel insecurity Categorical exposure			
No fuel insecurity	Reference	Reference	Reference
Mild fuel insecurity	0.94 (0.55 to 1.61), 0.820	1.43 (0.99 to 2.08), 0.056	1.14 (0.56 to 2.31), 0.712
Moderate to severe fuel insecurity	1.30 (0.54 to 3.13), 0.553	1.38 (0.69 to 2.75), 0.360	1.48 (0.41 to 5.30), 0.548
Fuel insecurity Linear exposure	1.07 (0.73 to 1.59), 0.722	1.27 (0.93 to 1.71), 0.127	1.20 (0.68 to 2.10), 0.522
Housing insecurity Categorical exposure			
No housing insecurity	Reference	Reference	Reference
Mild housing insecurity	1.05 (0.67 to 1.63), 0.491	1.41 (1.03 to 1.94), 0.033	0.83 (0.39 to 1.80), 0.641
Moderate to severe housing insecurity	1.32 (0.59 to 2.94), 0.491	1.96 (1.16 to 3.30), 0.012	1.98 (0.56 to 7.02), 0.286
Housing insecurity Linear exposure	1.12 (0.77 to 1.61), 0.558	1.41 (1.11 to 1.78), 0.005	1.22 (0.68 to 2.20), 0.506
Other essential goods insecurity Categorical exposure			
No other essential goods insecurity	Reference	Reference	Reference
Mild other essential goods insecurity	0.94 (0.64 to 1.40), 0.775	0.89 (0.66 to 1.20), 0.448	1.10 (0.62 to 1.94), 0.746
Moderate to severe other essential goods insecurity	1.05 (0.44 to 2.50), 0.914	0.78 (0.41 to 1.46), 0.432	0.97 (0.25 to 3.75), 0.961
Other essential goods insecurity Linear exposure	0.98 (0.69 to 1.40), 0.920	0.89 (0.67 to 1.17), 0.394	1.05 (0.60 to 1.82), 0.866

Model adjustments: a.Model adjusted for socioeconomic position, ethnicity, maternal characteristics, and sum of remaining financial insecurity indicators. Analyses conducted: [b]Multilevel logistic regression model. [c]Multievel linear regression model. [d]Linear regression model.

Table S15: Eating disorder symptoms at age 14, 16, and 18 and its association to food insecurity at age 7. Sample based on respondents with complete financial hardship data, confounders, and at least one available measurement of eating disorder outcomes across timepoints.

					Disordered eating behaviours (n=3,099)[a]
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	1.43 (0.91 to 2.25), 0.120	1.33 (0.84 to 2.11), 0.223	1.33 (0.84 to 2.11), 0.222	1.28 (0.81 to 2.03), 0.293	1.17 (0.68 to 2.03), 0.565
Moderate to severe food insecurity	2.86 (1.30 to 6.31), 0.009	2.75 (1.24 to 6.11), 0.013	2.74 (1.23 to 6.10), 0.013	2.56 (1.15 to 5.70), 0.022	2.11 (0.75 to 5.95), 0.157
Food insecurity Linear exposure	1.57 (1.16 to 2.14), 0.004	1.51 (1.10 to 2.07), 0.010	1.51 (1.10 to 2.06), 0.010	1.45 (1.06 to 1.99), 0.020	1.32 (0.85 to 2.06), 0.223
					Weight and shape concerns (N = 2,918)[b]
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Categorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	0.18 (0.02 to 0.34), 0.024	0.21 (0.04 to 0.37), 0.013	0.21 (0.04 to 0.37), 0.012	0.19 (0.02 to 0.35), 0.024	0.13 (-0.06 to 0.32), 0.186
Moderate to severe food insecurity	0.34 (0.04 to 0.65), 0.026	0.35 (0.05 to 0.66), 0.024	0.35 (0.05 to 0.66), 0.023	0.30 (-0.01 to 0.61), 0.057	0.17 (-0.20 to 0.55), 0.364
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Food insecurity Linear exposure	0.18 (0.07 to 0.29), 0.002	0.19 (0.08 to 0.30), 0.001	0.19 (0.08 to 0.30), 0.001	0.17 (0.05 to 0.28), 0.005	0.11 (-0.05 to 0.26), 0.177

Analyses conducted: [a]Multilevel logistic regression model. [b]Multievel linear regression model. [c]Linear regression model.

Table S15 continued

					Body dissatisfaction (n=624)[c]
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Food insecurity Cagetorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	0.43 (-2.53 to 3.39), 0.776	0.35 (-2.67 to 3.38), 0.818	0.48 (-2.54 to 3.50), 0.757	0.16 (-2.89 to 3.20), 0.920	-0.72 (-4.19 to 2.75), 0.683
Moderate to severe food insecurity	-1.68 (-7.95 to 4.60), 0.599	-1.80 (-8.22 to 4.63), 0.584	-1.66 (-8.07 to 4.75), 0.611	-1.72 (-8.16 to 4.72), 0.599	-3.51 (-10.8 to 3.77), 0.344
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Food insecurity Linear exposure	-0.17 (-2.36 to 2.02), 0.882	-0.23 (-2.39 to 2.03), 0.840	-0.14 (-2.39 to 2.11), 0.905	-0.32 (-2.60 to 1.95), 0.781	-1.21 (-4.03 to 1.62), 0.403

Analyses conducted: [a]Multilevel logistic regression model. [b]Multievel linear regression model. [c]Linear regression model

Table S16: Multilevel logistic regression models for disordered eating behaviours age 14, 16, and 18 and its association to other financial insecurity indicators at age 7. Sample based on respondents with complete financial hardship data, confounders, and at least one available measurement of any disordered eating behaviours across timepoints (N=3,099)

				Disordered eating behaviours	
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.15 (0.87 to 1.52), 0.338	1.09 (0.82 to 1.46), 0.550	1.09 (0.82 to 1.46), 0.553	1.02 (0.76 to 1.37), 0.885	0.90 (0.65 to 1.25), 0.535
Moderate to severe clothing insecurity	1.71 (1.10 to 2.64), 0.016	1.60 (1.02 to 2.51), 0.041	1.60 (1.02 to 2.51), 0.042	1.47 (0.93 to 2.31), 0.098	1.00 (0.51 to 1.92), 0.989
Clothing insecurity Linear exposure	1.25 (1.03 to 1.51), 0.021	1.20 (0.99 to 1.46), 0.068	1.20 (0.99 to 1.46), 0.069	1.14 (0.94 to 1.40), 0.193	0.95 (0.71 to 1.26), 0.711
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.40 (0.88 to 2.23), 0.151	1.33 (0.83 to 2.13), 0.238	1.33 (0.83 to 2.13), 0.237	1.25 (0.78 to 2.01), 0.352	1.13 (0.65 to 1.98), 0.665
Moderate to severe fuel insecurity	2.61 (1.24 to 5.47), 0.011	2.50 (1.18 to 5.30), 0.016	2.50 (1.18 to 5.29), 0.017	2.34 (1.11 to 4.96), 0.026	1.88 (0.70 to 5.01), 0.207
Fuel insecurity Linear exposure	1.53 (1.14 to 2.06), 0.005	1.48 (1.09 to 2.01), 0.012	1.48 (1.09 to 2.01), 0.012	1.42 (1.04 to 1.93), 0.026	1.27 (0.82 to 1.96), 0.282
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	1.41 (0.95 to 2.10), 0.089	1.38 (0.91 to 2.03), 0.137	1.36 (0.91 to 2.03), 0.135	1,32 (0.88 to 1.98), 0.172	1.37 (0.88 to 2.14), 0.163
Moderate to severe housing insecurity	3.05 (1.66 to 5.59), <.001	2.98 (1.61 to 5.50), <.001	2.98 (1.61 to 5.51), <.001	2.76 (1.49 to 5.12), 0.001	3.02 (1.39 to 6.58), 0.005
Housing insecurity Linear exposure	1.62 (1.26 to 2.08), <.001	1.58 (1.23 to 2.05), <.001	1.59 (1.23 to 2.05), <.001	1.53 (1.18 to 1.99), 0.001	1.48 (1.13 to 2.21), 0.008

Table S16 continued

	Disordered eating behaviours				
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Other essential goods insecurity Categorical exposure					
No other essential goods insecurity	Reference	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.16 (0.86 to 1.56), 0.332	1.08 (0.80 to 1.47), 0.607	1.08 (0.80 to 1.47), 0.611	1.02 (0.74 to 1.38), 0.923	0.89 (0.61 to 1.32), 0.571
Moderate to severe other essential goods insecurity	2.15 (1.26 to 3.65), 0.005	2.07 (1.20 to 3.58), 0.009	2.07 (1.19 to 3.58), 0.009	1.89 (1.08 to 3.29), 0.025	1.28 (0.52 to 3.16), 0.586
Other essential goods insecurity Linear exposure	1.32 (1.07 to 1.63), 0.010	1.27 (1.02 to 1.59), 0.036	1.27 (1.01 to 1.59), 0.037	1.21 (0.96 to 1.51), 0.114	0.97 (0.67 to 1.39), 0.850

Table S17: Multilevel linear regression models for weight and shape concerns at age 14 and 18 and its association to other financial insecurity indicators at age 7. Sample based on respondents with complete financial hardship data, confounders, and at least one available measurement of weight and shape concern outcome across timepoints (N = 2,918)

