Psychological Distress and Cancer Incidence in the Whitehall II Study

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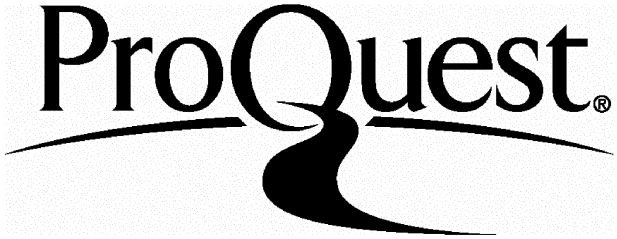

Abstract

The idea that depression or depressive symptoms are associated with cancer incidence is a very old one, but recent findings from the cohort literature are equivocal. Using longitudinal data from the Whitehall II Study, this research investigated whether elevated distress or depressive symptoms in cancer-free participants was associated with increased risk of cancer over a maximum of 10 – 12 years follow up. This study also examined the contribution of health behaviours as a possible pathway between distress and cancer, taking particular confounders into account (age, gender and socio-economic status).

After exclusions, 6799 men and 3300 women aged between 35 and 55 years were followed up for a mean of 10.7 years. Psychological distress was assessed at baseline in two ways, primarily using the chronic scoring of the 30-item General Health Questionnaire, as well as a depressive symptoms sub-scale from the GHQ-30. Participants who were distressed were more likely to be younger and female, and there were statistically significant associations between distress and health behaviours related to cancer risk (smoking, alcohol intake, diet and exercise).

There were 302 malignant neoplasms eligible for analysis, with breast cancer the most common (86), followed by prostate cancer (21) and colorectal cancers. Low numbers of cases necessitated the grouping of cancers according to behavioural risk factors and three outcomes were analysed using Weibull regression: any malignant neoplasm, smoking-related sites and breast cancer.

Results showed that for each of the outcomes there was no increased risk of developing cancer associated with psychological distress or depressive symptoms, but a repeated analysis after at least 10 years is recommended. Overall, cancer risk was associated with being female, increasing age and current smoking. The theoretical implications of this study were discussed along with directions for future research, in particular the role of health behaviours as a pathway.

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List of Abbreviations

β	Coefficient of parameter estimate
CI	Confidence interval
df	Degrees of freedom
DWPR	Death (from cancer) without prior registration
HR	Hazard ratio
HRT	Hormone replacement therapy
IV	Independent variable
ℓ	Log likelihood
LR	Likelihood ratio
OC	Oral contraceptives
OR	Odds ratio
PCB	Polychlorinated biphenols
PNI	Psychoneuroimmunology
RR	Relative risk
SA	Survival analysis
SAH	Self-assessed health (or self-rated health)
SD	Standard deviation
SE	Standard error

Key Studies

ACS	Alameda County Study
DPC	Danish Psychiatric Cohort study
ECA	Epidemiologic Catchment Area Program
EPESE	Established Populations for Epidemiologic Study of the Elderly
MFHS	Mini-Finland Health Study
NHANES	National Health & Nutrition Examination Survey
OFPC	Osteoporotic Fractures Prospective Cohort
WCCDS	Walnut Creek Contraceptive Drug Study
WCS	Washington County Study
WEHS	Western Electric Health Study

Organisations & Publications

DOH	Department of Health
DSM	Diagnostic and Statistical Manual for Mental Disorders
IARC	International Agency for Research on Cancer
ICD	International Classification of Diseases
ICRF	Imperial Cancer Research Fund
ONS	Office for National Statistics
WHO	World Health Organisation

Statement of Personal Contribution

This thesis presents research which was based on secondary data analysis of the Whitehall II Study. By the time I arrived at the Department of Epidemiology & Public Health in the autumn of 1998 and took up my 3-year research Fellowship, the main study had been running for over 12 years. The Whitehall II Study Group staff had collected and entered that data along with follow up data from the NHS Central Register and the ONS, and I am indebted to them. A number of WII statisticians have generated several useful composite variables from the data which I have used in this thesis, and where possible, their work is acknowledged in the text; particular thanks go to Martin Shipley and Jenny Head. However, the collation of cancer events in this thesis is entirely my own work, as are the preparation of many of the variables (including the healthy eating index), the rationale for grouping cancers and the analyses themselves.

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you're suffering it now as well! Thank you for your love and support and kindly refraining from asking how it is going.

Finally, I must thank Julia for her unswerving faith and belief in me, her patience, encouragement, constructive criticism, diligent proof-reading, and all round wonderfulness and boundless optimism in the face of a post-PhD future. It would have been a very different journey without you, thanks for walking it with me.

'Almost all diseases are easier prevented than afterwards removed'

James Lind

18th century Scottish physician

Chapter 1

Introduction

&

Literature Review

1.1 Introduction

This thesis is concerned with examining how mental ill-health can affect risk for physical disease, namely cancer. This chapter introduces the thesis (1.1.1) and presents a review of relevant literature (section 1.2). An outline of the thesis is also given in this chapter (section 1.1.2).

1.1.1 Background to Thesis

The purpose of the thesis is to investigate the association of psychological distress with cancer incidence in the Whitehall II Study over a maximum period of 10 to 12 years, using secondary data analysis. The effect of psychological distress on health behaviours received particular attention, principally those behaviours associated with cancer risk, with a view to clarifying the role health behaviours might play in any association between psychological distress and the development of cancer.

Although the term psychological distress implies a co-mingling of symptoms of anxiety and depression, a more specific form of psychological distress is depression. Depression has been described as the common cold of psychiatry (Coyne 1985), and conceptualised in a variety of forms and definitions. The first onset is typically in the second or third decade, with point prevalence higher in middle age, although there are increasing rates of major depression in younger age groups (Doris, Ebmeier, & Shajahan 1999; Levi 1998; Wittchen, Knauper, & Kessler 1994). The disorder can subsume the distressed response to interpersonal or life events (Wakefield 1999), and occurs more often in women than in men. At least one in six will experience significant anxious or depressive symptoms in their lifetime, but while 2% may have pure depression, community surveys show a further 8% suffer a mixture of depression and anxiety (Hale 1997; ONS 2001). Worryingly, significant proportions of these two groups, particularly the latter, do not receive professional assistance to alleviate their condition, even if they present with symptoms to primary caregivers (Goldberg & Huxley 1992). More ominously still, the World Health Organisation (WHO) estimates that by the year 2020, depression will be the number one cause of disease burden in developing countries and the second greatest worldwide (Murray & Lopez 1996).

However, depression is not just important as a health outcome in its own right. There is also evidence that depression can increase risk for specific conditions such as heart disease, as well as all-cause mortality (Kaplan & Reynolds 1988; Musselman, Evans, & Nemeroff 1998; Roose, Glassman, & Seidman 2001; Zheng et al. 1997). Furthermore, depression may contribute to mortality when occurring co-morbid with serious disease, such as the reduced survival observed in patients who developed depression after myocardial infarction (Frasure-Smith, Lesperance, & Talajic 1993; Frasure-Smith, Lesperance, & Talajic 1995). Whether these effects arise from physiological aspects of the disorder itself or by other means remains to be seen, but should depression prove to be as significant a cause of disability as the WHO predict, then the impact of morbidity arising from it may be at least as important, especially if it is potentially avoidable. Therefore, from a public health perspective, for the management of a depressive disorder, in addition to preventing ongoing disorder and with more severe depression the risk of suicide attempts, there is an argument for considering other health consequences that might arise secondary to depressive disorder.

Along with heart disease, another disease that has been linked with depression is cancer. One in three people in England and Wales will develop cancer at some point in their lives, and four sites account for nearly half of all new cases of cancer: lung, breast, colon-rectum and prostate (ONS 2000). Currently, cancer is the cause of one in four deaths (ONS 2000). The status of cancer as a leading cause of morbidity and mortality in the UK today is amply demonstrated by an example of promotional material from the Imperial Cancer Research Fund[1] (see Figure 1.1). Worldwide, lung cancer has the highest incidence in men, and breast cancer in women, although there has been an 'alarming' rise in lung cancer among women (IARC 1997). But cancer as a disease is something of a misnomer: it is in fact over 150 different diseases, which share the disorder of cell function that results in malignant growth or tumour development from abnormal and uncontrolled division of body cells. However, the link between the depression and cancer, as will be shown in the following section, is not clear cut or even reliably established.

[1]ICRF now works with the Cancer Research Campaign, collectively known as Cancer Research UK.

Figure 1.1 Poster from the Imperial Cancer Research Fund, c.2000. Reproduced with kind permission of Cancer Research UK (formerly ICRF & CRC)

Besides depression, in recent decades there have been a great variety of psychological or psychosocial variables considered with respect to cancer causation, including stress and stressful life events (Barraclough et al. 1992; Chen et al. 1995; Keehn, Goldberg, & Beebe 1974), bereavement (Ewertz 1986; Kaprio, Koskenvuo, & Rita 1987), the Type C personality construct (Morris & Greer 1980; Temoshok 1987), and social support (Reynolds & Kaplan 1990), amongst others. These studies have been widely reviewed elsewhere (Fox 1978; Fox 1998; Holland 1989; Stolbach & Brandt 1988), but the broad variety of variables studied has lent weight to Temoshok and Heller's (1984) remark that the literature was dominated by a '"fruit salad" of ... variables [that] may distort or wash out any significant findings' (Temoshok & Heller 1984, p. 235).

As Temoshok & Heller (1984) imply, it is extremely difficult to compare the results of studies which have used differing definitions and measures of the independent variable or psychosocial factor. Consequently, the literature review is restricted to considering depression and its role in the development of cancer (section 1.2). Yet psychological distress is the focus of the thesis itself, since the instrument used to assess psychiatric morbidity in the Whitehall II Study was the 30-item General Health Questionnaire (Goldberg 1972).

1.1.2 Outline of Thesis

The next chapter discusses salient theoretical issues (chapter 2), before outlining the rationale for the present study and presenting the hypotheses to be tested. Chapter 3 describes the materials and methods of the Whitehall II Study and the methodology and analytic strategy for the present study. The following two chapters (4 & 5) present the results. The first of these two chapters presents descriptive statistics on the Whitehall II sample used in the present study before investigating the association between psychological distress and health behaviours at baseline. The second chapter of results gives the pattern of cancer incidence over follow up, before using regression models to address the relationship between psychological distress and cancer incidence. The thesis concludes with a discussion of the findings (chapter 6).

1.2 Literature Review

The first part of this section charts the changing fortunes of the notion that depression or emotional disturbance affects cancer risk, dwelling mostly on the literature of the last three hundred years. Much of the earlier literature consists of the comments of learned physicians or surgeons ruminating upon their clinical experience, with the first piece of what might be considered scientific research not published until the end of the 19th century (Snow 1893). Section 1.2.2 sketches the explosion of ideas and thought that followed the advent of psychoanalysis at the start of the 20th century, leading in turn to case-control studies, and most recently to cohort research (section 1.2.3). Indeed, it has been said that 'the history of Western medicine might possibly include an unbroken chain of attempts by physicians to assign to emotional disturbance an etiological role in the development of cancer' (Rather 1978, p. 182).

Contributors throughout have been subject to prevailing concepts of cancer and psychological phenomena, as Rather (1978) notes in his history of cancer medicine: 'the investigator is always at the mercy of current theory, whatever the object under investigation' (*ibid.* p. 8). Reviewers too, were similarly affected, and tended to omit opposing views in their coverage (Kowal 1955; LeShan 1959; LeShan & Worthington 1956b; Perrin & Pierce 1959). The theory of humours dominated medicine from ancient times up until the 17th century. Challenged by the introduction of Harvey's modern circulatory theory and the world beginning to be revealed by the microscope, Galenical humours 'while not forgotten, had begun to seem slightly quaint to the scientific physician' by the end of the 1600s (Rather 1978, p. 30). By the 18th century it was widely accepted that fibres made up the tissues of the body, although key treatises on cancer still echoed the tenets of humour theory with respect to causation (e.g. Peyrilhe 1777). The rise of cell theory and greater interest in anatomy in the 19th century facilitated the notion of cancer seeds or the cancerous cell, as well as stimulating systems of categorising cells by site or origin. Nonetheless, it was not until the second half of the 19th century that a distinction was made between inflammation and neoplastic growths, some 60 years after tumours were investigated with respect to tissue theory, and 25 years after the application of Schwannian cell theory (Rather 1978).

Thereafter the literature was both advantaged and limited by the development and application of scientific method. Despite occasionally elaborate characterisations of psychological factors, as well as a great and often fascinatingly biased interest in cancer patients themselves, many psychologists tended to omit consideration of the means by which the traits or personality they examined could affect the behaviour of cells and give rise to cancer. Similarly those learning more about the cellular mechanisms of carcinogenesis in animal models and industrial settings found psychological factors far too distal to account for their observations and tended to dismiss them, along with their advocates. One tends to forget that the scientific method with its aspects of hypothesis testing, experimentation and falsification was still under development, as were the statistical techniques used to analyse data from observations. The nature and determination of cause and effect, the limits of particular designs and measurement methods, the development of new approaches to circumvent old difficulties, as well as the influence of different opinions and indeed prejudice about the legitimacy of particular lines of inquiry, all serve to add to the complexity of the literature.

Consequently this review gives greatest weight to the more recent cohort research, which would appear to be the most promising approach to the research question, and the most reliable body of evidence to date (section 1.2.3). Due to constraints of time and space, only passing mention will be made of other related strands of the literature, such as the relationship between schizophrenia and cancer development, or the association between psychological factors and cancer prognosis or survival.

1.2.1 From Galen to the 18th Century

Frequently, reviewers of this literature commence by making reference to Galen's observation in the 2nd century AD that melancholic women were more likely to develop breast cancer than women of a more sanguine temperament (LeShan & Worthington 1956b; Rather 1978; Stolbach & Brandt 1988). According to Rather, Galen regarded growths to be an aggregation of more or less abnormal humours arising from a flux of black bile, mixed or unmixed with blood (two of the four humours or *chymoi* of Greek and Roman medicine). Since one of the six non-naturals, or causes of disease, was emotional disturbance, and an excess of black bile was also considered to be associated with emotional melancholy (Rather 1978), Galen's observation was not necessarily

incongruent with contemporary medical understanding[2]. His description of the *tumor praetor naturam* as 'crab-like' was echoed centuries later (Fernel 1607), as was the sense that sad and 'bilious' emotions could cause scirrhus and cancer (Burrows 1783; Gendron 1701; Guy 1759; Pechlin 1691; Peyrilhe 1777). Pechlin (1691) considered the relationship between the emotions and the tumour to be direct, writing of the behaviour of a carcinoma 'when changed for the worse by fear or sorrow' (trans. Rather 1978), while Gendron wrote of the sudden halt in the 'courses' either by 'Fright' or 'violent Grief'. Guy (1759) thought that the women most likely to develop breast cancer were those 'of a sedentary, melancholic Disposition of Mind, and meet with such Disasters in Life, as occasion much trouble and Grief', presaging much of the 19th century discourse.

Others sought a means by which the growth or onset could be affected. Estimating the proximal cause of cancer to be in the lymph, Peyrilhe (1777) thought a cancerous change resulting in 'inspissating the lymph' could be brought about by grief. Burrows (1783) felt that the 'uneasy passions of the mind' affected the circulation of the blood and 'consequently, thicken it', leading to a tumour. However, a number of leading contemporary thinkers disregarded psychological status entirely: Stahl, Hoffman and Boerhaave considered cancer an unfavourable result of inflammation, from stagnation in blood or lymph glands, which contributed to the notion of tumours arising from a bruise or local injury (Rather 1978).

1.2.2 The 19th and Early 20th Centuries

The shedding of discussions of the emotions in connection with the cause and cure of ailments of the body in medical textbooks over the course of the 19th century may be attributed to the rise of the cellular concept, coupled with increased interest in anatomy (Rather 1978). Although the century began with The Society for the Prevention and Cure of Cancer posing eleven questions for research, including 'Is there a predisposing temperament?' (Hoffman 1915), the first scientific study in this area was not conducted and published until its close. Even then, interest was on the wane, despite the efforts of determined advocates such as the American neurologist Hughes (Hughes 1885) and

[2] Some commentators have disputed that Galen made any explicit connection between black bile as melancholic humour and the emotional state of melancholy (Hu & Silberfarb 1988).

Herbert Snow (Snow 1883; Snow 1891; Snow 1893). LeShan explained the decline in interest in what he termed the psychosomatic concept over this period as arising from these and other medical developments such as surgery and irradiation, and an inability to use the information effectively in the absence of clinical psychiatry (LeShan 1959). Advances in medicine and philosophical thought eroded the perceived link between mind and body on the one hand, and localised the tumour on the other, minimising the role of the organism as a whole in the development of cancer.

Nevertheless, some felt it was a short step between mental disturbance and cancer, whether through grief (Amussat 1854; Parker 1885), mental depression or stress (Cutter 1887; Paget 1870; Watson 1871), or trouble of mind and anxiety (Snow 1891; von Schmitt 1871). No doubt influenced by Lobstein's (1829) notion of 'perverted nutrition' in carcinogenesis, Cutter (1887) held that there was nothing like worry to wear on the nutrition of the body. He recommended the stimulation of the will to live, and changes in diet as treatment. Parker (1885) mused

> *'... will a long period of care, trouble and sorrow alone disturb the balance between the nervous and cellular elements, so as to make the latter take on an abnormal, a cancerous, development? It is more than probable, but can it be demonstrated?'*

Others were more sceptical. Walshe (1846) referred to the 'alleged influence of mental disquietude' in his landmark treatise on cancer, noting that it 'has never been made matter of demonstration'. Similarly, Cohnheim (1877), one of a line of prominent figures in the literature who had demonstrated that inflammation was irrelevant to cancer aetiology, did not accept a role for emotional disturbance in the development of cancer, except in influencing the circulation (Rather 1978).

Snow's remarks, that one 'invariably find [s] certain neurotic immediate antecedents... where trouble of mind and anxiety are the most constant' (Snow 1891), were corroborated by his finding that 156 of 250 in- and out-patients of the London Cancer Hospital reported recent misfortune such as bereavement (Snow 1893). This serves to illuminate a characteristic of Snow and his predecessors which qualifies their work, and indeed much of the literature of the century to come. Speaking from anecdotal or indeed their own clinical experience, the judgement of many if not all of these authors was subject to bias in terms of which patients they saw and which they did not.

Furthermore, the previous literature and the hallowed hangover of inductive reasoning discouraged searching for competing examples. One might contend that those who could have been concerned with finding such counter-examples were no longer interested in the topic.

While earlier Snow (1883) had complained that too much attention was being paid in 'false consideration of hereditary tendency and ... other injurious theories', others made sometimes isolated attempts to establish the importance of psychological factors within developing science. The relevant literature of the twentieth century may be considered to have followed three themes, which can be termed psycho-physiologic, epidemiological, and psychosomatic. The first of these sought physical means by which neurotic factors and the development of cancer could be linked, for instance through changes in serum salts and blood chemistry (Meyer 1921). Another, which LeShan dubbed epidemiological (LeShan & Worthington 1956b), examined interrelationships between cancer and further factors, for instance diet and nervous disorders (Hoffman 1925). A third, alternative approach exemplified by Foque (1931), was cited by LeShan and Worthington (1956), and seems to be one of the foundations of the psychosomatic orientation to come. Acknowledging other influences on cancer development (x-rays, chemicals, viruses and so on), Foque maintained that cells had to be in a receptive state before the cancerous process could begin. He prioritised the study of 'the role of sad emotions as activating and secondary causes in the activation of certain human cancers' (Foque 1931).

Although the first of these approaches may appear the most suitable for testing and refutation as understanding of the body and the cancer process increased, it relied upon active co-operation between different fields of knowledge. But as time went on, these specialties grew apart and more isolated from each other (Fox 1978). Subsequently in addressing the issue, each field took its own emphasis and its own lens to the issue, and either in concept or method failed to or inadequately accounted for factors not immediate to that vision. These three themes followed disparate paths changing and occasionally faltering in response to wider events in science (particularly psycho-physiologic efforts, e.g, Jonas 1966; Kavetsky, Turkevich, & Balitsky 1966; Meyer 1921). By 1955, Kowal noted that reflecting recent advances, the main oncology

focus for his contemporaries was on local treatment of the tumour. The absence of an 'acceptable theory of constitutional participation in neoplastic development' discouraged speculation or investigation of the role of psychological factors in cancer development (Kowal 1955, p. 218). More recently, contemplating the surge and subsequent decline of interest in an aetiological role for psychological factors in cancer over the 20th century, Tomatis suggested that this reflected the dominance of cellular theories of carcinogenesis, but also a prejudice against 'softer science' (IARC 1990).

Eighteenth and nineteenth century themes of loss to the patient of a significant figure whether through illness or separation, and the frustration of significant life goals (Kowal 1955), had assumed greater influence with the advent of psychoanalysis and psychodynamic theories. Key figures such as Evans and the controversial Groddeck influenced psychosomatic thought with respect to cancer. A Jungian therapist reporting on 100 patients, Evans noted that most of her patients had lost a major cathexis before tumour onset (Evans 1926). She argued that with the loss of an important emotional relationship, these patients had no outlet for psychic energy, which had turned in to be expressed through the primitive erotic outlet. Groddeck believed that cancer was 'an acting out' of deep frustrations on the part of the body (Groddeck 1928). These were but two voices in a growing field of medicine, which asserted that states of pain and ill-health were, on occasion, the body's best available means for expressing psychological distress (Roberts, Towell, & Golding 2001). Psychosomatic research had its heyday in the 1950's (Holland 1989): studies of cancer patients proliferated, and although some investigators did consider what patients believed had caused their illness (Bard 1966), many applied *a priori* psychodynamic structures and explanations to their observations of patients, sometimes in the absence of credible evidence for those structures.

Attending to the psychosomatic idea, many researchers concerned themselves with the person who had cancer, his or her particular characteristics, and brought the latest techniques to bear upon the task. In a sense, they focused on what was peculiar to the person who had cancer, in the light of this new and developing science of psychology. Researchers sought out object loss events in childhood, such as bereavement, separation or injury (Greene 1966; LeShan 1966; Reznikoff 1955; Schmale & Iker 1966b;

Schmale & Iker 1966a). Host susceptibility and resistance were invoked (Kavetsky, Turkevich, & Balitsky 1966), particularly by Kissen who held that the poorer the outlet for emotional discharge, the less the exposure required to cigarette smoke to induce lung cancer (Kissen 1967; Kissen & LeShan 1964). Anecdotal case series work and analysis of interviews and case histories of cancer patients predominated. The average cancer patient was considered eager to please, nice (Blumberg, West, & Ellis 1954), with some degree of hopelessness (Schmale & Iker 1966a), although it did not seem to be apparent that this profile should be anything other than typical of a patient with a serious disease. Sensing perhaps the difficulties for face validity of this area of research, LeShan developed the premise of childhood cathexis, and loss experiences in adulthood. Inspired by Peller's work on population statistics[3], he investigated whether age-adjusted cancer mortality varied as a function of marital status (LeShan & Worthington 1956a). Notable attention was paid by some researchers to the personalities and emotional characteristics of women with female specific cancers, such as breast, ovary, cervix or uterus (see Table 1.2).

Table 1.2 Examples of studies listing characteristics of female cancer patients

Authors	Characteristics
Tarlau & Smalheiser (1951)	Mother dominance; rejection of female role; negative attitude to sexuality, contributing to sexual maladjustment
Bacon, Rennecker & Cutler (1952)	Incapable of outward expression of basic drives such as anger, aggressiveness, or sex; masochistic character structure; unresolved hostile conflict with mother; resultant 'inner turmoil' covered by a façade of pleasantness
Reznikoff (1955)	More reports of sibling deaths at birth or infancy; more negative feelings about pregnancy and birth, and specific disturbances in feminine id; childhood with excessive responsibility (i.e. for siblings)

Looking back over the lives of cancer patients, attention turned to their personalities as providing a stable ongoing influence upon the onset and development of cancer. Initial suggestions described either a 'good' person consumed with self-pity, or an inhibited individual with repressed anger, hatred or jealousy (Butler 1954). This line of thinking contributed to the development later of the Type C personality concept. Investigating survival amongst patients, Blumberg et al. (1954) considered those designated fast-

[3] Having shown that mortality rates were higher among widows and spinsters, Peller concluded that 'the less satisfactory the marital status, the earlier the patient manifests cancer and dies from it' (Peller 1940; Peller 1952).

progressors to be 'consistently serious, over-cooperative, over-nice, over-anxious, painfully sensitive, passive, apologetic personalities' (p. 285) and reported that patients' families confirmed that description. The Bahnsons considered that cancer patients had a flattening and emptiness of personality which was not necessarily due to depression, but resulted from strong and continually utilised ego defences of repression and denial (Bahnson & Bahnson 1964; Bahnson & Bahnson 1966). Much was made of the seemingly protective effect of schizophrenia, through the individual having withdrawn from the environment and interpersonal trauma at an early age. However the reduction in risk for this group compared with other institution inmates was subsequently discovered to be based on erroneous use of proportional mortality rates instead of absolute mortality rates (Fox 1978; Perrin & Pierce 1959; Tsuang, Woolson, & Fleming 1980).

Much of this research can seem, to our eyes, to be deeply flawed, and both sympathetic and unsympathetic contemporaries drew similar conclusions (Arnott 1954; Perrin & Pierce 1959). Use of cross-sectional or retrospective designs could not clarify whether psychological disturbance preceded or resulted from neoplastic disease (Tarlau & Smalheiser 1951), and the choice of cases and controls was often less than ideal. Nor did such designs permit appreciation of the time period required for the neoplastic process, an oversight more likely due to ignorance than to error given the level of understanding of cancer at this time. Researchers frequently failed to establish the reliability or validity of their techniques, to adequately document and report their research, and sometimes reached premature conclusions, overlooking the limits of their methods (Crisp 1970; Grinker 1966). However these observations might be made for published research in quite disparate areas of scientific endeavour, both before and since.

The criticisms of projective methods and materials with inadequate psychometric profiles are well explored elsewhere e.g. (Kerlinger 1986) but the other main concern was the imbalance between theory and experimental evidence (Crisp 1970; Grinker 1966).

> *'One is struck with the tenuousness of the theoretical concepts and the weakness of the evidence for specificity – the same continually reiterated unscientific statements of*

correlation between disease or the organ involved with an interminable time-span and a spatial discrepancy which is insoluble by our present methods'

(Grinker 1966, p. 880).

Carelessness engendered by such eagerness easily brought the field into disrepute. Brown berated fellow researchers for seemingly supposing a psychological intermediate variable wherever the link was not clear (Brown 1966). Grinker (1966) reminded his colleagues that there was 'no convincing evidence that a psychological trauma has a direct effect on the development of cancer' (p. 875), and emphasised the limits of the methods at their disposal.

The alternative approach, which prefaces the next section, was to consider psychological variables more formally and parsimoniously, such as depression and anxiety (e.g. Kerr, Schapira, & Roth 1969). The use of more formal and structured instruments (such as the MMPI) lent itself well to larger studies, and addressed some concerns about measures previously used. Unfortunately, the latter were diverse, often poorly described and idiosyncratically defined and analysed, inhibiting comparison across studies, and raising serious concerns about validity and reliability.

Insufficient control for other causes and risk factors of cancer also undermined the body of work as it stood. Furthermore, the recall of cancer patients in almost exclusively retrospective case-control research led unavoidably to bias, whether due to diagnosis or disease process, as such individuals are more likely to report more negative life events (Blaney 1986; Clark & Teasdale 1982). The innovation of prospective designs, introduced by Doll and Hill (1954) amongst others, presented a new method to circumvent the temporal issue, along with developments in epidemiological techniques which permitted consideration of the influence of other variables in cancer risk.

1.2.3 The 20th Century: from Case-control to Cohort Studies

Although case-control research might be summarised as demonstrating a positive relationship between psychological status and cancer (Sklar & Anisman 1981), many had significant reservations about the value and quality of much of this research (Bieliauskas & Garron 1982; Fox 1978; Fox 1998; Perrin & Pierce 1959). By the late 1960's

and early 1970's, it became clear that a more satisfactory approach was required to address the question, with no less than the National Cancer Institute issuing a request for proposals related to personality, stress and cancer, based in long-term prospective studies of large populations (Holden 1978). Accounts of such cohorts have been published since e.g. (Hahn & Petitti 1988; Kaplan & Reynolds 1988; Knekt et al. 1996; Linkins & Comstock 1990; Penninx et al. 1998; Persky, Kempthorne-Rawson, & Shekelle 1987; Shekelle et al. 1981; Thomas, Duszynski, & Shaffer 1979; Zonderman, Costa, & McCrae 1989), but given the cost of conducting studies of this size, investigators have tended to 'piggy-back' the research question on to existing projects concerned with other hypotheses (parent studies).

Use of a prospective longitudinal design confers significant advantages over the methodologies employed in the earlier literature. It obviates concerns about causality and temporal relationships attendant upon retrospective and cross-sectional designs (Linkins & Comstock 1990), and is very useful for exploring aetiology. It also allows more time for cancer to develop between the initial assessments and follow up, and eliminates or at least reduces issues of bias in recall and selection. As all participants should be cancer-free at baseline, the prospective design makes it possible to assess whether there were differences in cancer rates between those considered at risk given the exposure, and those not considered at risk, by bringing that latter group into consideration. Furthermore, the cohort approach permits a broader perspective on the potential health hazards of the exposure of interest (Breslow & Day 1987).

However, such studies are costly and time-consuming. Economies of effort and of resources are unavoidable in collecting data from a large sample, and this has implications for the operational definitions and measurement of both independent and dependent variables. The nature of the cohort sample in terms of age and source population (e.g. with respect to occupation, or socio-economic distribution) also has implications with regard to cancer as an outcome. Complete follow up of all members of the original cohort is difficult to attain, which can bias results, and consideration for this issue tends to influence the nature of the population originally chosen to provide the cohort members. Moreover, cohort studies are not unlike lumbering giants in some respects: once in motion, it is very difficult to change elements or direction if required.

1.2.3.1 Findings from cohort studies

The cohort studies pertinent to the present review are described here over three tables, summarised with regard to the population and design (Table 1.2i), the independent and dependent variables (Table 1.2ii), and the results (Table 1.2iii). For the most part, these studies have defined depression as the psychological variable of interest, and the overall picture is mixed. Those studies that have not considered depression as the independent variable, for example the Johns Hopkins Precursors Study (Thomas 1976; Thomas, Duszynski, & Shaffer 1979), which focused on habits of nervous tension and relations within the family and used a nested case-control design, are not considered pertinent to this review.

Amongst those showing a positive association was the Western Electric Health Study (WEHS) at both 17 and 20 years of follow up. The first follow up found that those who were depressed at baseline had a 2.3 odds ratio (95% CI 1.38-3.54) of cancer death, after adjusting for age, smoking, alcohol consumption, family history of cancer and occupational status used as a proxy for socioeconomic status (Shekelle et al. 1981). The second follow up looked at cancer incidence as well as mortality over 20 years (Persky et al. 1987). Controlling for the same covariates as well as body mass index and serum cholesterol, they found that those who were depressed had a relative risk of 1.38 (95% CI 1.00-1.89) for developing cancer and of 1.96 (95% CI 1.33-2.90) for death from cancer. The Established Populations for Epidemiologic Study of the Elderly (EPESE; Penninx et al. 1998) was unusual in considering chronic rather than a single or one-off measure of depressive status, taking repeated measures of depression before and at baseline. Participants who were deemed chronically depressed had a 1.88 adjusted hazard ratio for cancer incidence (95% CI 1.13-3.14), although those depressed only at baseline were not at greater risk of cancer over follow up (adjusted HR = 1.02, 95% CI 0.73-1.42). Focusing on breast cancer risk alone, the Epidemiologic Catchment Area study (ECA) found that women who had had a major depressive episode were at some increased risk after follow up (adjusted RR = 3.8, 95% CI 1.0-14.2; Gallo et al. 2000).

Two other studies demonstrated an association between depressive status and cancer, in interaction with smoking. The Washington County study (Linkins & Comstock 1990) found a 2.6-fold increase in risk among current smokers who were depressed, after

adjusting for age, gender and follow up time (95% CI 1.41-4.80). In contrast, those current smokers who were not depressed did not have a significant increase in risk (RR = 1.24, 95% CI 0.79-1.95). Although the Mini-Finland Health Study (MFHS; Knekt et al. 1996) found no association between psychiatrically diagnosed depression and all cancers combined, men with the highest depressiveness score were at significant risk of developing lung cancer (age adjusted RR = 3.32, 95% CI 1.53-7.2) as were men with psychosis (age adjusted RR = 4.7, 95% CI 2.02-10.94). Indeed, the age-adjusted relative risk of lung cancer between smokers and non-smokers in the lowest tertile of depressiveness was 3.38 (95% CI 1.09-10.52), while the relative risk between these two groups in the highest tertile was 19.67 (95% CI 2.57-150.7).

These findings with respect to smoking behaviour in the Washington County and MFHS cohorts are interesting, but as with Gallo et al.'s (2000) findings from the ECA study which also concerns one site, the confidence intervals are quite broad. Overall, the findings from these three studies show little or no association. A number of other studies have also shown null association between measures of depressive status and subsequent cancer events (see Table 1.2iii), including the Alameda County study, the Walnut Creek Contraceptive Drug Study (WCCDS), the National Health and Nutrition Examination Survey (NHANES), and the Osteoporotic Fractures Prospective Cohort Study (OFPC). Indeed the Alameda County Study authors found a significant association between depression and non-cancer mortality (Kaplan & Reynolds 1988).