				Weight and shape concern	
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	0.04 (-0.05 to 0.13), 0.403	0.04 (-0.05 to 0.14), 0.379	0.04 (-0.05 to 0.14),0.368	0.03 (-0.06 to 0.13), 0.508	-0.04 (-0.15 to 0.07), 0.486
Moderate to severe clothing insecurity	0.14 (-0.01 to 0.29), 0.072	0.17 (0.01 to 0.33), 0.037	0.17 (0.01 to 0.33), 0.036	0.14 (-0.02 to 0.30), 0.095	-0.08 (-0.30 to 0.15), 0.511
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Clothing insecurity Linear exposure	0.06 (-0.01 to 0.12), 0.072	0.07 (0.001 to 0.14), 0.045	0.07 (0.002 to 0.14), 0.043	0.05 (-0.01 to 0.12), 0.116	-0.04 (-0.13 to 0.06), 0.431
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	0.21 (0.05 to 0.37), 0.009	0.25 (0.08 to 0.41), 0.003	0.24 (0.08 to 0.41), 0.003	0.22 (0.06 to 0.39), 0.008	0.20 (0.01 to 0.39), 0.040
Moderate to severe fuel insecurity	0.36 (0.08 to 0.64), 0.013	0.39 (0.11 to 0.67), 0.007	0.39 (0.11 to 0.68), 0.007	0.35 (0.07 to 0.64), 0.015	0.31 (-0.05 to 0.66), 0.091
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Fuel insecurity Linear exposure	0.19 (0.09 to 0.30), <.001	022 (0.11 to 0.33), <.001	0.22 (0.11 to 0.33), <.001	0.20 (0.08 to 0.31), 0.001	0.17 (0.02 to 0.33), 0.025

Table S17 continued

	Weight and shape concern				
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	0.11 (-0.03 to 0.25), 0.112	0.13 (-0.01 to 0.27), 0.071	0.13 (-0.01 to 0.27), 0.073	0.11 (-0.03 to 0.25), 0.115	0.08 (-0.08 to 0.23), 0.336
Moderate to severe housing insecurity	0.34 (0.11 to 0.57), 0.004	0.36 (0.13 to 0.60), 0.002	0.36 (0.13 to 0.60), 0.002	0.32 (0.08 to 0.56), 0.008	0.23 (-0.06 to 0.51), 0.117
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Housing insecurity Linear exposure	0.14 (0.05 to 0.27), 0.002	0.16 (0.07 to 0.25), 0.001	0.16 (0.07 to 0.25), 0.001	0.14 (0.05 to 0.23), 0.004	0.10 (-0.02 to 0.22), 0.112
Other essential goods insecurity Categorical exposure					
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
No other essential goods insecurity	Reference	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	0.08 (-0.02 to 0.18), 0.105	0.10 (-0.01 to 0.20), 0.069	0.10 (-0.01 to 0.20), 0.067	0.08 (-0.02 to 0.19), 0.119	0.01 (-0.12 to 0.14), 0.887
Moderate to severe other essential goods insecurity	0.20 (0.002 to 0.39), 0.047	0.25 (0.05 to 0.45), 0.015	0.25 (0.05 to 0.45), 0.014	0.20 (-0.004 to 0.40), 0.055	-0.02 (-0.33 to 0.29), 0.904
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Other essential goods insecurity Linear exposure	0.09 (0.02 to 0.16), 0.016	0.11 (0.03 to 0.19), 0.005	0.11 (0.03 to 0.19), 0.005	0.09 (0.01 to 0.17), 0.024	0.003 (-0.12 to 0.13), 0.954

Table S18: Linear regression models for body dissatisfaction and its association to other financial insecurity indicators at age 14. Sample based on respondents with complete financial hardship data, confounders, and body dissatisfaction outcomes (N=624)

					Body dissatisfaction
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.13 (-0.64 to 2.91), 0.211	1.36 (-0.53 to 3.26), 0.157	1.35 (-0.54 to 3.23), 0.160	1.04 (-0.87 to 2.95), 0.286	1.58 (-0.68 to 3.83), 0.170
Moderate to severe clothing insecurity	1.94 (-1.03 to 4.92), 0.200	2.19 (-0.93 to 5.30), 0.168	2.29 (-0.81 to 5.39), 0.147	1.80 (-1.34 to 4.94), 0.262	3.22 (-1.24 to 7.67), 0.170
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Clothing insecurity Linear exposure	1.03 (-0.20 to 2.27), 0.101	1.19 (-0.14 to 2.53), 0.080	1.22 (-0.11 to 2.55), 0.072	0.95 (-0.41 to 2.31), 0.170	1.40 (-0.50 to 3.30), 0.149
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.02 (-1.93 to 3.98), 0.497	0.58 (-2.51 to 3.67), 0.714	0.51 (-2.57 to 3.59), 0.746	0.16 (-3.00 to 3.32), 0.922	-0.67 (-4.28 to 3.03), 0.721
Moderate to severe fuel insecurity	0.04 (-5.69 to 5.78), 0.988	-0.31 (-6.14 to 5.52), 0.918	-0.21 (-6.02 to 5.59), 0.942	-0.44 (-6.25 to 5.37), 0.881	-1.91 (-8.64 to 4.82), 0.577
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Fuel insecurity Linear exposure	0.51 (-1.59 to 2.61), 0.635	0.19 (-2.01 to 2.39), 0.866	0.18 (-2.01 to 2.37), 0.871	-0.05 (-2.28 to 2.18) 0.965	-0.83 (-3.70 to 2.03), 0.567

Table S18 continued

					Body dissatisfaction
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	-0.11 (-2.63 to 2.40), 0.929	-0.18 (-2.79 to 2.43), 0.893	-0.18 (-2.79 to 2.42), 0.889	-0.40 (-3.03 to 2.22), 0.764	-1.00 (-3.92 to 1.92), 0.501
Moderate to severe housing insecurity	0.78 (-3.81 to 5.37), 0.739	0.61 (-4.06 to 5.27), 0.798	0.71 (-3.94 to 5.37), 0.763	0.04 (-4.68 to 4.75), 0.988	-1.07 (-6.34 to 4.20), 0.691
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Housing insecurity Linear exposure	0.16 (-1.56 to 1.91), 0.856	0.09 (-1.71 to 1.90), 0.920	0.12 (-1.68 to 1.92), 0.896	-0.17 (-2.00 to 1.67), 0.858	-0.73 (-2.93 to 1.47) 0.512
Other essential goods insecurity Categorical exposure					
	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p	MD (95% CI), p
No other essential goods insecurity	Reference	Reference	Reference	Reference	Reference
Mild other essential goods insecurity	1.06 (-0.83 to 2.95), 0.272	1.39 (-0.64 to 3.41), 0.179	1.39 (-0.62 to 3.41), 0.175	1.06 (-1.00 to 3.11), 0.313	0.96 (-1.78 to 3.70), 0.491
Moderate to severe other essential goods insecurity	0.76 (-3.21 to 4.72), 0.708	0.48 (-3.61 to 4.57), 0.819	0.59 (-3.49 to 4.67), 0.777	0.04 (-4.10 to 4.18), 0.986	-0.18 (-602 to 5.66), 0.952
	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p	Coefficient (95% CI), p
Other essential goods insecurity Linear exposure	0.74 (-0.71 to 2.18), 0.316	0.82 (-0.73 to 2.37), 0.298	0.85 (-0.69 to 2.39), 0.279	0.54 (-1.03 to 2.12), 0.498	0.51 (-1.97 to 2.99), 0.687

Table S19: Multilevel logistic regression models for binge eating, restrictive eating, and purging and its association to food insecurity and other financial insecurity indicators at age 14, 16, and 18. Sample based on respondents with complete financial hardship data, confounders, and at least one available measurement of any disordered eating behaviours outcome across timepoints (N=3,099)

					Binge eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Food insecurity Categorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	1.37 (0.74 to 2.55), 0.315	1.27 (0.73 to 2.58), 0.326	1.37 (0.73 to 2.58), 0.327	1.34 (0.71 to 2.53), 0.366	1.40 (0.66 to 3.00), 0.383
Moderate to severe food insecurity	2.28 (0.79 to 6.57), 0.126	2.32 (0.79 to 6.83), 0.125	2.35 (0.80 to 6.90), 0.121	2.26 (0.76 to 6.71), 0.141	2.50 (0.60 to 10.4), 0.207
Food insecurity Linear exposure	1.45 (0.96 to 2.19), 0.078	1.46 (0.95 to 2.23), 0.083	1.46 (0.95 to 2.24), 0.081	1.43 (0.93 to 2.21), 0.103	1.50 (0.66 to 2.99), 0.383
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.12 (0.76 to 1.65), 0.576	1.11 (0.74 to 1.66), 0.609	1.11 (0.74 to 1.67), 0.599	1.08 (0.72 to 1.62), 0.707	1.10 (0.66 to 1.84), 0.705
Moderate to severe clothing insecurity	1.60 (0.89 to 2.90), 0.119	1.61 (0.86 to 2.98), 0.134	1.61 (0.87 to 3.00), 0.130	1.56 (0.83 to 2.91), 0.167	1.64 (0.58 to 4.63), 0.346
Clothing insecurity Linear exposure	1.21 (0.94 to 1.57), 0.144	1.21 (0.92 to 1.59), 0.169	1.22 (0.93 to 1.61), 0.148	1.19 (0.90 to 1.57), 0.224	1.19 (0.75 to 1.89), 0.470
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	0.99 (0.50 to 1.94), 0.975	0.94 (0.47 to 1.88), 0.868	0.94 (0.47 to 1.88), 0.862	0.89 (0.44 to 1.79), 0.742	0.74 (0.32 to 1.71), 0.483
Moderate to severe fuel insecurity	1.82 (0.65 to 5.08), 0.252	1.82 (0.64 to 5.18), 0.263	1.83 (0.64 to 5.21), 0.258	1.77 (0.62 to 5.05), 0.289	1.21 (0.30 to 4.97), 0.788
Fuel insecurity Linear exposure	1.20 (0.79 to 1.83), 0.398	1.18 (0.76 to 1.83), 0.461	1.19 (0.77 to 1.84), 0.440	1.14 (0.73 to 1.79), 0.552	0.95 (0.50 to 1.80), 0.869

Table S19 continued

					Binge eating
	1: Univariable analysis	**2:1+socioeconomic position**	**3:2+ethnicity**	**4:3+maternal characteristics**	**5: 4+financial hardship**
Exposure	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p	OR (95% CI), p
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	0.96 (0.53 to 1.72), 0.884	0.95 (0.53 to 1.72), 0.870	0.95 (0.52 to 1.72), 0.858	0.92 (0.51 to 1.68), 0.793	0.88 (0.44 to 1.74), 0.707
Moderate to severe housing insecurity	2.00 (0.87 to 4.62), 0.103	2.01 (0.86 to 4.71), 0.107	2.01 (0.86 to 4.72), 0.107	1.93 (0.82 to 4.56), 0.132	1.71 (0.53 to 5.53), 0.369
Housing insecurity Linear exposure	1.24 (0.87 to 1.77), 0.244	1.24 (0.86 to 1.78), 0.257	1.24 (0.86 to 1.79), 0.254	1.21 (0.83 to 1.75), 0.320	1.12 (0.66 to 1.90), 0.679
Item insecurity Categorical exposure					
No item insecurity	Reference	Reference	Reference	Reference	Reference
Mild item insecurity	1.08 (0.71 to 1.63), 0.721	1.06 (0.69 to 1.62), 0.792	1.06 (0.69 to 1.63), 0.783	1.03 (0.67 to 1.58), 0.902	1.60 (0.53 to 4.84), 0.410
Moderate to severe item insecurity	1.67 (0.80 to 3.47), 0.172	1.72 (0.80 to 3.69), 0.165	1.73 (0.80 to 3.70), 0.162	1.64 (0.76 to 3.58), 0.210	5.30 (0.46 to 60.7), 0.180
Item insecurity Linear exposure	1.19 (0.89 to 1.60), 0.243	1.19 (0.87 to 1.63), 0.271	1.20 (0.88 to 1.64), 0.251	1.16 (0.84 to 1.60), 0.361	1.80 (0.62 to 5.26), 0.280

Table S19 continued

					Restrictive eating
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p	**5: 4+financial hardship** OR (95% CI), p
Food insecurity Categorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	1.34 (0.82 to 2.22), 0.246	1.21 (0.73 to 2.02), 0.455	1.22 (0.73 to 2.03), 0.448	1.17 (0.70 to 1.95), 0.547	1.07 (0.59 to 1.97), 0.820
Moderate to severe food insecurity	2.34 (0.99 to 5.52), 0.053	2.18 (0.92 to 5.19), 0.077	2.17 (0.91 to 5.16), 0.079	2.00 (0.84 to 4.78), 0.118	1.65 (0.53 to 5.14), 0.386
Food insecurity Linear exposure	1.45 (1.03 to 2.02), 0.031	1.36 (0.97 to 1.92), 0.079	1.36 (0.97 to 1.92), 0.079	1.31 (0.92 to 1.84), 0.131	1.18 (0.72 to 1.93), 0.500
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.08 (0.79 to 148), 0.634	1.02 (0.74 to 1.41), 0.895	1.02 (0.74 to 1.41), 0.898	0.94 (0.68 to 1.30), 0.710	0.79 (0.53 to 1.19), 0.265
Moderate to severe clothing insecurity	1.60 (0.99 to 2.58), 0.053	1.47 (0.90 to 2.41),0.125	1.47 (0.89 to 2.41), 0.128	1.32 (0.80 to 2.17), 0.278	0.83 (0.36 to 1.92), 0.661
Clothing insecurity Linear exposure	1.20 (0.97 to 1.48), 0.089	1.14 (0.92 to 1.42), 0.226	1.14 (0.92 to 1.42), 0.241	1.07 (0.86 to 1.34), 0.536	0.84 (0.58 to 1.23), 0.372
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	1.54 (0.94 to 2.53), 0.088	1.47 (0.89 to 2.44), 0.134	1.47 (0.89 to 2.44), 0.134	1.39 (0.83 to 2.31), 0.207	1.44 (0.76 to 2.72), 0.262
Moderate to severe fuel insecurity	2.37 (1.07 to 5.27), 0.033	2.24 (1.00 to 5.00), 0.050	2.23 (1.00 to 5.00), 0.051	2.09 (0.94 to 4.67), 0.072	2.26 (0.73 to 6.99), 0.159
Fuel insecurity Linear exposure	1.54 (1.12 to 2.12), 0.008	1.49 (1.07 to 2.06), 0.018	1.48 (1.07 to 2.06), 0.018	1.42 (1.02 to 1.98), 0.036	1.48 (0.88 to 2.47), 0.136

Table S19 continued

					Restrictive eating
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p	**5: 4+financial hardship** OR (95% CI), p
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	1.50 (0.97 to 2.30), 0.067	1.43 (0.93 to 2.22), 0.106	1.44 (0.93 to 2.23), 0.106	1.40 (0.90 to 2.18), 0.130	1.66 (0.99 to 2.76), 0.054
Moderate to severe housing insecurity	2.04 (1.61 to 5.76), 0.001	2.93 (1.54 to 5.60), 0.001	2.95 (1.54 to 5.63), 0.001	2.71 (1.41 to 5.18), 0.003	4.04 (1.62 to 10.07), 0.003
Housing insecurity Linear exposure	1.65 (1.27 to 2.16), <.0001	1.61 (1.23 to 2.12), 0.001	1.61 (1.23 to 2.12), 0.001	1.56 (1.18 to 2.06), 0.002	1.86 (1.24 to 2.79), 0.003
Item insecurity Categorical exposure					
No item insecurity	Reference	Reference	Reference	Reference	Reference
Mild item insecurity	1.10 (0.79 to 1.53), 0.587	1.00 (0.71 to 1.42), 0.980	1.00 (0.71 to 1.41), 0.988	0.93 (0.66 to 1.31), 0.667	0.74 (0.45 to 1.21), 0.231
Moderate to severe item insecurity	1.85 (1.03 to 3.31), 0.038	1.73 (0.95 to 3.15), 0.074	1.73 (0.95 to 3.15), 0.075	1.54 (0.84 to 2.82), 0.165	0.84 (0.27 to 2.58), 0.761
Item insecurity Linear exposure	1.24 (0.98 to 1.57), 0.075	1.17 (0.91 to 1.50), 0.215	1.17 (0.91 to 1.50), 0.224	1.09 (0.l85 to 1.41), 0.493	0.79 (0.49 to 1.27), 0.325

Table S19 continued

					Purging
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p	**5: 4+financial hardship** OR (95% CI), p
Food insecurity Categorical exposure					
No food insecurity	Reference	Reference	Reference	Reference	Reference
Mild food insecurity	1.52 (0.52 to 4.48), 0 0.448	1.66 (0.53 to 5.20), 0.386	1.65 (0.52 to 5.19), 0.392	1.71 (0.54 to 5.41), 0.364	1.21 (0.31 to 4.73), 0.787
Moderate to severe food insecurity	2.54 (0.41 to 15.8), 0.317	2.56 (0.55 to 22.9), 0.181	3.63 (0.56 to 23.4), 0.175	3.81 (0.58 to 25.0), 0.164	1.70 (0.14 to 21.4), 0.681
Food insecurity Linear exposure	1.56 (0.76 to 3.21), 0.223	1.79 (0.84 to 3.80), 0.129	1.80 (0.85 to 3.83), 0.127	1.85 (0.86 to 3.99), 0.116	1.26 (0.42 to 3.80), 0.681
Clothing insecurity Categorical exposure					
No clothing insecurity	Reference	Reference	Reference	Reference	Reference
Mild clothing insecurity	1.42 (0.73 to 2.78), 0.305	1.50 (0.74 to 3.04), 0.266	1.50 (0.74 to 3.05), 0.264	1.52 (0.74 to 3.11), 0.258	1.17 (0.47 to 2.90), 0.739
Moderate to severe clothing insecurity	1.67 (0.58 to 4.79), 0.341	2.02 (0.66 to 6.24), 0.219	2.05 (0.66 to 6.32), 0.212	2.13 (0.68 to 6.65), 0.194	1.04 (0.15 to 7.12), 0.965
Clothing insecurity Linear exposure	1.34 (0.85 to 2.10), 0.208	1.45 (0.89 to 2.36), 0.140	1.45 (0.89 to 2.37), 0.137	1.48 (0.90 to 2.44), 0.126	1.10 (0.48 to 2.53), 0.821
Fuel insecurity Categorical exposure					
No fuel insecurity	Reference	Reference	Reference	Reference	Reference
Mild fuel insecurity	2.00 (0.70 to 5.73), 0.198	2.29 (0.75 to 6.97), 0.144	2.27 (0.74 to 6.91), 0.149	2.46 (0.79 to 7.65), 0.121	2.34 (0.56 to 9.78), 0.245
Moderate to severe fuel insecurity	3.31 (0.66 to 16.76), 0.147	4.60 (0.86 to 24.60), 0.074	4.68 (0.88 to 25.07), 0.071	4.96 (0.91 to 27.00), 0.064	4.47 (0.38 to 52.77), 0.234
Fuel insecurity Linear exposure	1.88 (0.97 to 3.65), 0.061	2.19 (1.09 to 4.42), 0.028	2.20 (1.09 to 4.43), 0.028	2.30 (1.12 to 4.71), 0.023	2.19 (0.70 to 6.85), 0.178