Some authors have taken this spectrum of findings to indicate that there is absolutely no association between psychological variables and cancer and that no further research in this area will prove profitable (Young 1990; Zonderman, Costa, & McCrae 1989). But it is not an uncomplicated matter to compare across studies and reach such a conclusion. Earlier comments by Bieliauskas and Garron (1982) on the first findings from the WEHS may well remain relevant: '[it] seems clear that a relationship between depression and cancer, if present, is of a magnitude which cannot overcome design and methodology difficulties' (Bieliauskas & Garron 1982, p. 193). Thus various aspects of the methodology of these studies deserve closer scrutiny. These aspects include (1) the definition and measurement of the independent and dependent variables; (2) the

nature of the study population and length of follow up; (3) statistical issues; and (4) confounding.

Table 1.2i Summary of cohort studies, part 1: original population and sample, exclusion criteria, years of follow-up and design notes

Author, Year Title, acronym, location	Population Sampling method	Exclusions (specifically for cancer)	Sample (M, men; W, women)	Follow up time Loss to follow up	Design
Shekelle et al. 1981 Western Electric Health Study (WEHS) , Chicago, USA	Recruited 1957-58 from Hawthorne electric factory workers, aged 40-55 years Probability random sampling From 3102 invited, 2107 participated (68% response rate)	127 with existing CHD, disability, on leave, death, transferred (Upon analysis, 5 discovered to have not been cancer-free at baseline: did not affect results)	N = 2020 M	17 years Lost: Not clear	Prospective Cohort Hypothesis prospective Collaborative cohort, main focus CHD
Persky et al. 1987 Western Electric Health Study (WEHS), Chicago, USA	As above	89: aged less than 40 at baseline, not cancer-free at baseline, missing data, non-response to items	N = 2018 M	20 years Lost: Incidence: 1.6% of 1546 survivors; Mortality: 3 out of 2107 (i.e. 0.1%)	Prospective cohort Collaborative cohort, main focus CHD
Kaplan & Reynolds 1988 Alameda County, USA	Recruited from Alameda County Study Representative sample of the general population in 1965 (stratified sampling of all households in County)	80 with cancer before or on baseline	N = 6848 M, W	16 years 17 died of cancer outside follow up area; estimate under ascertainment of 30 incident cases	Prospective cohort Hypothesis retrospective
Hahn & Petitti 1988 Walnut Creek Contraceptive Drug Study (WCCDS) California, USA	Recruited Dec 1968 – Feb 1972, women getting check up from Kaiser Permanente Medical Care Program, aged 25 – 44 years Attendance at check-up	Participants with breast cancer before entering the study	N = 8932 W Mostly white, married & moderately well educated (Main cohort = 16638)	12-14 years Did not follow up outcomes for those no longer members of KPMP; does not report size of this group	Prospective cohort Hypothesis retrospective, piggy-backed on to study investigating an oral contraceptive
Zonderman et al. 1989 National Health & Nutrition Examination Survey Epidemiologic Follow Up Study (NHANES), USA	Recruited between 1971-75 No age range, gender distribution given Stratified probability survey of adult, non-institutionalised, civilian population of USA Two waves of psychological assessment	None reported (on the grounds of having or had cancer)	N_1 [CES-D] = 2585 N_2 [GWB-D] = 6403 Different waves of cohort examination meant not all got same IV measure	Over 6 years: GWB-D, mean 9.4 years CES-D, mean 8.2 years Lost: GWB-D group, 7%, CES-D group, 8%	Prospective cohort Hypothesis retrospective, piggy-backed on to national survey
Linkins & Comstock 1990 Washington County Maryland, USA	Recruited 1971-74, baseline cohort = 2264 (956 M, 1308 W) from household units, 1 adult aged 18-65 selected to participate Response rate 78%	History of cancer before baseline (120)	N = 1863 M,W	12 years Lost: 377/2264 (13.6%)	Prospective cohort
Knekt et al. 1996 Mini-Finland Health Study (MFHS) Finland	Recruited 1978-80 from 40 areas; 8000 aged 30+ years (3637 M, 4363 W) 2-stage random sample, 10% refused (N = 7219)	History of cancer before baseline (201)	N = 7018 Lung cancer, males: N = 3245	11-14 years Lost: Negligible (Registry almost 100% coverage)	Prospective cohort
Penninx et al. 1998 Established Populations for Epidemiologic Study of the Elderly (EPESE), USA	Entire population aged 65+ in 3 US areas, N = 10000 (80-85%) in 1982 N = 6566 by baseline, 1988	Not on MEDPAR files (for follow-up), self-report cancer, hospital cancer diagnosis <3 years, use of tamoxifen, missing depression data	N = 1708 M, 3117 W Mean age at baseline, 79.0 years (range 71-96)	4 years (mean 3.8 years) Lost: Not clear	Prospective cohort
Whooley & Browner 1998 Osteoporotic Fractures Prospective Cohort (OFPC), USA	Recruited between 1986 & 1988 9704 ambulatory women for study of risk factors for osteoporotic fractures from population register	No information	N = 7518 W At least 65 years old at baseline	Up to 7 years (mean 6 years) Lost: 112 (5.4% of which were depressed)	Prospective cohort Hypothesis retrospective
Gallo et al. 2000 Epidemiologic Catchment Area Program (ECA), USA	Community-dwelling adults aged 18-65 years, recruited in 1980-84 from five university-based sites	If reported history of cancer, or if rated own health as 'poor'	N = 1202 M, 1907 W	13 years Lost: Men, 33%, Women, 36.3%	Prospective cohort

Table 1.2ii Summary of cohort studies, part 2: independent & dependent variables and their measurement; presence of site information

Study, year	Independent Variable, Distribution at Baseline	Measure	Dependent Variable, Outcome	DV Measurement, Number of Events	Site Data
WEHS, 1981	Depression Present: 379 (18.8%) Absent: 1641 (81.2%)	MMPI (566-item) D scale, depression Present/Absent if D score>scores of other clinical scales. Magnitude of D score also available	MORTALITY Cancer death, any site (ICD-8)	Death certificates, checked against medical records, coded to ICD-8 82 events	Given as frequencies per site Insufficient for analysis by site
WEHS, 1987	Depression High D: 380 (18.8%)	MMPI as above, High D if D score>scores of other clinical scales; magnitude of D score. Welsh's R (repression) scale & 16pf scale also available	INDIDENCE & MORTALITY	Self report; medical reports, death certificates 212 events; excluded NMSC	Frequencies for top 6 sites
Alameda County, 1988	Depression 11.8% men 17.0% women	HPLDI, 18 item 2 response scale summed symptom inventory; caseness if score 1SD or more above the total mean (∴ report 5+ symptoms)	INCIDENCE and MORTALITY	Automated record linkage with local cancer registry (later to SF area & SEER) Incidence: 213 (M), 260 (F); Mortality: 122 (M), 134 (F)	Yes (ICD-O) Analysis for top 4 sites in addition to overall cancer (lung, breast, prostate, colon)
WCCDS, 1988	Severe depression Present: 836 (9%) Absent: 8096 (91%)	MMPI (399-item), standardised depression score cut off ≥70 (10% did not complete inventory)	INCIDENCE Primary cancer event, breast (female)	Ascertainment from KPMP membership data; medical records, diagnosis confirmed by biopsy 117 events	117 breast cancer events. No reporting of any other sites
NHANES, 1989	Depressed mood CES-D: 371 (14.3%) GWB-D: 846 (13.2%)	CES-D, cut-off of 16+; GWB Schedule, Cheerful v Depressed sub-scale.	INCIDENCE & MORTALITY Cancer event (ICD-9): death, diagnosis, any evidence of cancer	Hospitalisation records; death certificates Events not clear: CES-D, 205 GWB-D, 637	No site information
Washington County, 1990	Depressed mood Present: 368 (16.25%) Absent: 1896 (83.75%)	CES-D, cut off of 16+	INCIDENCE Primary cancer event, any site Groups smoking-related cancers v cancers unrelated to smoking	County Register, death certificates, clinician confirmed Compared against SEER national data 169 events	Given in comparison of smoking-related cancers and cancers unrelated to smoking (types listed)
MFHS, 1996	Depressiveness Tertiles of depressiveness Psychiatric diagnosis: Psychosis, 2.2% Depression, 3.5% Other, 9.2%	36-item GHQ for screening, generated depressiveness score on the basis of 18 items; short-form PSE interview, for psychiatric diagnosis	INCIDENCE Primary cancer event, lung (male)	National Register (coverage ≈100%) 605 new events in overall cohort	70 lung cancer events
EPESE, 1998	Chronically depressed (CD) mood (elevated score at baseline, and at 3 & 6 years prior to baseline), depressed mood (D) at baseline only CD, 146 (3.0%) D, 575 (13%)	CES-D, cut off of 20+	INCIDENCE Primary cancer event, any	Listed hospital discharge, or underlying cause of death. ICD-9, 140-208 402 events	Gives as frequencies per site
OFPC, 1998	Depression 6.3% (473/7518) Depression assessed on 2nd visit	GDS, short form, 6+ symptoms: 6-7 mild, 8-10 moderate, 11+ severe	MORTALITY Cardiovascular, cancer, or non-cancer, non-cardiovascular	From death certificate & hospital records, if available. ICD-9 coding. 295 cancer events	Frequencies for all cancer, lung, breast, colon and other cancer
ECA, 2000	Episodes of Major Depression (MDE), and of Dysphoria (DE). MDE 140 (4.5%), DE 669 (21.5%)	DIS, DSM-III diagnoses from interviews	INCIDENCE Primary cancer event, any	Self-report, and death certificates 203 events	Sites: lung, prostate, colon, skin, breast

Table 1.2iii Summary of cohort studies, part 3: analysis method, results, covariates and notes

Study, year	Analysis Methods	Results (95% CI)	Adjustments	Notes
WEHS, 1981	χ^2 Multiple risk logistic regression model Odds Ratio	Psychological depression associated with cancer death: 2.3, $p < .001$, adjusted	Age, smoking, alcohol, family history of cancer, occupational status	Good choice of age group; considered role of other risk factors for cancer
WEHS, 1987	ANOVA, ANCOVA, M-H χ^2 Cox's regression Relative risk	Adjusted: High D & cancer incidence 1.38 (1.00-1.89); & cancer mortality 1.96 (1.33-2.90)	Age, smoking, alcohol, family history of cancer, occupational status, body mass index, serum cholesterol	High D also associated with risk for non-cancer causes of death
Alameda County, 1988	Age adjusted rates (direct to 1970 adult pop.) Cox's proportional hazards model	D v non-D Mortality, M: 0.83, NS; W: 1.19, NS Incidence, M: 0.97, NS; W: 1.27, NS Also HR for sites, NS	Age Notes in discussion HR not affected if adjust for smoking education income SAH alcohol & race; no measurement details	Found association between depression and all cause mortality (M: 1.43, $p < 0.001$; W: 1.43, $p < 0.001$) and noncancer mortality (M: 1.58, $p < 0.001$; W: 1.49, $p < 0.001$)
WCCDS, 1988	T-test for differences in sub-groups, χ^2 Cox's regression, multivariate life table analyses Relative risk	D v non-D, 1.4 (0.8-2.4) unadjusted D v non-D, 1.5 (0.9-2.5) adjusted	Age, nulliparity, obesity, prior hysterectomy	Did not report oral contraceptive use
NHANES, 1989	Proportional hazards Relative risk	CES-D: Unadjusted, 1.0 (0.7-1.5) Adjusted, 0.9 (0.6-1.3) GWB-D: Unadjusted, 1.2 (1.0-1.5) Adjusted, 1.2 (0.9-1.5)	Age, sex, marital status, smoking, family history of cancer, hypertension, cholesterol	Disregarded other mortality findings
Washington County, 1990	Woolf's χ^2 Cox's proportional hazards model Relative risk, age-adjusted	Overall, D: 1.09 (0.69-1.71) Interaction: if current smoker & depressed: 2.6 (1.41-4.80) & non-depressed: 1.24 (0.79-1.95) with linear trend for ⇑ rates of smoking ($p=.03$)	Age, sex, length of follow-up (others not relevant at 10% level of significance)	Increased cancer in older participants; broad age distribution; smoking data for only1863 participants
MFHS, 1996	Contrasted mean depressiveness score for different levels of confounding variables (age, education, smoking, lung fn etc). Cox's proportional hazards model Relative risk	Male lung cancer: Increased risk with psychosis 4.7 (2.02-10.94) age-adjusted Increased risk with highest tertile depressiveness: 3.32 (1.53-7.2) age-adjusted; 2.89 (1.18-7.08) adjusted NS between psychiatric diagnosis & all cancers combined	Age, smoking status, BMI, serum cholesterol, alcohol intake, antidepressant use, education, marital status, area, general health, leisure exercise, various lung functions Checked prevalence of quitting (NSD between levels)	Interaction between depressiveness score and smoking status (most risk determinants for lung cancer were associated with depressiveness score) Repeated analyses, taking out cases from 1st 4 yrs, taking out those on antidepressants ⇒ results unaffected
EPESE, 1998	Contrasted CD and non-CD (χ^2, t-test, Mann-Whitney) Proportional hazards model stratified by community Hazard ratios	Higher crude rate of cancer in CD than Non-CD CD HR 1.88 (1.13-3.14) D HR 1.02 (0.73-1.42) Also HR for sites, NS	Age, sex, ethnicity, physical disability, number of hospital admissions in follow-up, smoking, alcohol intake	No significant interaction between CD & smoking (quite the reverse) Results stand after adjusting for competing causes
OFPC, 1998	Contrasted with/without depression for baseline characteristics (χ^2, t-test) Proportional hazards models Hazard ratios	Depressive symptoms not associated with cancer 1.0 (0.6-1.7, $p = .93$) but associated with cardiovascular mortality, 1.8 (1.2-2.5, $p = .003$), and non-cancer, non-cardiovascular mortality 1.8 (1.2-2.7, $p = .01$)	Age, history of MI, stroke, COPD, hypertension, diabetes, smoking, perceived health and cognitive function	
ECA, 2000	Logistic regression (no time measurement) Relative risk	BASIC MODEL: MDE 1.0 (0.5-2.1) DE 1.3 (0.9-1.9) ADJUSTED: MDE 1.3 (0.6-2.8) DE 1.3 (0.9-1.9) HIGHLIGHTS: Women with MDE, elevated risk of breast cancer, 3.8 (1.0-14.2)	Age, gender, smoking, alcohol use (DSM dependence or abuse) SES & ethnicity NS in unadjusted model, dropped from further analyses	Very skewed age population, broad and unbalanced; loss to follow-up, query under-ascertainment of depression

1.2.3.2 Methodological issues: the dependent variable

Breslow and Day (1987) point out that most cancers are rare diseases, and if looking at rare ones, 'cohort studies are unlikely to be of much value, unless the relative risk associated with the exposure under study is very large' (p. 21). One might argue that since many of these cohort studies have considered all cancers together as the outcome, rather than considering cancers of specific sites, that this point is fairly addressed. However, although the neoplastic disease process is itself essentially similar, different sites of cancer have different aetiologies, and it is inadvisable to regard them together as a homogenous outcome. Repeatedly, commentators on this literature have recommended that attention be paid to different sites and stages of disease (Bieliauskas & Garron 1982; Fox 1978; Perrin & Pierce 1959). But for many cohorts there may be insufficient events of any one site for reliable analysis. This limitation is illustrated by the wide confidence intervals for findings in two of the studies previously mentioned which analysed cancer incidence by site. Elevated breast cancer risk in depressed women in the ECA study was based on 25 cases, 3 of whom were categorised as having had a major depressive episode (Gallo et al. 2000). Sub-group analysis of smoking status with respect to lung cancer in the Mini-Finland Health Survey was based on 1 case in 143 non-smokers, compared with 13 cases of cancer among 137 smokers (Knekt et al. 1996).

The next issue concerns the type of cancer outcome. Some studies have focused on cancer mortality exclusively (e.g. the first follow up of the WEHS, and the OFPC), but most have considered both incidence and mortality (although it is not always clear that the two have been acceptably differentiated, as for instance in the NHANES study). Typically there is some order of delay between an individual being diagnosed with cancer and that event being officially recorded as a registration. The delay is often shorter with recording death and cause of death, so in the absence of the registration itself, it makes sense to count the death event along with the incidence to increase ascertainment of cancer events and therefore the numbers available for analysis. But there are many uncertainties with respect to timing and cancer: when the disease actually begins; between onset and discovery; between discovery and diagnosis, and thus registration (Fox 1978). More importantly there are other variables at work influencing the course of the disease and the risk of death after diagnosis, such as

diagnostic skill, efficacy of and response to treatment, psychosocial factors and so forth. While there is a well-developed literature devoted to psychological variables and their influence on prognosis or survival, when examining the relationship to development of cancer, incidence of the first cancer event would be the preferred dependent variable or outcome.

As in any properly conducted study, the most valid and reliable measures should be used, but these cohort studies vary in the quality of their outcome data. Although medical records or inspection of death certificates corroborated deaths from cancer, incidence was not always similarly assessed. The WEHS and ECA studies relied on the self-reporting of cancer by participants, a strategy which introduces elements of recall bias, while ascertainment in the WCCDS depended upon its participants remaining in the medical care programme in which they were enrolled (Hahn & Petitti 1988). Other studies relied upon local registers or hospital discharges, although hospital care may not be accessible to all persons in some societies. In fairness, not all health-care systems have speedy or reliable cancer registries with a high percentage of coverage (unlike that serving the MFHS, which had almost 100% coverage), and several studies strove to compensate by setting their findings in the context of national data, i.e. the Alameda County, ECA, EPESE and Washington County studies.

The majority of studies at least describe the distribution of cancer cases by site, with the possible sole exception of the reporting of the NHANES follow up. The authors of the Washington County study grouped cancer events of sites related to smoking and those not, and analysed accordingly. Interestingly, they found that the effect of depressed mood on risk of smoking-related cancers was increased in the presence of smoking, though only significantly so in the heaviest smokers (RR = 18.47, 95% CI 4.58-74.41; Linkins & Comstock 1990).

1.2.3.3 Methodological issues: the independent variable

The cohort studies have by no means been united in their definition and measurement of depression. It is readily apparent from Table 1.2ii that the nature of the independent variable, or categorisation of exposure, differs in cohort studies from the preceding research. Moreover, a wide variety of measures have been employed, further

constraining comparison. These scales and inventories have included: the Center for Epidemiologic Studies Depression scale (CES-D; Radloff 1977); the Diagnostic Interview Schedule (DIS; Robins et al. 1981); the Cheerful v Depressed sub-scale of the General Well-Being Schedule (GWB-D; Dupuy 1977); the short form Geriatric Depression Scale (GDS; Yesavage 1988); the Human Populations Laboratory Depression Inventory (HPLDI; Berkman & Breslow 1983); the Minnesota Multiphasic Personality Inventory, in two different versions (MMPI; Dahlstrom, Welsh, & Dahlstrom 1972); the 36-item General Health Questionnaire (GHQ; Goldberg 1972); and the Present State Examination (PSE; Wing, Cooper, & Sartorius 1974).

The expense and logistical demands of cohort studies emphasises use of self-administered questionnaires to measure psychosocial data rather than interviews, which are more time-consuming and costly. Although this step facilitated the use of standardised assessment instruments, it also tended to limit the conceptual basis underlying the work, and the application of instruments was by no means consistent. Some studies using the same key instrument would employ certain sub-scales in preference to others, reflecting an ongoing diversity of opinion regarding the salient characteristics of psychological exposure. For example, the WCCDS used a shorter version of the MMPI than the WEHS studies and used a standard cut-off of 70 on the depression sub-scale (D) to identify those with 'severe' depression (Hahn & Petitti 1988). The Western Electric studies used absolute magnitude of score on this sub-scale, as well as a dichotomous measure of depression for those who scored higher on the D sub-scale than on all other sub-scales (high D). Furthermore, the later study also took repression (Welsh's R scale) and Cattell's 16pf scale into account (Persky et al. 1987). Similarly, two studies used the cut-off of 16 on the CES-D (NHANES and Washington County studies), while the EPESE used a cut-off of 20, on the grounds that it would be more stringent (Penninx et al. 1998).

Not all of the measures employed in these cohort studies were examining the same object and this may contribute to differences in findings by shifting the denominator at risk, artificially altering the exposure. There are two possible approaches: to consider psychological wellbeing as existing along a continuum, or as a dichotomous variable, this latter approach being preferred in psychiatry. The DIS is designed to classify

psychiatric diagnoses according to DSM-III criteria and the PSE is similarly oriented; either the participant has major depression, or not. These methods obtain more conservative estimates for prevalence of major depression than self-rating scales or inventories, typically less than 5% (see Table 1.2ii) and those studies that employed these methods did not find an association with cancer risk. Nevertheless, these studies also undertook to identify participants who might fall outside these strict criteria, by assessing dysphoric episodes (ECA) or by also using a screening instrument, which in the MFHS did demonstrate a significant association with cancer incidence.

Other studies used self-rating scales of depressive symptoms for the most part, although these measures vary in their assessment of state or trait characteristics and most tend to require a clinician examination to confirm diagnostic status. By these means, the participant has psychological disturbance or depression to a lesser or greater degree. Some scales were derived from a personality approach to this aspect of mental health, others were more influenced by the stress literature; certainly the variety of measures used does not engender an untroubled comparison of like with like (Temoshok & Heller 1984). The various questionnaire or inventory measures obtain a range of 9 – 21% for prevalence of depressive or dysphoric symptoms (see Table 1.2ii). Interestingly, the chronically depressed made up around 3% of the EPESE population, while those depressed only at baseline constituted 13%. This may reflect the improved sensitivity and specificity for major depression the authors cite for the higher CES-D cut-off (Penninx et al. 1998), as well as the advantage of increased sensitivity to chronic depression from the use of repeated measures.

Another matter concerns the type of population for which a measure was designed. It is not straightforward to compare a scale devised for geriatric populations such as the Geriatric Depression Scale (OFPC) with one designed for use in the general population; indeed this study estimated a prevalence of depression of 6.3% in their sample, somewhat less than the prevalence estimated by the other questionnaire measures. Furthermore, clinical definitions of depressive disorder and psychological disturbance have changed over time in successive issues of the DSM criteria, as well as in the International Classification of Diseases, albeit in minor ways (Horwitz & Scheid 1999).

1.2.3.4 Methodological issues: study population & follow up

The next consideration that impacts on both rates of depression and cancer risk is the nature of the population from which the cohort members are drawn. It is more efficient to choose a study population which is likely to have experienced the risk factor or exposure to some degree, and will be at reasonable risk of the disease of interest, particularly when one does not expect the association between each to be of great magnitude. Age is a significant risk factor for cancer (IARC 1990) and an important factor in depression (Doris et al.1999; Levi 1998; Wittchen et al.1994). Perhaps mindful of this, the MFHS for example had a lower age limit of 30 years at baseline. The study sample should also be carefully screened for cancer to begin with and then diligently followed-up to ascertain cancer events as completely as possible.

If the age distribution of a cohort is skewed for example by including many younger people at lesser risk of developing cancer over follow up, then this reduces the likelihood of any association being discovered. The target age range of parent studies restricted several cohorts in this regard. The women in the WCCDS were chosen as a function of their likely use of oral contraceptives, and so age in that cohort ranged from less than 25 to over 45 years (Hahn & Petitti 1988). Although follow up of 12 to 14 years would have placed the older participants within an appropriate age bracket in terms of risk, the younger participants would not have been at the same risk, therefore reducing the likely number of cancer events obtained. The 'nationally representative' samples of the NHANES [4] and Alameda County Study seem to cover the entire age range using a stratified probability sampling strategy. Nevertheless since the authors omit clear details of either age or gender in their description of the cohort (Kaplan & Reynolds 1988; Zonderman et al. 1989), it is very difficult to tell what this means in practice.

Both the Washington County and ECA cohort include members aged between 18 and 65 years, but the latter has a particularly skewed distribution, with the youngest group contributing most to the cohort size. On the other hand, some cohorts might be considered to benefit from their target age bracket. Participants in the OFPC cohort

[4] According to Kelsey, Thompson, & Evans (1986), the NHANES I study participants had an age range of 1 to 74 years, and NHANES II participants had an age range of 25 to 74 years.

were at risk of osteoporosis and were on average aged 72 years (Whooley & Browner 1998), and those in the EPESE had a mean age of 79 years (Penninx et al. 1998). Cancer rates are typically higher in these age groups. However, these older samples may be considered likely to have lost individuals who would have developed or died from cancer or some other cause and so conclusions from these studies may be limited to an older population. In some respects the WEHS cohort was ideal for addressing the research question, with an age range of 40 to 55 years at baseline.

The majority of studies were sampled from the general population, and included both men and women, with the exception of the WCCDS, OFPC and WEHS cohorts. The WCCDS enrolled women from a health care programme in California, which suggests the possibility of some selection bias and their findings would not necessarily generalise to those who would have been unable to avail of such a programme. Indeed the authors describe their study sample as mostly white, married and moderately well educated (Hahn & Petitti 1988). The OFPC was also a female-only study sample. On the other hand, the WEHS comprised male workers from an electrical factory and only a small proportion were office workers or supervisors. Thus there is significant contrast between the studies in terms of study base and sample characteristics. Further, it seems that for most studies, investigators seem to have assumed that the effect of depression or depressive symptomatology on risk, if any, will be uniform irrespective of the gender, age, and socioeconomic make-up of the study sample, or indeed cancer site.

Participants in these cohort studies should be cancer free at the time of entry to the study. However, it can be very difficult to establish disease-free status at baseline. Although some studies relied upon self-reports of cancer rather than official records, neither the OFPC nor the NHANES authors indicated how they accounted for disease-free status and presumably may not have excluded participants on this basis. The ECA investigators made an effort to exclude occult cancers by excluding those who rated their health as 'poor', but it is questionable how many persons with somatically oriented depressive symptomatology might have been left out because of this.

Moreover, the study design should address the reasonable concern that the neoplastic process can itself produce neurological effects such as depressive symptoms (Fox 1978), further confusing the denominator at risk. Addressing this, several studies either eliminated cases from the first few years of follow up from analysis or strove to indicate the spread of cases over the years of follow up (e.g. WEHS, MFHS). Others excluded those participants who had been prescribed drugs such as tamoxifen that are used to treat cancer (e.g. EPESE).

The EPESE study excluded participants at baseline who were not going to be easily followed-up for cancer, attempting to reduce the loss to follow up in that study (even though it was the shortest at only 4 years), but potentially introduced serious bias in estimating the denominator at risk. On the whole, follow up time should be sufficient to permit the development of cancer due to the exposure of interest (Fox 1978; Fox 1995a) and this time for the EPESE might be regarded as insufficient. However their participants had been assessed for depression at 6 and 3 years prior to baseline and all those with cancer excluded at baseline. So it might be argued that this concern is fairly addressed, though not excluding the possibility of erroneously measuring depressive symptoms as a by-product of the disease process. Regrettably these authors were not explicit about the loss to follow up (Penninx et al. 1998), nor were some others (WCCDS or the first follow up of the WEHS). The loss to follow up in the ECA study of almost a third and to a degree that of the Washington County Study (c. 13%), may give rise to concern, but more likely reflects the difficulties of ascertainment in the absence of a formal national Register system with high coverage.

1.2.3.5 Methodological issues: competing risks

A related issue to loss to follow up is the consideration of competing risks, i.e. endpoints other than cancer associated with the exposure under study that would remove a participant from being at risk of cancer. Depression has been identified as a predictor of a variety of cardiovascular conditions and myocardial infarction (Whooley & Browner 1998). Use of a technique such as Cox's regression allows for these competing events (Clayton & Hills 1993; Cox 1972). The analyses of the WEHS used competing risk multiple logistic regression and Cox's regression models and reported non-cancer deaths. The EPESE found an association between chronic depression and

cancer risk without replicating the findings of other studies with respect to interaction with smoking (MFHS, Washington County Study). But as the mean age of this study population was quite advanced, one could argue that those participants who might have been at greater risk through smoking were likely to have been eliminated already from the sample through premature death, as might have been the case for participants in the OFPC study.

1.2.3.6 Methodological issues: confounding variables

In order to avoid confounding results and repeating the shortcomings of earlier research, it is vital to account for other exposures to cancer-causing agents. If any relevant variables or confounders are not measured from baseline, their role in the exposure-outcome relationship cannot be established with reliability, potentially undermining confidence in the overall results. When the study outcome is simply any and all cancers, adequate control of confounders becomes quite difficult to accomplish and therefore is more easily done where the outcome is one site only. Thus Knekt et al. (1996) adjusted for various lung function measures in addition to age, smoking status, alcohol consumption and body mass index, since this part of the MFHS focused on lung cancer as an outcome. Similarly, the WCCDS considered age, nulliparity, obesity and prior hysterectomy in addition to a core set of variables but curiously omitted oral contraceptive use.

Nearly all of the cohort studies endeavoured to assess a reasonable range of likely confounders (see Table 1.2iii), however not all measures used were ideal. For example, the ECA investigators used the DIS to measure alcohol consumption in terms of DSM-III definitions of alcohol dependence or abuse which are not necessarily the same as unit increases in alcohol intake (grams per week, or 'units' per week) considered elsewhere and which are arguably more relevant to estimating cancer risk. Similarly socio-economic status, which has associations both with rates of depression (Levi 1998) and rates of various cancers (Faggiano et al. 1997), was not assessed in comparable ways, if at all. Instead, reporting typically focused on ethnicity, marital status and levels of education (e.g. WCCDS, Washington County study, MFHS, ECA) or occupational status (WEHS).

There have been suggestions that the positive findings of the WEHS cohort were due to occupational exposure to polychlorinated biphenols or PCBs (Fox 1995b; Fox 1998; Spiegel & Kato 1996). Since there is no indication that exposure to this carcinogen might have been any different in the depressed as compared with the non-depressed, it is difficult to refute the study findings on this basis. On the contrary, it may have been more useful to have a cohort like this one, which would already have some likely occupational exposures to carcinogens, in order to assess whether depressive status increased the likelihood of developing cancer or not. There will be more discussion of this point later.

1.2.4 Conclusions & Remaining Issues

In addition to the material reviewed here, a meta-analysis of cohort studies suggested that a small but significant statistical risk was associated with depression as a risk factor for cancer (McGee, Williams, & Elwood 1994). Elsewhere, Friedman conducted a study of psychiatric patients and found a slight excess risk amongst those psychiatrically diagnosed as depressed (Friedman 1994), but he explained this to be due to confounding by other exposures (including exogenous hormones). In contrast, the Danish Psychiatric Cohort (DPC; Dalton et al. 2002), which followed 89 491 individuals hospitalised with psychiatric disorder between 1969 and 1993, yielded a standardised incidence ratio of 1.05 (95% CI, 1.03 – 1.07) for any cancer over follow up. However, Dalton et al. (2002) attributed much of the excess risk to smoking-related cancers, particularly after follow up of ten or more years.

But it is not apparent how depression may affect cancer: whether it acts on the disease aetiology, or on some aspect of promotion and progression. Although observational epidemiological techniques may not be able to answer that question with precision, they do provide the means to establish whether an association, if any, exists. In conclusion, a clear association between depression and cancer incidence has not been established, but many interesting questions have been raised, along with several pointers from the literature for the appropriate design of a future study.

At the very least, preliminary recommendations may be made about design and population. In order to address the research question, prospective cohort study designs

including both men and women should be used in preference to retrospective or cross-sectional designs. The age range of that cohort is central: the distribution should not include too many younger people, who are not otherwise likely to be at risk of developing cancer over follow up; nor include only older adults, from whom those who might have been at risk may have developed cancer or died before entry to the study. Participants should be cancer-free at entry to the study and assiduously followed up using objective sources of information, such as state cancer registries or hospital records, in preference to self-report.

There are a number of unresolved issues which need further investigation: these relate to the definition and measurement of depression; the nature of the cancer outcome; and the consideration of confounders. The definition of depression, whether using a continuous or a discrete model (Horwitz & Scheid 1999), remains a contentious issue that only contributes to the inconsistencies in this literature. Should the independent variable be defined as clinical depression, or chronic depressive symptoms? Or, given the contrasting findings in the literature and as Bieliauskas argued (Bieliauskas 1984), is it sub-pathological depressive disorder or psychological distress? These terms do not define the same groups of people; similar, perhaps overlapping, but not comparable in terms of the denominator at risk, there being arguably more people with lesser disorder than those with severe depressive disorder (Hale 1997). A related point is the duration of exposure. Certainly, to have any significant effect on the process of carcinogenesis, a more established disorder occurring over time should have more impact than a brief, transitory episode. The findings from the EPESE study with regard to chronic depression support this assertion, in contrast to studies which found no association using strict clinical measures administered on one occasion alone.

It is not clear whether depression could affect all cancers or specific types of cancer such as those which are hormone-related (Gallo et al. 2001). The definition of outcome should ideally be specific cancer sites, rather than a simple dichotomous outcome of 'cancer' / 'no cancer' irrespective of site. This may require more time devoted to follow up than many studies have available resources, with 10 to 15 years an acceptable minimum follow up as well as allowing for efforts to mitigate attrition and reporting delays in registration systems. Some authors have recommended the use of staging

information (e.g. Fox 1978); as a variable for this kind of research staging may prove to be more reflective of factors influencing diagnosis and registration rather than being entirely pertinent to the question at hand. For example, those who are depressed may be shown to have later staging registrations, but rather than indicate more serious or developed disease as a result of depression itself, this might reflect delayed help-seeking and thus being further along the disease course at diagnosis. Nevertheless, incidence information is preferable to mortality data, for whatever inter-individual variation there may be in time to diagnosis, there are many more sources of variance in survival, ranging from treatment and site-specific factors before even considering psychological variables.

Finally, a drawback of using an existing cohort study to address this research question is that the parent study, being originally designed with outcomes other than cancer in mind, may not have had optimal consideration of confounders. Thus key and less obvious confounders may not have received sufficient attention and thorough appropriate measurement. A list of potential variables to measure and therefore enable appropriate adjustment in analyses is summarised in Table 1.2iv.

Table 1.2iv Possible confounders and other risk factors for cancer

	Variables
Minimum	Age, gender, smoking, alcohol use, family history of cancer, socio-economic status Consideration of occupational exposures
Optimal	*Plus* Body mass index (obesity), marital status, ethnicity, education, diet, reproductive variables General health, anti-depressant use, hospital admissions over follow up
Ideal	*Plus* Exercise, physical disability Site-specific risk factors

Moreover, the effects of some of these confounders, such as socioeconomic status or gender for example, are not necessarily limited to the dependent variable, but also affect the independent variable. To aid interpretation of results, it might be useful to illustrate the contrasting characteristics of participants with depression compared with those without, as reported in the EPESE and OFPC studies.

1.3 Summary

The notion that the risk of developing cancer could be increased by depression has very old roots. It is also a notion that has fallen in and out of favour among physicians and scientists over the centuries. Twentieth century developments in psychoanalysis and psychosomatic theory have stimulated more recent interest, and helped generate a body of case-control research that seems to provide support for a positive association. However, many of these studies were flawed, not least from being retrospective in design, casting doubt on their findings: it was impossible to determine whether depression arose from the disease process or preceded it. As interest focused increasingly on a standardised definition of depression, the cohort study was the methodological development of the mid-twentieth century that seemed best suited to addressing the issue of temporal order.

Ten cohort studies are reviewed in this chapter (with reference made to other relevant studies), but these cohorts differed in a variety of ways, not least in their results, thus impeding comparison and straightforward conclusions. It may be said that cohort research from the last 20 to 30 years does not on the whole support an association between depression and cancer risk. But the presence of methodological flaws and unresolved issues prevents a definitive statement to that effect, not least in the light of intriguing findings from particular cohort studies such as the Western Electric Health Study, the Mini-Finland Health Study and most recently the Danish Psychiatric Cohort. Specific issues that need to be addressed include the nature of depression (clinical or sub-clinical) and how it could be related to the development of cancer and whether any effect of depression impacts all cancers or only specific sites.

Chapter 2

Theoretical Background

Aims & Hypotheses

2.1 Introduction

This chapter considers the theoretical background and the means by which depression and cancer risk might be related, with reference to particular features of depression or distress and cancer (section 2.2). The next section presents the rationale and model for the present research (section 2.3). It concludes with the aims and hypotheses for the present study (section 2.4).

2.2 Theoretical Background

Considering the literature as a whole and the direction of this thesis, there is clearly an underlying question with regard to the relationship between depression and cancer. There are three possible theoretical positions. First there is the contention that there is no relationship between depression and cancer; that is, the null hypothesis. Alternatively, one might hold there is a relationship between depression and cancer, which is direct or indirect in nature. This section deals with each of these premises in turn, referring to the cohort literature in the main part, but also to other branches of the literature.

2.2.1 Null Association between Depression and Cancer

Inasmuch as researchers have devoted considerable energies to addressing the premise that there is some manner of relationship between depression and cancer (Rather 1978), and although the case-control evidence might be construed as supporting this position albeit profoundly flawed, the prevailing perception in the late 20th century has sided with the null hypothesis (McGee, Williams, & Elwood 1994; Young 1990; Zonderman, Costa, & McCrae 1989). Evidence from cohort research may be considered at best mixed, with influential cohort studies having found little or no grounds to reject the hypothesis of null association (Hahn & Petitti 1988; Kaplan & Reynolds 1988; Whooley & Browner, 1998; Zonderman et al. 1989). The controversy surrounding the Crvenka study (Grossarth-Maticek et al. 1982; Grossarth-Maticek, Bastisams, & Kanazin 1985; Psychological Inquiry [whole issue] 1991), even though this research was concerned with personality and cancer risk, served only to bolster the sceptic's stance, not least with regard to the association of any psychological factors with physical ill-health, e.g. (Angell 1985).

But if there is no association between depression and cancer, how can positive results which support the alternative hypothesis be explained? These findings may be due to chance; or due to the association of depression with some other unmeasured variable which independently increases cancer incidence; or due to Type I error, that the null hypothesis has been accepted when it is in fact false. This latter eventuality might arise from a variety of factors, or a combination of factors. These factors might include (1) sample characteristics, e.g. selection of individuals not normally at risk of developing

cancer; (2) issues around definition of exposure such as assessing strict clinical major depression versus more general psychological distress using symptom inventories; (3) curtailed follow up; (4) inadequate measurement or adjustment for covariates; or (5) definition of outcome, leading to all cancer rather than site-specific analyses, or using mortality rather than incidence data.

The notion that depression might be associated with some other unmeasured factor which independently increases cancer risk has been put most emphatically by Fox (1978; 1995). He suggested that the positive findings from the WEHS may have been confounded by occupational exposure to PCBs in the cohort (see section 1.2.3.6). Depression can arise from exposure to this carcinogen, and thus a spurious association could have arisen between depression and cancer, when in fact the excess depression reflected the exposure to this chemical compound. While the idea itself is sound, and the level of depression measured in the WEHS was high (18.2%), this suggestion seems never to have amounted to more than simply that, and does not explain findings from non-industrial samples (the MFHS or Washington County Study).

Of course the null hypothesis also implies that there is no relationship in the other direction, between cancer and the development of depression. The possibility that occult disease, or immune responses to it, may produce neurological effects, including depressive symptomatology has been widely acknowledged (Evans, Hucklebridge, & Clow 2000; Fox 1998; Holland & Zittoun 1990; Mitchell 1967). Kaplan and Reynolds (1988) argued that the inclusion of items tapping physical health and functioning used in the MMPI might account for the positive finding in the WEHS, while the absence of somatically contaminated items in the HPLDI would explain the finding of null association in the Alameda County Study. Previously, this issue dogged case-control research in this area and serves as a key argument in favour of prospective research (by ensuring a sample cancer-free at entry to the study). It remains pertinent in the measurement of affective status in studies related to physical health in general and has led to the development of measures designed to be free of somatic contamination (e.g. the Hospital Anxiety & Depression Scale; Zigmond & Snaith 1983). However somatisation is an important if complicating feature of psychiatric morbidity (Goldberg & Huxley 1992) and to remove it from a measure of depression entirely might lead to

underestimating the prevalence of the disorder. One remedy could be to eliminate from analyses those participants who presented with cancer within the first few years after entry to the study. The authors of the MFHS repeated their analysis after excluding incident cancers in the first 4 years of follow up, but this made no significant difference to their results (Knekt et al. 1996).

While it is no longer universally assumed that a diagnosis of cancer is an automatic death sentence, to the point of omitting to disclose to a patient his or her disease status (Bard 1966; Moses & Cividali 1966), the impact of diagnosis may be severe. Allowing for side-effects of neoplastic disease mentioned above, the variety of patients' responses to the diagnosis of cancer and equally, the treatments offered for it, has helped to produce a thriving field of care and research in itself, psychooncology. The notion that emotional factors may contribute to length of survival through a direct route has assumed more clinical significance than the direct impact of psychological factors on cancer risk (Holland 1989). Findings have been provocative, such as significantly reduced 5-year survival rates for women with early stage breast cancer who scored highly on a depression measure (Watson et al. 1999).

2.2.2 Direct Association between Depression and Cancer

The first alternative hypothesis is that there is a direct relationship between depression and cancer. This provokes the simple question: how? Certainly it is not necessary and sufficient to have depression in order to develop cancer; nor is it automatically the case that the cancer patient develops depression however much he or she might be at increased likelihood of distress in response to a potentially devastating diagnosis. The days of unswerving acceptance of the psychosomatic premise have long since departed. In order to support this hypothesis, direct pathways between depression and the development of cancer have to be demonstrated. This is not straightforward, even in the light of state of the art knowledge about depression and cancer, briefly sketched here.

2.2.2.1 The development of cancer

The development of neoplastic disease is a thumbnail epic of evolution in its own right. First a cancer causing agent or carcinogen must interact with cell DNA, producing a strand break or more often an altered nucleotide (adduct) unless the damage is repaired. The damage or misrepaired alteration can be a permanent heritable change in the genome (Perantoni 1998), and should it occur in a growth area bestow a growth advantage on that cell. Although the initiated cells are genetically programmed with the superimposed malignant phenotype, it will be expressed only in an appropriate environment of promotion (Pierce 1998). Promoters, working by mechanisms yet to be clarified stimulate growth or block differentiation preferentially of initiated cells. However if a promoter is removed, the expanding clones of cells will disappear, as it is not in itself genotoxic.

Progression is necessary before the neoplasm acquires an autonomous state, more dynamic and continually more and more malignant (Pierce 1998). This stage is marked by a multiplicity of events, still poorly understood, which allow some permanent selective growth advantage to initiated cells, the over-expression of transforming genes (oncogenes) or inactivation of tumour suppressor genes (IARC 1997). But however the means, the effects are irreversible. Foulds defined it as 'the gain or loss of unit characters leading to the autonomous state' once lost not regained (Foulds 1969). Autonomy seems insufficient however; there is a propensity for malignant neoplasms to disseminate and grow as secondary tumours in the host, often before the primary tumour is discovered. Metastasis requires a sequence of steps to be negotiated successfully, summarised thus: disruption of cell membrane; cell detachment; cell motility; invasion; penetration of vascular system; cancer cells in circulation; stasis, or arresting of cancer cells in circulation; the growth of the cancer cells into metastases, followed ultimately by the metastasis of the metastases (Pierce 1998). Thus the course of neoplastic development may be deemed subject to accelerating and decelerating influences throughout.

Several investigators suggested that a common underlying biological process, arising from one of, or a combination of, the central nervous system, the hypothalamic pituitary adrenal (HPA) axis or the immune system might be involved in the

relationship between depression and cancer (Dalton et al. 2002; Knekt et al. 1996; Linkins & Comstock 1990; Penninx et al. 1998; Shekelle et al. 1981). Gallo et al. (2000) highlighted the finding of increased risk associated with depression for prostate and breast cancers in their cohort and suggested that depression may produce hormonal changes that in turn elevate risks for cancer of particular sites. Discussing the process of carcinogenesis, Perantoni (1998) noted that endogenous promoters such as hormones and growth factors were relatively unstudied and required further investigation.

2.2.2.2 Features of depression

Depression produces characteristic physiological changes (Kiecolt-Glaser et al. 2002), in addition to its behavioural, cognitive and affective features (see Table 2.2). Briefly, these physiological changes include reduced monoamine neurotransmitter availability in the brain, as well as alterations in the immune system (reduced NK cell activity, activation of inflammation and the acute phase response) and in the HPA axis (increased corticotrophin releasing factor and cortisol). Altogether depression 'is associated with dysfunction in this triangular relationship' (Evans, Hucklebridge, & Clow 2000, p. 94), that is, between these three systems. Evans et al. (2000) hold that in combination with genetic and environmental predispositions such dysregulation can lead to physical illness. Thus a direct association could be represented as either operating directly between depression and cancer, or with the effects of depression moderating the effects of risk factors on the development of cancer.

Table 2.2 Typical symptoms of depression

Symptoms of Depression
Sad or low mood
Reduced ability to experience pleasure (anhedonia)
Pessimism
Feelings of worthlessness or guilt, suicidal thoughts
Inhibition
Retardation/agitation of action
Variety of physical complaints
Changes in appetite, sleep, energy level, libido

(from: Coyne 1985; Horwitz & Scheid 1999; Katona & Robertson 1995)

However, the sum of PNI research thus far, allowing for the complication of measurement issues with respect to assessing the depressed mood itself, is less positive about the potential for depression to predispose to cancer and far more sanguine about the potential for depression to influence disease course once cancer has developed (Evans et al. 2000). There seems to be little evidence for a direct association between depression and cancer incidence. Nor has a cohort study to date published this kind of data in examining the relationship between depression and cancer risk, although such an investigation would remain limited as it is very difficult to perform a controlled prospective study designed to establish whether particular psychological characteristics predispose to a particular condition (Evans et al. 2000). Further, these measurements are typically invasive and expensive (sometimes prohibitively so for PNI variables). More pertinently, our understanding of the complex relationships of these systems and their interactions within the body is still very much under development. It would be unwise to over-extend the data at hand and thus further discussion of this area is limited here.

2.2.3 Indirect Association Between Depression and Cancer

The second alternative hypothesis holds that there is an indirect association between depression and cancer. Intervening variables or pathways mediate the relationship between the two variables and other variables may further moderate the relationship. A number of authors have drawn attention to the health behaviour (such as smoking, alcohol use or diet) of people with depression and the role this might play in cancer risk (Croyle 1998; Dalton et al. 2002; McGee, Williams, & Elwood 1994). Knekt et al. (1996) suggested that differences in risk might arise from those alterations in behaviour arising from depression. Although concluding that there was no association between depression and cancer incidence, the authors of a Danish cohort study of cancer incidence among patients hospitalised for depression between 1969 and 1993 (the Danish Psychiatric Cohort) attributed a slight excess risk to smoking-related cancers alone (Dalton, Mellemkjær, Olsen, Mortensen, & Johansen 2002).

Leaving aside the many hundreds of carcinogenic chemical compounds that humans have managed to introduce over the past 150 years (which incidentally have shown little relevance to cancers of the uterine cervix, breast, ovary, colon-rectum or prostate),

there are many more immediate risk factors for cancer, namely: tobacco, alcohol, diet, endogenous and exogenous hormones, viruses, immune system factors, solar radiation and last but by no means least, age (IARC 1990). Ageing, apart from indicating a greater time period in which to accumulate risk exposures, is associated with increases in mutagenic activity and declines in immune, nervous and DNA repair systems in the body. Time may wait for no man, but exposures to the other risk factors are to some extent modifiable and several have been the target of health promotion campaigns.

2.2.3.1 Health behaviours and cancer risk

Thus a form of indirect association between depression and cancer might be that health behaviours mediate the relationship, at least in part (Croyle 1998). Health behaviours play a recognised and substantial part in the development of many diseases, particularly chronic disease like heart disease and cancer (Kaplan, Sallis, & Patterson 1993). Doll and Peto advocated a significant role for health behaviours in cancer incidence (Doll & Peto 1981). Health behaviours represent the individual's contribution to his or her exposure history at the level of diet, smoking (smoking, in this thesis, refers to cigarette smoking rather than pipe or cigar smoking), alcohol use, exercise, sun exposure, viruses and use of exogenous hormones and arguably these behaviours may modulate the functioning of the immune system.

At present 'tobacco smoking is the single most important cause of lung cancer and, in fact, of all human cancer considered as a group' (Trichopoulos et al. 1997, p. 240). As well as lung cancer (Doll et al. 1994; Hammond 1966; McLaughlin et al. 1995; Surgeon General 1989), other sites also associated with smoking include bladder (Hartge et al. 1987; IARC 1986; Silverman, Morrison, & Devesa 1996), renal pelvis and ureter (McCredie & Stewart 1992; McLaughlin et al. 1983; McLaughlin et al. 1984; McLaughlin et al. 1992), oesophagus (Baron & Rohan 1996; Muñoz & Day 1996) and pancreas (Baron & Rohan 1996; IARC 1986). There is also evidence of some effect of smoking on cancers of the stomach (Nomura 1996), brain (Preston-Martin & Mack 1996), vulva (Daling & Sherman 1996), cervix uteri (Schiffman et al. 1996), colon and rectum (Schottenfeld & Winawer 1996), as well as leukaemia (Baron & Rohan 1996; Linet & Cartwright 1996).

The picture with diet is less clear cut than with smoking, not least because no single factor emerges as carcinogenic or anti-carcinogenic (Peto 2001) and the methodological difficulties in assessing the various contributions of a variety of factors to cancer risk has proved formidable (Schottenfeld & Winawer 1996). Key risk factors appear to be total energy intake, dietary fat and salt (which acts as a local irritant), but there is also risk for certain sites associated with intake of animal proteins, fried fatty food, cured or salted foodstuffs, and a diet low in fibre (Willett 1996). A related issue to energy intake and dietary fat is the risk associated with obesity, for cancer risk overall (Peto 2001) as well as specific sites, including endometrium and the biliary system as well as renal cell cancer and colon cancer in men (Willett 1996).

Protective effects have been associated with a diet high in fruits and vegetables, as well as intake of vitamins A, C, E and selenium, although more research is required (Blot & Fraumeni 1996; World Cancer Research Fund/American Institute for Cancer Research 1997). The sites principally associated with elevated risk due to dietary factors include cancers of the colon and rectum (Giovannucci et al. 1992; Schottenfeld & Winawer 1996), bladder (Claude et al. 1986; Riboli et al. 1991; Steineck et al. 1990; Vena et al. 1992), renal cell (Chow et al. 1994; McLaughlin et al. 1996), stomach (Nomura 1996), uterus (Armstrong & Doll 1975) and prostate (Armstrong & Doll 1975; Carroll & Khor 1975; Ross & Schottenfeld 1996).

Alcohol consumption has been associated with increased risk for cancers of the oral cavity, pharynx, larynx, oesophagus and liver (Jensen, Paine, MacMichael, & Ewertz 1996). All types of alcoholic drink affect risk, reflecting total amount of ethanol consumed. Smoking and alcohol consumption together have a synergistic effect for cancers of the upper aerodigestive tract (Baron & Rohan 1996; Jensen et al.1996). Moreover, heavy drinkers tend to be heavy smokers, an association which complicates the relationship further. There is also some suggestion that alcohol consumption may be associated with breast cancer risk (Howe et al. 1991; Longnecker et al. 1988).

Lower levels of physical exercise, as exemplified by sedentary work practices, seem to be associated with increased risk for cancer of the colon and rectum, at least in men (Garabrant, Peters, Mack, & Bernstein 1984). There is certainly evidence of decreased

risk associated with higher levels of physical activity for this site (Arbman et al. 1993; Ballard-Barbasch et al. 1990; Chow et al. 1993; Fredriksson et al. 1989; Garabrant et al. 1984; Gerhardsson et al. 1986; Vena et al. 1985; Wu et al. 1987) and others, including breast and prostate (Frisch et al. 1985; Ross & Schottenfeld 1996; Trichopoulos, MacMahon, & Cole 1972; Wannamethee, Shaper, & Walker 2001; World Cancer Research Fund/American Institute for Cancer Research 1997). However, there is some evidence of increased risk for certain sites associated with heavy or vigorous sporting activity (American Cancer Society 1992; Wannamethee, Shaper, & Walker 2001).

Related health behaviours include exposure to solar radiation through tanning or outdoor occupational exposure; infection by viruses through for example sexual behaviour; and the use of exogenous hormones, such as oral contraceptives or hormone replacement therapy. Epidemiological studies have consistently shown that exposure to UVB radiation in sunlight to be linked with both melanoma and non-melanoma types of skin cancer (Scotto, Fears, & Fraumeni 1996). Skin cancer is more common in white Celtic types and there is an inverse relation with latitude. Non-melanoma types of cancer are more common in outdoor workers, while melanoma tends to be found in indoor workers with intermittent exposure (Armstrong & English 1996; Scotto et al. 1996). A variety of viruses have been associated with cancer risk (Mueller 1996; Mueller, Evans, & London 1996), most notably hepatitis B and C (for hepatocellular carcinoma), Epstein-Barr virus (for Burkitt's lymphoma, nasopharyngeal carcinoma and Hodgkin's disease), as well as human papilloma virus 16/18 (for cancer of the cervix). Typically exogenous hormones have been administered for therapeutic benefit, but use is associated with increased risk for cancers of the breast, endometrium and ovary in women, but this risk is complicated by the history of endogenous exposure to hormones, through age at menarche, nulliparity and menopause (Bernstein & Henderson 1996).

2.2.3.2 Interrelationships between health behaviours and depression

It is readily apparent that depression can affect appetite, sleep, alcohol use, cognitive set (Glassman et al. 1990; Hughes et al. 1986; Schuckit 1994) and smoking cessation (Anda et al. 1990; Hughes et al. 1986). But much as one cannot simply presume that positive mental health correlates positively with health promoting behaviours, neither

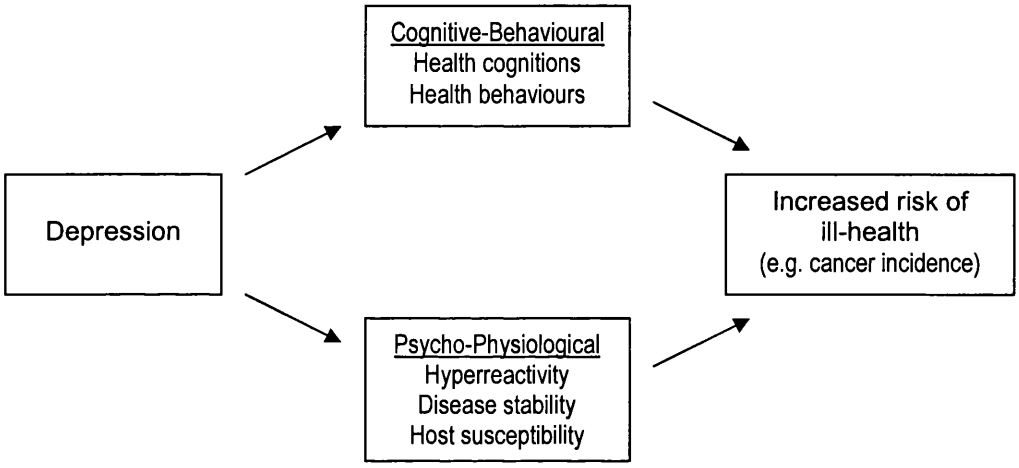
can one assume that poor mental health should necessarily be associated with negative health behaviours. The assumption bears testing, not least since remarkably little research has been carried out into differences in health cognition and health behaviours as a function of depressive state (Connor & Norman 1995).

Given the interactions already observed (Linkins & Comstock 1990; Knekt et al. 1996; Gallo et al. 2000), health behaviours may well prove to be a pathway between depression and cancer risk; although apart from the post hoc analyses of the MFHS and Washington County Study, none of the cohort studies explicitly tested hypotheses about intervening variables or mechanisms. Penninx et al. (1998) indicated that the chronically depressed in the EPESE cohort were older, more likely women, less often smokers or excessive drinkers. In addition, they were more likely to have had hospital admissions over follow up, used anti-depressants and to have been physically disabled. Depressed women in the OFPC tended to be older, more likely to report poorer health and have more illnesses, as well as exhibit poorer cognitive and physical functioning (Whooley & Browner 1998), although in contrast to the EPESE, were more likely to be smokers. Some investigators did not convey differences or similarities among those categorised as depressed or non-depressed. Fewer studies still took account of changes in depressive status during follow up, or of changes in relevant risk factors throughout follow up, such as smoking cessation or change in alcohol use.

Assuming that mental illness such as depression or distress constitute a form of stress (Smith 1993), Steptoe's (1991) conceptualisation of how psychobiological stress responses might affect health may prove useful. Under this framework, health may be influenced through two pathways: the psycho-physiological and the cognitive-behavioural (see Figure 2.2). The role of the former has been touched upon in the previous section on direct associations, and Steptoe (1991) specifies three processes: psycho-physiological hyperreactivity (abnormally large autonomic or neuroendocrine responses or delayed recovery from a stressful exchange), disease stability (physiological stress responses affect the course of an existing clinical condition) and the host vulnerability process (stress-induced alterations to the endocrine and immune systems that reduce the resistance to external challenges). The second pathway relates to health cognitions and behaviours and while 'the extent to which this mechanism is

responsible for changes in disease incidence or severity is largely unknown' (Steptoe 1991, p. 637), the balance of evidence indicates that this pathway of the stress response can affect health status 'irrespective' of the psycho-physiological pathway (Steptoe 1991).

Figure2.2 Indirect association: Pathways between depression and ill-health (after Steptoe 1991)



However, this is not to suggest that either pathway might operate alone. For example, it may be that in addition to finding smoking cessation more difficult, depressed heavy smokers inhale more deeply, more often, for longer and use more of the cigarette than heavy smokers who are not depressed. But equally the metabolism of tobacco carcinogens and response of the immune and DNA repair systems may be disadvantaged in favour of disease within the person who is depressed, as a result of that disorder. Separating the entangled relationships is by no means uncomplicated, and may prove to be beyond the grasp of observational epidemiological research.

But in this context what of Fox's point about another factor associated with depression which independently increases cancer risk (Fox 1995a; Fox 1995b)? He maintained that 'if a psychological factor is associated with a physical carcinogen, it will not be considered an independent variable, although it may be regarded as a possible confounder' (Fox 1995a). Giving the example of smoking, he argues that 'certain traits' affecting smoking behaviour should only be of interest inasmuch as they affect cancer independently of smoking. This may appropriately be the case when considering age, gender or socioeconomic status, all of which act as confounders independently influencing the experience and phenomenon of depression, as well as cancer risk. However it seems needlessly simplistic to remove a potential pathway entirely; never mind give countenance to the notion that psychological variables have no influence over behaviour.

Fox's implied warning against simplistic interpretations of empirical evidence is undoubtedly well meant, but a more apposite conclusion might be inferred. An increasingly complex set of factors must be borne in mind when considering the relationships between depression and health behaviours, health behaviours and cancer, and depression and cancer. As much as possible, these relationships should be elucidated at social, psychological and biological levels, as well as over time (Leventhal & Tomarken 1987). This is more demanding, not least for the scientist and the science. Particular risk factors associated with cancer, such as health behaviours, may well be closely associated with depressive status. The nature of those associations must be assessed either as contributing to the risk relationship between depression and cancer, or as confounding it.

In the absence of conclusive evidence in favour of either the null or the direct hypotheses, and given the salience of intervening variables, the indirect hypothesis seems the more promising alternative to the null hypothesis. Choosing health behaviours as explanatory variables may well limit the evidence that can be gathered in support of this hypothesis to those cancer sites associated with behavioural risk factors. Furthermore, in an epidemiological cohort study the possible contribution of the psycho-physiological pathway may go entirely unmeasured and its effects subsumed in both the direct association between depression and cancer and within the cognitive-behavioural pathway variables.

Nevertheless, the indirect hypothesis is a viable hypothesis to test and shapes the focus of this thesis exploring the relationship between distress and cancer incidence. The rationale for the present study is presented in the next section (2.3).

2.3 Rationale & Model for the Present Research

This section presents the rationale and context of the present study, elaborating the choice of study design, the components and make up of the research model, as well as considering the influence of confounding variables. The present study was based on secondary data analysis of the Whitehall II Study, a cohort made up of London-based civil servants. As the cohort includes both men and women, with age limits of 35 to 55 years, it provides an opportunity to examine whether psychological distress is associated with increased risk of cancer incidence, thereby complementing the existing cohort literature (see section 1.2.3). Moreover, there is the opportunity to investigate the possibility of an indirect association and assess the function of health behaviours as explanatory variables in any relationship between psychological distress and cancer incidence.

2.3.1 Model Components

The components of the model for the present study include the independent variable (psychological distress), the explanatory variables (health behaviours), key confounders (age, sex and socioeconomic status), other risk factors for cancer (family history and for women, reproductive factors) and the dependent variable, cancer. The health behaviours of interest include smoking, alcohol use, diet and exercise. Each of these have, in some measure, recognised associations with cancer risk (Schottenfeld & Fraumeni 1996). Key confounders include age, sex and socioeconomic status, as each of these might be expected to have an effect on both the independent and dependent variables (as well as on the explanatory variables) and this issue deserves particular comment (see 2.3.3 below).

2.3.1.1 Depression & psychological distress

The main measure of psychiatric morbidity used in the Whitehall II Study was the 30-item General Health Questionnaire (GHQ; Goldberg 1972). The GHQ has been administered at regular intervals since baseline. As a screening questionnaire, the 30-item GHQ does not provide a clinical diagnosis but gives a score which serves as 'a rough proxy measure of the position of that individual on the hypothetical underlying dimension of psychiatric illness' (Goldberg & Williams 1988, p.8).The GHQ was designed to detect inability to carry out normal functions and the appearance of new

and distressing phenomena. However, it is a 'pure state measure' (Goldberg & Williams 1988, p. 9) and could miss less transient psychological disorder. It would be difficult to argue for a short-lived exposure to have any reasonable effect on carcinogenesis. One strategy for detecting longstanding disorders is to use the CGHQ scoring convention developed by Goodchild and Duncan-Jones (1985) in place of the conventional GHQ scoring. This scoring method is sensitive to more chronic disorder or distress and has several advantages including producing a more normal distribution of scores and the scores obtained correlate better with other measures of psychiatric illness, such as the Present State Examination (Goodchild & Duncan-Jones 1985).

Thus psychological distress rather than depression is the focus for the present study, implying a dimensional rather than categorical approach. And while earlier studies have presented findings in the Whitehall II Study using the GHQ (Stansfeld & Marmot 1992), the prevalence of psychological distress assessed using the CGHQ method has not been reported to date. A sub-scale assessing depressive symptoms deriving from the GHQ (Ferrie 1999; Stansfeld et al. 1995; Stansfeld, Head, & Marmot 1998) was also available, which allowed for some comparison with the psychological distress measure.

2.3.1.2 Numbers of cancer events over follow up

Particular characteristics of the Whitehall II cohort might serve to limit the number of cancer cases to be expected during the follow-up period. Some reasons why one might expect fewer cancer cases include the healthy worker effect, length of follow-up and the completeness of registration data, as well as the specific age characteristics of the cohort.

As previously discussed, it is not sound practice to lump all cancers together into one dichotomous outcome variable irrespective of site, such as 'cancer'/'no cancer' (Fox 1978; Perrin & Pierce 1959) and ideally analysis should be of risk in relation to single sites. In addition to the features of Whitehall II mentioned above, most cancers are relatively rare (Breslow & Day 1987) and so there were legitimate grounds to be concerned as to whether there would be sufficient numbers of any one site for analysis. It seemed expedient therefore to group cancers of different sites together according to

common aetiological features, relating those groupings in turn to the explanatory variables of the present investigation. This method has been used in other cohort studies to investigate cancer risk associated with childhood energy intake (Davey Smith, Shipley, & Leon 1998) and height (Gunnell et al. 1998) and with respect to depression in the Washington County Study (Linkins & Comstock 1990).

The fundamental logic to grouping cancers of different sites depends upon evidence of the commonality of an aetiological factor and its relationship to the explanatory variables in the present research (principally health behaviours such as smoking, alcohol use, diet, as well as reproductive factors amongst women). The full rationale and literature review for the grouping of cancer sites used in the present study is available in Appendix I. It was not supposed that the groups themselves should have achieved Hill's criteria of causation (Hill 1965), but that the rationale for placing an individual cancer site within a group was based on robust evidence.

However, while one factor might be established as having the effect of increasing cancer risk, other aetiological factors might interact, or act independently either to reduce risk or increase it further. For example, the synergistic effect of smoking and alcohol use observed for risk for cancer of the oesophagus is well recognised (Baron & Rohan 1996). Similarly, if an individual's occupation presents an increased risk for carcinogenic exposures, the addition of smoking will elevate the risk of cancer. But consider diet: the consumption of fruit and vegetables and vitamin A is protective, and reduces cancer risk in smokers as opposed to those with a lower intake of these nutrients. Therefore factors associated with a reduction in risk for particular sites are also explored in Appendix I, and where possible, these effects are taken into account in the analyses. As well as identifying key groupings of cancers, the overall grouping scheme permits useful conceptualisation of risk and protective factors.

2.3.2 Choice of Study Design

The Whitehall II Study is a longitudinal cohort that has been followed prospectively since 1985—88, bearing all the advantages of such a design, including estimates of absolute risk, as well as possessing a wealth of covariate and exposure information relevant for studying the relationship between exposure to psychological distress and

subsequent development of disease. Since there were data on person-time and cancer events within the sample, the most appropriate technique for addressing this research question would be a survival regression technique (e.g. Cox's regression). But the number of cancer cases accrued by the end of follow up may prove too few for the analysis to be viable: relative risk may be high for a given exposure (i.e. psychological distress), but the incidence of cancer too low to be informative (Breslow & Day 1987). Nor can follow up time be extended for this thesis.

Alternative design strategies include the nested case-control design (Liddell, McDonald, & Thomas 1977; Mantel 1973), Prentice's case-cohort design (Prentice 1986) and the two-phase design (Cain & Breslow 1988). Indeed, there is evidence which indicates that these alternative approaches to full cohort analysis drastically reduce sample size requirements but with little cost to statistical efficiency (Wacholder, Gail, & Pee 1991). However, the main strategy for the present study was secondary data analysis and it was not possible to elicit more information from participants than was already available. Therefore, of these approaches, the two-phase design, which depends on further data collection, was ruled inappropriate.

The case-cohort design (Prentice 1986), entails selection of a single unmatched control sample at random from the entire cohort at entry and uses Cox's regression to compare each case with a subset of controls still at risk at the time each case occurred (Thomas 1998). But overall cancer incidence may be overlooked using this approach and analysis complicated by the dependency between contributions from each case-subcohort comparison (Thomas 1998; Wacholder et al. 1992).

The most promising alternative method is the nested case-control design. For each case, controls are chosen from 'those members of the cohort who are at risk at that moment, in other words from the risk set defined by the case' (Clayton & Hills 1993, p. 329). This method avoids many of the problems of the case-control design whilst retaining the advantages of the cohort method (Austin et al. 1994). The labour and cost of data collection is reduced because the focus is on a sub-sample of the whole sample, although this is a slim advantage in the present study. However, Austin et al. (1994) cautioned that this method may be unsuitable if the disease is very rare, or if one is

attempting to evaluate recent exposures or exposures that change over time. Moreover, the precision of the case-control study does not seem greatly enhanced compared with the cohort study (Clayton & Hills 1993).

Choosing between the alternatives and cohort analysis depends on numerous factors, not least considering the substantive question to be answered, the nature and measure of the outcome under study, and the nature of exposures and covariates and their relation to outcome (Samet & Muñoz 1998). The loss of time of event measurement disadvantages many alternative methods of analysis, even allowing that the dating of cancer incidence can only be an estimate, given that we are unable to determine the exact date of disease onset. The choice then between cohort and nested case-control analysis is particularly keen. Reasonable objectives for the present research are to make the most of the data available, obtain incidence data and enable comparison with previous research, i.e. cohort studies. Therefore the cohort design was preferred for the present study.