Table S19 continued

					Purging
Exposure	**1: Univariable analysis** OR (95% CI), p	**2:1+socioeconomic position** OR (95% CI), p	**3:2+ethnicity** OR (95% CI), p	**4:3+maternal characteristics** OR (95% CI), p	**5: 4+financial hardship** OR (95% CI), p
Housing insecurity Categorical exposure					
No housing insecurity	Reference	Reference	Reference	Reference	Reference
Mild housing insecurity	1.00 (0.36 to 2.78), 0.998	1.02 (0.35 to 2.95), 0.972	1.01 (0.35 to 2.93), 0.989	1.05 (0.36 to 3.07), 0.932	0.73 (0.21 to 2.56), 0.627
Moderate to severe housing insecurity	2.41 (0.58 to 10.11), 0.228	3.31 (0.75 to 14.60), 0.113	3.34 (0.76 to 14.72), 0.111	3.50 (0.78 to 15.66), 0.102	1.44 (0.16 to 12.82), 0.746
Housing insecurity Linear exposure	1.34 (0.72 to 2.49), 0.352	1.50 (0.78 to 2.87), 0.223	1.49 (0.78 to 2.87), 0.227	1.54 (0.80 to 2.99), 0.199	0.98 (0.36 to 2.63), 0.969
Item insecurity Categorical exposure					
No item insecurity	Reference	Reference	Reference	Reference	Reference
Mild item insecurity	1.25 (0.61 to 2.56), 0.542	1.43 (0.66 to 3.06), 0.364	1.43 (0.67 to 3.09), 0.356	1.47 (0.67 to 3.19), 0.333	0.99 (0.53 to 1.85), 0.980
Moderate to severe item insecurity	2.93 (0.89 to 9.62), 0.077	3.99 (1.13 to 14.08), 0.031	4.04 (1.15 to 14.3), 0.030	4.27 (1.17 to 15.56), 0.028	1.49 (0.36 to 6.27), 0.583
Item insecurity Linear exposure	1.51 (0.91 to 2.49), 0.108	1.75 (.01 to 3.03), 0.046	1.76 (1.02 to 3.05), 0.043	1.81 (1.03 to 3.18), 0.040	1.05 (0.57 to 1.92), 0.874

Table S20: Multilevel logistic regression models for disordered eating behaviours at age 14, 16, and 18 and weight and shape concerns at age 14 and 18 and their association with dietary patterns at age 7. Sample based on respondents with complete data on dietary patterns, confounders, and at least one available eating disorder symptoms outcome measurement across timepoints.

	Disordered eating behaviours (n=2,917)	Weight and shape concerns (n= 2,753)
Dietary pattern	**OR (95% CI), p-value**	**Coefficient (95% CI), p value**
Varied-staple diet		
Model 1	1.02 (0.89 to 1.15), 0.813	-0.02 (-0.06 to 0.02), 0.354
Model 2	0.99 (0.88 to 1.13), 0.914	-0.03 (-0.07 to 0.01), 0.176
Model 3	1.03 (0.91 to 1.18), 0.606	-0.02 (0.07 to 0.02), 0.295
Model 4	1.05 (0.93 to 1.20), 0.415	-0.02 (-0.06 to 0.02), 0.349
Model 5	1.06 (0.93 to 1.21), 0.368	-0.02 (-0.06 to 0.02), 0.341
Model 6	1.06 (0.93 to 1.20), 0.387	-0.03 (-0.07 to 0.02), 0.230
Model 7	1.06 (0.93 to 1.20), 0.394	-0.02 (-0.06 to 0.02), 0.296
Model 8	1.05 (0.93 to 1.19), 0.449	-0.02 (-0.06 to 0.02), 0.302

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S20 continued

	Disordered eating behaviours (n=2,917)	Weight and shape concerns (n= 2,753)
Dietary pattern	**OR (95% CI), p-value**	**Coefficient (95% CI), p value**
Convenience-oriented diet		
Model 1	0.97 (0.85 to 1.11), 0.658	0.001 (-0.04 to 0.05), 0.956
Model 2	0.99 (0.87 to 1.14), 0.928	0.01 (-0.03 to 0.05), 0.602
Model 3	0.96 (0.84 to 1.10), 0.548	0.01 (-0.04 to 0.05), 0.811
Model 4	0.94 (0.82 to 1.08), 0.406	0.001 (-0.04 to 0.05), 0.969
Model 5	0.94 (0.82 to 1.08), 0.420	-0.001 (-0.05 to 0.04), 0.960
Model 6	0.93 (0.81 to 1.07), 0.295	-0.004 (-0.05 to 0.04), 0.864
Model 7	0.93 (0.81 to 1.07), 0.308	-0.01 (-0.05 to 0.04), 0.671
Model 8	0.93 (0.81 to 1.06), 0.281	-0.01 (-0.05 to 0.04), 0.672

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S20 continued

	Disordered eating behaviours (n=2,917)	Weight and shape concerns (n= 2,753)
Dietary pattern	**OR (95% CI), p-value**	**Coefficient (95% CI), p value**
Traditional British diet		
Model 1	0.96 (0.85 to 1.10), 0.582	0.02 (-0.02 to 0.07), 0.250
Model 2	0.92 (0.81 to 1.05), 0.212	0.01 (-0.03 to 0.05), 0.594
Model 3	0.92 (0.81 to 1.04), 0.201	0.01 (-0.03 to 0.05), 0.628
Model 4	0.92 (0.82 to 1.05), 0.209	0.01 (-0.03 to 0.05), 0.562
Model 5	0.93 (0.82 to 1.05), 0.245	0.01 (-0.03 to 0.05), 0.550
Model 6	0.91 (0.80 to 1.03), 0.124	0.004 (-0.04 to 0.04), 0.841
Model 7	0.89 (0.79 to 1.02), 0.099	0.01 (-0.03 to 0.05), 0.542
Model 8	0.90 (0.79 to 1.02), 0.097	0.01 (-0.03 to 0.05), 0.580

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S21: Linear regression models for body dissatisfaction at age 14 and dietary patterns at age 7. Sample based on respondents with complete data on dietary patterns, confounders, and body dissatisfaction outcome (N=576)

	Body dissatisfaction
Dietary pattern	**Coefficient (95% CI), p value**
Varied-staple diet	
Model 1	-0.10 (-0.91 to 0.71), 0.813
Model 2	-0.13 (-0.95 to 0.68), 0.745
Model 3	0.03 (-0.82 to 0.88), 0.949
Model 4	0.03 (-0.81 to 0.88), 0.941
Model 5	0.06 (-0.79 to 0.90), 0.890
Model 6	-0.04 (-0.86 to 0.78), 0.922
Model 7	-0.01 (-0.82 to 0.81), 0.983
Model 8	-0.04 (-0.86 to 0.78), 0.925

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S21 continued

Dietary pattern	Body dissatisfaction Coefficient (95% CI), p value
Convenience-oriented diet	
Model 1	0.51 (-0.36 to 1.38), 0.251
Model 2	0.51 (-0.36 to 1.38), 0.247
Model 3	0.29 (-0.64 to 1.22), 0.545
Model 4	0.29 (-0.63 to 1.21), 0.537
Model 5	0.25 (-0.67 to 1.18), 0.589
Model 6	0.18 (-0.72 to 1.07), 0.699
Model 7	0.08 (-0.83 to 0.98), 0.871
Model 8	0.05 (-0.86 to 0.96), 0.915

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S21 continued

Dietary pattern	Body dissatisfaction Coefficient (95% CI), p value
Traditional British diet	
Model 1	-0.75 (-1.62 to 0.13), 0.093
Model 2	-0.79 (-1.67 to 0.08), 0.075
Model 3	-0.72 (-1.61 to 0.18), 0.116
Model 4	-0.69 (-1.58 to 0.20), 0.129
Model 5	-0.63 (-1.53 to 0.26), 0.163
Model 6	-0.69 (-1.55 to 0.17), 0.118
Model 7	-0.54 (-1.43 to 0.35), 0.232
Model 8	-0.54 (-1.43 to 0.35), 0.234

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S22: Multilevel logistic regression models for binge eating, restrictive eating, and purging at age 14, 16, and 18 and its association with dietary patterns at age 7. Sample based on respondents with complete data on dietary patterns, confounders, and at least one available measurement of any disordered eating behaviour across timepoints. (n=2,917)

	Binge eating	Restrictive eating	Purging
Dietary pattern	**OR (95% CI), p-value**	**OR (95% CI), p-value**	**OR (95% CI), p-value**
Varied-staple diet			
Model 1	1.05 (0.89 to 1.25), 0.561	1.02 (0.88 to 1.19), 0.746	0.95 (0.71 to 1.27), 0.717
Model 2	1.03 (0.87 to 1.23), 0.697	1.01 (0.87 to 1.16), 0.916	0.91 (0.67 to 1.24), 0.553
Model 3	1.03 (0.86 to 1.23), 0.770	1.07 (0.92 to 1.25), 0.351	0.88 (0.64 to 1.21), 0.416
Model 4	1.03 (0.86 to 1.23), 0.755	1.10 (0.95 to 1.28), 0.197	0.87 (0.63 to 1.20), 0.383
Model 5	1.03 (0.86 to 1.24), 0.709	1.11 (0.95 to 1.29), 0.175	0.88 (0.64 to 1.21), 0.420
Model 6	1.03 (0.86 to 1.24), 0.721	1.11 (0.95 to 1.29), 0.178	0.89 (0.64 to 1.22), 0.457
Model 7	1.04 (0.87 to 1.24), 0.687	1.10 (0.95 to 1.28), 0.194	0.88 (0.64 to 1.21), 0.429
Model 8	1.03 (0.86 to 1.24), 0.722	1.10 (0.95 to 1.28), 0.218	0.87 (0.63 to 1.19), 0.380