2.3.3 A Summary of the Influence of Key Confounders

Depression, like mental disorders in general, is commonly associated with low socioeconomic status (Kessler & Zhao 1999; Levi 1998), although whether that is due to drift (those with mental disorders tending to slip down the social classes as they would have more difficulty with employment) or selection (those predisposed to mental disorder have lower than expected educational and occupational attainment) is unclear (Eaton & Muntaner 1999). It is also associated with being young or very old; consequently, Mirowsky and Ross argue that middle age is 'the best time of life in terms of depression' (Mirowsky & Ross 1999). Finally, although overall rates of psychopathology do not differ as a function of gender, studies have shown that women tend to have higher rates of depression and anxiety than men (American Psychiatric Association 1994; Wittchen, Knauper, & Kessler 1994), although depression in women is not necessarily more chronic than in men (Kessler & Zhao 1999).

Variations in patterns of social class and cancer morbidity and mortality have been observed, with an overall negative social gradient apparent for cancer mortality in the UK (Faggiano et al. 1997). Principal sites where this effect has been found amongst men

include cancers of the mouth, larynx, lung and stomach. A similar pattern has been found in women in all cancer sites combined and in cervical cancer; no clear gradient is apparent for colon and other cancers, although a positive relationship has been found with melanoma. Cancers of the breast, endometrium and ovaries tend to be more common in women of higher socioeconomic status (Henderson, Pike, & et al. 1984; Silva & Beral 1997), typically reflecting later age at first birth and lower achieved parity with consequent variation in hormone exposure in these women. In contrast, cervical cancer is consistently associated with lower socioeconomic status, presumably reflecting differences in sexual behaviour and exposure to varieties of the human papilloma virus (Silva & Beral 1997).

While the pattern of tobacco smoking by class has changed over the past 40 years in the UK, being predominantly a habit of the upper classes in the 1940's, it was common to all classes by the 1950's. Since then there has been a steady decline in smoking in the higher classes, with the General Household Survey (1972-88) revealing an inverse gradient with social class. The interactive effects of smoking and alcohol intake are well established (Baron & Rohan 1996) and while a strong social gradient for smoking has been observed, the evidence is less strong for alcohol intake. Although Koveginas has shown that 25% of manual versus 10% of non-manual workers are heavy drinkers (Kogevinas 1990), this finding has not been consistently supported by other research in the UK. Others concluded that differences in mortality due to social class gradient in alcohol intake were more likely due to differences in smoking (Møller & Tønnessen 1997).

Finally, there is an unequal distribution of dietary and related risk behaviour across social class, especially with respect to fat, meat and alcohol intake and the consumption of fresh fruit and vegetables, favouring the higher social classes (Potter 1997). Similarly, higher socioeconomic status groups tend to report more vigorous activity (Wardle & Griffith 2001). But only 14% of men and 4% of women in the general population take enough exercise to gain maximum cardiac benefit and a substantial proportion of the population, some 60% of men and 70% of women, may be considered sedentary (DOH 1999).

2.3.4 Other Key Covariates

Two further groups of variables deserve comment. In the process of determining the association of psychological distress with health behaviours, it would also be useful to assess how psychological distress was associated with other personal health indicators such as longstanding illness or disability, use of medications and self-assessed health[5], some of which may have a bearing on cancer risk. In addition, given the prominent role of sleep in definitions of depression and psychological distress (APA 1994; Goldberg & Williams 1988), some account of the relationship of sleep with psychological distress in the sample would be appropriate.

Another group of variables that pertain to cancer risk include family history of cancer; reproductive variables; and to a lesser extent, obesity. Family history of cancer is salient and not simply for those cancers for which genes have been identified (e.g. FAP, some forms of breast cancer) but as a general risk factor. Epidemiological studies have shown that close relatives of a cancer patient may be considered to have some elevated risk of developing neoplastic disease at that site, but not for all forms of cancer (Li 1996). To a lesser degree, family history might indicate the effect of nurture, health behaviours passed from parent to child. A different set of risk factors concern women only. Those reproductive risk factors which contribute to hormonal exposure over the lifespan should be assessed in relation to cancer risk of relevant sites, both in terms of endogenous and exogenous hormones. Finally the potential of obesity to be a general risk factor for cancer is gaining credence in the literature (Peto 2001).

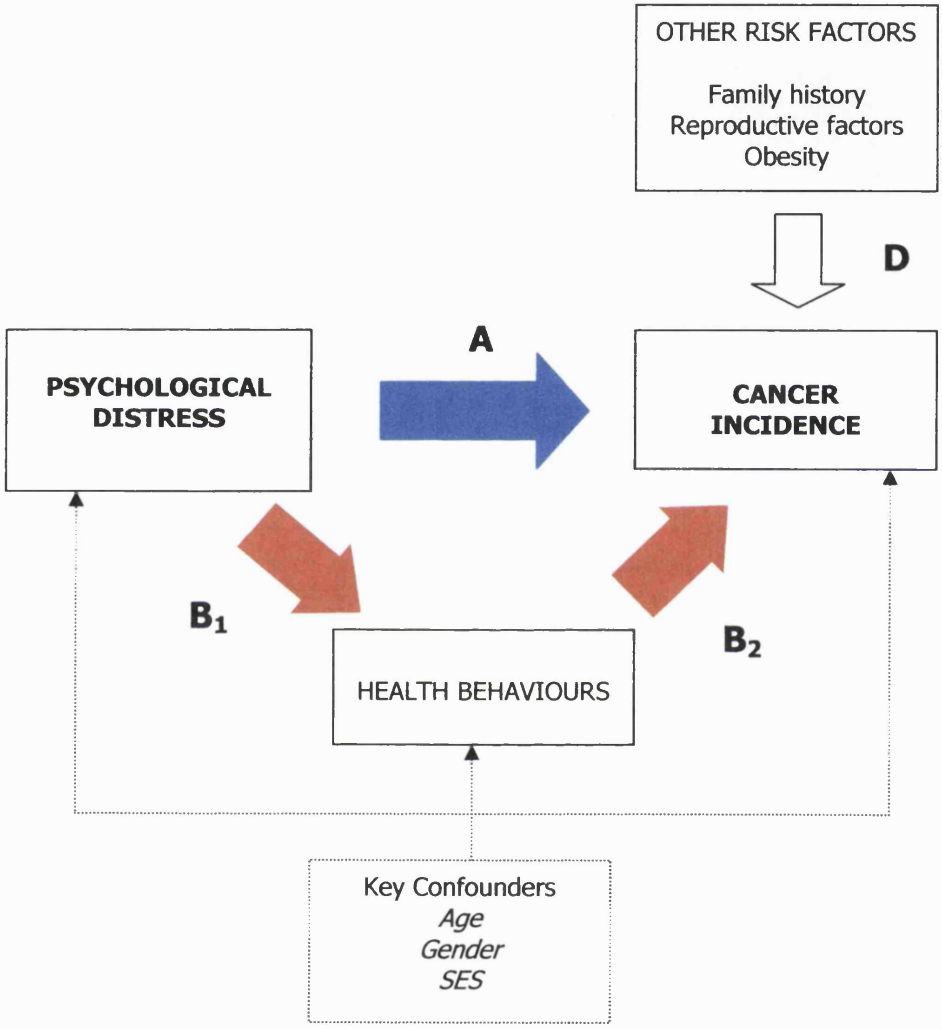
[5] Self-assessed health is also known as self-rated or self-reported health (Idler 1992; Singer et al. 1976).

2.3.5 Research Model

The hypothesised model which forms the core of the present study is illustrated in a simplified form in Figure 2.3. A direct relationship between psychological distress and cancer is represented by arrow A. Lack of evidence for such an association would support the null association, but not exclude the possibility of an indirect association. It is proposed that an indirect relationship exists between psychological distress and cancer incidence, mediated by health behaviours (arrows B_1 and B_2). The effect of key confounders such as age, gender and socioeconomic status (SES) on the independent and dependent variables as well as the explanatory variables is also indicated and it may be assumed that these confounders will also have an impact on the other risk factors for cancer. The particulars of this model will alter as a function of the exact cancer outcome: for example, reproductive factors should have no bearing on risk of lung cancer in men.

Figure2.3 Core research model: Psychological Distress & Cancer Incidence

Arrow A represents a direct association between psychological distress & cancer; arrows B_1 and B_2 indicate an indirect association between psychological distress & cancer mediated by health behaviours. Arrow D indicates the role of other risk factors, and the line arrows indicate the influence of key confounders.



Having first described the characteristics of the population under study, the relationship between psychological distress and health behaviours should be examined: do those with psychological distress exhibit more health risking behaviours? What is the relationship between psychological distress and other key variables such as longstanding illness, self-assessed health and medication use? The availability of a depressive symptoms sub-scale as well as a measure of psychological distress allows some exploration, albeit limited in the present research, of the implications of using differing definitions of the independent variable.

The relationship between the health behaviours and cancer incidence must then be considered, within the context of an indirect association between psychological distress and cancer incidence. Regression models will be used to establish these relationships and test specific hypotheses, outlined in the next section.

2.4 Aims & Hypotheses

This section describes the aims and hypotheses of the present study and briefly describes the experimental approach used to assess each hypothesis.

2.4.1 Aims & Hypotheses

The aims of the present study were:

- To assess the prevalence of psychological distress (using CGHQ scoring) in the Whitehall II Study sample at baseline
- To investigate the association of psychological distress at baseline with health behaviours (smoking, alcohol use, diet and exercise)
- To ascertain the influence of key confounders (age, gender and socioeconomic status) on psychological distress and health behaviours
- To collate the incidence of cancer events within the Whitehall II Study over follow up
- To establish whether psychological distress was associated with an increased incidence of cancer over follow up within the Whitehall II Study, adjusting for key confounders
- To investigate whether health behaviours serve as a pathway in an indirect association between psychological distress and cancer

Hypothesis I

It is hypothesised that psychological distress at baseline will be associated with increased risk of cancer incidence over follow up in the Whitehall II Study.

This is the direct hypothesis, adjusting for the effects of key confounders and other risk factors for cancer.

Hypothesis II

> It is hypothesised that increased risk for developing cancer arising from psychological distress will be at least partially explained by the health behaviours of those with psychological distress.

This is the indirect hypothesis, where health behaviours mediate the effect of psychological distress on cancer incidence, adjusting for key confounders and other risk factors for cancer.

Hypothesis III

> It is hypothesised that individuals with psychological distress exhibit demonstrably poorer health behaviours compared to individuals without psychological distress.

This hypothesis addresses a paucity of knowledge in the literature as to how health behaviours are affected by psychological distress. In measurement terms, poorer health behaviours include: smoking; moderate to heavy alcohol intake; poor diet such as high meat intake, low consumption of fibre and fruits and vegetables; and low or irregular physical activity.

2.5 Summary

This chapter explores further how depression and cancer could be related, in order to develop hypotheses for the present study. The relationship between depression and cancer incidence might be direct, indirect, or null. Potential pathways for direct and indirect associations were examined and the evidence for each manner of association weighed in the light of the literature and particular features of cancer and depressive disorder. In the absence of evidence for a direct association between depression and cancer risk, a postulated role for health behaviours associated with cancer risk was presented.

Since the present study undertook secondary data analysis of the Whitehall II Study, the measures and design of that study had implications for the rationale and model adopted. The chapter concluded with the aims of the present study and the three hypotheses to be tested.

Chapter 3

Methodology

3.1 Introduction

This chapter outlines the design, methodology and materials for the present study. The chapter begins by describing the design and methodology of the Whitehall II Study (section 3.2). The next section addresses the design and methodology of the present study (section 3.3), which is concerned with psychological distress and cancer incidence in the Whitehall II study.

3.2 The Whitehall II Study

The Whitehall II Study (WII) was set up in response to the findings of the Whitehall I Study (Reid et al. 1974), to investigate 'the degree and causes of the social gradient in morbidity, to study additional factors related to the gradient in mortality, and importantly, to include women' (Marmot et al. 1991). Known to its participants as the Stress & Health Study, over ten thousand male and female civil servants were recruited and have been followed up for nearly 16 years over six phases of data collection. Ethical approval for the Whitehall II Study was obtained from the University College London Medical School Committee on the ethics of human research.

3.2.1 Whitehall II Study Sample

14 397 male and female civil servants of Her Majesty's Government from 20 London based departments were targeted for recruitment between 1985 and 1988, aged at that time between 35 and 55 years. 10 314 consented to participate, of whom 6 were ineligible. The final number of participants was 10 308 (response rate 71.6%: 6895 men and 3413 women).

A broad cross-section of civil service grades were sampled (from office support to permanent secretary) but the response rate varied as a function of grade: ranging from over 80% of executive and administrative staff to 46% of male and 65% of female clerical and office support personnel (Ferrie 1999).

3.2.2 Whitehall II Study Materials & Methods

There were two main methods of data collection: self-completed questionnaire administered approximately every 2 years and medical screening examinations every five years (see Figure 3.1). Between late 1985 and early 1988 (Phase 1 of data collection), self-administered questionnaires were posted to participants at their place of work. Participants were asked to complete the questionnaire and return it at the screening examination, which took place at their work site. At screening, an interviewer checked returned questionnaires for missing data and validity, seeking clarification where necessary.

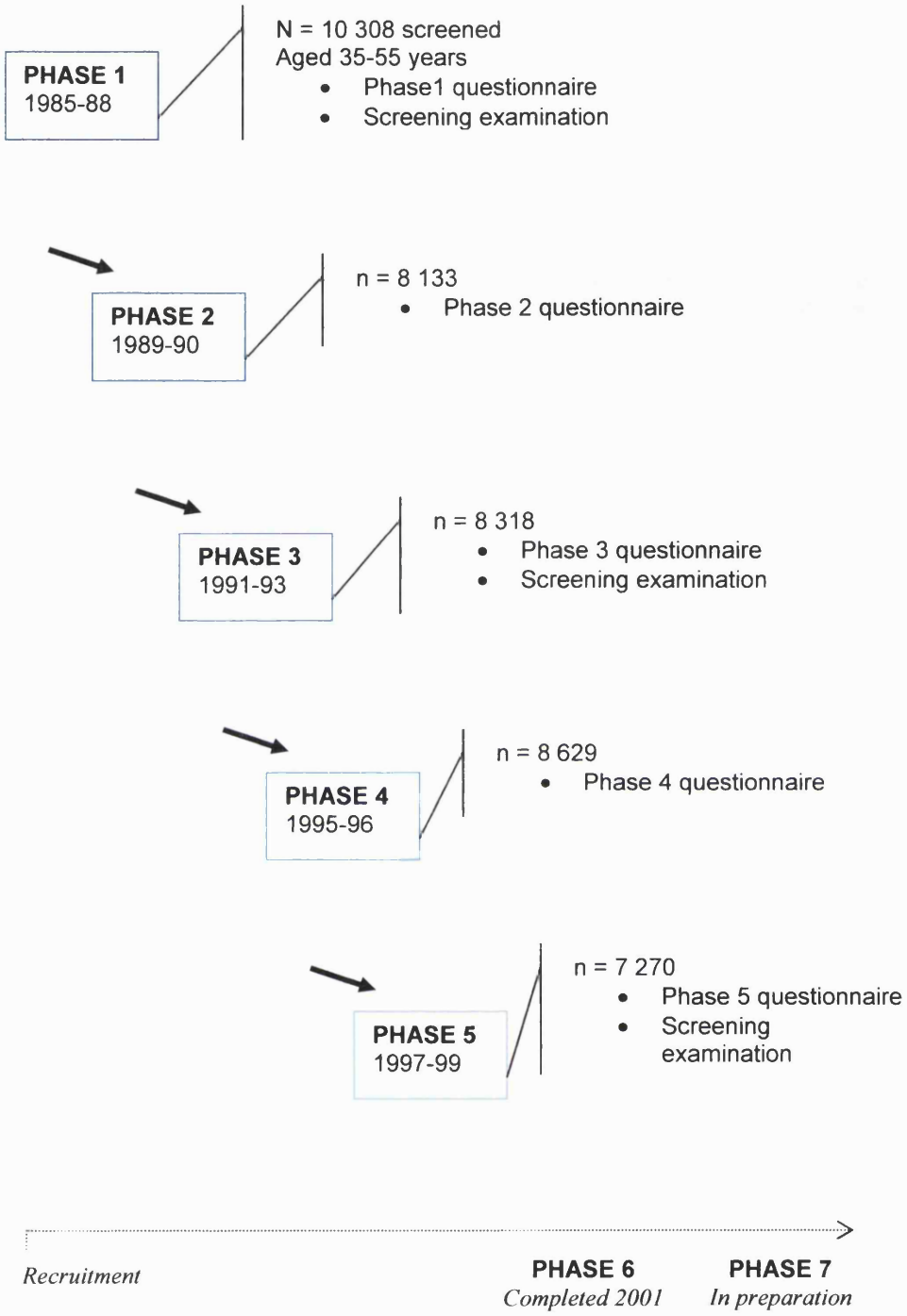


Figure 3.1 Phases of data collection in the Whitehall II Study

At subsequent Phases of data collection, the questionnaires were posted to participants (see Table 3.2a for summary of response rates over time). At all phases, non-responders were followed up with up to 2 reminder letters, in conjunction with telephone contact both at the office and at home if possible. Persistent non-responders were sent questionnaires by recorded delivery. After Phase 2, follow up tended to focus on the home address as respondents had either changed jobs, were made redundant, or retired from the Civil Service.

Table 3.2a Whitehall II Study: Patterns of questionnaire response rate over Phases

Phase	2	3*	4	5*
Response rate[a]	79%	81%	84%	76%
Men (n)	5533	5739	5929	5091
Women (n)	2600	2579	2700	2179

[a] Response rates of Phases 2-5 based on Phase 1 respondents
* For long questionnaire only

3.2.2.1 Questionnaire data

The questionnaires from Phases 1 to 5 are collected together in Appendix V. The Phase 1 questionnaire had sections which assessed demographic and socioeconomic characteristics, general health, work characteristics and psychosocial characteristics such as social support, life events and health behaviours. Four different versions of the phase 1 questionnaire were administered, with later versions typically featuring more rather than less items, so there was not complete data for all participants for each of the aforementioned sections. The content of the Phase 2 and Phase 3 questionnaires were largely similar, with some changes, for example in items relating to diet. The Phase 4 questionnaire was particularly short and focused on coronary heart disease outcomes. The Phase 5 questionnaire returned to the more comprehensive format of the earlier questionnaires, but was updated to take account of changes in employment, retirement and the health issues of an older population, as well as address gaps in previously held information.

3.2.2.2 Screening examination data

The screening examination included the following measurements: weight; height; waist-hip ratio (Phase 3); blood pressure readings; electrocardiogram; and a variety of

laboratory assays (e.g. blood cholesterol, fibrinogen, and triglycerides). Participants were also asked about smoking, including the number of cigarettes smoked daily.

3.2.3 Data Quality

Data from questionnaires, clinical screening and laboratory test results were checked by double entry.

3.3 Psychological Distress & Cancer Incidence in the Whitehall II Study

This section presents the methodology used in the present investigation. The design is described in section 3.3.1, the sample in 3.3.2 and the analytic strategy in section 3.3.5. The data used from the Whitehall II Study in order to address the aims, objectives and hypotheses as listed in Chapter 2 is described in 3.3.3 and the outcome data in 3.3.4.

3.3.1 Design

The association of psychological distress with cancer incidence (Hypotheses I & II) was analysed using a closed cohort design (MacMahon & Trichopoulos 1996) with Cox's regression (survival analysis). The association of health behaviours with psychological distress (Hypothesis III) was examined using cross-sectional data from the first Phase.

3.3.2 Sample

Participants were excluded who had a history of cancer (i.e. registration) occurring prior to or at baseline. Otherwise all members of the original cohort of 10 308 participants in the Whitehall II Study were eligible for inclusion. A small number of participants with cancer events occurring shortly after entry to the study were excluded from some analyses (see section 3.3.4).

3.3.3 Materials & Methods

The majority of data used was sourced from the questionnaire and screening examination at Phase 1, unless otherwise indicated. Some variables were re-categorised or transformed on inspection of the distributions of the data and these are reported throughout this section. Participants were only identified using their unique 6 digit Whitehall II Study number.

3.3.3.1 Demographic data

The key demographic variables were age, gender, socioeconomic status and to a lesser extent, marital status and education (summarised in Table 3.3a). Age at baseline was calculated from date of birth (Phase 1, Q1a) and stratified into four levels: < 40 years, 40 – 44 years, 45 – 49 years, > 50 years. Gender was available from questionnaire items (Phase 1, Q1b) and confirmed at screening examination. Grade level was used as a proxy for socio-economic status, previously generated by the Whitehall II Study

statisticians based on Civil Service grade title (Phase 1, Q2) and was available as six or three categories in descending order of status. The three-category variable was used in the main analyses, and the six-category variable reported only in the descriptive statistics (section 4.2). Marital status (Phase 1, Q6) was reported over four levels, with married and cohabiting categories combined. The level of full-time education (Phase 1, Q5a) was categorised as up to 16 years of age, between 17 & 18 years of age, and over 18 years of age.

Table 3.3a Reported Categories of Demographic Variables

Variable	Categories	*Phase*
Age Group	▪ 35-49 years ▪ 40-44 years ▪ 45-49 years ▪ 50-55 years	*1*
Gender	▪ Male ▪ Female	*1*
Grade Level (6 categories)	▪ I ▪ II ▪ III ▪ IV ▪ V ▪ VI	*1*
Grade Level (3 categories)	▪ Administrative (I & II) ▪ Professional-Executive (III, IV & V) ▪ Clerical (VI)	*1*
Marital Status	▪ Married/cohabiting ▪ Single ▪ Divorced/separated ▪ Widowed	*1*
Education	▪ Full time up to 16 years ▪ Between 17 & 18 years ▪ Over 18 years	*1*

3.3.3.2 Socioeconomic & other data

Other socioeconomic variables included social class of father and type of accommodation (see Table 3.3b). Father's social class was derived from responses to questions about father's education and occupation (Phase 1, Q12). Type of accommodation (Phase 1, Q8) was reported in three categories, with 'rented privately' collapsed into one category combining both furnished and unfurnished

accommodation. In order to assess whether respondents lived alone or not, the reverse of the questionnaire item responses were used from Q9 (Phase 1).

Table 3.3b Reported Categories of Socioeconomic Variables

Variables	Categories	*Phase*
Father's social class	▪ I ▪ II ▪ III ▪ IV ▪ V ▪ VI	*1*
Type of accommodation	▪ Own home, mortgage ▪ Rent from local authority ▪ Rent privately	*1*
Live alone or with others	▪ No ▪ Yes	*1*

3.3.3.3 Anthropometric data

Body mass index was calculated using the standard formula of weight in kilograms divided by the square of height in metres. Height was measured at screening to the nearest 0.5 centimetre, using a standard metal stadiometer with feet together and head in the Frankfort plane position (Beksinska, Yea, & Brunner 1995). Weight was measured to the nearest 0.1 kilogram using a pair of Soehnle Digital S electronic scales, with participants dressed only in underwear and socks when measurements were made (Beksinska, Yea, & Brunner 1995).

3.3.3.4 Health data

Self-assessed health in the past year was measured on a five point response scale (Phase 1, Q16; Phase 2, Q10; Phase 3, Q10), which was collapsed into two categories for the main analyses: good or very good versus average or worse. Participants were asked about any longstanding illness or disability (Phase 1, Q17; Phase 2, Q11; Phase 3, Q11) and completed a short symptom scale assessing minor morbidity in the past two weeks (Phase 1, Q19; Phase 2, Q17; Phase 3, Q15). The distribution of scores on the symptom scale was positively skewed and so was summarised using non-parametric statistics. Participants were asked to report use of medication in the past 14 days such as tranquillisers or anti-depressants (Phase 1, Q32). Participants were also asked about the number of hours of sleep they obtained on a given night (Phase 1, Q31); responses to

this item were collapsed into three categories: less than 6 hours, 7 hours, or more than or equal to 8 hours per night. These variables and their categories are summarised in Table 3.3c.

Table 3.3c Reported Categories of Health Variables

Variables	Categories	*Phase*
Self-Assessed Health (SAH)	▪ Very good ▪ Good ▪ Average ▪ Poor ▪ Very poor	*1, 2, 3*
Self-Assessed Health (2 categories)	▪ Good or very good ▪ Average or worse	*1, 2, 3*
Longstanding illness, disability or infirmity	▪ Yes ▪ No	*1, 2, 3*
Use of tranquillisers in past 14 days	▪ Yes ▪ No	*1*
Use of anti-depressants in past 14 days	▪ Yes ▪ No	*1*
Sleep, average hours a night	▪ 6 hours or less ▪ 7 hours ▪ 8 hours or more	*1*

3.3.3.5 Risk factors for cancer

Two sources of cancer risk were assessed: family history of cancer and for women, reproductive factors (see Table 3.3d). Family history of cancer was measured through reported cause of death of a parent (Phase 1, Q12 & Q13; Phase 2, Q7 & Q 8) and reported as three categories in the descriptive statistics, but further collapsed for the main analyses into two categories to indicate any reported family history of cancer. Reproductive factors included nulliparity, menopausal status and use of exogenous hormones (oral contraceptives and hormone replacement therapy).

Parity was only indirectly assessed at Phase 1 (Phase 1, Q10f-h), but captured in more detail at Phase 5 (Q3.9) and considered in two forms: parity at baseline and parity overall, the latter identifying women who had had children after the age of 35 years. In the absence of information about menarche, endogenous oestrogen exposure was tapped using menopausal status (Phase 1, Q35a-c). This was considered in terms of ongoing menstruation, natural menopause or hysterectomy with or without removal of the ovaries (oophorectomy). Note that any woman who has had a hysterectomy may

not be considered at risk for cancer of the endometrium. Perimenopausal status was inferred for women who reported ongoing menstruation as well as either natural menopause or use of hormone replacement therapy. However, this group was very small and subsumed into the premenopausal group. Current and past use of oral contraceptives was assessed (Phase 1, Q33a-c & Q34) and duration of use calculated and categorised into four levels: never, 1 to 5 years, 6 to 10 years and 11 or more years. Use of hormone replacement therapy (HRT) was similarly categorised in terms of years of use at Phase 1 (Q35d-e, g): 0 to 12 months, 1-4 years and 5 years or more.

Table 3.3d Reported Categories of Cancer Risk Factor Variables

Variables	Categories	*Phase*
Family history of cancer	▪ None ▪ One parent died of cancer ▪ Both parents died of cancer	*1, 2*
Any family history of cancer	▪ None ▪ Yes	*1, 2*
Parity	▪ Nulliparous ▪ Parous	*5*
Parity, overall	▪ Nulliparous ▪ Had first child after age 35 ▪ Parous	*5*
Menopausal status	▪ Premenopause ▪ Perimenopause ▪ Natural Menopause ▪ Hysterectomy ▪ Hysterectomy & oophorectomy	*1*
Menopausal status	▪ Premenopause ▪ Natural menopause ▪ Surgical menopause	
Oral contraceptive use (Current at Phase 1)	▪ Yes ▪ No	*1*
Oral contraceptive use (Past use)	▪ Yes ▪ No	*1*
Oral contraceptive use (Duration of use at Phase 1)	▪ Never ▪ 1-5 years ▪ 6-10 years ▪ 11+ years	*1*
Use of hormone replacement therapy (at Phase 1)	▪ 0-12 months ▪ 1-4 years ▪ 5+ years	*1*

3.3.3.6 Psychological distress (PD)

The main measure of psychiatric morbidity or psychological distress was the 30-item General Health Questionnaire (Goldberg 1972; Phase 1, Q80 – 109; Phase 2, Q53-82; Phase 3, Q87-116).

For the GHQ, respondents were asked a series of questions about their 'general health' over the past few weeks with a four point response scale scored 0-0-1-1 and summed. This produces a range of 0 to 30 (previous work in the Whitehall II Study has identified the threshold of 4/5 as the most suitable cut off to distinguish those with a high probability of psychiatric diagnosis from those who may be termed 'normal' (Stansfeld & Marmot 1992)). The chronic scoring method (CGHQ; Goodchild & Duncan-Jones 1985), used to tap longstanding or ongoing distress more relevant to cancer risk than transient disorder, produces a continuous score in the same range but more normally distributed. This method weights the 'same as usual' response for negative items (see Table 3.3e) and requires a higher threshold to identify caseness.

Table 3.3e Comparison of scoring methods for the GHQ-30

Scoring	Method	Range
Likert	1-2-3-4 all items	30-120
GHQ[a]	0-0-1-1 all items	0-30
Chronic GHQ[b]	0-0-1-1 positive items 0-1-1-1 negative items	0-30

[a] (Goldberg 1972)
[b] (Goodchild & Duncan-Jones 1985)

Investigations of the validity and reliability of using the CGHQ scoring were carried out (principal components analysis and Cronbach's alpha respectively) prior to adopting the method for use in the study.

In addition the depressive symptoms sub-scale (Ferrie 1999; Stansfeld, Head, & Marmot 1998) was used to identify the prevalence of these features of distress at Phase 1. This sub-scale used four items which were each scored on a Likert scale of 0-1-2-3 and summed: been thinking of yourself as a worthless person; felt that life is entirely

hopeless; felt that life wasn't worth living; found at times you couldn't do anything because your nerves were so bad (Phase 1, Q103, Q104, Q108, Q109).

3.3.3.7 Health behaviours

The health behaviours assessed at Phase 1 included smoking, alcohol use, diet and exercise.

Smoking

Participants were asked about cigarette smoking as part of the Phase 1 questionnaire (Q39 & Q40; Phase 2, Q25-26; Phase 3, Q30) and during the screening examination. Those who reported that they currently smoked were also asked to indicate how many manufactured cigarettes they smoked daily. WII statisticians have used data from both of these sources to create two summary variables of smoking habit: over five categories or three (see Table 3.3f). The second variable is more general (never, ex-smokers and current) and so includes those participants who indicated that they smoked without giving a daily estimate of quantity of cigarettes smoked. Information about cigar and pipe smoking was not incorporated into measures of smoking for the present study as they are associated with different disease aetiology.

Table 3.3f Reported Categories of Smoking Variables

Variables	Categories	*Phase*
Smoking	▪ No ▪ Ex-smoker ▪ Light ▪ Medium ▪ Heavy	*1, 2, 3*
Ever smoked	▪ Never ▪ Ex-smoker ▪ Current	*1, 2, 3*

Alcohol Use

Based on responses to questions about the amount of wine, spirits and beer consumed in the last 7 days (Phase 1, Q 44; Phase 2, Q30; Phase 3, Q34), units of alcohol per week were calculated. A unit is equivalent to half a pint of beer or cider, one measure of spirits, or a glass of wine. Intake of units of alcohol was defined according to

convention used by the ONS for 1984 – 1996 self-reported alcohol consumption (ONS 1998). The breakdown of units of categorisation is indicated in Table 3.3g for both men and women.

Participants were also asked if they had changed their drinking habits and if they had, whether they drank more or less than they used to do (Phase 1, Q43; Phase 2, Q29; Phase 3, Q33; see Table 3.3f). Responses to these two questions were pertinent to the testing of Hypothesis III only.

Table 3.3g Reported Categories of Alcohol Use Variables

Alcohol consumption, Men (Units per week)	▪ Non-drinker (0) ▪ Light (< 11) ▪ Moderate (11-21) ▪ Heavy (>21)	*1, 2, 3*
Alcohol consumption, Women (Units per week)	▪ Non-drinker (0) ▪ Light (<8) ▪ Moderate (8-14) ▪ Heavy (>14)	*1, 2, 3*
Change in drinking habits in the past 5 years?	▪ Yes ▪ No	*1, 2, 3*
Compared with current drinking habits, how much consumed before?	▪ A lot more ▪ A bit more ▪ A bit less ▪ A lot less	*1, 2, 3*

Diet

The dietary items available from Phase 1 data (Q47) assessed the risk factors of interest (intake of fresh fruits & vegetables, fibre and meat) along with others (milk, spread on bread, cream, cheese, fish, & eggs) through self-report. Based on the overall distributions of responses to the variables, nearly all were re-categorised (see Table 3.3g). Fibre intake was assessed using type of bread usually eaten (on the grounds of extraction) and number of slices consumed daily. Fruit and vegetable intake was measured over four categories of intake. Meat consumption (not including poultry or fish) was assessed by three categories of intake. Estimates of these three variables were also available from Phases 2 & 3 (Q32; Q37 & 38).

Table 3.3h Reported Categories of Dietary Variables

Variable	Description	Number of original response categories	Number and content of reported categories	
Bread	Type of bread usually eaten	5	3	▪ Wholemeal ▪ Other brown ▪ White
	Amount of bread usually eaten daily	5	2	▪ 0-3 slices daily ▪ More than 3 slices daily
Fruits or Vegetables	Frequency of eating fresh fruit or vegetables	8	4	▪ 2+ times daily ▪ Daily ▪ 3-6 times a week ▪ Once or twice a week or less
Meat	Frequency of meals containing meat (not poultry or fish)	7	3	▪ 1-2 a week or less often ▪ 3-4 times a week ▪ 5+ times a week
Spread	Type of spread usually use	6	2	▪ Polyunsaturated, low calorie or rare use ▪ Butter or margarine
Milk	Type of milk usually drunk	6	3	▪ Skimmed or semi-skimmed milk ▪ Do not use / Other ▪ Whole milk
	Amount of milk drunk per day	5	2	▪ 0-0.5 pints ▪ More than 0.5 pints
Cream	Frequency of using cream	7	3	▪ Seldom, never ▪ 0-3 times a month ▪ Weekly or more often
Cheese	Frequency of using cheese	7	4	▪ 0-3 times a month ▪ 1-2 times a week ▪ 3-4 times a week ▪ 5+ times a week
Eggs	Frequency of eating eggs	7	3	▪ 1-3 times a month or less ▪ 1-2 times a week ▪ 3+ times a week
Fish	Frequency of eating fish	7	2	▪ 1-2 times a week or more ▪ 1-3 times a month or less often

A healthy eating index (HEI) was generated from six other dietary variables to indicate a diet lower in consumption of fat, dairy produce and eggs, with greater consumption of fish (see Table 3.3i). Each of these variables was further collapsed into an item with two response categories, with the more healthy option scored as 1, and the less healthy as 0. This resulted in a range of scores from 0 to 6 for the index (HEI). However, since

there were many missing values for consumption of eggs, a revised version of the index was created by the same method but excluding this variable (HEIWE, range 0 to 5).

Table 3.3i Health Eating Index (HEI) Items and Scoring

Constituent Variables	Number of original categories	Scoring (in bold) of reduced categories
Milk	3	**1** Semi-skimmed or skimmed milk **0** Whole milk
Spread	2	**1** Polyunsaturated, low calorie or rare use **0** Butter or margarine
Cream	3	**1** 0-3 times a month or less **0** Weekly or more often
Cheese	4	**1** 1-2 times a week or less **0** 3-5 times a week or more
Fish	2	**1** 1-2 times a week or more **0** 1-3 times a month or less often
Eggs†	3	**1** 1-3 times a month or less **0** Once a week or more often

† This item deleted from HEI to produce HEIWE.

Exercise

Participants were asked about the frequency of their participation in mildly energetic activities (e.g. walking, woodwork, weeding, hoeing, bicycle repair, playing darts, general housework), moderately energetic activities (e.g. scrubbing, polishing car, chopping, dancing, golf, cycling, decorating, lawn mowing, leisurely swimming) and vigorous activity (e.g. running, hard swimming, tennis, squash, digging, cycle racing). They were then asked to give an estimate of the average number of hours a week they spent engaged in those or similar activities (Phase 1, Q48; Phase 2, Q35; Phase 3, Q51). Since the distributions of these latter data were skewed, three new dichotomous categorical variables were created around the median value for all participants for each item (see Table 3.3j).

Table 3.3j Reported Categories of Exercise Variables

Variables	Categories	*Phase*
Frequency of mildly energetic activities	▪ 3 times a week or more ▪ Once or twice a week ▪ About once to three times a month ▪ Never / hardly ever	*1, 2, 3*
Frequency of moderately energetic activities	▪ 3 times a week or more ▪ Once or twice a week ▪ About once to three times a month ▪ Never / hardly ever	*1, 2, 3*
Frequency of vigorous activities	▪ 3 times a week or more ▪ Once or twice a week ▪ About once to three times a month ▪ Never / hardly ever ▪	*1, 2, 3*
Mild exercise	▪ 5 hours or less a week ▪ More than 5 hours a week	*1, 2, 3*
Moderate exercise	▪ 2 hours or less a week ▪ More than 2 hours a week	*1, 2, 3*
Vigorous exercise	▪ Less than an hour a week ▪ More than or equal to 1 hour a week	*1, 2, 3*

3.3.3.8 Other variables

Two items specifically asking about 'nervous trouble or persistent depression' over the past year and 'nervy, tense or depressed' symptoms in the past fortnight (Phase 1, Q18l, Q19h; Phase 2, Q16l, Q 17h) were used for comparison with CGHQ scores and the depressive symptoms sub-scale scores.

3.3.4 Outcome Data

The key outcome variable for the present investigation was first incidence of malignant neoplasm after entry to the study (i.e. ICD-9 sites 140 – 208; ICD-10 sites C00 – C97; along with date of registration). Cancer registrations reports for the WII study arrive annually from the ONS, with the latest complete data delivered in mid-summer 2001. These registrations were then processed in order to identify pre-baseline registrations (for exclusion from the study), and exclude duplicate or successive registrations, and non-malignant cancer registrations (i.e. ICD-9 sites 210 – 239; ICD-10 sites D00 – D48).

Ideally, the outcome of interest should be site-specific cancer incidence, e.g. breast, lung, etc. However, given the likely incidence of cancer in the Whitehall II Study sample over the maximum amount of follow up time (14 to 16 years), there was concern that there would not be enough of any one or more sites for reliable site-specific analysis. Furthermore, since national coverage of cancer registrations may not be considered complete for up to four years, the available follow up time was cut short and limited to 10 to 12 years at maximum (see 3.3.4.2 below). Thus a strategy for grouping cancer sites was developed to address this issue in the present study (see 3.3.4.3 below).

Mortality data for the Whitehall II Study were available up until the end of 1999 from the NHS Central Register (i.e. primary cause of death from death certificate and date of death). Participants who died from another cause of death (e.g. CHD) had their follow up time censored at that point. Cancer mortality would be informative for the present study where it indicated cancer incidence in the absence of registration data (i.e. death without prior registration, or DWPR).

Although those with a history of cancer at baseline were excluded using the cancer registrations data, those who developed cancer within 2 to 4 years of entry to the study were also identified. Those participants with cancer registrations within 2 years of entry to the study were excluded from the main regression analyses, as they had contributed insufficient time at risk in the study between the measurement of psychological distress and the registration of cancer.

3.3.4.1 Time at risk

Time contributed to the study by participants was measured in days since date of entry to the study until date of registration *or* date of cancer death without prior registration (DWPR), *or* 31st December 1997, whichever event occurred soonest.

3.3.4.2 Cancer reporting & registration in the UK

Cancer registrations are compiled by the Office of Population Censuses and Surveys (OPCS) and latterly by the ONS [6], through collation of registration records from independent regional registries. The nature of data from registries and the extent of their geographic coverage have changed over time, and there is some variation as to data quality and completeness of registration (Swerdlow, dos Santos Silva, & Doll 2001). There are inevitable delays before data may be considered up to date and complete and the most recent up to date coverage was to the end of 1997 (available summer 2001), which was a slight improvement on the 5 years delay reported previously (Swerdlow, dos Santos Silva et al. 2001). This wait therefore required that follow up time was right-censored for participants in the present study at 10 to 12 years.

It is desirable to have as many numbers of cancer cases to hand as possible for reliable analyses. Both incidence and mortality data were available and given the delays inherent in the current UK reporting system, those deaths that had occurred without prior registration (DWPR) within follow-up were included in figures of incidence. This increased the number of events available for analysis and it may be reasonable to assume that the registrations of the latter group will have taken place and be returned soon by the ONS. However, such an approach does introduce some inaccuracy into person-time measurement, as there are many more variables affecting cancer mortality than might affect incidence (Swerdlow, dos Santos Silva et al. 2001).

Typically records for non-melanoma skin cancer may not be considered complete and reliable in the UK, as they are not subject to the usual rigour in reporting (Ko et al. 1994; Lloyd Roberts 1990). Thus, consideration of other skin cancers in the present study was cautious and limited to descriptive statistics (5.2).

Furthermore, the scope of follow up encompassed registrations coded according to different revisions of the International Classification of Diseases (WHO 1977; WHO

[6] The OPCS combined with the Central Statistics Office in April 1996 to form the Office for National Statistics (ONS).

1992). On the whole, these Classifications are similar, but the latter revision is more specific, separating for example cancers of the renal pelvis and ureter from renal cell cancers and further sub-dividing colorectal and lung cancer sites in line with increased understanding about aetiology.

3.3.4.3 Grouping of cancer sites

Given the limits set on follow up indicated above, a strategy of grouping cancers according to the explanatory variables as risk factors was devised, consistent with the literature (see Appendix I for full details). These groupings would serve as the basis for definition of the outcomes for analyses.

Sites were first assembled according to seven factors associated with increased risk of cancer (see Table 3.3.4a). However, not all of the groups could be assessed as laid out. The association of dietary factors with cancer risk is particularly complex, hence the four sub-groups. But in the absence of data collected from the sample on starch intake, or on consumption of foods containing nitrates or salt, or on food which is cured or pickled, these two sub-groups could not be studied. Low fibre intake was assessed using the type of bread variable and the Healthy Eating Index (HEIWE) used along with meat consumption to assess the high fat & high meat intake sub-group. On reflection, the effect of height was assumed to be small and probably subsumed by obesity, which, in turn, along with alcohol intake and exercise, was considered as a covariate rather than as two groups for analysis in themselves.

Table 3.3.4a Cancer Grouping I: sites associated with particular risk factors

RISK FACTOR	Nature	Sites
SMOKING		Trachea bronchus & lung Pancreas Oropharynx Renal pelvis & ureter Tongue Oesophagus Bladder Renal cell
ALCOHOL	High intake	Oesophagus* Tongue* Breast
DIET	High fat intake, high animal protein intake	Colorectal Prostate Bladder Body of uterus Renal cell
	Nitrate, salted, pickled, cured foods	Stomach
	Low fibre intake	Colorectal
	High starch intake	Stomach
EXERCISE	Low	Colon
OBESITY	BMI & Weight	Breast Renal cell Body of uterus
REPRODUCTIVE FACTORS	High oestrogen exposure	Breast
	Nulliparity	Body of uterus Ovary
	Oral contraceptive use	Breast Body of uterus Vulva
HEIGHT	Increased	Ovary Breast

* (synergistic with smoking)

Sites were also assembled according to protective factors (see Table 3.3.4b). The most notable factors were high intake of fruits or vegetables, moderate to high levels of exercise and low oestrogen exposure. A further group of cancers were all of those not falling in either cancer grouping (i.e. unrelated to the explanatory variables).

Table 3.3.4b Cancer Grouping II: protective factors associated with particular sites

PROTECTIVE FACTOR	Nature	Sites
SMOKING	Post-menopausal women	Body of uterus
DIET	High Fruit & Vegetable intake	Colorectal Lung Renal cell Stomach Pancreas Thyroid
	Low fat	Other of skin
	Vitamin A	Prostate Bladder
EXERCISE	Moderate to high levels	Colon Breast
REPRODUCTIVE	Low oestrogen exposure	Breast
	Oral contraceptive use	Ovary
	Parity	Body of uterus

Cancer outcome groups

Thus the outcome groups for the analyses were:

1. any malignant neoplasm (excluding NMSC)
2. smoking-related cancers
3. diet related cancers (high fat, high animal protein intake)
4. breast cancers
5. cancers related to use of oral contraceptives (OC)
6. other cancers (unrelated to explanatory variables)

The first group, any malignant neoplasm, was analysed only for comparison with previously published studies. Other factors such as obesity, alcohol use, exercise and intake of fruits or vegetables, were considered as covariates in analyses where appropriate. The relevant variable sets for each outcome group are presented in Table 3.3.4c below.

Table 3.3.4c Variable sets for analysis for each outcome group

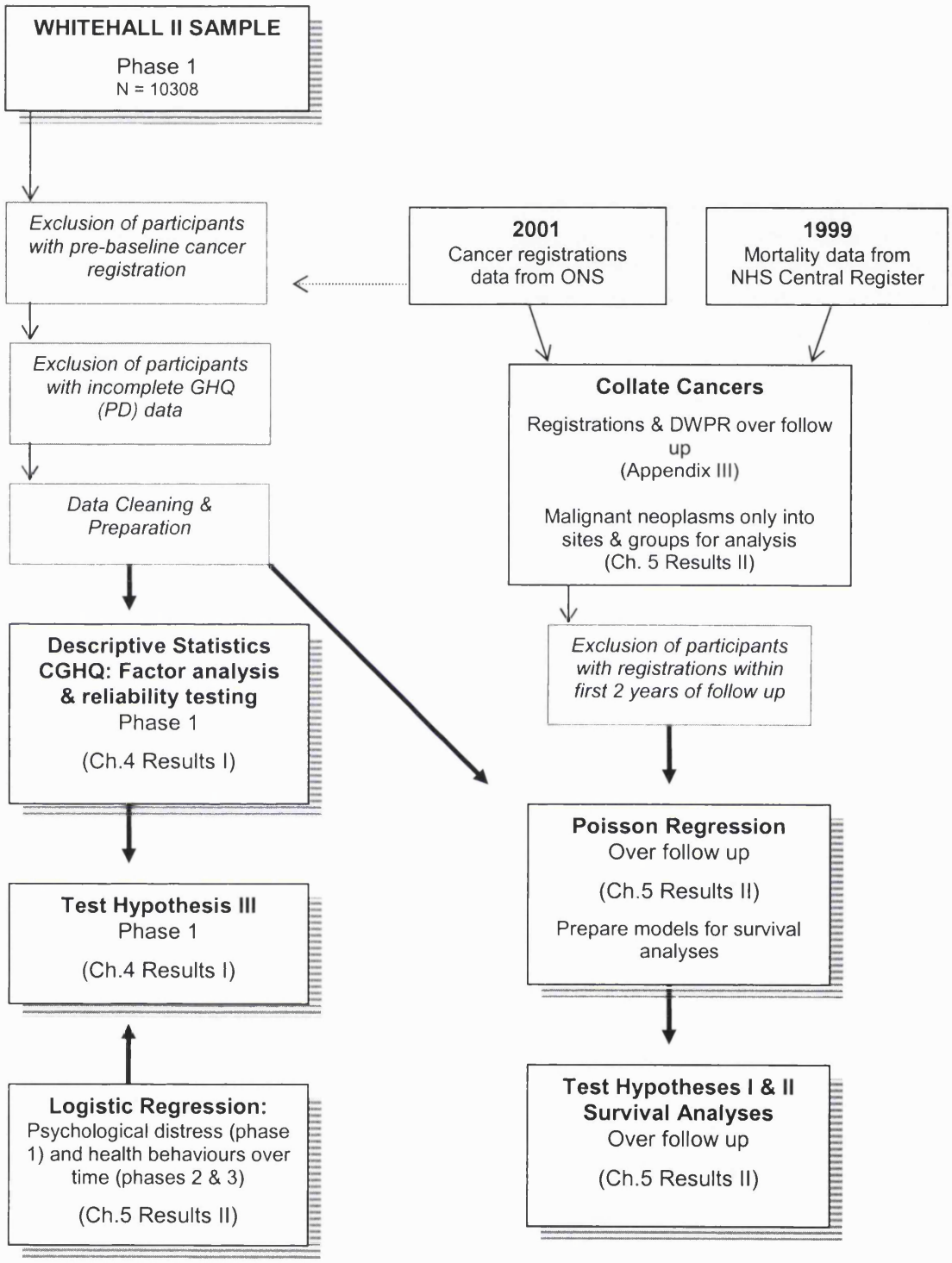
Outcome Group	Health Behaviours	Other Explanatory Variables	Key Confounders
Any malignant neoplasm	Smoking Fruits or vegetables HEIWE Exercise	BMI Family history of cancer Self-assessed health	Age Sex Grade
Smoking-related cancers	Smoking (5 levels) Alcohol Fruits or vegetables HEIWE	BMI Family history of cancer Self-assessed health	Age Sex Grade
Diet-related cancers	Fruits or vegetables Bread Meat Spread HEIWE	BMI Family history of cancer Self-assessed health	Age Sex Grade
Cancers related to OC use		BMI OC use Menopausal status [a] Nulliparity HRT use Family history of cancer	Age Grade
Breast cancers	Smoking Alcohol Fruits or vegetables HEIWE Exercise	BMI OC use Menopausal status Parity	Age Grade (reversed)
Other cancers	Smoking Alcohol Fruits or vegetables HEIWE Exercise	BMI	Age Sex Grade

[a] Premenopause v natural menopause only: women with surgical menopause excluded from this analysis.

3.3.5 Analytic Strategy

The key points of the analytic strategy are illustrated in Figure 3.2. Prior to analyses, the data were screened for extreme values and missing data. After exclusions (participants with a history of cancer at baseline, registrations occurring within 2 years of entry to the study and those with missing or incomplete PD data at phase 1), the sample was described using appropriate summary statistics across gender (means, standard deviations, medians, frequencies). Missing data were indicated for each variable in the results where appropriate.

Figure 3.2 Flow chart of analytic procedure, with reference to results chapters



3.3.5.1 Measurement of psychological distress

In preparation for using the CGHQ scoring to assess psychological distress, exploratory factor analyses were carried out to evaluate the validity of the scoring as compared with the GHQ data. An operationalisation of psychological distress was generated from scrutiny of the distribution of CGHQ scores and the resulting dichotomous variable (similar to the 4/5 threshold for the GHQ) was assessed in relation to self-reported sleep and related personal health items. In addition, Cronbach's α coefficients (Cronbach 1951) were calculated to gauge the reliabilities for the CGHQ scoring and the depressive symptoms sub-scale, respectively.

The prevalence at baseline of psychological distress using the CGHQ scoring was presented and distress was considered in relation to key confounders and explanatory variables. The continuous CGHQ score was used for these analyses along with the dichotomous variable, but the latter was the principal measure of distress used in the present study.

3.3.5.2 Psychological distress and health behaviours

A major plank of this thesis concerns the relation of psychological distress to health behaviours, which might serve as a possible pathway for increased cancer risk (see Figure 2.3 in chapter 2). This relationship is explicitly addressed in Hypothesis III, but supplementary longitudinal analyses were also carried out to explore the relationship further in the WII sample.

3.3.5.3 Testing hypothesis III

Hypothesis III was tested using cross-sectional data from Phase 1. According to this hypothesis, there should be significantly different profiles of health behaviours between those categorised as distressed and those without distress. In order to support the hypothesis, psychological distress should be significantly (at the 0.05 level) positively associated with current smoking (and in current smokers, with heavier tobacco use) and with moderate to heavy consumption of alcohol. Moreover, psychological distress should be inversely associated with consumption of fruits or vegetables and healthy eating index scores (HEIWE) and with more regular

participation in exercise, particularly moderate and vigorous physical activity (again, at the 0.05 level).

Supplementary data

Since there was some sample attrition at later phases, findings from Phase 1 alone were used to support or reject the third hypothesis. Nevertheless, further evidence about the relationship between PD and health behaviours was gleaned from analyses of data from later phases of data collection (Phases 2 & 3). Logistic regression analyses were carried out to examine how well distress at phase 1 predicted cancer-relevant health-risking behaviours at phases 2 and 3 (current smoking, heavy alcohol consumption, less frequent consumption of fruits or vegetables, and infrequent exercise).

3.3.5.4 Cancer incidence in the Whitehall II Study

The cancer events which occurred over follow up were tabulated to show incidence by site (full details are reported in Appendix III) and processed according to inclusion and exclusion criteria. Standardised cancer rates (and standard errors) were calculated for men and women over four age groups using the direct method (Gardner & Altman 1989). The eligible events were then collated into the six cancer outcome groups (any malignant neoplasm, smoking-related cancers, cancers related to use of oral contraceptives, breast cancers and other cancers). The association of psychological distress with cancer incidence in these outcome groups was assessed using regression techniques.

3.3.5.5 Poisson regression analysis

Poisson regression analysis was used initially in order to establish the key variables for each outcome group regression model, clarify the calibration of variables, and determine whether further analyses were appropriate for each outcome group. Prior to fitting Poisson regression models, the data were grouped according to the relevant risk factors for each outcome variable (listed in Table 3.3.4c). These models also estimated the incidence rate ratio for each parameter including psychological distress and controlled for confounding factors.

First, the sets of explanatory variables deemed pertinent to each outcome group were subjected to preliminary stepwise regression analyses. Those variables that did not contribute to the regression model were eliminated from the next step in the procedure. Poisson models were fitted with time at risk (days) entered as an offset to the model (in sequence: distress only; distress plus health behaviours; distress plus health behaviours adjusted for age, sex and grade). Parameter estimates were reported for each of these models, along with incidence rate ratios and 95% confidence intervals.

The capacity of the models to describe the data adequately determined which outcome groups would be analysed using survival models. If, for a given outcome group, the third (full) model LR χ^2 did not differ significantly from the constant-only model, this group would not be analysed further.

3.3.5.6 Survival analysis

Survival analyses were carried out for each of the outcome groups selected by Poisson regression analyses. First, Kaplan-Meier curves were plotted and the cumulative hazards graphed for each outcome in relation to psychological distress. Parametric survival models were fitted using a Weibull distribution, on the assumption that over follow up there would be increasing risk with age. Univariate analyses established the relationships between cancer risk and explanatory variables.

Three survival models were fitted for each outcome group in the following sequence in a similar fashion to the Poisson models: (1) psychological distress only; (2) psychological distress and the explanatory variables; (3) psychological distress, the explanatory variables and the key confounders (age, sex and grade). As these models were nested, improvement in fit between models was assessed by comparing the model deviances using the log likelihood ratio statistic, $-2\ (\ell_1 - \ell_2)$. This statistic has a χ^2 distribution with degrees of freedom (df) equal to $p_2 - p_1$, where model 1 has p_1 parameters and the second $p_2 > p_1$ parameters.

3.3.5.7 Testing hypotheses I & II

A significantly elevated hazards ratio (at the 0.05 level) for psychological distress after adjustment for other variables constituted supporting evidence for hypothesis I.

Should hypothesis I be supported, the contribution of health behaviours to the model and their effect on the distress parameter would be examined to accept or reject hypothesis II. The percentage change in the coefficient for psychological distress over the first two models was inspected to assess the impact of the addition of health behaviours and other explanatory variables (hypothesis II). If there was no contribution of health behaviours to distress in the model, the exclusion of the latter should not make a significant difference to the change in log likelihood (using the likelihood ratio test), and hypothesis II would be rejected.

3.3.6 Statistical Analyses

The majority of the statistical operations were performed using the STATA computer package (1985) and where necessary, a scientific calculator was also used (Sharp EL-531A). The significance of statistics was indicated using probability values (α equal to 5%, 1%, and 0.1%) and 95% confidence intervals where appropriate. STATA commands used in the analyses are identified in Courier New font in this section.

Descriptive statistics used for the present study included χ^2 tests of association, the Student's t-test, the Wilcoxon-Mann-Whitney test, one-way analysis of variance (ANOVA) and the Kruskal-Wallis one-way analysis of variance by ranks [`tab .. column chi2, ttest.. by(..), ranksum, oneway, kwallis`]. Where numbers in cells were too small for χ^2 tests, the frequencies were presented alone. These statistics were also used to investigate the differences in health behaviours between the distressed and non-distressed.

Logistic regression was used to assess the relationship between psychological distress and health behaviours at later phases, using the STATA commands `logit` and `logistic`. Factor analysis was carried out with principal components analysis using STATA's `factor [var01-vari], pcf` and `rotate, varimax` commands. Cronbach's alpha coefficient was calculated using the command, `alpha x1-xi`.

Standardised cancer rates were calculated over age groups for men and women by the direct method given by Gardner and Altman (1989). Crude rates were calculated for men and women separately for each of the outcome groups prior to the regression

analyses. The data were grouped according to the relevant risk factors for each outcome variable for the Poisson regression models using the STATA command `collapse`.

Poisson regression models were fitted using STATA's `poisson` command, with `exposure(pdays)` as the offset, and the extension `irr` to obtain the incidence rate ratios. Univariate and multivariate survival models were fitted using STATA's `streg` command, using a Weibull distribution indicated by the extension `dist(w)` and the extension `nohr` to obtain the parameter coefficients. The Kaplan-Meier estimates were obtained using the command `sts graph` and the cumulative hazard estimates for psychological distress were graphed using the command `sts graph, na cna by(cpd1)` with 95% confidence intervals. Dummy variables for regression analyses were obtained by using the command `xi:` and the prefix `i.var` where necessary.

3.4 Summary

This chapter outlined the methodology of the Whitehall II Study before presenting the methodology for the present study. The Whitehall II Study has followed a cohort of 10308 men and women since 1985-88 over six waves of data collection to date. Participants from the Whitehall II study were selected for the present study according to two main criteria: participants should be cancer-free at baseline and have a CGHQ score at baseline.

The present study uses data from phase 1 of the Whitehall II Study to establish psychological distress status and assess other risk factors at baseline (socio-demographic, personal health, reproductive factors and health behaviours including generating a composite variable, the healthy eating index). Information on cancer morbidity (registrations) and mortality was available from July 2001 and anticipating low numbers of cases per site over follow up, a strategy for grouping cancers by aetiology was devised and implemented. Six main outcome groups were identified: any malignant neoplasm, smoking-related cancers, diet-related cancers, cancers related to oral contraceptive use, breast cancers and other cancers.

A cross-sectional design was used at phase 1 to investigate the association between psychological distress and health behaviours (Hypothesis III), supplemented by logistic regression analyses of psychological distress (phase 1) predicting health behaviours over time. A longitudinal cohort design was used to address Hypotheses I and II. Survival regression techniques were used to establish whether there was increased risk for cancer associated with psychological distress and to explore how health behaviours contributed to risk.

Chapter 4

Results I

Description of sample

Measurement of psychological distress

The association of psychological distress with health behaviours at phase 1

Depressive symptoms

4.1 Introduction

The results of the analyses are presented over two chapters. This chapter describes the key baseline characteristics of the sample drawn from the Whitehall II Study for the present research. The next chapter presents outcome data and the results of regression analyses investigating Hypotheses I and II.

The sample from the Whitehall II Study is described in terms of summary statistics for socio-demographic and personal health characteristics, along with risk factors for cancer and health behaviours (section 4.2). This chapter continues with a section on the measurement of psychological distress for the present study (4.3), reporting the results of factor analyses and reliability analyses for the chronic scoring of the GHQ.

Section 4.4 examines the relationship between psychological distress and key covariates and explanatory variables in order to address Hypothesis III. Section 4.5 briefly describes the association of health behaviours with the depressive symptoms sub-scale from the GHQ at phase 1.

4.2 Description of Sample from the Whitehall II Study

Out of the original 10308 participants sampled for Whitehall II at Phase 1 (baseline), 90 (0.8%) were excluded because they had a history of cancer (see section 5.2 for more details). A further 119 (1.1%) participants were excluded from further analyses because they did not attempt or complete all items of the GHQ and there was insufficient assessment of their psychological distress at baseline. A comparison of the characteristics of responders and non-responders on the GHQ is presented later in this chapter (section 4.3.1).

4.2.1 Sample

After exclusions, at baseline the sample drawn from the Whitehall II Study consisted of 6799 men and 3300 women. Overall, the mean age was 44.4 years (SD = 6.05, range 34 to 56 years) and women were significantly older than men ($p < 0.001$; see Table 4.2a for a summary of demographic characteristics). When age was stratified into four age groups (less than 39 years; 40-44 years; 45-49 years; more than 50 years), a greater proportion of men were less than 45 years of age (56.5%), while a greater proportion of women were 45 years of age and older (53.4%). Most of the participants were married or cohabiting (men, 80.5%; women, 61.3%) and men significantly more often ($p < 0.001$).

Grade of employment within the Civil Service was used as an indicator of socioeconomic status within the Whitehall II Study. There was a clear difference in gender distribution across grades ($p < 0.001$). There were significantly more women than men in the lower grades. The six grade levels were collapsed into three groups for the present study: Administrative (I & II); Professional & Executive (III, IV & V); and Clerical (VI). The greatest proportion of women was in the Clerical group, while the greatest proportion of men was in the Professional & Executive group.

49.2% of women reported attending full-time education until the age of 16, as compared with 27.6% of men. In contrast 46.6% of men reported attending full-time education after the age of 18 years, compared to 28.7% of women. Very few participants lived in rented accommodation although, of these, proportionately more were female ($p < 0.001$).

Table 4.2a Descriptive statistics Whitehall II (Phase 1): Demographics

			Men[a]	Women[a]	
N = 10099			6799 (67.32)	3300 (32.68)	
Age (years)	Mean (SD)		44.02 (6.001)	45.27 (6.077)	t = -9.785 **
Age group		35 to 39	1997 (29.37)	772 (23.39)	χ^2 = 91.12 **
		40 to 44	1843 (27.11)	767 (23.24)	df = 3
		45 to 49	1321 (19.43)	740 (22.42)	
		50 to 55	1638 (24.09)	1021 (30.94)	
Grade level		I	997 (14.66)	115 (3.48)	χ^2 = 2518.8 **
		II	1609 (23.67)	253 (7.67)	df = 5
		III	1213 (17.84)	196 (5.94)	
		IV	1480 (21.77)	466 (14.12)	
		V	875 (12.87)	645 (19.55)	
		VI	625 (9.19)	1625 (49.24)	
Grade level, collapsed into 3 groups		Administrative	2606 (38.33)	368 (11.15)	χ^2 = 2232.98 **
		Professional-Executive	3568 (52.48)	1307 (39.61)	df = 2
		Clerical	625 (9.19)	1625 (49.24)	
Education [b] n = 7538		Up to 16 years	1411 (27.56)	1190 (49.21)	χ^2 = 360.84 **
		17 & 18 years	1324 (25.86)	533 (22.04)	df = 2
		Over 18 years	2385 (46.58)	695 (28.74)	
Marital status n = 10062		Married/cohabiting	5459 (80.52)	2013 (61.33)	χ^2 = 513.28 **
		Single	937 (13.82)	709 (21.6)	df = 3
		Divorced/separated	350 (5.16)	462 (14.08)	
		Widowed	34 (0.5)	98 (2.99)	
Father's social class [b] n = 6859		I	455 (9.64)	186 (8.7)	χ^2 = 72.08 **
		II	1507 (31.93)	593 (27.72)	df = 5
		III	800 (16.95)	267 (12.48)	
		IV	1480 (31.36)	795 (37.17)	
		V	321 (6.8)	169 (7.9)	
		VI	157 (3.33)	129 (6.03)	
Accommodation type n = 10024		Owned or mortgaged	6266 (92.73)	2569 (78.63)	χ^2 = 475.46 **
		Rent from local authority	227 (3.36)	468 (14.33)	df = 2
		Rent privately	264 (3.91)	230 (7.04)	
Live alone [b] n = 7524		No	4356 (85.24)	1861 (77.09)	χ^2 = 75.92 **
		Yes	754 (14.76)	553 (22.91)	df = 1

df = Degrees of freedom ** $p < 0.001$

[a] n (%) unless otherwise indicated

[b] Variable omitted from earlier version of Phase 1 Questionnaire, not administered to entire sample

4.2.2 Other Descriptive Statistics

Other characteristics of the sample at baseline described here include health and medication use, risk factors for cancer, and health behaviours.

4.2.2.1 Health characteristics and medication use

At baseline, women had a higher mean body mass index (BMI) than men ($p < 0.05$; see Table 4.2b). Although similar proportions of men and women had a BMI in the normal range of 18 to 24.9, there were proportionately more women with BMI scores in excess of 30. Thus 10.7% of women in the sample and 5.1% of men had BMI scores that may be considered obese.

In keeping with what might be expected of an occupational cohort of predominantly office-based workers, the majority of participants described their health as good or very good at Phase 1 (men, 77.6%, women 64.0%) and most reported very few minor symptoms, which produced a positively skewed distribution of symptom scores. Nevertheless, men were more likely to report good self-assessed health in the past year than women ($p < 0.001$) and had lower median symptom scores ($p < 0.001$). Subsequent analyses used the collapsed two-category version of self-assessed health (SAH; good or very good, average or worse).

Very few participants reported using tranquillisers or anti-depressants in the 14 days prior to completing the questionnaire, but of those participants that did, proportionately more women were using these medications than men (tranquillisers, $p < 0.05$; anti-depressants, $p < 0.01$). Similar proportions of men and women, 31.3% and 32.1% respectively, reported longstanding illness, disability or infirmity at baseline.

Table 4.2b Descriptive Statistics Whitehall II (Phase 1): Health characteristics & medication use

	N		Men[a]	Women [a]	
Body mass index	10088	Mean (SD) Range	24.56 (3.037) *14.96-43.6*	24.74 (4.232) *13.92-47.73*	t = -2.326 §
Categories of BMI		Underweight (BMI<18) Normal Overweight (BMI>25) Obese (BMI>30)	38 (0.56) 4074 (60.0) 2332 (34.34) 346 (5.1)	40 (1.21) 1987 (60.25) 917 (27.8) 354 (10.73)	χ^2 = 143.4 ** df = 3
Self-assessed health in the past year	10068	Very good Good Average Poor Very poor	2428 (35.83) 2833 (41.81) 1254 (18.51) 239 (3.53) 22 (0.32)	807 (24.51) 1301 (39.52) 946 (28.74) 217 (6.59) 21 (0.64)	χ^2 = 248.3 ** df = 1
SAH	10068	Good or better Average or worse	5261 (77.64) 1515 (22.36)	2108 (64.03) 1184 (35.97)	χ^2 = 209.1 ** df = 1
Symptom Score[c]	7446	Median n (range)	2 *5089* (0-14)	3 *2357* (0-15)	z[b] = -10.86 **
Average hours sleep per night reported	10061	6 hours or less 7 hours 8 hours or more	2164 (31.96) 3538 (52.25) 1069 (15.79)	1113 (33.83) 1533 (46.6) 644 (19.57)	χ^2 = 35.07 ** df = 2
Reported tranquilliser use (past 14 days)[c]	7525	Yes No	86 (1.68) 5028 (98.32)	57 (2.36) 2354 (97.64)	χ^2 = 4.09 § df = 1
Reported anti-depressant use (past 14 days)[c]	7525	Yes No	66 (1.29) 5048 (98.71)	54 (2.24) 2357 (97.76)	χ^2 = 9.4 * df = 1
Reported longstanding illness, disability or infirmity[c]	7512	Yes No	1601 (31.35) 3506 (68.65)	773 (32.14) 1632 (67.86)	χ^2 = 0.47 df = 1

df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

[a] n (%) unless otherwise indicated

[b] Mann-Whitney U with ties

[c] Variable omitted from earlier version of Phase 1 Questionnaire, not administered to entire sample

4.2.2.2 Risk factors for cancer: family history & reproductive factors

Less than a quarter of the sample reported a family history of cancer at Phase 1 and few of these reported that both parents had died from cancer. By Phase 2, a further 204 men and 88 women reported a parental death due to cancer (see Table 4.2ci).