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S22 continued

Dietary pattern	Binge eating OR (95% CI), p-value	Restrictive eating OR (95% CI), p-value	Purging OR (95% CI), p-value
Convenience-oriented diet			
Model 1	1.01 (0.84 to 1.21), 0.930	0.97 (0.82 to 1.13), 0.686	0.98 (0.73 to 1.33), 0.918
Model 2	1.02 (0.85 to 1.23), 0.795	0.99 (0.85 to 1.16), 0.882	1.02 (0.75 to 1.39), 0.899
Model 3	1.04 (0.86 to 1.26), 0.685	0.93 (0.79 to 1.09), 0.383	1.02 (0.74 to 1.41), 0.905
Model 4	1.03 (0.85 to 1.25), 0.753	0.91 (0.78 to 1.08), 0.266	1.02 (0.74 to 1.41), 0.910
Model 5	1.03 (0.85 to 1.24), 0.790	0.91 (0.77 to 1.07), 0.247	1.00 (0.72 to 1.39), 0.989
Model 6	1.02 (0.84 to 1.24), 0.837	0.90 (0.76 to 1.06), 0.202	0.99 (0.71 to 1.37), 0.952
Model 7	1.01 (0.83 to 1.23), 0.934	0.91 (0.77 to 1.07), 0.262	1.02 (0.73 to 1.42), 0.912
Model 8	1.01 (0.83 to 1.22), 0.972	0.91 (0.77 to 1.07), 0.240	1.01 (0.72 to 1.41), 0.956

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Table S22 continued

Dietary pattern	Binge eating OR (95% CI), p-value	Restrictive eating OR (95% CI), p-value	Purging OR (95% CI), p-value
Traditional British diet			
Model 1	0.91 (0.76 to 1.08), 0.283	0.98 (0.84 to 1.14), 0.785	0.94 (0.70 to 1.27), 0.704
Model 2	0.89 (0.74 to 1.06), 0.173	0.94 (0.81 to 1.09), 0.401	0.89 (0.65 to 1.22), 0.462
Model 3	0.89 (0.74 to 1.06), 0.179	0.93 (0.81 to 1.08), 0.371	0.91 (0.67 to 1.25), 0.568
Model 4	0.90 (0.75 to 1.07), 0.220	0.94 (0.81 to 1.08), 0.376	0.93 (0.68 to 1.26), 0.625
Model 5	0.90 (0.75 to 1.08), 0.232	0.94 (0.81 to 1.09), 0.430	0.92 (0.68 to 1.26), 0.619
Model 6	0.89 (0.75 to 1.06), 0.189	0.92 (0.80 to 1.06), 0.273	0.91 (0.67 to 1.23), 0.529
Model 7	0.90 (0.75 to 1.08), 0.268	0.90 (0.77 to 1.04), 0.163	0.85 (0.62 to 1.17), 0.332
Model 8	0.90 (0.75 to 1.08), 0.277	0.90 (0.77 to 1.05), 0.166	0.84 (0.60 to 1.16), 0.290

Model 1: univariable, Model 2: 1+ child ethnicity, Model 3: 2+income, area-level deprivation, educational attainment, social class, financial hardship, Model 4: 3+maternal history of eating disorders, pre-pregnancy body dissatisfaction, pre-pregnancy BMI, and maternal depressive symptoms, Model 5:4+child autistic traits and internalizing and externalizing symptoms , Model 6: 5+child BMI, Model 7: 6+feeding difficulties, parental feeding worries, and skipping meals, Model 8: 7+remaining dietary patterns at age 7

Appendices

Appendix 1 — Family Socioeconomic Position and Eating Disorder Symptoms Across Adolescence

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Family Socioeconomic Position and Eating Disorder Symptoms Across Adolescence

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Abstract

IMPORTANCE Adolescentswhoexperiencedchildhoodsocioeconomicdeprivationreportmore eating disorder symptoms compared with their counterparts with higher socioeconomic status but may have more barriers in receiving diagnoses and accessing eating disorder services.

OBJECTIVE Toinvestigatetheassociationsofchildhoodsocioeconomicindicatorswitheating disorder symptoms across adolescence.

DESIGN, SETTING, AND PARTICIPANTS This prospective cohort study used a population-based sample from the Avon Longitudinal Study of Parents and Children (ALSPAC). ALSPAC recruited pregnant women in the former region of Avon, United Kingdom, with expected delivery dates from April 1, 1991, to December 31, 1992. This study used follow-up data of the mother-offspring collected until 2010. The final analytical sample included children who were alive at 1 year of age and who had complete exposures, retaining 1 twin at random. Data were analyzed from October 1, 2022, to November 25, 2024.

EXPOSURES Themainexposureswereparentalincome,education,occupation,financialhardship (range, 0-15; higher score indicates more hardship), reported by mothers between 32 weeks' gestation and 47 months postpartum, and area-level deprivation, derived from the Office for National Statistics indicators linked to the participant's residential post code at 32 weeks' gestation.

MAIN OUTCOMES AND MEASURE Primary outcomes were disordered eating, weight and shape concerns, and body dissatisfaction at ages 14, 16, and 18 years. Individual disordered eating behavior was a secondary outcome.

RESULTS Thesampleincluded7824participants(4003[51.1%]male).A1-pointincreaseinfinancial hardship was associated with increased odds of disordered eating (odds ratio [OR], 1.06; 95% CI, 1.04-1.10), an increase in weight and shape concerns (coefficient, 0.02 (95% CI, 0.01-0.04), and an increase in body dissatisfaction (coefficient, 0.22 (95% CI, 0.06-0.37). Lower parental education was associated with higher odds of disordered eating (OR, 1.80; 95% CI, 1.46 to 2.23).

CONCLUSIONS AND RELEVANCE This cohort study using ALSPAC data found that eating disorder symptoms were more common in individuals experiencing socioeconomic deprivation. Potential socioeconomic inequalities in eating disorder presentation and diagnosis in clinical settings require further investigation. Reducing population-level socioeconomic inequalities could also aid eating disorder prevention.

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Key Points

Question Arefamilysocioeconomic factors associated with eating disorder symptoms among adolescents?

Findings Thiscohortstudyincluding 7824 participants found adolescents from more deprived backgrounds were at highest risk of eating disorder symptoms, especially those whose parents reported difficulties in affording cost of essential material goods. Children of parents who had only compulsory educations were also at highest risk of developing disordered eating compared with children of parents who were had university educations.

Meaning Thesefindingssuggestthat reducing socioeconomic inequalities could also help prevent eating disorders in the general population.

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Introduction

Socioeconomic deprivation is a major determinant of poor mental and physical health in children.1,2 In the UK, 1 in 3 children live in poverty, with increasing proportions living in extreme poverty.3 Children from the most deprived households experience a higher prevalence of mental health problems, such as depression and anxiety, compared with those living in the least deprived households.1-3

In contrast, it is often believed that eating disorders are more common in people with families from higher socioeconomic positions,2,4,5 but evidence supporting this association is mixed. Most longitudinal register-based studies, where diagnoses are derived from clinical records, find a higher incidence of eating disorders in people whose parents had higher income and education and who lived in more affluent areas.2,4-10 Conversely, cross-sectional11-14 studies either find no evidence of any differences in the distribution of self-reported eating disorder symptoms by parental socioeconomic position12,15,16 or find increased risk of these symptoms in people from more deprived backgrounds.11,13,14,16-22 Longitudinal population studies found that individuals with lower personal socioeconomic position in adulthood or children from parents with lower educational attainment, greater financial hardship, or from lower overall socioeconomic position reported more eating disorder symptoms.15-22

Nevertheless, the literature has several limitations. Findings from register-based studies may be affected by selection bias if people from more deprived backgrounds experience barriers in accessing eating disorder services.11,23 On the other hand, investigating self-reported symptoms in general population samples reduces this risk, but it can still inform us on etiology of eating disorders. Longitudinal studies either used a long follow-up spanning into adulthood2,4,21,22 or, when focusing on young people, did not include the peak time of eating disorder symptom onset (age approximately 16 years),15-18,20,24 which could affect findings if early onset cases are underpinned by different etiological mechanisms.25 Most studies adjusted their analyses for factors that are potentially on the causal pathway between family socioeconomic position and offspring eating disorder, such as adverse life experiences22 or offspring's body mass index (BMI),16,18,19,21,22 which can bias results. Finally, existing studies used either a single measure of socioeconomic position or composite indices, but exploring a wide range of socioeconomic indicators may be more helpful to develop future preventative strategies. In this study, we investigated the longitudinal association of parental income, occupation, education, financial hardship, and area-level deprivation in early childhood with adolescent eating disorder symptoms in a large UK general-population cohort.

Methods

Sample

This cohort study used data from the Avon Longitudinal Study of Parents and Children (ALSPAC). Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees. Informed consent for the use of data collected via questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time. This report follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cohort studies.

ALSPAC is a birth cohort study that recruited 14 541 pregnant women in the former region of Avon, UK, with expected delivery dates from April 1, 1991, to December 31, 1992. Of these pregnancies, 14 062 (96.1%) resulted in live births and 13 988 children (93.8%) were alive at 1 year.26,27 In this study, we included children from this original sample who had data available on all the exposures. In the case of twins, we retained 1 child at random to avoid potential overestimation of associations due to clustering of environmental and genetic risk.

Outcomes

We used 3 different outcomes capturing behavioral and cognitive symptoms of eating disorders. We defined disordered eating as a binary variable based on whether adolescents reported any binge eating, purging, or restrictive eating (excessive dieting and fasting) or none of these behaviors in the previous 12 months at ages 14, 16, and 18 years using modified questions from the validated Youth Risk Behavior Surveillance System questionnaire,28 which has been used in previous literature.29 We used binge eating, purging, and restrictive eating individually as a secondary outcome to investigate their specific associations with socioeconomic position.

Body dissatisfaction was self-reported by adolescents at age 14 years using 11 items from the body satisfaction scale.30 Individual items were summed and ranged from 11 to 55, with higher scores indicating greater body dissatisfaction.

Weight and shape concerns were self-reported by adolescents at ages 14 and 18 years using 2 items from the McKnight Risk Factor survey.31 We summed the 2 items. The total score ranged from 0 to 6, with higher scores indicating greater concerns. Further details on all outcomes are provided in eMethods 1 in Supplement 1.