Table 4.2ci Descriptive Statistics Whitehall II (Phase 1& 2): Family history of cancer

	N		Men[a]	Women[a]	df	
Family history of cancer (parental death from cancer)	10099	None	5212 (76.66)	2449 (74.21)	2	$\chi^2 = 7.84$ §
		One parent	1450 (21.33)	785 (23.79)		
		Both parents	137 (2.02)	66 (2.00)		
Any family history of cancer	10099	None	5212 (76.66)	2449 (74.21)	1	$\chi^2 = 7.26$ *
		Yes	1587 (23.34)	851 (25.79)		

df = Degrees of freedom § $p < 0.05$; * $p < 0.01$
[a] n (%) unless otherwise indicated

The cancer risk arising from reproductive factors concerns women only. These factors include parity and nulliparity, menopausal status, use of oral contraceptives and use of hormone replacement therapy (HRT). These results are reported over two tables: 4.2cii and 4.2ciii.

1140 women (55.3%) out of 2062 reported having ever had children by Phase 5 (see Table 4.2cii), and 922 (44.7%) reported being nulliparous. 84 women reported their first birth after the age of 35 years (of which 30 births occurred after entry to the study). 1931 (64.6%) women were premenopausal at Phase 1. A further 40 women (1.3%) were deemed perimenopausal as they reported active menstruation but also reported either having started their menopause, or use of hormone replacement therapy (HRT). Given the small numbers involved, these women were considered among the premenopausal in later analyses. Similarly, the two hysterectomy groups were combined to form a surgical menopause group for later analyses (short form menopause status).

Women who were premenopausal were significantly younger (mean age 42.2 years, SD = 4.8) than women who had had surgical menopause (mean age 48.4 years, SD = 4.98, t = -22.96, $p < 0.0001$). Women who had experienced natural menopause had a significantly higher mean age than both of these groups, but lower variance in age (mean age 51.96 years, SD = 2.6; Kruskal-Wallis (with ties) = 1359.7, df = 2, $p < 0.001$).

Table 4.2cii Descriptive Statistics Whitehall II (Phase 1 & 5): Risk factors for cancer, reproductive factors, part 1

Factor	n		Categories				
WOMEN ONLY	*3300*						
			Age group[a]				
			35-39	*40-44*	*45-49*	*50-55*	
Parity ¶	2062	Nulliparous	276 (53.8)	264 (50.19)	159 (35.41)	223 (38.85)	χ^2 = 47.22 **
		Parous	237 (46.2)	262 (49.81)	290 (64.59)	351 (61.15)	df = 3
Parity (overall) ¶	2032	Nulliparous	276 (54.44)	264 (50.97)	159 (35.97)	223 (39.47)	χ^2 = 105.9 **
		1st child after age 35	42 (8.28)	26 (5.02)	7 (1.58)	9 (1.59)	df = 6
		Parous	189 (37.28)	228 (44.02)	276 (62.44)	333 (58.94)	
Menopause status	2991	Premenopause	682 (95.79)	629 (90.5)	459 (67.6)	161 (17.79)	
		Perimenopause	1 (0.14)	3 (0.43)	12 (1.77)	24 (2.65)	
		Natural Menopause	1 (0.14)	5 (0.72)	98 (14.43)	532 (58.78)	
		Hysterectomy	26 (3.65)	49 (7.05)	92 (13.55)	124 (13.7)	
		Hysterectomy and oophorectomy	2 (0.28)	9 (1.29)	18 (2.65)	64 (7.07)	
Menopause Status (Short form)	2991	Premenopause	683 (95.93)	632 (90.94)	471 (69.37)	185 (20.44)	χ^2 = 1455.2 **
		Natural Menopause	1 (0.14)	5 (0.72)	98 (14.43)	532 (58.78)	df = 6
		Surgical Menopause	28 (3.93)	58 (8.35)	110 (16.2)	188 (20.77)	
			Age at menopause[a]				
			≤44 yrs	*45-49 yrs*	*≥50 yrs*		
Menopause & Age	955	Natural	87 (25.66)	270 (77.36)	255 (95.51)		χ^2 = 358.68 **
		Surgical	252 (74.34)	79 (22.64)	12 (4.49)		df = 2

df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

[a] n (%) unless otherwise indicated ¶ Phase 5 data

At Phase 1, only 189 (6.4 %) of women reported currently using oral contraceptives (OC; see Table 4.2ciii). These current users were significantly younger (mean age 39.4 years, SD = 3.96, median 39 years) than women not using OC at Phase 1 (mean age 45.6 years, SD = 5.99, median 46 years; Mann-Whitney U with ties, $z = -13.42$, $p < 0.001$). 1550 (54.6%) of respondents had used OC in the past, while 1290 (45.4%) reported never having used OC. This latter group of never-users were significantly older (mean age 47.7, SD = 5.55, median 49 years) than women who reported having used OC at some time in the past (mean age 43.7, SD = 5.75, median 43 years; Mann-Whitney U with ties, $z = -17.4$, $p < 0.001$).

The mean age at reported first use of oral contraceptives was 25.5 years (SD = 6.45, range 14-45, n = 181). Women who identified themselves as current users (n = 176) reported using OC for an average of 11.9 years (SD = 4.89, range 1-23), while those who had used them in the past (n = 1493) reported having done so for 6.4 years on average (SD = 4.7, range 1-31). Altogether, combining current users with past users, mean duration of use of OC was 7 years (SD = 4.99, range 1-31, median 6 years). Duration of OC use (n = 2956) was categorised for further analyses as: never; 1-5 years; 6-10 years; and 11 years or more.

In contrast to the numbers using OC, just 244 women reported ever using HRT (mean number of months 19.5, SD = 38.7, range 1-456, median 7 months). Out of 259 women who responded to the question, 106 reported currently using HRT at Phase 1 (mean number of months 29.1, SD = 52.8, range 1-456, n = 98). Duration of HRT use was categorised as: 0 months, 1 to 12 months; 1 to 4 years; and 5 years or more.

Table 4.2ciii Descriptive Statistics Whitehall II (Phase 1): Risk factors for cancer, reproductive factors, part 2

Factor		n		Categories				
WOMEN ONLY		*3300*						
					Age group[a]			
Oral Contraceptive Use				*35-39*	*40-44*	*45-49*	*50-55*	
	Current	2931	Yes	116 (16.86)	49 (7.11)	21 (3.19)	3 (0.34)	χ^2 = 191.2 **
			No	572 (83.14)	640 (92.89)	638 (96.81)	892 (99.66)	df = 3
	Past	2840	Yes	459 (76.12)	438 (66.46)	322 (48.06)	331 (36.45)	χ^2 = 282.2 **
			No	144 (23.88)	221 (33.54)	348 (51.94)	577 (63.55)	df = 3
	Overall duration of use	2956	Never	144 (20.54)	221 (32.17)	348 (51.71)	577 (64.47)	χ^2 = 394.02 **
			1-5 years	230 (32.81)	222 (32.31)	160 (23.77)	182 (20.34)	df = 9
			6-10 years	167 (23.82)	135 (19.65)	106 (15.75)	80 (8.94)	
			11+ years	160 (22.82)	109 (15.87)	59 (8.77)	56 (6.26)	
Hormone Replacement Therapy Use		1430	0 months	119 (93.7)	159 (89.33)	287 (87.76)	655 (82.1)	
			1-12 months	6 (4.72)	10 (5.62)	22 (6.73)	95 (11.9)	
			1-4 years	1 (0.79)	7 (3.93)	15 (4.59)	37 (4.63)	
			5+ years	1 (0.79)	2 (1.12)	3 (0.92)	11 (1.37)	
					HRT Use			
				Yes	*No*			
Menopause & HRT Use		1004	Natural	85 (47.49)	542 (65.7)			χ^2 = 40.2 **
			Hysterectomy	57 (31.84)	228 (27.64)			df = 2
			Hysterectomy +	37 (20.67)	55 (6.67)			

df = Degrees of freedom ** $p < 0.001$

[a] n (%) unless otherwise indicated

4.2.2.3 Health behaviours: smoking

Fewer than 20% of the overall sample reported that they smoked cigarettes currently at Phase 1 (14.4% of men, 22.9% of women; see Table 4.2d). Proportionately more women (52.7%) reported never having smoked than men (47.6%), but women who smoked reported a higher median number of cigarettes smoked per day ($p < 0.05$).

Table 4.2d Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Smoking

	n†		Men[a]	Women[a]	
Smoking habit	9868	No	3207 (48.47)	1727 (53.12)	$\chi^2 = 244.16$ **
		Ex-smoker	2458 (37.15)	780 (23.99)	df = 4
		Light	312 (4.72)	217 (6.67)	
		Medium	376 (5.68)	380 (11.69)	
		Heavy	264 (3.99)	147 (4.52)	
Ever smoked	10016	Never	3207 (47.59)	1727 (52.7)	$\chi^2 = 189.66$ **
		Ex-smoker	2458 (36.47)	780 (23.8)	df = 2
		Current	1074 (15.94)	770 (23.5)	
Current smokers: Number of cigarettes smoked daily ‡	1836	Median n (range)	15 *1058* (0-60)	16 *778* (0-60)	$z^b = -2.219$ §

df = Degrees of freedom § $p < 0.05$; ** $p < 0.001$
[a] n (%) unless otherwise indicated
[b] Mann-Whitney U with ties
† Different n between composite variables 'Smoking' and 'Ever smoked' reflects differing response rate to original variables (from questionnaire and screening).
‡. Distributions skewed necessitating non-parametric summary statistic.

4.2.2.4 Health behaviours: alcohol use

Men reported more alcohol use in the week preceding questionnaire administration than women, both in terms of overall units per week ($p < 0.001$; see Table 4.2e) and units of beer per week ($p < 0.001$). Most participants indicated that they had changed their drinking habits in the past five years, although this was more commonly the case among men than amongst women ($p < 0.001$). Similar proportions of men and women reported having drunk more alcohol in the past compared with current habits, but women were marginally more likely to report drinking more alcohol more recently (i.e. consumed less alcohol in the past, see Table 4.2e).

Table 4.2e Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Alcohol use

	n		Men[a]	Women[a]	
Units of alcohol in the past week ‡	10012	Median n (range)	8 *6748* (0-141)	3 *3264* (0-93)	$z^b = 30.764$ **
Units of beer in the past week ‡	10012	Median n (range)	2 *6748* (0-120)	0 *3264* (0-42)	$z^b = 44.55$ **
Alcohol consumption ¶	10012	Non-drinker Light Moderate Heavy	877 (13.0) 3081 (45.66) 1533 (22.72) 1257 (18.63)	942 (28.86) 1507 (46.17) 491 (15.04) 324 (9.93)	$\chi^2 = 474.43$ ** df = 3
Change in drinking habits in the past 5 years	10006	Yes No	2436 (36.05) 4322 (63.95)	969 (29.83) 2279 (70.17)	$\chi^2 = 37.71$ ** df = 1
[If changed] Compared with current drinking habits, how much consumed in the past?	3472	A lot more A bit more A bit less A lot less	368 (14.89) 1012 (40.94) 820 (33.17) 272 (11.0)	130 (13.0) 408 (40.8) 290 (29.0) 172 (17.2)	$\chi^2 = 27.02$ ** df = 3

df = Degrees of freedom ** $p < 0.001$
[a] n (%) unless otherwise indicated
[b] Mann-Whitney U with ties
‡ Distributions very skewed necessitating non-parametric summary statistic.
¶ Consumption based on (ONS 1998) categorisation of units per week. Men: light, < 11 units; moderate, 11-21 units; heavy, > 21 units. Women: light, < 8 units; moderate 8-14 units; heavy, > 14 units. Non-drinkers = 0 units.

4.2.2.5 Health behaviours: diet

The diet variables may be considered in three groups. First, the intake of fibre (i.e. type and amount of bread), meat and fruits or vegetables is summarised (Table 4.2f). Second, the remaining dietary variables are summarised (Table 4.2g), prior to their use in generating the Healthy Eating Index.

Intake of Fibre, Meat, and Fruits or Vegetables

Men were marginally more likely to report consuming white bread than women ($p < 0.01$), but reported eating substantially more slices of bread per day ($p < 0.001$; see Table 4.2f) and using more spread on bread ($p < 0.05$, see Table 4.2g). Women reported consuming fresh fruits or vegetables more frequently than men ($p < 0.001$) and were less likely to report eating meat more than five times a week ($p < 0.001$; see Table 4.2f).

Table 4.2f Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Diet, part 1

	n		Men[a]	Women[a]	df	
Fibre						
Usual type of bread eaten	10040	Wholemeal	2820 (41.65)	1419 (43.41)	2	$\chi^2 = 11.34$ *
		Other brown	2439 (36.02)	1216 (37.2)		
		White	1512 (22.33)	634 (19.39)		
Amount of bread usually eaten daily	10082	0-3 slices	2584 (38.07)	2027 (61.52)	1	$\chi^2 = 491.25$ **
		More than 3 slices	4203 (61.93)	1268 (38.48)		
Fruit & Vegetables						
Frequency of eating fresh fruit & vegetables	10072	2+ times daily	1001 (14.76)	666 (20.26)	3	$\chi^2 = 86.09$ **
		Daily	2752 (40.57)	1433 (43.58)		
		3-6 times a week	2160 (31.84)	877 (26.67)		
		Once or twice a week, or less often	871 (12.84)	312 (9.49)		
Meat						
Frequency of eating meat (not poultry or fish)	10084	1-2 times a week or less often	1327 (19.54)	1147 (34.84)	2	$\chi^2 = 346.63$ **
		3-4 times a week	2498 (36.78)	1212 (36.82)		
		5+ times a week	2967 (43.68)	933 (28.34)		

df = Degrees of freedom * $p < 0.01$; ** $p < 0.001$

[a] n (%) unless otherwise indicated

Intake of Dairy Produce, Spreads, Eggs and Fish

Whole milk was the more popular type of milk consumed in the sample, with men less likely to report using semi-skimmed milk than women, although women reported consuming less milk overall per day than men (see Table 4.2g). Women tended to report consuming less cream, cheese and eggs than men (all $p < 0.001$), but there was no significant difference between men and women in the reported frequencies of eating fish.

Table 4.2g Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Diet, part 2

	n		Men[a]	Women[a]	df	
Other diet						
Usual type of spread used	9957	Polyunsaturated / low calories spreads / rarely use	3473 (51.74)	1605 (49.48)	1	$\chi^2 = 4.46$ §
		Butter or margarine	3240 (48.26)	1639 (50.52)		
Average size of spread used per slice	9809	1	981 (14.81)	871 (27.36)	3	$\chi^2 = 229.13$ **
		2	2650 (39.99)	1156 (36.32)		
		3	2217 (33.46)	830 (26.08)		
		4	778 (11.74)	326 (10.24)		
Type of milk usually used	10032	Skimmed or semi-skimmed milk	2362 (34.94)	1312 (40.1)	2	$\chi^2 = 63.96$ **
		Do not use milk, or use other type	340 (5.03)	249 (7.61)		
		Whole milk	4058 (60.03)	1711 (52.29)		
Amount of milk drunk per day	10075	0-0.5 pints daily	3533 (52.04)	2212 (67.32)	1	$\chi^2 = 210.83$ **
		More than 0.5 pints daily	3256 (47.96)	1074 (32.68)		
Frequency of consuming cream	9507	Seldom or never	2743 (42.55)	1521 (49.69)	2	$\chi^2 = 44.11$ **
		1-3 times a week	2752 (42.69)	1169 (38.19)		
		Once weekly or more often	951 (14.75)	371 (12.12)		
Frequency of consuming cheese	9514	0-3 times a month	1186 (18.38)	788 (25.73)	3	$\chi^2 = 138.61$ **
		1-2 times a week	2067 (32.04)	1122 (36.64)		
		3-4 times a week	1798 (27.87)	700 (22.86)		
		5+ times a week	1401 (21.71)	452 (14.76)		
Frequency of consuming eggs	7541	1-3 times a month or less	1482 (28.93)	850 (35.14)	2	$\chi^2 = 41.42$ **
		1-2 times a week	2533 (49.45)	1167 (48.24)		
		3+ times a week	1107 (21.61)	402 (16.62)		
Frequency of consuming fish	10077	1-3 times a month or less	2690 (39.64)	1328 (40.35)	1	$\chi^2 = 0.468$
		1-2 times a week or more	4096 (60.36)	1963 (59.65)		

df = Degrees of freedom § $p < 0.05$; ** $p < 0.001$
[a] n (%) unless otherwise indicated

Healthy Eating Index

The dietary variables from Table 4.2g were combined to produce a Healthy Eating Index score (HEI; see Appendix IV Additional Results). The distribution of these scores was normal, and overall women had a higher mean HEI score ($t = -7.36$, $p < 0.001$). However, since the item assessing egg consumption was added to the questionnaire later in data collection at Phase 1, there were 1910 participants with missing data on this variable in the sample. Thus the HEIWE version of the index (range 0-5), excluding this variable assessing egg consumption, was preferred. The HEIWE corroborated the sex difference in diet found with the HEI (men, mean HEIWE = 2.87, SD = 1.15; women, mean HEIWE = 3.07, SD = 1.17; $t = -7.59$, $p < 0.001$).

4.2.2.6 Health behaviours: exercise

There were significant sex differences in reported frequency of exercise of different types and of hours per week per type (Table 4.2h). The hours reported per type of activity per week were skewed, so the duration of time reported in the three types of activity were categorised into dichotomised variables, above and below the median.

Men were more likely to participate more often in physical activity, particularly vigorous activity ($p < 0.001$). Women were more likely to report more than 5 hours of mildly energetic exercise per week than men ($p < 0.001$). However, women were more likely to report spending 2 hours or less in moderate activity per week ($p < 0.001$) and were substantially more likely to spend less time in vigorous activity ($p < 0.001$).

Table 4.2h Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Exercise

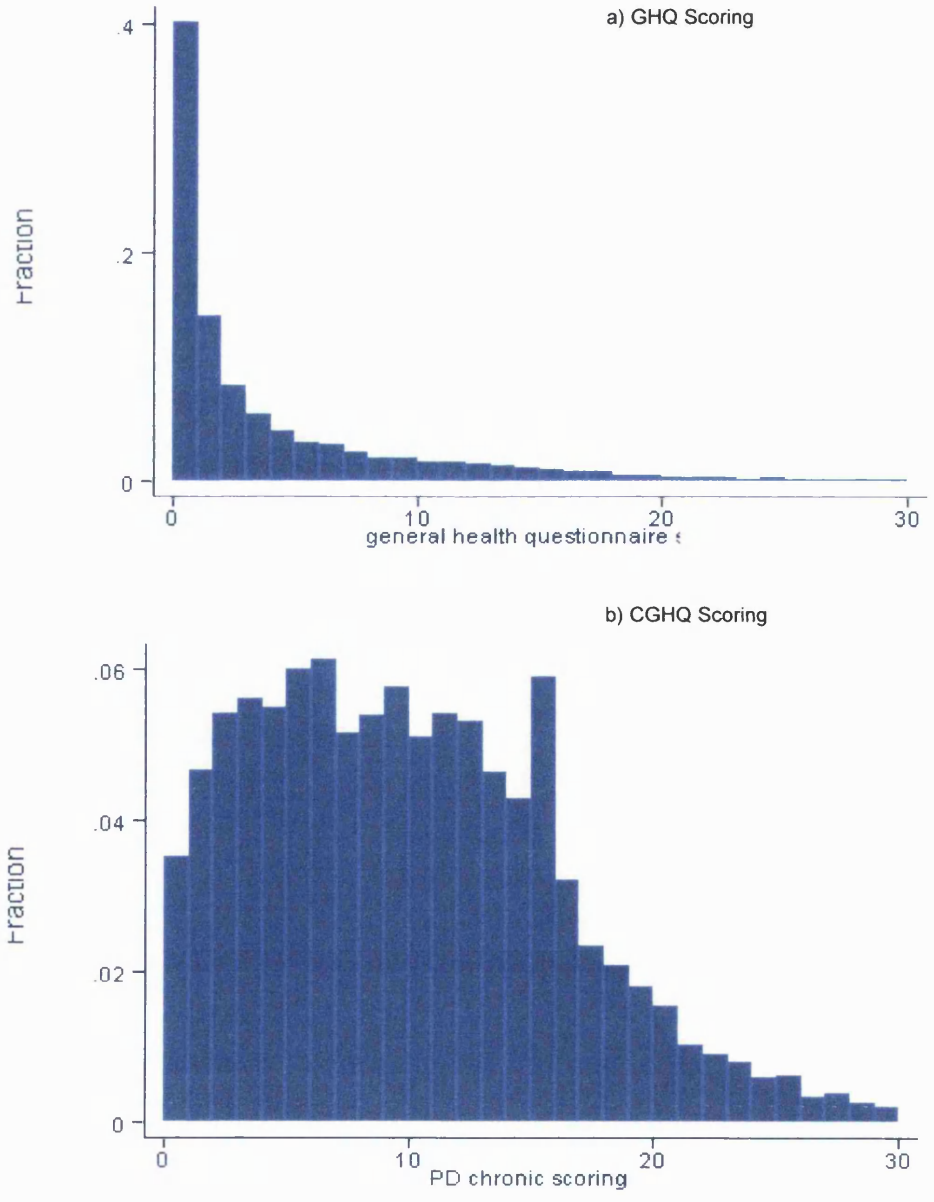
	n		Men[a]	Women[a]	df	
Frequency of mildly energetic activities	9976	3 times a week or more	4911 (73.2)	2228 (68.2)	3	$\chi^2 = 48.55$ **
		Once or twice a week	1314 (19.59)	765 (23.42)		
		About once to three times a month	284 (4.23)	114 (3.49)		
		Never / Hardly ever	200 (2.98)	160 (4.9)		
Frequency of moderately energetic activities	9883	3 times a week or more	1290 (19.3)	415 (12.98)	3	$\chi^2 = 366.48$ **
		Once or twice a week	2993 (44.77)	1134 (35.46)		
		About once to three times a month	1666 (24.92)	853 (26.67)		
		Never / Hardly ever	736 (11.01)	796 (24.89)		
Frequency of vigorous activities	9774	3 times a week or more	666 (10.05)	120 (3.81)	3	$\chi^2 = 623.17$ **
		Once or twice a week	1175 (17.73)	288 (9.15)		
		About once to three times a month	1580 (23.84)	378 (12.01)		
		Never / Hardly ever	3206 (48.38)	2361 (75.02)		
Mild exercise	9911	5 hours or less a week	2119 (31.66)	770 (23.93)	1	$\chi^2 = 62.9$ **
		More than 5 hours a week	4574 (68.34)	2448 (76.07)		
Moderate exercise	9740	2 hours or less a week	2247 (33.94)	1537 (49.28)	1	$\chi^2 = 210.04$ **
		More than 2 hours a week	4374 (66.06)	1582 (50.72)		
Vigorous exercise	9732	Less than an hour a week	3102 (47.21)	2347 (74.23)	1	$\chi^2 = 632.02$ **
		An hour or more a week	3468 (52.79)	815 (25.77)		

df = Degrees of freedom ** $p < 0.001$
[a] n (%) unless otherwise indicated

4.3 Measurement of Psychological Distress

Psychological distress was measured using the chronic method of scoring of the General Health Questionnaire (CGHQ; Goodchild & Duncan-Jones 1985). The effect on the distributions of scores as a result of using this method as opposed to using the original GHQ scoring is illustrated in Figure 4.3. Although still displaying some positive skew, the CGHQ data were much more normally distributed over the same range.

Figure 4.3 Distribution of General Health Questionnaire scores overall (Phase 1): a) GHQ scoring; b) CGHQ scoring



The availability of a continuous score for psychological distress was useful, in particular for examining its association with socio-demographic variables (see section 4.4.1). However, a categorical variable was required, despite the loss of information such a transformation would entail. The threshold of 4/5 had previously been used to define caseness with the GHQ scoring in the Whitehall II Study (Stansfeld & Marmot 1992), but no clear convention applies to the CGHQ score. On inspecting the distribution of scores, psychological distress (PD) was defined as having a CGHQ score of 15 or more, which approximately corresponded to the top 20-25% of the distribution. This prevalence rate was similar to that found with the 4/5 threshold and conventional scoring of the GHQ (Stansfeld & Marmot 1992). Therefore, this definition constituted the principal measure of psychological distress for the present study. The depressive symptoms sub-scale was also investigated (see section 4.5).

4.3.1 Non-responders and Responders to the GHQ

119 participants (1.2 %) did not attempt or failed to complete all items on the GHQ at baseline. The gender split in this group differed from the overall gender distribution of the sample, with proportionately more women as non-responders (57 men, 47.9%; 62 women, 52.1%). Although non-responders (NR) were marginally older than responders (R), this difference was not significant (NR: mean age 44.8 years, SD = 6.1; R: mean age 44.4, SD = 6.05; t = -0.729). Unlike responders, there was no difference in the distribution of men and women across age groups ($\chi^2 = 1.968$, df = 3, p = 0.579). Numbers in cells were too small to analyse socioeconomic status by grade level (I to IV) for non-responders, but women were more likely to be in the lower grades, with men in the higher grades, in a relatively similar fashion to the main sample. Likewise, most non-responders were married or cohabiting (men, 71.4%; women 61.3%).

250 participants (2.4%) completed 29 out of the 30 GHQ items. Using the original Likert scoring of the scale (1 – 2 – 3 – 4), the missing values were imputed and total GHQ scores computed for these participants by a WII statistician, resulting in a sample size of 10099. Thus the chronic scoring (CGHQ) could be based either on those participants with complete data only (n = 9849), or including those 250 observations with imputed values (n = 10099). Overall the two sets of data correlate perfectly ($r_{xy} = 1$) and there was no significant difference between the means achieved using complete data only, or

using imputed data as well (see Appendix IV for more details). Therefore the CGHQ scores incorporating imputed values could be used with confidence.

4.3.2 CGHQ Factor Structure and Reliability

Exploratory factor analysis was used to assess whether the structure of the GHQ scale was substantially altered by using the chronic scoring method. Principal components analysis (PCA) was used on the complete GHQ & CGHQ data from the first three phases of data collection. The inter-item correlation matrices (GHQ & CGHQ scoring) were examined for each of the data sets of the three phases, revealing many values above 0.3, justifying the use of PCA. Principal components factors were extracted and then rotated orthogonally using the varimax procedure. The resulting factors were compared across phases of data collection for each method and then the structures of the two methods themselves compared. Full details of the analyses and comparisons are reported in Appendix II.

In summary, there were six factors extracted from the GHQ at Phases 1 & 2 ($n_{Phase\ 1}$ = 9936 & $n_{Phase\ 2}$ = 8276), and five factors at Phase 3 ($n_{Phase\ 3}$ = 7633), with the largest proportion of the variance in the measure accounted for by the first factor at each phase. Although the pattern of sample attrition at Phases 2 and 3 in the Whitehall II Study was probably not random, undermining comparisons over time, there was great similarity in the rotated factor solutions (although two items did load on more than one factor).

In contrast, there were five factors extracted from the CGHQ at each phase, with slightly more of the variance being shared between the first two factors. There was consistent loading of items on the same factors across phases after orthogonal rotation. The factors and items which loaded more than 0.45 for each scoring method are presented in Table 4.3a.

On the whole, the factor solutions for the two scoring methods were similar, with a few inconsistencies, lending confidence to the use of the CGHQ scoring in the present study. The constraints of the item values (0 or 1) no doubt affected the factor structures, but those of the CGHQ appeared tight and fairly consistent over time. There have been

many factor analyses performed on the GHQ-30 over the years, in a variety of populations, with varying results, which is unsurprising as the scale was not designed to have any particular sub-scales (Goldberg 1972; Goldberg & Williams 1988). Nonetheless the second factor under the GHQ scoring and the third under the CGHQ scoring, comprised the depressive symptoms sub-scale previously established (Stansfeld et al. 1995). These items share face validity with the depressive sub-scale items of the scaled GHQ-28 (Stansfeld, Head & Marmot 1998) and were used to assess depressive symptoms in addition to psychological distress for the present study (see section 4.5).

Table 4.3a GHQ & CGHQ: factors after rotation and item descriptions

Factor	Items
GHQ	
1	GHQ14 'felt constantly under strain?' GHQ15 'felt you couldn't overcome your difficulties?' GHQ16 'been finding life a struggle all the time?' GHQ18 'been taking things hard?' GHQ21 'found everything getting on top of you?' GHQ22 'been feeling unhappy and depressed?'
2	GHQ24 'been thinking of yourself as a worthless person?' GHQ25 'felt that life is entirely hopeless?' GHQ29 'felt that life wasn't worth living?' *GHQ30 'found at times you couldn't do anything because your nerves were so bad?
3	GHQ07 'felt on the whole you were doing things well?' GHQ08 'been satisfied with the way you've carried out your task?' *GHQ09 'been able to feel warmth & affection for those near to you?' GHQ12 'felt that you are playing a useful part in things?' GHQ13 'felt capable of making decisions about things?'
4	GHQ05 'been getting out of the house as much as usual?' *GHQ09 'been able to feel warmth and affection for those near to you?' GHQ10 'been finding it easy to get on with other people?' GHQ11 'spent much time chatting with people?'
5	GHQ02 'lost much sleep over worry?' GHQ03 'been having restless, disturbed nights?'
6	*GHQ30 'found at times you couldn't do anything because your nerves were so bad?' GHQ19 'been getting scared or panicky for no good reason?' GHQ20 'been able to face up to your problems?'
CGHQ	
1	GHQ14 'felt constantly under strain?' GHQ15 'felt you couldn't overcome your difficulties?' GHQ16 'been finding life a struggle all the time?' GHQ18 'been taking things hard?' GHQ21 'found everything getting on top of you?' GHQ22 'been feeling unhappy and depressed?' GHQ23 'been losing confidence in yourself?'
2	GHQ01 'been able to concentrate on whatever you're doing?' GHQ07 'felt on the whole you were doing things well?' GHQ08 'been satisfied with the way you've carried out your task?' GHQ12 'felt that you are playing a useful part in things?' GHQ13 'felt capable of making decisions about things?'
3	GHQ24 'been thinking of yourself as a worthless person?' GHQ25 'felt that life is entirely hopeless?' GHQ29 'felt that life wasn't worth living?' GHQ30 'found at times you couldn't do anything because your nerves were so bad?'
4	GHQ05 'been getting out of the house as much as usual?' GHQ09 'been able to feel warmth and affection for those near to you?' GHQ10 'been finding it easy to get on with other people?' GHQ11 'spent much time chatting with people?'
5	GHQ02 'lost much sleep over worry?' GHQ03 'been having restless, disturbed nights?'

* Item appearing in two factors

The scale reliability coefficients, Cronbach's α (Cronbach 1951), of the 30 items of the GHQ are presented in Table 4.3b for both scoring methods across phases. The alpha coefficient was in excess of 0.90 at all time points, irrespective of scoring method, satisfying the reliability criterion of 0.80 or more (Carmines & Zeller 1979).

Table 4.3b Cronbach's alpha for GHQ-30 in Whitehall II Study, CGHQ & GHQ Scoring

	Phase	Average Inter-item Covariance	Cronbach's α Coefficient
CGHQ	1	0.0382	0.91
	2	0.0409	0.91
	3	0.0402	0.91
GHQ	1	0.0305	0.93
	2	0.0348	0.93
	3	0.0277	0.93

4.3.3 Psychological Distress at Baseline

At Phase 1 men had a mean CGHQ score of 9.25 (SD = 6.12) while women had a mean CGHQ score of 10.09 (SD = 6.18). 21.9% of the overall sample was designated as psychologically distressed at Phase 1, i.e. scoring 15 or more on the CGHQ, and significantly more women than men were psychologically distressed (see Table 4.3c, $p < 0.001$).

Table 4.3c Distribution of Psychological Distress at Phase 1 by sex

	n	Men [a]	Women [a]	
	10099			
PD		1416 (20.8)	805 (24.4)	$\chi^2 = 16.48$ **
Non-PD		5383 (79.2)	2495 (75.6)	df = 1

df = Degrees of freedom ** $p < 0.001$
[a] n (%) unless otherwise indicated

The mean CGHQ scores of men and women were compared with two variables which asked about 'nervous trouble or persistent depression' over the past year and 'nervy, tense or depressed' symptoms in the past fortnight (see Table 4.3d below). Those who responded in the affirmative to either of these items had significantly higher CGHQ scores. Similarly, there were significant associations between responses to these items and distress.

Table 4.3d Differences in mean CGHQ score & PD status as a function of related variables, Phase 1

Mean CGHQ score

			n	Mean (SD)	
n = 7488	Nervous trouble in past year				
Men		Yes	423	16.28 (6.33)	t = 24.57 **
		No	4670	8.45 (5.63)	
Women		Yes	311	16.44 (6.04)	t = 19.54**
		No	2084	9.3 (5.75)	
N = 7479	Nervy tense or depressed in past 14 days		n	Mean (SD)	
Men		Yes	1066	14.47 (5.81)	t = 34.47 **
		No	4032	7.68 (5.34)	
Women		Yes	765	14.69 (5.67)	t = 26.82 **
		No	1616	8.13 (5.39)	

Psychological Distress (PD)

Nervous trouble in past year

	n		PD [a]	Non-PD[a]	
Men	5093	Yes	256 (24.93)	167 (4.11)	χ^2 = 466.66 **
		No	771 (75.07)	3899 (95.89)	df = 1
Women	2395	Yes	203 (33.22)	108 (6.05)	χ^2 = 297.35 **
		No	408 (66.78)	1676 (93.95)	df = 1

Nervy tense or depressed in past 14 days

			PD[a]	Non-PD[a]	
Men	5098	Yes	531 (51.35)	535 (13.16)	χ^2 = 726.91 **
		No	503 (48.65)	3529 (86.84)	df = 1
Women	2381				
		Yes	388 (63.5)	377 (21.3)	χ^2 = 370.98 **
		No	223 (36.5)	1393 (78.7)	df = 1

df = Degrees of freedom ** $p < 0.001$

[a] n (%) unless otherwise indicated

4.4 Psychological Distress, Covariates and Explanatory Variables

This section summarises the association of psychological distress with socio-demographic variables, personal health variables and health behaviours at baseline (Phase 1).

4.4.1 Psychological Distress & Socio-demographic Variables

At Phase 1, women had a significantly higher mean CGHQ score than men (see Table 4.4a; $p < 0.001$), with younger participants tending to exhibit more distress than older participants, regardless of gender ($p < 0.001$).

Table 4.4a Differences in mean CGHQ score as a function of gender and age group, Phase1

		N	Mean (SD)	
Gender	Men	6799	9.25 (6.12)	t = -6.49 **
	Women	3300	10.09 (6.18)	
Age Group				
Overall	< 40 years	2769	9.72 (6.26)	F = 14.2
	40-44 years	2610	9.65 (6.24)	df = 4 **
	45-49 years	2061	9.49 (6.07)	
	> 50 years	2659	9.22 (6.01)	
Men	< 40 years	1997	9.48 (6.25)	
	40-44 years	1843	9.29 (6.18)	
	45-49 years	1321	9.35 (6.06)	
	> 50 years	1638	8.84 (5.94)	
Women	< 40 years	772	10.35 (6.25)	
	40-44 years	767	10.51 (6.32)	
	45-49 years	740	9.77 (6.08)	
	> 50 years	1021	9.84 (6.07)	

df = Degrees of freedom. ** $p < 0.001$

Amongst women, there were significant differences across employment grade in mean CGHQ score ($p < 0.001$; see Table 4.4b), with women in the lowest grade exhibiting less distress. Women with more years of education had significantly higher mean CGHQ scores ($F = 4.07$, $df = 2$, $p < 0.05$) but this did not remain significant after adjusting for age group. Participants who were married or cohabiting had lower mean CGHQ scores, although there was considerable heterogeneity of variance and small numbers in some of the cells. When considering married and cohabiting against the other groups combined, this difference was significant (men, $p < 0.001$; women, $p < 0.01$). Men who reported living alone had elevated CGHQ scores ($p < 0.001$).

Table 4.4b Differences in mean CGHQ score across gender: grade level, marital status, education and type of accommodation at Phase 1, adjusted for age group

		Men					Women				
		N	Mean (SD)	df	Median [a]		N	Mean (SD)	df	Median [a]	
Grade level	Administrative	2606	9.18 (5.9)	2		F = 0.08	368	10.50 (6.15)	2		F = 8.26 **
n = 10099	Prof.-Exec.	3568	9.31 (6.25)				1307	10.59 (6.34)			
	Clerical	625	9.19 (6.28)				1625	9.61 (6.01)			
Marital Status	Married/cohabiting	5459	8.95 (5.94)	3	8	KW = 55.11 **	2013	9.84 (9.09)	3	10	KW = 10.8 §
n = 10062	Single	937	10.17 (6.32)		10		709	10.32 (6.30)		10	
	Divorced/separated	350	11.24 (7.36)		11		462	10.76 (6.38)		11	
	Widowed	34	10.59 (7.53)		9.5		98	10.66 (5.73)		11	
Marital status	Married/cohabiting	5459	8.95 (5.94)	1		F = 61.94 **	2013	9.84 (6.09)	1		F = 9.85 *
	Other	1321	10.46 (6.65)				1269	10.51 (6.28)			
Education level	Up to 16 years	1411	8.91 (6.27)	2		F = 2.06	1190	9.87 (6.15)	2		F = 2.70
n = 7538	17 & 18 years	1324	8.96 (5.99)				533	10.42 (6.53)			
	Over 18 years	2385	9.32 (6.05)				695	10.69 (6.2)			
Live alone	No	4356	8.91 (6.02)	1		F = 31.85 **	1861	10.15 (6.21)	1		F = 1.34
n = 7524	Yes	754	10.29 (6.42)				553	10.47 (6.42)			
Type of accommodation	Own home, mortgage	6266	9.21 (6.07)	2		F = 1.68	2569	10.22 (6.23)	2		F = 1.44
	Rent from local authority	227	9.53 (6.53)				468	9.64 (6.04)			
n = 10024	Rent privately	264	9.88 (6.85)				230	9.79 (5.94)			

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

[a] Significant heterogeneity of variance for both marital status and type of accommodation necessitated nonparametric analysis (Kruskal-Wallis with ties)

4.4.2 Psychological Distress and Health

The health variables whose association with psychological distress needed to be established included self-assessed health (2 levels), longstanding illness, disability or infirmity, use of medication in the past fortnight (tranquillisers, anti-depressants) and average hours of sleep per night.

Irrespective of gender, participants who were designated as psychologically distressed were more likely to report poorer self-assessed health, longstanding illness, fewer hours of sleep per night ($p < 0.001$; see Tables 4.4c&d). Distressed participants were also more likely to be using medication (either tranquillisers or antidepressants), although the numbers using medications of these kinds was quite small.

Table 4.4c Psychological Distress & Health: Men (Phase 1)

	PD	No PD		
	n (%)	n (%)	df	
Self-assessed health n = 6776				
Very good or good	848 (60.14)	4413 (82.24)	1	$\chi^2 = 314.1$ **
Average or worse	562 (39.86)	953 (17.76)		
Longstanding illness, disability or infirmity n = 5107				
Yes	410 (39.54)	1191 (29.26)	1	$\chi^2 = 40.54$ **
No	627 (60.46)	2879 (70.74)		
Use of tranquillisers in past 14 days n = 5114				
Yes	42 (4.04)	44 (1.08)	1	$\chi^2 = 43.95$ **
No	997 (95.96)	4031 (98.92)		
Use of antidepressants in past 14 days n = 5114				
Yes	37 (3.56)	29 (0.71)	1	$\chi^2 = 52.76$ **
No	1002 (96.44)	4046 (99.29)		
Sleep N = 6771				
6 hours or less	568 (40.23)	1596 (29.78)	2	$\chi^2 = 56.24$ **
7 hours	653 (46.25)	2885 (53.83)		
8 hours or more	191 (13.53)	878 (16.38)		

df = Degrees of freedom. ** $p < 0.001$

Table 4.4d Psychological Distress & Health: Women (Phase 1)

	PD n (%)	No PD n (%)	df	
Self-assessed health n = 3292				
Very good or good	367 (45.65)	1741 (69.98)	1	$\chi^2 = 15.2$ **
Average or worse	437 (54.35)	747 (30.02)		
Longstanding illness, disability or infirmity n = 2405				
Yes	260 (42.21)	513 (28.68)	1	$\chi^2 = 38.47$ **
No	356 (57.79)	1276 (71.32)		
Use of tranquillisers in past 14 days n = 2411				
Yes	29 (4.73)	28 (1.56)	1	$\chi^2 = 19.95$ **
No	584 (95.27)	1770 (98.44)		
Use of antidepressants in past 14 days n = 2411				
Yes	35 (5.71)	19 (1.06)	1	$\chi^2 = 45.2$ **
No	578 (94.29)	1779 (98.94)		
Sleep N = 3290				
6 hours or less	344 (42.84)	769 (30.92)	2	$\chi^2 = 42.29$ **
7 hours	341 (42.47)	1192 (47.93)		
8 hours or more	118 (14.69)	526 (21.15)		

df = Degrees of freedom. ** $p < 0.001$

4.4.3 Psychological Distress and Health Behaviours

4.4.3.1 Smoking

Men with psychological distress were more likely to be current smokers ($p < 0.01$; see Table 4.4e) but this was not the case amongst women with psychological distress. However, considering smokers alone, there were no significant associations between psychological distress and type of smoking (light, medium or heavy; men, n = 952, $\chi^2 = 0.94$, df = 2, $p > 0.05$; women, n = 744, $\chi^2 = 0.61$, df = 2, $p > 0.05$). Similarly there were no significant differences on the basis of psychological distress in mean number of cigarettes smoked daily for either gender.

Table 4.4e Psychological Distress & Health Behaviours (Smoking): Men & Women, Phase 1

			PD	No PD		
Men	N		n (%)	n (%)	df	
Smoking	6617	No	636 (46.05)	2571 (49.1)	4	$\chi^2 = 12.56$ §
		Ex-smoker	508 (36.78)	1950 (37.24)		
		Light	73 (5.29)	239 (4.56)		
		Medium	93 (6.73)	283 (5.4)		
		Heavy	71 (5.14)	193 (3.69)		
Ever Smoked	6739	Never	636 (45.23)	2571 (48.21)	2	$\chi^2 = 10.23$ *
		Ex-smoker	508 (36.13)	1950 (36.56)		
		Current	262 (18.63)	812 (15.23)		
Cigarettes per day	1058	Mean (SD)	16.48 (11.30)	15.25 (11.32)	1	t = -1.53
Women						
Smoking	3251	No	397 (50.19)	1330 (54.07)	4	$\chi^2 = 4.64$
		Ex-smoker	207 (26.17)	573 (23.29)		
		Light	58 (7.33)	159 (6.46)		
		Medium	91 (11.5)	289 (11.75)		
		Heavy	38 (4.8)	109 (4.43)		
Ever Smoked	3277	Never	397 (49.81)	1330 (53.63)	2	$\chi^2 = 3.98$
		Ex-smoker	207 (25.97)	573 (23.1)		
		Current	193 (24.22)	577 (23.27)		
Cigarettes per day	778	Mean (SD)	16.27 (9.18)	16.24 (9.02)	1	t = -0.04

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
[a] Mann-Whitney U with ties
‡ Distributions very skewed necessitating non-parametric summary statistic.

4.4.3.2 Alcohol use

Participants with psychological distress were more likely to report that they had changed their drinking habits in the past five years, with women with psychological distress more likely to report that they drank more in the past (p = 0.055; see Table 4.4f). The distributions of units of alcohol and units of beer consumed in the past week were substantially negatively skewed. Men with psychological distress reported a higher median of units of alcohol per week compared with men without distress (z = -2.91, p < 0.01). Men with psychological distress also drank significantly more beer in the past week than men who were not psychologically distressed (z = -3.55, p < 0.001). The difference in consumption as a function of psychological distress is clearly illustrated amongst men (p < 0.01) and among women (p < 0.05) when alcohol consumption is considered in terms of categories of units per week.

Table 4.4f Psychological Distress & Health Behaviours (Alcohol): Men & Women, Phase 1

			PD	No PD		
Men	N		n (%)	n (%)	df	
Change in drinking habits in past 5 years	6758	Yes	633 (44.83)	1803 (33.73)	1	$\chi^2 = 59.74$ **
		No	779 (55.17)	3543 (66.27)		
Drink more or less in the past?	2472	A lot more	102 (15.94)	266 (14.52)	3	$\chi^2 = 3.01$
		A bit more	266 (41.56)	746 (40.72)		
		A bit less	196 (30.63)	624 (34.06)		
		A lot less	76 (11.88)	196 (10.7)		
Units alcohol per week ‡	5871	Median (N, range)	9 (1234, 0-130)	8 (4637, 0-141)		$z^* = -2.90$ *
Units beer per week ‡	4293	Median (N, range)	4 (923, 0-90)	2 (3370, 0-120)		$z^* = -3.55$ **
Alcohol consumption ¶	6748	Non-drinker	172 (12.23)	705 (13.2)	3	$\chi^2 = 16.64$ *
		Light	600 (42.67)	2481 (46.44)		
		Moderate	332 (23.61)	1201 (22.48)		
		Heavy	302 (21.48)	955 (17.88)		
Women						
Change in drinking habits in past 5 years	3248	Yes	284 (35.86)	685 (27.89)	1	$\chi^2 = 18.16$ **
		No	508 (64.14)	1771 (72.11)		
Drink more or less in the past?	1000	A lot more	50 (17.06)	80 (11.32)	3	$\chi^2 = 7.61$
		A bit more	116 (39.59)	292 (41.3)		
		A bit less	74 (25.26)	216 (30.55)		
		A lot less	53 (18.09)	119 (16.83)		
Units alcohol per week ‡	2292	Median (N, range)	3 (546, 0-93)	3 (1746, 0-78)		$z^a = -2.38$ §
Units beer per week ‡	564	Median (N, range)	0 (160, 0-28)	0 (404, 0-42)		$z^a = -2.33$ §
Alcohol consumption ¶	3264	Non-drinker	222 (27.82)	720 (29.2)	3	$\chi^2 = 8.54$ §
		Light	349 (43.73)	1158 (46.96)		
		Moderate	129 (16.17)	362 (14.68)		
		Heavy	98 (12.28)	226 (9.16)		

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

[a] Mann-Whitney U with ties

‡ Distributions very skewed necessitating non-parametric summary statistic.

¶ Consumption based on (ONS 1998) of units per week. Men: light, < 11 units; moderate, 11-21 units; heavy, > 21 units. Women: light, < 8 units; moderate 8-14 units; heavy, > 14 units.

4.4.3.3 Diet

There were few significant differences in dietary intake as a function of psychological status. Men with psychological distress tended to report consuming fewer fresh fruits or vegetables ($p < 0.001$; see Table 4.4g) and consuming fish and cheese less frequently ($p < 0.05$). Women with psychological distress reported eating meat ($p < 0.05$; see Table 4.4h) and cheese less often ($p < 0.01$). There were no differences between distressed and non-distressed in healthy eating index score (HEIWE).

Table 4.4g Psychological Distress & Health Behaviours (Diet): Men, Phase 1

	N		PD n (%)	No PD n (%)	df	
Bread	6771	Wholemeal	593 (42.09)	2227 (41.53)	2	$\chi^2 = 0.19$
		Other brown	501 (35.56)	1938 (36.14)		
		White	315 (22.36)	1197 (22.32)		
Bread slices	6787	0-3 slices	523 (37.01)	2061 (38.35)	1	$\chi^2 = 0.85$
		More than 3 slices	890 (62.99)	3313 (61.65)		
Fruit or Vegetables	6784	2+ times daily	186 (13.17)	815 (15.17)	3	$\chi^2 = 34.42$ **
		Daily	507 (35.91)	2245 (41.79)		
		3-6 times a week	487 (34.49)	1673 (31.14)		
		Once or twice a week, or less often	232 (16.43)	639 (11.9)		
Meat	6792	1-2 times a week / less often	285 (20.17)	1042 (19.37)	2	$\chi^2 = 1.26$
		3-4 times a week	529 (37.44)	1969 (36.61)		
		5+ times a week	599 (42.39)	2368 (44.02)		
Spread	6713	Polyunsaturated / low calories / rarely use	735 (52.69)	2738 (51.49)	1	$\chi^2 = 0.64$
		Butter or margarine	660 (47.31)	2580 (48.51)		
Milk	6760	Skimmed / semi-skimmed milk	469 (33.33)	1893 (35.36)	2	$\chi^2 = 2.26$
		Do not use milk, / use other	69 (4.9)	271 (5.06)		
		Whole milk	869 (61.76)	3189 (59.57)		
Amount of milk used daily	6789	0-0.5 pints	730 (51.63)	2803 (52.15)	1	$\chi^2 = 0.12$
		More than 0.5 pints	684 (48.37)	2572 (47.85)		
Cream	6446	Seldom or never	608 (45.27)	2135 (41.84)	2	$\chi^2 = 5.13$
		1-3 times a week	547 (40.73)	2205 (43.21)		
		Once weekly or more often	188 (14)	763 (14.95)		
Cheese	6452	0-3 times a month	286 (21.31)	900 (17.61)	3	$\chi^2 = 11.26$ §
		1-2 times a week	405 (30.18)	1662 (32.52)		
		3-4 times a week	378 (28.17)	1420 (27.79)		
		5+ times a week	273 (20.34)	1128 (22.07)		
Eggs	5122	1-3 times a month or less	324 (31.15)	1158 (28.37)	2	$\chi^2 = 3.27$
		1-2 times a week	494 (47.5)	2039 (49.95)		
		3+ times a week	222 (21.35)	885 (21.68)		
Fish	6786	1-3 times a month or less	601 (42.53)	2089 (38.88)	1	$\chi^2 = 6.24$ §
		1-2 times a week or more	812 (57.47)	3284 (61.12)		
HEIWE	6326	Mean (SD)	2.86 (1.14)	2.88 (1.16)	6324	t = 0.63

df = Degrees of freedom. § $p < 0.05$; ** $p < 0.001$

Table 4.4h Psychological Distress & Health Behaviours (Diet): Women, Phase 1

			PD	No PD		
	N		n (%)	n (%)	DF	
Bread	3269	Wholemeal	358 (45.03)	1061 (42.89)	2	$\chi^2 = 1.56$
		Other brown	293 (36.86)	923 (37.31)		
		White	144 (18.11)	490 (19.81)		
Bread slices	3295	0-3 slices	506 (62.86)	1521 (61.08)	1	$\chi^2 = 807$
		More than 3 slices	299 (37.14)	969 (38.92)		
Fruit or Vegetables	3288	2+ times daily	141 (17.62)	525 (21.1)	3	$\chi^2 = 6.55$
		Daily	346 (43.25)	1087 (43.69)		
		3-6 times a week	227 (28.38)	650 (26.13)		
		Once or twice a week, or less often	86 (10.75)	226 (9.08)		
Meat	3292	1-2 times a week or less often	313 (38.98)	834 (33.51)	2	$\chi^2 = 8.05$ §
		3-4 times a week	279 (34.74)	933 (37.48)		
		5+ times a week	211 (26.28)	722 (29.01)		
Spread	3244	Polyunsaturated / low calories / rarely use	406 (51.46)	1199 (48.84)	1	$\chi^2 = 1.64$
		Butter or margarine	383 (48.54)	1256 (51.16)		
Milk	3272	Skimmed / semi-skimmed milk	329 (41.28)	983 (39.72)	2	$\chi^2 = 0.62$
		Do not use milk, / use other	60 (7.53)	189 (7.64)		
		Whole milk	408 (51.19)	1303 (52.65)		
Amount of milk used daily	3286	0-0.5 pints	522 (65.17)	1690 (68.01)	1	$\chi^2 = 2.22$
		More than 0.5 pints	279 (34.83)	795 (31.99)		
Cream	3061	Seldom or never	366 (48.87)	1155 (49.96)	2	$\chi^2 = 0.36$
		1-3 times a week	293 (39.12)	876 (37.89)		
		Once weekly or more often	90 (12.02)	281 (12.15)		
Cheese	3062	0-3 times a month	181 (24.13)	607 (26.25)	3	$\chi^2 = 15.04$ *
		1-2 times a week	253 (33.73)	869 (37.59)		
		3-4 times a week	174 (23.2)	526 (22.75)		
		5+ times a week	142 (18.93)	310 (13.41)		
Eggs	2419	1-3 times a month or less	217 (35.23)	633 (35.11)	2	$\chi^2 = 1.68$
		1-2 times a week	287 (46.59)	880 (48.81)		
		3+ times a week	112 (18.18)	290 (16.08)		
Fish	3291	1-3 times a month or less	335 (41.61)	993 (39.94)	1	$\chi^2 = 0.7$
		1-2 times a week or more	470 (58.39)	1493 (60.06)		
HEIWE	2983	Mean (SD)	3.062 (1.174)	3.077 (1.17)	2981	t = 0.3

DF = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

4.4.3.4 Exercise

Men with psychological distress participated less often in moderately energetic and vigorous activities ($p < 0.001$) and spent less time at these activities ($p < 0.001$) than non-distressed men. Indeed men with psychological distress were more likely to spend fewer hours per week in any form of exercise (see Table 4.4i).

Table 4.4i Psychological Distress & Health Behaviours (Exercise): Men, Phase 1

			PD	Non-PD		
	N		n (%)	n (%)	DF	
Frequency of mildly energetic activities	6709	3 times a week or more	950 (67.86)	3961 (74.61)	3	$\chi^2 = 30.872$ **
		Once or twice a week	312 (22.29)	1002 (18.87)		
		About 1-3 times a month	83 (5.93)	201 (3.79)		
		Never / hardly ever	55 (3.93)	145 (2.73)		
Frequency of moderately energetic activities	6685	3 times a week or more	232 (16.67)	1058 (19.99)	3	$\chi^2 = 21.96$ **
		Once or twice a week	602 (43.25)	2391 (45.17)		
		About 1-3 times a month	364 (26.15)	1302 (24.6)		
		Never / hardly ever	194 (13.94)	542 (10.24)		
Frequency of vigorous activities	6627	3 times a week or more	112 (8.15)	554 (10.55)	3	$\chi^2 = 15.598$ *
		Once or twice a week	232 (16.87)	943 (17.96)		
		About 1-3 times a month	306 (22.25)	1274 (24.26)		
		Never / hardly ever	725 (52.73)	2481 (47.24)		
Mild exercise	6693	5 hours or less a week	473 (33.91)	1646 (31.07)	1	$\chi^2 = 4.112$ §
		More than 5 hours a week	922 (66.09)	3652 (68.93)		
Moderate exercise	6621	2 hours or less a week	530 (38.46)	1717 (32.75)	1	$\chi^2 = 15.886$ **
		More than 2 hours a week	848 (61.54)	3526 (67.25)		
Vigorous exercise	6570	Less than an hour a week	707 (51.68)	2395 (46.04)	1	$\chi^2 = 13.831$ **
		More than an hour a week	661 (48.32)	2807 (53.96)		

DF = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

There was no difference in reported participation in physical activity due to psychological distress in women, except with regard to moderately energetic activities: women with psychological distress reported engaging less frequently in this level of activity ($p < 0.001$) and were more likely to devote less time per week exercising at this level ($p < 0.05$; Table 4.4j).

Table 4.4j Psychological Distress & Health Behaviours (Exercise): Women, Phase 1

			PD	Non-PD		
	N		n (%)	n (%)	DF	
Frequency of mildly energetic activities	3267	3 times a week or more	529 (66.04)	1699 (68.9)	3	$\chi^2 = 5.67$
		Once or twice a week	201 (25.09)	564 (22.87)		
		About 1-3 times a month	36 (4.49)	78 (3.16)		
		Never / hardly ever	35 (4.37)	125 (5.07)		
Frequency of moderately energetic activities	3198	3 times a week or more	93 (11.86)	322 (13.34)	3	$\chi^2 = 19.06$ **
		Once or twice a week	236 (30.1)	898 (37.2)		
		About 1-3 times a month	245 (31.25)	608 (25.19)		
		Never / hardly ever	210 (26.79)	586 (24.28)		
Frequency of vigorous activities	3147	3 times a week or more	25 (3.23)	95 (4.01)	3	$\chi^2 = 6.46$
		Once or twice a week	57 (7.35)	231 (9.74)		
		About 1-3 times a month	87 (11.23)	291 (12.27)		
		Never / hardly ever	606 (78.19)	1755 (73.99)		
Moderate exercise	3119	2 hours or less a week	403 (52.82)	1134 (48.13)	1	$\chi^2 = 5.06$ §
		More than 2 hours a week	360 (47.18)	1222 (51.87)		
Vigorous exercise	3162	Less than an hour a week	590 (75.93)	1757 (73.67)	1	$\chi^2 = 1.57$
		More than an hour a week	187 (24.07)	628 (26.33)		

DF = Degrees of freedom. § $p < 0.05$; ** $p < 0.001$

4.4.4 Psychological Distress and Other Variables

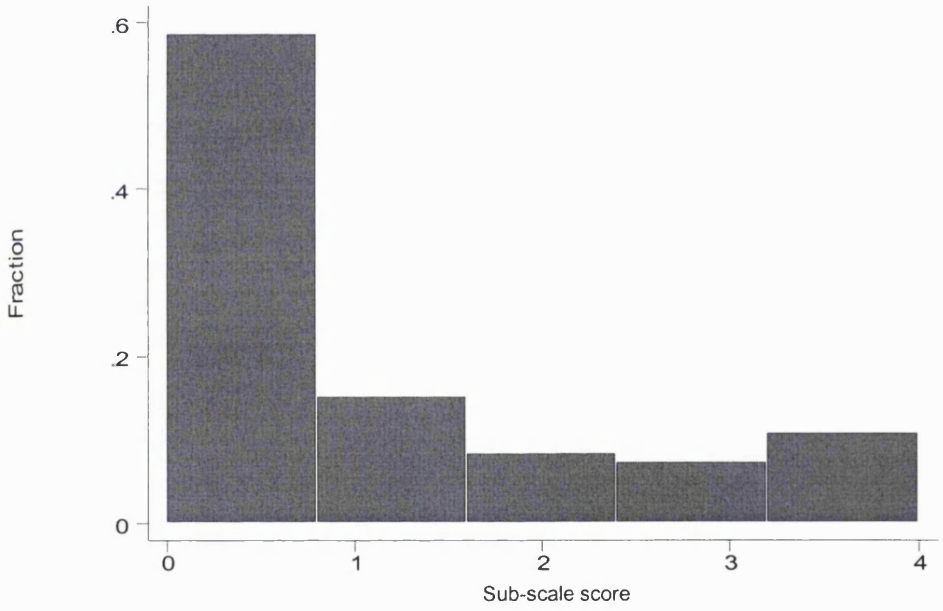
There was no significant difference in mean BMI as a function of psychological distress in men or women (men: t = 0.705; women: t = 1.23); nor were there any significant associations between psychological distress and family history of cancer (men: $\chi^2 = 2.58$, df = 1; women: $\chi^2 = 0.33$, df = 1). Amongst women, there were significant associations between psychological distress and duration of use of oral contraceptives ($\chi^2 = 10.97$, df = 3, $p < 0.05$), parity ($\chi^2 = 11.56$, df = 2, $p < 0.01$) and menopausal status ($\chi^2 = 6.29$, df = 2, $p < 0.05$), which persisted after adjusting for age. But there were not significant associations between psychological distress and nulliparity or age at menopause. These results are reported in full in Appendix IV Additional Results.

4.5 Depressive Symptoms

This section reports on the GHQ depressive symptoms sub-scale at Phase 1, and its association with socio-demographic variables, personal health variables and health behaviours at baseline.

Scores on the GHQ depressive symptoms sub-scale were available at Phase 1 for 10077 participants, and there was a pronounced positive skew to the distribution of scores which ranged from 0 to 4 (see Figure 4.5). This distribution was dichotomised into 'low' scores, ranging from 0 to 3, and 'high' scores on the sub-scale, i.e. a sub-scale score of 4 (Stansfeld et al. 1995).

Figure 4.5 Distribution of GHQ depressive symptoms sub-scale scores at Phase 1



There were proportionately more high scorers on the sub-scale amongst women at Phase 1, with 14.5% of women so categorised, as opposed to 12.9% of men (see Table 4.5a). Overall, there were no significant differences in mean age as a function of sub-scale scores (low: mean age 44.42, SD = 6.06; high: mean age 44.39, SD = 5.96), or proportionately across age groups by gender.

Table 4.5a Depressive symptoms sub-scale (Phase 1): Gender and age group

	n				df	
			Men n (%)	Women n (%)		
Gender	10077	Low	5914 (87.1)	2809 (85.5)	1	$\chi^2 = 5.13$ §
		High	876 (12.9)	478 (14.5)		
			Depressive symptoms			
			High n (%)	Low n (%)		
Gender & Age Group						
Men	6790	35-39 years	248 (28.31)	1744 (29.49)	3	$\chi^2 = 2.49$
		40-44 years	247 (28.2)	1595 (26.97)		
		45-49 years	182 (20.78)	1138 (19.24)		
		50-55 years	199 (22.72)	1437 (24.3)		
Women	3287	35-39 years	111 (23.22)	659 (23.46)	3	$\chi^2 = 6.38$
		40-44 years	129 (26.99)	637 (22.68)		
		45-49 years	90 (18.83)	645 (22.96)		
		50-55 years	148 (30.96)	868 (30.9)		

df = Degrees of freedom. § $p < 0.05$

4.5.1 Depressive Symptoms & Socio-demographic Variables

As compared with men who were low scorers on the sub-scale, there were comparatively more high scorers in the professional-executive and clerical grades at Phase 1 ($p < 0.001$; see Table 4.5b). There were proportionately fewer high scorers who were married or cohabiting (68.2%), compared to low scorers of that status (82.3%), although numbers were too few in some of the cells to permit a reliable test of association. The picture was clearer amongst women, if less marked, with 53.9% of high scorers being married or cohabiting compared with 62.5% of low scorers ($p < 0.01$).

There was no association between years of education and depressive symptoms. However, there were significant associations between sub-scale scoring and features of housing in men: proportionately more high scorers lived alone ($p < 0.001$) and although numbers were small, lived in rented accommodation ($p < 0.05$).

Table 4.5b Depressive symptoms & socio-demographic variables, Phase 1

	n		Depressive symptoms		df	
			High	Low		
Men			n (%)	n (%)		
Grade level	6790	Administrative	278 (31.74)	2326 (39.33)	2	$\chi^2 = 28.1$ **
		Prof.-Exec.	485 (55.37)	3077 (52.03)		
		Clerical	113 (12.9)	511 (8.64)		
Marital Status	6771	Married/cohabiting	595 (68.23)	4857 (82.34)	3	
		Single	181 (20.76)	754 (12.78)		
		Divorced/separated	86 (9.86)	264 (4.48)		
		Widowed	10 (1.15)	24 (0.41)		
Education	5113	Up to 16 years	174 (26.73)	1234 (27.66)	2	$\chi^2 = 0.93$
		17 & 18 years	162 (24.88)	1159 (25.97)		
		Over 18 years	315 (48.39)	2069 (46.37)		
Live alone	5103	No	510 (78.7)	3839 (86.17)	1	$\chi^2 = 25.06$ **
		Yes	138 (21.3)	616 (13.83)		
Accommodation type	6748	Own home, mortgage	789 (90.59)	5468 (93.04)	2	$\chi^2 = 6.86$ §
		Rent from local authority	39 (4.48)	188 (3.2)		
		Rent privately	43 (4.94)	221 (3.76)		
Women						
Grade level	3287	Administrative	43 (9.0)	324 (11.53)	2	$\chi^2 = 3.47$
		Prof.-Exec.	203 (42.47)	1102 (39.23)		
		Clerical	232 (48.54)	1383 (49.23)		
Marital Status	3269	Married/cohabiting	256 (53.89)	1748 (62.56)	3	$\chi^2 = 15.17$ *
		Single	113 (23.79)	594 (21.26)		
		Divorced/separated	87 (18.32)	374 (13.39)		
		Widowed	19 (4.0)	78 (2.79)		
Education	2408	Up to 16 years	166 (44.86)	1017 (49.9)	2	$\chi^2 = 3.34$
		17 & 18 years	91 (24.59)	440 (21.59)		
		Over 18 years	113 (30.54)	581 (28.51)		
Live alone	2404	No	277 (75.07)	1575 (77.4)	1	$\chi^2 = 0.95$
		Yes	92 (24.93)	460 (22.6)		
Accommodation type	3254	Own home, mortgage	377 (79.2)	2184 (78.62)	2	$\chi^2 = 0.09$
		Rent from local authority	67 (14.08)	398 (14.33)		
		Rent privately	32 (6.72)	196 (7.06)		

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

4.5.2 Depressive Symptoms & Health

As with psychological distress (section 4.4.2), high scorers on the depressive symptoms sub-scale were more likely to report poorer self-assessed health, longstanding illness or disability, less hours sleep per night and were more likely to be using medications such as tranquillisers or antidepressants at Phase 1 (see Table 4.5c).

Table 4.5c Depressive symptoms & health, Phase 1

		Depressive symptoms		df	
Men		High n (%)	Low n (%)		
Self-assessed health n = 6767	Very good or good	520 (59.77)	4734 (80.28)	1	$\chi^2 = 183.6$ **
	Average or worse	350 (40.23)	1163 (19.72)		
Longstanding illness n = 5101	Yes	240 (36.92)	1360 (30.55)	1	$\chi^2 = 10.68$ *
	No	410 (63.08)	3091 (69.45)		
Use of tranquillisers in past 14 days n = 5107	Yes	27 (4.16)	59 (1.32)	1	$\chi^2 = 27.5$ **
	No	622 (95.84)	4399 (98.68)		
Use of antidepressants in past 14 days n = 5107	Yes	32 (4.93)	34 (0.76)	1	$\chi^2 = 77.1$ **
	No	617 (95.07)	4424 (99.24)		
Sleep n = 6762	6 hours or less	352 (40.37)	1809 (30.71)	2	$\chi^2 = 32.9$ **
	7 hours	393 (45.07)	3139 (53.29)		
	8 hours or more	127 (14.56)	942 (15.99)		
Women					
Self-assessed health n = 3279	Very good or good	205 (42.98)	1896 (67.67)	1	$\chi^2 = 107.9$ **
	Average or worse	272 (57.02)	906 (32.33)		
Longstanding illness n = 2395	Yes	163 (44.17)	607 (29.96)	1	$\chi^2 = 28.9$ **
	No	206 (55.83)	1419 (70.04)		
Use of tranquillisers in past 14 days n = 2401	Yes	19 (5.15)	38 (1.87)	1	$\chi^2 = 14.48$ **
	No	350 (94.85)	1994 (98.13)		
Use of antidepressants in past 14 days n = 2401	Yes	28 (7.59)	25 (1.23)	1	$\chi^2 = 58.4$ *
	No	341 (92.41)	2007 (98.77)		
Sleep n = 3277	6 hours or less	209 (43.82)	901 (32.18)	2	$\chi^2 = 25.1$ **
	7 hours	194 (40.67)	1331 (47.54)		
	8 hours or more	74 (15.51)	568 (20.29)		

df = Degrees of freedom. * $p < 0.01$; ** $p < 0.001$

4.5.3 Depressive Symptoms & Health Behaviours

4.5.3.1 Smoking

Men who were high scorers on the depressive symptoms sub-scale were more likely to have been current smokers at phase 1 and low scorers were more likely to report being ex-smokers ($p < 0.01$; see Table 4.5d). However there were no significant associations between sub-scale scoring and smoking in women.