Exposures

We derived highest parental occupation (professional, managerial, skilled nonmanual, skilled manual, and semiskilled or unskilled manual) and highest parental education (university degree, A-level, compulsory education) from individual paternal and maternal measures as reported by the mother at 32 weeks of gestation. If either parent had missing data on these variables, or in cases of single-parent households, we used data on the available parent.

At 32 weeks' gestation, mothers were also asked how difficult they were finding it to afford food, heating, clothing, rent or mortgage, and items for their baby. Scores ranging from 0 to 15, with higher scores representing greater financial hardship.

Mothers reported weekly family income when the study child was ages 33 months and 47 months. We calculated mean parental income across these time points and weighted income by number of people within the household according to their age and estimated housing benefits using the Organisation for Economic Co-operation and Development modified scale and split into fifths.32 Mothers also provided residential post codes throughout gestation. These were linked to enumeration district codes (small census areas) and 1991 Census data Townsend deprivation index scores,33 which were subsequently standardized. Higher values indicate greater deprivation (eMethods 2 in Supplement 1).

Confounders

We identified potential confounders based on literature-informed a priori assumptions and using direct acyclic graphs to model our assumptions. In main analyses, we mutually adjusted each exposure for all other indicators of socioeconomic position, given their interconnectedness and intergenerationally (eFigure 1 in Supplement 1). We did not include child characteristics, as those are on the causal pathway between the socioeconomic position and eating disorder risk. We also hypothesized that maternal characteristics could be on the causal pathway between exposures and outcomes, as socioeconomic position in pregnancy could reflect earlier socioeconomic position and this could affect subsequent maternal socioeconomic indicators (eFigure 2 in Supplement 1). However, in sensitivity analyses, we tested competing causal assumptions and confounding structures. First, we hypothesized that some socioeconomic indicators could affect others, for instance, that education could affect subsequent income (eFigure 3 in Supplement 1).34 Second, we hypothesized that maternal characteristics35,36 could affect subsequent socioeconomic position; for instance, maternal history of eating disorders could affect the mother's educational attainment, since peak age onset of eating disorders coincides with adolescence (eFigure 4 in Supplement 1). In sensitivity analyses, given the small number of participants from minoritized ethnic groups (eg, Black African, Indian), we also additionally adjusted analyses for child's ethnicity as a proxy of parental

ethnicity, as people from minoritized ethnic groups face additional barriers that can affect their socioeconomic status and eating disorder risk (eMethods 3 in Supplement 1).34 The child was classified as being of minoritized ethnicity if either the mother or partner or both self-reported being from 1 of the following backgrounds: Bangladeshi, Black African, Black Caribbean, Chinese, Indian, Other Black, Other (not including White), and Pakistani.

Statistical Analysis

Protocol deviations are available in eMethods 4 in Supplement 1. We described sample characteristics overall and by levels of exposures using frequencies with proportions and means with SDs. For participants with complete exposure data, we compared the distribution of exposures and potential confounders between the full sample and participants who had missing outcome measures.

To investigate the association between each socioeconomic indicator and eating disorder symptoms, we used univariable and multivariable multilevel logistic (any and each individual disordered eating) and linear (for weight and shape concerns) regression models with time of outcome assessment nested within individuals. First, we ran an unconditional model only including a mean-centered indicator of age at outcome measurements to describe how the latter changed across adolescence. For disordered eating, where we had 3 measurements available, we also added a quadratic term for age to test for nonlinear associations with age, retaining this in the models if there was evidence of an association. Subsequently, we ran a univariable model for each exposure and a multivariable model, adjusting each exposure for all other indicators of socioeconomic position. For the any disordered eating and weight and shape concerns outcomes, we subsequently included an interaction between each exposure and age to investigate whether there were differential associations with the exposure based on timing of outcome measurement for any disordered eating and weight and shape concerns. We stratified results by age when we found evidence of an interaction.

To investigate associations with body dissatisfaction at age 14 years, we used univariable and multivariable linear regression models mutually adjusting each socioeconomic indicators for all other indicators. We imputed missing confounder and outcome data using multiple imputation by chained equations for participants with complete data on exposure. We imputed 50 datasets on the assumption that the data were missing at random using all the variables included in the final models and auxiliary variables (eMethods 5 in Supplement 1).

We ran 4 sets of sensitivity analyses. First, we further adjusted the main multivariable models for maternal marital status and history of eating disorders and depression. Second, we reran the main multivariable models adjusting parental occupation for parental education, family income for parental occupation and education, and financial hardship for family income and highest parental occupation and education. We also adjusted all the main analyses for participants' ethnicity to explore how ethnicity may confound our associations. To explore whether missing data patterns affected our effect sizes and estimates, we ran all our main analyses in a sample of participants with complete exposures and outcome (for body dissatisfaction) or at least 1 time point of outcome measurement available (for disordered eating and weight and shape concerns). Findings were interpreted with reference to effect sizes and CIs. Analyses were conducted using Stata software version 17 (StataCorp) from October 1, 2022, to November 25, 2024.

Results

Sample Characteristics

From the total sample of 13 988 ALSPAC children alive at 1-year, 7824 children (55.9%) had complete data on all exposures after removing 1 twin and were included in the analytical sample. There were 4003 (51.1%) male children; 294 children (3.8%) were from a minoritize ethnicity and 7420 children (96.2%) were White.

A large proportion of participants' parents had a managerial occupation (3404 children [43.5%]) and compulsory education as their highest educational qualification (3127 children [40.0%]) (**Table 1**) and were in the highest fifth of income categories (1704 children [21.8%]) (**Table 2**). Most families did not experience financial hardship (5981 children [76.4%]) and lived in areas of low deprivation (576 children [73.7%]) during pregnancy (Table 2).

The distribution of participants in terms of sex assigned at birth was comparable across all socioeconomic position indicators. Parents of children from minoritized ethnic background had lower income, experienced more financial hardship, and lived in higher deprivation areas. A greater proportion of participants with unmarried mothers reported more deprivation across all indicators. Mean levels of maternal depressive symptoms were progressively higher and mean maternal age lower in categories denoting more deprived backgrounds (Table 1 and Table 2). Outcome measurements were more commonly missing among participants from more deprived backgrounds across all socioeconomic indicators as well as in those with younger and single mothers as well as mothers with greater depressive symptoms. (eTable 1 in Supplement 1)

Descriptive Data of Eating Disorder Symptom

At 14 years, 338 participants (7.9%) experienced disordered eating. This proportion increased at age 16 years (574 participants [15.9%]) and at age 18 years (462 participants [18.9%]). At age 14 years, the mean (SD) weight and shape concern score was 1.7 (1.2) and 2.0 (1.5) at age 16 years. The mean body dissatisfaction score at age 14 years was 25.6 (10.3) (eTable 2 in Supplement 1).

Early-Life Socioeconomic Position and Adolescent Disordered Eating

All unconditional models are in eTable 3 and eTable 4 in Supplement 1. In univariable models, participants whose parents had only completed compulsory education (OR, 1.80; 95% CI, 1.46-2.23),

Table 1. Sample Characteristics by Parental Occupation and Education

Characteristic	Participants, No. (%)								
		Highest parental occupationa					Highest parental educationb		
	Analytical sample	Professional	Managerial	Skilled nonmanual	Skilled manual	Semiskilled or unskilled manual	University degree	Advanced level	Compulsory education
Total	7824 (100)	1153 (14.7)	3404 (43.5)	1996 (25.5)	883 (11.3)	388 (5.0)	1954 (25.0)	2743 (35.1)	3127 (40.0)
Sex									
Male	4003 (51.1)	593 (14.8)	1731 (43.2)	1036 (22.9)	452 (11.3)	191 (4.8)	989 (24.7)	1402 (35.0)	1612 (40.3)
Female	3821 (48.9)	560 (14.7)	1673 (43.8)	960 (25.1)	431 (11.3)	197 (5.2)	965 (25.3)	1341 (35.1)	1515 (39.6)
Ethnicity									
Minoritized ethnicityc	294 (3.8)	59 (20.1)	118 (40.1)	65 (22.1)	37(12.6)	15 (5.1)	93 (31.6)	92 (31.3)	109 (37.1)
White	7420 (96.2)	1086 (14.6)	3257 (43.9)	1895 (25.5)	830 (11.2)	352 (4.7)	1850 (24.9)	2626 (35.4)	2944 (39.7)
Maternal history of eating disordersd									
No	7411 (96.4)	1100 (14.9)	3219 (43.4)	1909 (25.8)	822 (11.1)	361 (4.9)	1850 (25.0)	2603 (35.1)	2958 (39.9)
Yes	277 (3.6)	38 (13.7)	139 (50.2)	55 (19.9)	30 (10.8)	15 (5.4)	84 (30.3)	101 (36.5)	92 (33.2)
Maternal marital statuse									
Married	6208 (80.2)	1043 (16.8)	2808 (45.2)	1555 (25.1)	582 (9.4)	220 (3.5)	1700 (27.4)	2245 (36.2)	2263 (36.4)
Not married	1530 (19.8)	106 (6.9)	568 (37.1)	417 (27.3)	277 (18.1)	162 (10.6)	244 (16.0)	476 (31.1)	810 (52.9)
Maternal age at birth of study child, mean (SD), y	28.7 (4.6)	31.0 (3.8)	29.8 (4.3)	27.7 (4.3)	27.5 (4.7)	27.1 (4.9)	31.3 (3.7)	29.1 (4.2)	27.4 (4.4)
Maternal depressive symptoms, mean (SD)e	6.59 (4.7)	5.58 (4.1)	6.21 (4.5)	6.49 (4.6)	7.3 (4.9)	7.72 (4.6)	5.8 (4.3)	6.3 (4.5)	6.8 (4.8)

[a] Among 2-parental households, 9.7% were missing data for 1 parent.

[b] Among 2-parental households, 3.0% were missing data for 1 parent.

[c] Child was classified as being of minoritized ethnicity if either the mother or partner or both reported being from 1 of the following backgrounds: Bangladeshi, Black African, Black Caribbean, Chinese, Indian, Other Black, Pakistani, and other (not including White).

[d] Maternal report at 12 weeks of pregnancy.

[e] Maternal report at 8 weeks of pregnancy.

[f] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy.

had a semiskilled or unskilled occupation (OR, 2.09; 95% CI, 1.32-3.34), and whose income was in the lowest fourth (OR, 1.35; 95% CI, 1.04-1.74) and fifth (OR, 1.34; 95% CI, 1.01-2.79) of income distribution had higher odds of experiencing disordered eating compared with adolescents whose parents had university-level education or a professional occupation and who were in the highest fifth of income distribution, respectively (**Table 3**). A 1-point increase in financial hardship score (OR, 1.07; 95% CI, 1.04-1.10) and a 1-SD increase in area-level deprivation (OR, 1.05; 95% CI, 1.02-1.09) were associated with higher odds of experiencing disordered eating in adolescence.

In the adjusted analyses, there was still strong evidence that adolescents whose parents only had compulsory education had higher odds of disordered eating compared to adolescents whose parents had university-level education (OR, 1.64; 95% CI, 1.24-2.16) and that a 1-point increase in financial hardship score (OR, 1.06; 95% CI, 1.03-1.09) was associated with higher odds of disordered eating (Table 3). The association between area-level deprivation and disordered eating was attenuated when adjusting for remaining socioeconomic conditions (OR, 1.03; 95% CI, 0.99-1.07). There was no evidence of an association for lower parental occupation and income. When investigating interactions between each exposure and age of outcome measurements, we found evidence of an interaction between income and age (P for interaction = .03), wherein children from lower income brackets experienced more disordered eating when they were younger (eTable 5 in Supplement 1).

Early-Life Socioeconomic Position and Adolescent Weight and Shape Concerns and Body Dissatisfaction

In univariable models, a 1-point increase in parental financial hardship score was associated with an increase in weight and shape concern score (coefficient, 0.02; 95% CI, 0.01-0.04) and body

Table 2. Sample Characteristics by Parental Income, Financial Hardship, and Area-Level Deprivation

Characteristic	Participants, No. (%)								
	Fifths of equivalized parental income					Financial hardshipa		Area-level deprivationb	
	Highest	Second	Third	Fourth	Lowest	No	Yes	Low deprivation	High deprivation
Total	1704 (21.8)	1670 (21.3)	1560 (19.9)	1535 (19.6)	1355 (17.3)	5981 (76.4)	1843 (23.6)	5762 (73.7)	2062 (26.4)
Sex									
Male	859 (21.4)	839 (21.0)	813 (20.3)	779 (19.5)	713 (17.8)	3.056 (76.3)	947 (22.7)	2956 (73.8)	1047 (26.2)
Female	845 (22.1)	831 (21.7)	747 (19.6)	756 (19.8)	642 (16.8)	2925 (76.5)	896 (23.5)	2806 (73.4)	1015 (26.6)
Ethnicityc									
Minoritized ethnicity	63 (21.4)	53 (18.0)	47 (16.0)	56 (19.0)	75 (25.5)	193 (65.7)	101 (34.4)	151 (51.4)	143 (48.6)
White	1632 (22.0)	1602 (21.6)	1491 (20.1)	1456 (19.6)	1239 (16.7)	5733 (77.3)	1687 (22.7)	5539 (74.6)	1881 (25.4)
Maternal history of eating disordersd									
No	1625 (21.9)	1591 (21.5)	1491 (20.1)	1458 (19.7)	1246 (16.8)	5699 (76.9)	1712 (23.1)	1928 (26.0)	5483 (74.0)
Yes	64 (23.1)	60 (21.7)	43 (15.5)	46 (16.6)	64 (23.1)	197 (71.1)	80 (28.9)	87 (31.4)	190 (68.6)
Maternal marital statuse									
Married	1492 (24.0)	1435 (23.1)	1298 (20.9)	1164 (18.8)	819 (13.2)	4949 (79.7)	1259 (20.3)	1344 (21.6)	4864 (78.4)
Not married	201 (13.1)	224 (14.7)	250 (16.3)	353 (23.1)	502 (32.8)	970 (63.4)	560 (36.6)	683 (44.6)	847 (55.4)
Maternal age at birth of study child, mean (SD)	30.8 (3.8)	29.7 (4.2)	28.5 (4.3)	28.4 (4.5)	27.6 (5.0)	28.2 (5.0)	29.5 (4.2)	29.4 (4.4)	28.2 (4.6)
Maternal depressive symptoms, mean (SD)f	5.44 (4.2)	6.09 (4.4)	6.34 (4.3)	6.66 (4.5)	7.77 (5.0)	5.81 (4.3)	8.33 (4.8)	6.07 (4.4)	7.15 (4.7)

[a] For descriptive table purposes we defined experiencing high financial hardship as scoring 5 or above (75th percentile of scores of the total sample) on the financial hardship scale.

[b] For descriptive table purposes we defined high area-level deprivation as having a standardized Townsend score equal or lower than 0.36, which was the mean deprivation score in the UK in 1990.

[c] Child was classified as being of minoritized ethnicity if either the mother or partner or both reported being from 1 of the following backgrounds: Bangladeshi, Black African, Black Caribbean, Chinese, Indian, Other Black, Pakistani, and Other (not including White).

[d] Maternal report at 12 weeks of pregnancy.

[e] Total Edinburgh Postnatal Depression Scale score at 12 weeks of pregnancy.

[f]

dissatisfaction score (coefficient, 0.24; 95% CI, 0.10-0.39) (**Table 4**). Associations for weight and shape concern (coefficient, 0.02; 95% CI, 0.01-0.04) and body dissatisfaction (coefficient, 0.22; 95% CI, 0.06-0.37) remained similar after adjusting. There was no evidence of an association between the remaining socioeconomic positions and cognitive eating disorder symptoms.

In univariable models, a 1-SD increase in area-level deprivation was associated with an increase in weight and shape concern scores (coefficient, 0.01; 95% CI, 0.00-0.03), which was completely attenuated in the adjusted analyses. We did not observe evidence of an interaction between socioeconomic position and age of weight and shape concern measurements.

Early-Life Socioeconomic Position and Individual Adolescent Disordered Eating

In the analyses of individual disordered eating, we found that lower education and greater financial hardship were associated with increased odds of restrictive eating. Higher area-level deprivation was associated with increased odds of binge eating and purging (eTable 6 in Supplement 1).

Sensitivity Analyses

Sensitivity analyses adjusting for ad hoc socioeconomic position indicators (eTable 7 and eTable 8 in Supplement 1), including maternal characteristics (eTable 9 and eTable 10 in Supplement 1), restricting to participants with complete data (eTable 11 and eTable 12 in Supplement 1), or adjusting for child ethnicity (eTable 13 and eTable 14 in Supplement 1) yielded comparable estimates to those observed in the main analyses, albeit with wider CIs in some cases. This may be due to the loss of power in these analyses.

Table 3. Univariable and Multivariable Multilevel Logistic and Linear Regression Models for Any Behavioral Eating Disorder Symptoms and Weight and Shape Concerns at Ages 14, 16, and 18 Years According To Parental Socioeconomic Position

	Disordered eating				Weight and shape concerns			
	Univariable model		Multivariable model		Univariable model		Multivariable model	
Parental socioeconomic position	OR (95% CI)	*P* value	OR (95% CI)	*P* value	Mean difference (95%CI)	*P* value	Mean difference (95% CI)	*P* value
Highest parental education								
University degree	1 [Reference] 1.35	NA	1 [Reference] 1.31	NA	0 [Reference]	NA	0 [Reference] 0.02	NA
A-level	(1.09 to 1.68) 1.80	.007	(1.03 to 1.66) 1.64	.03	0.07 (−0.02 to 0.15)	.12	(−0.07 to 0.12) 0.02	.67
Compulsory education	(1.46 to 2.23)	<.001	(1.24 to 2.16)	.001	0.08 (−0.002 to 0.18)	.06	(−0.09 to 0.14)	.70
Highest parental occupation								
Professional	1 [Reference] 1.27	NA	1 [Reference] 1.05	NA	0 [Reference] 0.10	NA	0 [Reference] 0.08	NA
Managerial	(1.00 to 1.62) 1.54	.05	(0.81 to 1.36) 1.09	.73	(0.01 to 0.28) 0.13	.03	(−0.03 to 0.19) 0.08	.14
Skilled nonmanual	(1.17 to 2.02) 1.54	.002	(0.78 to 1.51) 0.99	.61	(0.03 to 0.22) 0.12	.01	(−0.04 to 0.20) 0.05	.20
Skilled manual	(1.08 to 2.19) 2.09	.02	(0.65 to 1.51) 1.26	.97	(−0.04 to 0.27) 0.18	.14	(−0.13 to 0.23) 0.09	.61
Semiskilled or unskilled	(1.32 to 3.34)	.002	(0.75 to 2.11)	.38	(−0.05 to 0.40)	.12	(−0.15 to 0.35)	.43
Fifths of equivalized family income								
Highest 20%	1 [Reference] 0.99	NA	1 [Reference] 0.84	NA	0 [Reference] 0.02	NA	0 [Reference] −0.01	NA
Second	(0.77 to 1.30) 1.08	.99	(0.65 to 1.10) 0.79	.21	(−0.07 to 0.12) 0.07	.63	(−0.11 to 0.09) 0.006	.79
Third	(0.82 to 1.42) 1.35	.60	(0.59 to 1.04) 0.88	.10	(−0.04 to 0.19) 0.10	.21	(−0.12 to 0.13) −0.0002	.93
Fourth	(1.04 to 1.74) 1.34	.02	(0.66 to 1.16) 0.75	.36	(−0.01 to 0.21) 0.06	.09	(−0.12 to 0.12) −0.08	.99
Lowest 20%	(1.01 to 1.79). 1.07	.04	(0.55 to 1.03) 1.06	.08	(−0.07 to 0.18) 0.02	.37	(−0.23 to 0.06) 0.02	.27
Financial hardship score, per 1-point increase	(1.04 to 1.10)	<.001	(1.03 to 1.09)	<.001	(0.01 to 0.04)a	.001	(0.01 to 0.04)a	.003
Standardised area-level deprivation score, per 1-SD increase	1.05 (1.02 to 1.09)	.002	1.03 (0.99 to 1.07)	.07	0.01 (0.001 to 0.03)a	.04	0.01 (−0.003 to 0.02)a	.12

Abbreviations: NA, not applicable; OR, odds ratio.

[a] Expressed as coefficient (95% CI).

Discussion

In this cohort study, we found that participants from more deprived backgrounds experienced greater eating disorder symptoms throughout adolescence. More severe financial hardship was associated with increased risk of disordered eating, weight and shape concerns, and body dissatisfaction. Lower parental educational attainment was strongly associated with increased odds of offspring's disordered eating in adolescence.

Interpretation of Findings and Comparison With Previous Literature

Our study found opposite associations from those of register-based studies2,4-10 Anorexia nervosa is often overrepresented in clinical samples.4 If anorexia nervosa has a different pattern of association with socioeconomic position, we might not have been able to capture this using our restrictive eating measure, which may not represent severe fasting and dieting present in anorexia nervosa. However, register-based studies also find an association between high socioeconomic position and higher incidence of diagnosed bulimia nervosa and eating disorders not otherwise specified,4 which we should have captured more accurately with our outcome measures. Therefore, we hypothesize that the discrepancy between the socioeconomic patterning of clinical diagnoses and self-reported symptoms might be explained by inequalities in identification of eating disorders and access to services rather than measurement issues.

On the other hand, we expand on previous findings using self-reported symptoms16-22 by showing that the association between deprivation and eating disorder symptoms extends to the full adolescent period. This suggests persistent effects of childhood deprivation extending into the period of greatest risk for eating disorders symptoms.

Greater financial difficulties and lower parental educational attainment have the strongest associations with eating disorder symptoms. While these are small effect sizes, in general population settings, these can reflect large shifts in the number of individuals who experience eating disorder symptoms.37 It is possible that putative risk factors for eating disorders more commonly observed in

Table 4. Linear Regression Model for Body Dissatisfaction at Age 14 Years According to Parental Socioeconomic Position

Parental socioeconomic position indicators	Body dissatisfaction			
	Univariable model		Multivariable model	
	Mean difference (95% CI)	*P* value	Mean difference (95% CI)	*P* value
Highest parental education				
University degree	0 [Reference] 0.23	NA	0 [Reference]	NA
A-level	(−0.94 to 1.41) 1.08	.69	−0.03 (−1.12 to 1.06)	.96
Compulsory education	(−0.08 to 2.23)	.07	0.57 (−0.65 to 1.79)	.36
Highest parental occupation				
Professional	0 [Reference] 0.34	NA	0 [Reference] 0.01	NA
Managerial	(−1.02 to 1.70) 0.77	.62	(−1.40 to 1.43) 0.11	.98
Skilled nonmanual	(−0.72 to 2.25) 1.49	.31	(−1.50 to 1.73) 0.48	.89
Skilled manual	(−0.69 to 3.66) 0.93	.18	(−1.89 to 2.85) −0.27	.69
Semiskilled or unskilled	(−1.95 to 3.81)	.52	(−3.25 to 2.72)	.86
Fifths of equivalized family income				
Highest 20%	0 [Reference]	NA	0 [Reference]	NA
Second	0.61 (−0.78 to 2.01)	.38	0.31 (−1.04 to 1.67)	.64
Third	−0.35 (−2.09 to 1.39)	.69	−0.94 (−2.69 to 0.81)	.29
Fourth	2.17 (0.45 to 3.91)	.01	1.27 (−0.48 to 3.01)	.15
Lowest 20%	0.72 (−1.07 to 2.50)	.43	−0.61 (−2.58 to 1.37)	.54
Financial hardship score, coefficient (95% CI) per 1-point increase	0.24 (0.10 to 0.39)	.001	0.22 (0.06 to 0.37),	.007
Standardised Area-level deprivation score, coefficient (95% CI) per 1-SD increase	0.13 (−0.03 to 0.29)	.12	0.07 (−0.09 to 0.22)	.40

Abbreviation: NA, not applicable.

individuals from lower socioeconomic positions, such as higher child BMI,38 increased food insecurity,39-41 and greater experience of childhood adversities,18,42 might explain these associations.

The lack of evidence for an association between low parental education and cognitive eating disorder symptoms is surprising, as the latter usually precede onset of behavioral symptoms.43 We might not have been able to observe those associations due to low statistical power, although other studies with smaller sample sizes have observed an association between lower socioeconomic position and these symptoms.15,19-21 If these findings are true, they could suggest different risk mechanisms among parental education, disordered eating, and cognitive eating disorder symptoms.

Limitations

This study has some limitations. There are high levels of attrition among ALSPAC respondents from lower socioeconomic backgrounds. This might have biased our results if those participants have differential risk of eating disorder symptoms. For example, we observed evidence of an association between income and disordered eating behaviors only at age 14. This could be explained by earlier onset of eating disorder symptoms in those from more deprived background. However, it could also be the result of missing data patterns, so replication in future studies is needed to help clarify the nature of this finding. However, in general, our results were comparable across complete record and imputed analyses.

Information from ALSPAC was collated in the 1990s and 2000s. Given the historical changes in economic contexts, such as the cost-of-living crisis, using a more recent cohort study may yield different associations than those observed in this study.

Using the data available for parental occupation and educational attainment may have introduced bias in our associations if missingness patterns relate to both the exposure and the outcome. Nearly 10% of 2-person households had data missing from 1 parent for occupation and 3.0% for education.

Our measurement of restrictive eating behaviors may not accurately capture extreme restrictive behaviors, such as typical symptoms of anorexia nervosa, as these are uncommon in general-population samples. Our outcome might have instead captured young people with more common restrictive eating behaviors, which could have different patterns of associations with socioeconomic status.

Previous research has shown that genetic susceptibility for a number of psychiatric conditions, including anorexia nervosa, is associated with increased probability of being born in more deprived environments, possibly as a result of intergenerational drift.33 Although we adjusted our models for maternal mental health difficulties in sensitivity analyses, we were unable to robustly account for the potential for genetic confounding, as polygenic risk scores currently explain limited phenotypical variance44 and the sample did not allow other genetically informed designs.

Conclusions

In this cohort study, we found that children from lower socioeconomic positions experienced greater levels of eating disorder symptoms throughout adolescence. People from more deprived backgrounds experience greater difficulties in accessing health care.45 However, eating disorders are one of the few conditions in which an association with deprivation is either not observed or reversed when using clinical registers, suggesting that there might be eating disorder–specific barriers in access to care. Individuals in lower socioeconomic groups with eating disorders could be less likely to seek help due to internalized, stigmatizing beliefs that eating disorders are a “disease of affluence”46,47 or because of differences in perceived need for treatment.48 Second, individuals with higher BMI are less likely to receive consultation for eating disorders,49 which might limit referrals for adolescents from lower socioeconomic positions who are more likely to have higher BMI.50

Identifying and addressing existing barriers that might prevent young people from deprived backgrounds from accessing eating disorder services should be research and policy priority. Provision

of comprehensive medical training might facilitate identification of a broader spectrum of eating disorder presentations in primary care, particularly in populations who are more likely to be missed. Lastly, our findings add to the extensive evidence base calling for a reduction in socioeconomic inequalities as part of population-wide mental health prevention strategies.

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SUPPLEMENT 1.

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SUPPLEMENT 2.

Data Sharing Statement

Appendix 2 — Auxiliary variables

Child's depressive symptoms at age 13, 14, and 18 years old were measured with the Moods and Feelings Questionnaire. The adolescents responded to 13 items on statements about how they have been "feeling or acting recently", with response options including (0) "Not true", (1) "Sometimes", and (2) "True". Scores ranged from 0-26, with higher scores representing greater levels of depression. Child's total, verbal, and performance IQ at 8 years was measured using the Weschler Intelligence Scale for Children WISC-III at a research clinic for children enrolled in the ALSPAC cohort. Children performed five verbal subtests (Information, Similarities, Arithmetic, Vocabulary and Comprehension) and five performance subtests (picture completion, coding, picture arrangement, block design and object assembly), which were added to create the verbal and performance IQ test respectively. I coded maternal smoking in pregnancy at 18 weeks of gestation as a binary variable based on the mother's report of tobacco use. If mothers reported that they had used "cigarettes", "cigars", "pipe", or "other" products for smoking, they were coded as having smoked. If they reported not having used any of these items, they were coded as not having smoked. I coded eating behaviours using the adolescent reported Dutch Eating Behaviour Questionnaire at age 14 years old. The questionnaire consisted of the restrictive (2 items), emotional (14 items), and external eating (7 items) scales. These scores were totalled, with higher scores indicating greater levels of difficulties in eating behaviours. I coded a child as experiencing relational or overt peer victimisation if they reported "yes" to these respective items and as not experiencing relational or over peer victimisation if they reported "no" to these respective items at 8 and 10 years old.

Appendix 3 — Food Frequency Questionnaire at 81 months (~7 years)

[Redacted]