Table 4.5d Depressive symptoms & health behaviours: Smoking (phase 1)

	n		Depressive symptoms		df	
			High n (%)	Low n (%)		
Men						
Smoking	6610	No	418 (49.18)	2784 (48.33)	4	$\chi^2 = 12.47$ §
		Ex-smoker	282 (33.18)	2174 (37.74)		
		Light	52 (6.12)	260 (4.51)		
		Medium	54 (6.35)	322 (5.59)		
		Heavy	44 (5.18)	220 (3.82)		
Ever smoked	6730	Never	418 (48.1)	2784 (47.5)	2	$\chi^2 = 12.28$ *
		Ex-smoker	282 (32.45)	2174 (37.09)		
		Current	169 (19.45)	903 (15.41)		
Women						
Smoking	3238	No	238 (50.96)	1483 (53.52)	4	$\chi^2 = 2.31$
		Ex-smoker	115 (24.63)	663 (23.93)		
		Light	38 (8.14)	179 (6.46)		
		Medium	54 (11.56)	323 (11.66)		
		Heavy	22 (4.71)	123 (4.44)		
Ever smoked	3264	Never	238 (50.53)	1483 (53.1)	2	$\chi^2 = 1.19$
		Ex-smoker	115 (24.42)	663 (23.74)		
		Current	118 (25.05)	647 (23.17)		

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$

4.5.3.2 Alcohol use

High scorers of both genders were more likely to have reported a change in drinking habits in the past 5 years (men, $p < 0.01$; women, $p < 0.01$; see Table 4.5e), although there were no significant associations between reported change in intake and sub-scale scoring. Although there was some difference in alcohol intake as a function of depressive symptoms in men ($p < 0.05$), the same was not true of women.

Table 4.5e Depressive symptoms & health behaviours: Alcohol Use (phase 1)

	n		Depressive symptoms		df	
			High	Low		
Men			n (%)	n (%)		
Alcohol Use						
Change in drinking habits in past 5 years	6749	Yes	358 (41.15)	2074 (35.28)	1	$\chi^2 = 11.33$ *
		No	512 (58.85)	3805 (64.72)		
Drink more or less in the past?	2468	A lot more	56 (15.3)	312 (14.84)	3	$\chi^2 = 6.59$
		A bit more	144 (39.34)	867 (41.25)		
		A bit less	112 (30.6)	707 (33.63)		
		A lot less	54 (14.75)	216 (10.28)		
Units of alcohol per week	6739	Median	8	8		$z^a = 0.821$
		n (range)	*870* (0-130)	*5869* (0-141)		
Units of beer per week	6739	Median	2	2		$z^a = -0.284$
		n (range)	*870* (0-90)	*5869* (0-120)		
Alcohol consumption ¶	6739	Non-drinker	135 (15.52)	742 (12.64)	3	$\chi^2 = 10.2$ §
		Light	379 (43.56)	2698 (45.97)		
		Moderate	177 (20.34)	1352 (23.04)		
		Heavy	179 (20.57)	1077 (18.35)		
Women						
Alcohol Use						
Change in drinking habits in past 5 years	3236	Yes	166 (35.39)	798 (28.84)	1	$\chi^2 = 8.23$ *
		No	303 (64.61)	1969 (71.16)		
Drink more or less in the past?	995	A lot more	30 (17.34)	99 (12.04)	3	$\chi^2 = 4.69$
		A bit more	63 (36.42)	343 (41.73)		
		A bit less	47 (27.17)	241 (29.32)		
		A lot less	33 (19.08)	139 (16.91)		
Units of alcohol per week		Median	3	3		$z^a = 0.069$
		n (range)	*473* (0-93)	*2778* (0-88)		
Units of beer per week		Median	0	0		$z^a = -2.122$ §
		n (range)	*473* (0-22)	*2778* (0-42)		
Alcohol consumption ¶	3251	Non-drinker	147 (31.08)	791 (28.47)	3	$\chi^2 = 7.45$
		Light	199 (42.07)	1307 (46.83)		
		Moderate	67 (14.16)	423 (15.23)		
		Heavy	60 (12.68)	263 (9.47)		

[a] Mann-Whitney U with ties df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$

¶ Consumption based on (O.N.S.1998) of units per week. Men: light, < 11 units; moderate, 11-21 units; heavy, > 21 units. Women: light, < 8 units; moderate 8-14 units; heavy, > 14 units.

4.5.3.3 Diet

Men with high depressive symptom sub-scale scores were less likely to consume fruits or vegetables daily ($p < 0.001$; see Table 4.5f), drink skimmed or semi-skimmed milk ($p < 0.05$), and were less frequent consumers of cheese ($p < 0.001$), eggs ($p < 0.01$) and fish ($p < 0.05$). However, high scorers on the depressive symptoms sub-scale did not have significantly different healthy eating index scores (HEIWE) compared with low scorers.

In contrast, for women, high and low scorers on the depressive symptoms sub-scale differed only in consumption of fish (see Table 4.5g): high scorers were less likely to consume fish frequently ($p < 0.05$).

Table 4.5f Depressive symptoms & health behaviours (Men): Diet, phase 1

	n		Depressive Symptoms		df	
			High n (%)	Low n (%)		
Bread	6762	Wholemeal	374 (43.04)	2442 (41.44)	2	$\chi^2 = 5.20$
		Other brown	284 (32.68)	2151 (36.5)		
		White	211 (24.28)	1300 (22.06)		
Bread slices	6778	0-3 slices	342 (39.13)	2238 (37.91)	1	$\chi^2 = 0.48$
		More than 3 slices	532 (60.87)	3666 (62.09)		
Fruit or Vegetables	6775	2+ times daily	110 (12.57)	891 (15.1)	3	$\chi^2 = 38.5$ **
		Daily	304 (34.74)	2443 (41.41)		
		3-6 times a week	299 (34.17)	1858 (31.49)		
		Once or twice a week, or less often	162 (18.51)	708 (12.0)		
Meat	6783	1-2 times a week, less often	200 (22.88)	1125 (19.04)	2	$\chi^2 = 7.59$ §
		3-4 times a week	316 (36.16)	2177 (36.84)		
		5+ times a week	358 (40.96)	2607 (44.12)		
Spread	6704	Polyunsaturated / low calories spreads / rarely use	441 (51.22)	3027 (51.81)	1	$\chi^2 = 0.103$
		Butter or margarine	420 (48.78)	2816 (48.19)		
Milk	6751	Skimmed/semi-skimmed milk	268 (30.77)	2089 (35.53)	2	$\chi^2 = 8.12$ §
		Do not use milk, or use other	51 (5.86)	288 (4.9)		
		Whole milk	552 (63.38)	3503 (59.57)		
Amount of milk used daily	6780	0-0.5 pints	481 (54.97)	3046 (51.58)	1	$\chi^2 = 3.50$
		More than 0.5 pints	394 (45.03)	2859 (48.42)		
Cream	6437	Seldom or never	402 (48.43)	2337 (41.68)	2	$\chi^2 = 13.49$ *
		1-3 times a week	318 (38.31)	2429 (43.32)		
		Once weekly or more often	110 (13.25)	841 (15.0)		
Cheese	6443	0-3 times a month	202 (24.31)	982 (17.5)	3	$\chi^2 = 25.03$ **
		1-2 times a week	246 (29.6)	1818 (32.39)		
		3-4 times a week	200 (24.07)	1596 (28.44)		
		5+ times a week	183 (22.02)	1216 (21.67)		
Eggs	5115	1-3 times a month or less	221 (33.95)	1261 (28.25)	2	$\chi^2 = 10.37$ *
		1-2 times a week	288 (44.24)	2238 (50.13)		
		3+ times a week	142 (21.81)	965 (21.62)		
Fish	6777	1-3 times a month or less	378 (43.25)	2307 (39.08)	1	$\chi^2 = 5.52$ §
		1-2 times a week or more	496 (56.75)	3596 (60.92)		
HEI	2359	Mean (SD)	3.22 (1.264)	3.22 (1.265)	1	F = 0.00
HEIWE	2983	Mean (SD)	2.84 (1.124)	2.88 (1.157)	1	F = 0.70

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

Table 4.5g Depressive symptoms & health behaviours (Women): Diet, phase 1

	n		Depressive Symptoms		df	
			High n (%)	Low n (%)		
Bread	3256	Wholemeal	207 (43.58)	1211 (43.55)	2	$\chi^2 = 0.43$
		Other brown	181 (38.11)	1028 (36.97)		
		White	87 (18.32)	542 (19.49)		
Bread slices	3282	0-3 slices	298 (62.34)	1721 (61.38)	1	$\chi^2 = 0.16$
		More than 3 slices	180 (37.66)	1083 (38.62)		
Fruit or Vegetables	3275	2+ times daily	91 (19.12)	573 (20.47)	3	$\chi^2 = 6.32$
		Daily	189 (39.71)	1240 (44.3)		
		3-6 times a week	145 (30.46)	728 (26.01)		
		Once or twice a week, or less often	51 (10.71)	258 (9.22)		
Meat	3279	1-2 times a week or less often	184 (38.66)	959 (34.21)	2	$\chi^2 = 3.81$
		3-4 times a week	169 (35.5)	1036 (36.96)		
		5+ times a week	123 (25.84)	808 (28.83)		
Spread	3231	Polyunsaturated / low calories spreads / rarely use	250 (53.19)	1350 (48.9)	1	$\chi^2 = 2.96$
		Butter or margarine	220 (46.81)	1411 (51.1)		
Milk	3259	Skimmed/semi-skimmed milk	191 (40.3)	1116 (40.07)	2	$\chi^2 = 0.63$
		Do not use milk, or use other	32 (6.75)	217 (7.79)		
		Whole milk	251 (52.95)	1452 (52.14)		
Amount of milk used daily	3273	0-0.5 pints	314 (66.11)	1888 (67.48)	1	$\chi^2 = 0.34$
		More than 0.5 pints	161 (33.89)	910 (32.52)		
Cream	3048	Seldom or never	221 (49.66)	1293 (49.67)	2	$\chi^2 = 0.52$
		1-3 times a week	166 (37.3)	1000 (38.42)		
		Once weekly or more often	58 (13.03)	310 (11.91)		
Cheese	3049	0-3 times a month	112 (25.17)	671 (25.77)	3	$\chi^2 = 1.01$
		1-2 times a week	157 (35.28)	963 (36.98)		
		3-4 times a week	105 (23.6)	592 (22.73)		
		5+ times a week	71 (15.96)	378 (14.52)		
Eggs	2409	1-3 times a month or less	136 (36.76)	709 (34.77)	2	$\chi^2 = 2.19$
		1-2 times a week	166 (44.86)	997 (48.9)		
		3+ times a week	68 (18.38)	333 (16.33)		
Fish	3291	1-3 times a month or less	216 (45.19)	1104 (39.43)	1	$\chi^2 = 5.63$ §
		1-2 times a week or more	262 (54.81)	1696 (60.57)		
HEI	2359	Mean (SD)	3.46 (1.247)	3.46 (1.279)	1	$F = 0.01$
HEIWE	2983	Mean (SD)	3.03 (1.132)	3.08 (1.176)	1	$F = 0.51$

df = Degrees of freedom. § $p < 0.05$

4.5.3.4 Exercise

Men with high depressive symptom scores reported partaking less frequently in all three levels of activity ($p < 0.001$; see Table 4.5h). A similar pattern of reported participation in physical activity was the case for women who scored highly on the depressive symptoms sub-scale: mild, $p < 0.05$; moderate, n.s.; vigorous, $p < 0.05$.

Table 4.5h Depressive symptoms & health behaviours: Exercise (Phase 1)

	n		Depressive Symptoms		df	
			High n (%)	Low n (%)		
MEN						
Frequency of mildly energetic activities	6700	3 times a week or more	564 (65.28)	4343 (74.42)	3	$\chi^2 = 38.6$ **
		Once or twice a week	203 (23.5)	1107 (18.97)		
		About 1-3 times a month	57 (6.6)	227 (3.89)		
		Never / Hardly ever	40 (4.63)	159 (2.72)		
Frequency of moderately energetic activities	6677	3 times a week or more	131 (15.32)	1157 (19.87)	3	$\chi^2 = 41.3$ **
		Once or twice a week	352 (41.17)	2637 (45.29)		
		About 1-3 times a month	229 (26.78)	1436 (24.67)		
		Never / Hardly ever	143 (16.73)	592 (10.17)		
Frequency of vigorous activities	6618	3 times a week or more	69 (8.16)	596 (10.33)	3	$\chi^2 = 19.68$ **
		Once or twice a week	133 (15.72)	1041 (18.04)		
		About 1-3 times a month	175 (20.69)	1402 (24.29)		
		Never / Hardly ever	469 (55.44)	2733 (47.35)		
Mild exercise	6684	5 hours or less a week	316 (36.83)	1799 (30.88)	1	$\chi^2 = 12.24$ **
		More than 5 hours a week	542 (63.17)	4027 (69.12)		
Moderate exercise	6612	2 hours or less a week	358 (42.37)	1887 (32.72)	1	$\chi^2 = 30.6$ **
		More than 2 hours a week	487 (57.63)	3880 (67.28)		
Vigorous exercise	6561	Less than an hour a week	465 (55.09)	2633 (46.06)	1	$\chi^2 = 24.1$ **
		More than an hour a week	379 (44.91)	3084 (53.94)		
WOMEN						
Frequency of mildly energetic activities	3255	3 times a week or more	303 (63.66)	1918 (69.02)	3	$\chi^2 = 13.36$ *
		Once or twice a week	113 (23.74)	647 (23.28)		
		About 1-3 times a month	25 (5.25)	89 (3.2)		
		Never / Hardly ever	35 (7.35)	125 (4.5)		
Frequency of moderately energetic activities	3186	3 times a week or more	60 (12.93)	353 (12.97)	3	$\chi^2 = 12.83$ *
		Once or twice a week	132 (28.45)	996 (36.59)		
		About 1-3 times a month	137 (29.53)	714 (26.23)		
		Never / Hardly ever	135 (29.09)	659 (24.21)		
Frequency of vigorous activities	3136	3 times a week or more	13 (2.83)	107 (4.0)	3	$\chi^2 = 7.92$ §
		Once or twice a week	33 (7.17)	255 (9.53)		
		About 1-3 times a month	45 (9.78)	331 (12.37)		
		Never / Hardly ever	369 (80.22)	1983 (74.1)		
Mild exercise	3206	5 hours or less a week	131 (27.87)	635 (23.21)	1	$\chi^2 = 4.79$ §
		More than 5 hours a week	339 (72.13)	2101 (76.79)		
Moderate exercise	3107	2 hours or less a week	236 (52.68)	1296 (48.74)	1	$\chi^2 = 2.37$
		More than 2 hours a week	212 (47.32)	1363 (51.26)		
Vigorous exercise	3150	Less than an hour a week	362 (78.7)	1975 (73.42)	1	$\chi^2 = 5.70$ §
		More than an hour a week	98 (21.3)	715 (26.58)		

df = Degrees of freedom. § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

4.6 Summary of Results I

This chapter began by describing the Whitehall II sample characteristics at baseline after exclusions for the present study (n = 10099). Briefly, the sample was predominantly male (67.3%), with proportionately more women in the lower civil service grades. For the most part, the participants reported good health, with slightly less than a third indicating longstanding illness, infirmity or disability. Over half of women in the oldest age group (50 – 55 years) had experienced menopause, with the majority of younger women still premenopausal. Use of oral contraceptives and hormone replacement therapy was relatively limited in the sample. Although less than 20% of the overall sample was made up of smokers at baseline, proportionately more women than men smoked. Men, however, reported a greater consumption of alcohol. There were also marked differences in diet between men and women, with women more likely to eat more fruits or vegetables, and score more highly on the healthy eating index. Men on the other hand, reported more participation in moderate and vigorous physical activity.

Factor analyses of the GHQ and CGHQ scoring supported the use of the chronic scoring in the present study. The CGHQ scale demonstrated a five factor structure after rotation, one of which was the depressive symptoms sub-scale. Psychological distress was defined as a score of 15 or more on the chronic scoring of the GHQ.

Overall, women had higher mean CGHQ scores than men, and were more likely to be designated as having psychological distress. Younger participants were more likely to be distressed, while women in the lower grades exhibited less distress. Married or cohabiting participants of both sexes reported less distress than other categories of marital status ($p < 0.001$) with men living on their own reporting significantly more distress ($p < 0.001$). Overall, participants categorised as distressed were more likely to report longstanding illness, disability or infirmity, as well as poorer self-assessed health and fewer hours of sleep per night. There was relatively little reported use of antidepressants or tranquillisers at baseline, but such use was likely to be associated with psychological distress.

At baseline, men who were distressed (n = 1416, 20.8%) were more likely to be current smokers and report moderate or heavy alcohol consumption; they tended to consume fruits or vegetables less frequently and were less likely to engage in regular exercise. In contrast, women who were distressed (n = 805, 24.4%) did not differ from women who were not distressed in self-reported smoking or dietary behaviour. However, women who were distressed tended to consume alcohol more heavily and participate in less moderate physical exercise.

Proportionately more women scored highly on the depressive symptoms sub-scale (n = 478, 14.5%) than men (n = 876, 12.9%). There was no association with grade of employment in women, although there were proportionately more high scorers among men in the professional and executive and clerical grades ($p < 0.001$). As with the distress scale, participants who were married or cohabiting were more likely to be low scoring on the sub-scale. Participants with a high sub-scale score were also more likely to report poorer self-assessed health ($p < 0.001$), fewer hours of sleep per night ($p < 0.001$) and longstanding illness or disability (men, $p < 0.01$; women, $p < 0.001$). Elevated depressive symptoms were also associated with use of tranquillisers and antidepressants.

The same associations with health behaviours were observed for high scorers as with the psychological distress measure, except in women for alcohol consumption (no difference between high and low scorers) and reported exercise (high scorers reporting less participation).

Chapter 5

Results II

Cancer events over follow up in the Whitehall II Study

The association of psychological distress with cancer incidence

Psychological distress and health behaviours over time

5.1 Introduction

This chapter opens with a summary of cancer incidence over follow up in the Whitehall II Study, before describing the numbers of events available for analysis in the outcome groups (section 5.2).

Preliminary analyses were carried out using Poisson regression to clarify the models for survival analysis (section 5.3). Survival analyses were carried out for three outcome groups to address the relationship between psychological distress and cancer risk, as well as assessing the relationship between psychological distress and health behaviours in terms of cancer risk (section 5.4). Finally, logistic regression analyses were used to investigate the relationship between psychological distress and health behaviours over time (section 5.5).

5.2 Cancer Events in the Whitehall II Study

There were two sources of data on cancer events: for registrations (incidence), the National Cancer Registry, through the ONS; and for mortality, the NHS Central Register. The outcome of cancer event in the present study was defined as the first officially reported malignant neoplasm (ICD-9, 140-208; ICD-10, C00-C97). Other forms of neoplastic disease were noted but not considered as outcomes (e.g. benign tumours, in-situ neoplasms and neoplasms of uncertain or unknown behaviour). Cancer events occurring within follow up are tabulated in Appendix III (i.e. exclusions, registrations, deaths without prior registration, other neoplastic events, and cancer groups) along with summaries of the ICD-9 and ICD-10 classifications of neoplastic diseases.

5.2.1 Cancer Registrations

Information on cancer incidence was available from the ONS for 10246 participants in the Whitehall II Study by July 2001. These data included date of registration and site according to ICD coding (revision 9 or 10). At that point, 545 neoplasms (of all types) had been registered among the Whitehall II participants. But not all events qualified for consideration in the present study. Events eligible for inclusion were malignant neoplasms registered between date of entry to the study and the end of follow up. Registrations of non-malignant neoplasms were disregarded, as were duplicate registrations, or registrations following an earlier registration. Specific procedures were followed for registrations which occurred outside the follow up period (see 5.2.1.2).

5.2.1.1 Multiple registrations

34 participants had multiple registrations. There were various reasons for these multiple registrations, the most common being an additional registration (or two) over time (n = 25 participants). Some duplicate registrations differed only in histology (n = 4), and one participant had simultaneous registrations for two different sites (lung and breast). For those participants with a preceding in-situ registration (ICD-9, 233; ICD-10, D05-07), the succeeding malignant neoplasm was taken as the event of interest, with the history of in-situ disease identified for that participant (unless the in-situ registration took place before baseline; these participants were excluded). Otherwise the first malignant neoplastic event was retained as the measure of cancer incidence for a given participant and his or her subsequent registrations ignored. The removal of

duplicate registrations from the original 545 events left 509 remaining cancer registrations.

5.2.1.2 Pre-baseline registrations & registrations after follow up

All participants should be free of cancer at baseline. 90 participants had registrations which predated their entry into the study and these participants were excluded from the sample at baseline (as reported in section 4.2). Given the delay of up to four years for complete national coverage of cancer registrations, follow up was right-censored for all participants at the end of 1997 (i.e. 31st December 1997). So from the remaining 419 cancer registrations, the 55 events registered after that date were disregarded and those participants treated as not having developed cancer for the present analyses. Table 5.2a summarises the number of eligible participants and those excluded according to type of neoplastic disease (see Appendix III for a complete listing of eligible events by site).

Table 5.2a Whitehall II cancer registrations data: Eligibility by type of neoplastic disease over follow up

	Pre-baseline	Eligible	Post-31/12/1997	Total
Malignant neoplasm	*75*	326	*49*	450
In-situ neoplasm	*10*	28	*3*	41
Benign neoplasm	*3*	4	*1*	8
Neoplasm of uncertain or unknown behaviour	*2*	6	*2*	10
No cancer	-	9737	-	9737
Total	*90*	10101	*55*	10246

5.2.1.3 Missing registrations data

There was no follow up for 62 participants among the cancer registrations reported by the ONS. These participants could be categorised as one of three groups: lost to follow up; deaths due to cancer without prior registration; and deaths due to other causes. Comparing these 62 records with data from the National Health Service Central Register (complete for the Whitehall II Study up until the end of 1999), eight participants were not flagged for mortality and may be considered lost to follow up. 21 of the remaining 54 participants died from cancer and a further 33 died from a range of other causes very soon after entry to the study (see Table 5.2b).

Table 5.2b Cancer registrations: Reasons for missing registrations (n = 62)

			N
Lost to follow up (mortality)			8
Cancer deaths without prior registration (DWPR)	Oesophagus	1	21
	Stomach	1	
	Colon	2	
	Rectum	1	
	Pancreas	2	
	Melanoma	1	
Deaths due to other causes	Immune system related	2	33
	Meningitis	1	
	Anterior cell horn disease	1	
	Cardiovascular disease	12	
	CVA	1	
	Other vascular disease	4	
	Asthma	2	
	Gastric ulcer	1	
	Head injury	2	
	Other injury	1	
	Poisoning (psychotropic agents)	2	
	Toxic effect of carbon monoxide	2	
	Other external causes	2	

5.2.1.4 Registrations within the first years of follow up

Finally, those registrations and deaths without prior registration which occurred within the first two years after baseline were identified in order that they may be excluded from analyses. There were 43 such events in the first two years[7] and these participants were excluded from further analyses. 52 events occurred in the following two years of follow up.

5.2.2 Cancer Mortality Events

Given the delays in the cancer registration reporting system, in order to increase the number of cases available for analysis, those deaths due to cancer which occurred during follow up without prior registration (DWPR) were also included as eligible events. Thus a further 13 events among men and 14 among women were considered as outcome events in addition to the incidence data[8].

[7] Table III.6 in Appendix III.

[8] Table III.4 in Appendix III.

81 deaths occurred between the end of follow up and the end of the available mortality follow up (31/12/99), of which 39 had cancer as primary cause of death. Again, as with registrations occurring after the end of follow up, these events were ignored unless registered before the end of follow up and these participants treated as not having developed cancer for the present analyses. A further 7 individuals had no follow up information from the NHS Central Register, bringing the number lost to follow up to 15 overall (0.14% of the original sample of 10308 participants).

5.2.3 Total Cancer Events over Follow Up

Over follow up, in 10042 adults there were 302 malignant neoplastic events eligible for analysis. Non-melanoma skin cancer (n = 31) was the most commonly occurring cancer in men over follow up and the next most common neoplasm was cancer of the prostate, followed by colorectal cancers and lung cancer (see Table 5.2c). Breast cancer was the most common type of cancer in women (n = 86). Cancers of the ovary and uterine adnexa followed and then endometrial cancer (body of uterus) as the next most common cancer in women. Inspecting the numbers of cancers by site, only breast cancer could be considered with confidence for site-specific analyses.

Table 5.2c Ten most commonly occurring cancer sites over follow up by gender

	Site	Registrations	DWPR	Total
Men				
1	Prostate	21	1	22
2	Colon	15	2	17
3	Rectum etc	12	0	12
4	Trachea, bronchus & lung	11	0	11
5	Stomach	7	1	8
	Melanoma	7	1	8
	Bladder	7	1	8
8	Kidney, except renal pelvis	7	0	7
	Brain	6	1	7
10	Testis	4	1	5
Women				
1	Breast	81	5	86
2	Ovary etc	10	1	11
3	Body of uterus	10	0	10
4	Melanoma	6	0	6
	Trachea, bronchus & lung	5	1	6
5	Colon	5	0	5
6	Bladder	4	0	4
	Rectum etc	3	1	4
8	Cervix uteri	3	0	3
	Kidney, except renal pelvis	3	0	3
	Brain	2	1	3

After making the exclusions described above (and those described in section 4.2), by the conclusion of follow up there had been 157 malignant neoplastic events in men and 145 in women. Once non-melanoma skin cancers were discarded[9], these totals reduced to 126 events in men and 141 events in women (see Table 5.2d). A trend for increased cancer rates with age was apparent among both sexes.

Table 5.2d Total cancer events over follow up and direct standardised rates: by gender, age & event type

Age Group	Registrations	DWPR[a]	Cancer Events	N at risk	SR per 1000 †	SE (SR)
Men						
35-39 years	18	0	18	1994	*2.65*	*(0.002)*
40-44 years	17	2	19	1836	*2.80*	*(0.002)*
45-49 years	25	0	25	1319	*3.68*	*(0.003)*
50-55 years	59	5	64	1630	*9.44*	*(0.004)*
Total	*119*	*7*	*126*	*6779*	*18.59*	*(0.000)*
Women						
35-39 years	15	0	15	770	*4.58*	*(0.005)*
40-44 years	26	1	27	763	*8.24*	*(0.006)*
45-49 years	44	0	44	735	*13.43*	*(0.009)*
50-55 years	48	7	55	1009	*16.78*	*(0.007)*
Total	*133*	*8*	*141*	*3277*	*43.03*	*(0.000)*

[a] DWPR = deaths without prior registration
† SR, standardised rate calculated using direct method SE, standard error of SR

5.2.4 Cancer Events by Groups

Based on the rationale presented in Appendix I, the eligible cancer outcomes occurring over follow up were collated into their respective groups (Table 5.2e). By the end of follow up, there had been 33 smoking-related malignant events among men and 15 amongst women. There were comparatively few alcohol-related cancers (the number of events for women was inflated by inclusion of the breast cancers). As cancers of the oesophagus and tongue were also smoking related cancers, these sites were considered in the analysis of that outcome group with alcohol consumption included as a covariate.

[9] See Appendix IV Additional Results for a version of this table including non-melanoma skin cancers.

Table 5.2e Number of events per group by gender

Cancer Group	Sub-grouping	Men	Women
Smoking		33	15
Alcohol		4	76
Diet	Fat, meat	60	22
	Fibre	26	8
Exercise		15	5
Reproductive	Oestrogen	-	74
	Nulliparity	-	17
	OC use	-	83
Others	Excluding NMSC	46	26

Diet-related cancer events made up the largest grouping for men, with 60 malignancies that could be associated with a diet high in animal protein and high in fat (assessed using meat intake and the healthy eating index). Fewer diet-related cancers occurred among women. Given its implication as an overall risk factor for cancer (Peto 2001), obesity was used as a covariate in analyses as assessed by body mass index score.

The reproductive grouping applied to women only, within three overlapping subsets: high oestrogen exposure, nulliparity, and oral contraceptive use. The incidence of breast cancers contributed greatly to the first and last of these. There were only 17 events that could be related to nulliparity as a risk factor.

Finally, there were 46 other cancers (i.e. not grouped) among men and 26 among women. These included cancers of the stomach, liver, head and neck, melanoma, lymphatic and haematopoietic tissues, testis, connective and soft tissues and malignancies which were stated or presumed to be secondary (see Appendix III, tables III.7-8).

The numbers of events in each outcome group available for analysis are summarised across age groups in Table 5.2f. The denominators at risk were 6773 men and 3269 women.

Table 5.2f Events per outcome group, by age group and gender

Outcome Group		Age group				Total Events	Crude Rate Per 1000
		35-39	**40-44**	**45-49**	**50-55**		
Any malignant neoplasm including NMSC	M	19	23	34	81	157	23.18
	F	16	29	44	56	145	44.35
Any malignant neoplasm excluding NMSC	M	18	19	25	64	126	18.6
	F	14	27	44	56	141	43.13
Smoking related cancers	M	5	3	5	20	33	4.87
	F	1	1	2	11	15	4.58
Diet related cancers (high fat, high meat)	M	8	5	13	34	60	8.86
	F	2	5	8	7	22	6.73
Cancers related to oral contraceptive use [a]	F	11	19	24	29	83	28.65
Breast cancers	F	10	17	21	26	74	22.64
Other malignant neoplasms (grouped)	M	8	11	9	18	46	6.79
	F	1	3	8	14	26	7.95

[a] Denominator at risk excluding women with hysterectomies = 2897

5.2.5 Time at Risk

Barring those exclusions indicated in section 5.2.1.4, there was a mean 10.7 years of follow up from date of entry to the study, ranging from 0 to 4509 days, with the total time at risk equal to 39 278 999 days.

5.3 Psychological Distress and Cancer Incidence: Preliminary Findings

After excluding events occurring within the first two years of follow up, there were no significant differences in the proportions of cancer events as a function of psychological distress (see Table 5.3a).

Table 5.3a Cancer events over follow up and psychological distress at phase 1

Distress at baseline	Cancer incidence[a]		
			n
	Any malignant neoplasm †	**No cancer**	
Psychological Distress	52 (2.35)	2157 (97.65)	2209
No Distress	215 (2.74)	7618 (97.26)	7833
N = 10042			
	Smoking-related cancer	**No cancer**	
Psychological Distress	5 (0.23)	2204 (99.77)	2209
No Distress	43 (0.55)	7790 (99.45)	7833
N = 10042			
	Diet-related cancers	**No cancer**	
Psychological Distress	16 (0.72)	2193 (99.28)	2209
No Distress	66 (0.84)	7767 (99.16)	7833
N = 10042			
	OC use-related cancers	**No cancer**	
Psychological Distress	22 (2.76)	775 (97.24)	797
No Distress	61 (2.47)	2411 (97.53)	2472
N = 3269			
	Breast cancer	**No cancer**	
Psychological Distress	19 (2.38)	778 (97.62)	797
No Distress	55 (2.22)	2417 (97.78)	2472
N = 3269			
	Other cancer	**No cancer**	
Psychological Distress	11(0.50)	2198 (99.50)	2209
No Distress	61 (0.78)	7772 (99.22)	7833
N = 10042			

[a] n (%)
† Excluding non-melanoma skin cancers

5.3.1 Psychological Distress

Preliminary analyses were undertaken using Poisson regression, with time at risk (days) used as an offset to the model. This event-count method was used (1) to identify the key variables for each outcome group; (2) to clarify the models and calibration of variables; and (3) to assess the suitability of each outcome group model for further analysis. The explanatory variables identified for each outcome group are listed in Table 5.3b.

Table 5.3b Explanatory variables identified for each outcome group by Poisson regression

	Health Behaviours	Others
Any malignant neoplasm	Smoking, HEIWE	BMI, family history of cancer, self-assessed health
Smoking-related cancers	Smoking, HEIWE, intake of fruits or vegetables	BMI, family history of cancer
Diet-related cancers	HEIWE , intake of fruits or vegetables, meat, bread	BMI, family history of cancer
OC use-related cancers	Smoking, HEIWE, alcohol intake, mild exercise	Use of oral contraceptives, menopausal status, nulliparity, family history of cancer
Breast cancers	Smoking, HEIWE, alcohol intake, exercise (mild, moderate & vigorous)	BMI, menopausal status, nulliparity
Other cancers	Smoking, HEIWE, intake of fruits or vegetables, alcohol intake	BMI

The results of Poisson regression analyses for the different outcome groups are summarised in incidence rate ratios for psychological distress in Table 5.3c. There was little evidence of increased cancer incidence associated with psychological distress at baseline. More complete details of these results are reported in Appendix IV (Additional Results).

Table 5.3c Psychological distress: Summary of Poisson regression incidence rate ratios

	IRR (95% CI)[a]	IRR (95% CI) †
Any malignant neoplasm	0.85 (0.63 – 1.16)	0.76 (0.55 – 1.05)
Smoking-related cancers	0.41 (0.16 – 1.04)	0.45 (0.17 – 1.16)
Diet-related cancers	0.86 (0.49 – 1.48)	0.89 (0.51 – 1.55)
OC use-related cancers	1.21 (0.73 – 2.00)	1.83 (0.89 – 3.72)
Breast cancers	1.07 (0.64 – 1.81)	1.39 (0.67 – 2.90)
Other cancers	0.64 (0.33 – 1.21)	0.67 (0.35 – 1.28)

[a] Unadjusted, distress only model
† Adjusted for age, grade, sex and relevant variables & health behaviours (listed in Table 5.3b)

However, the results for three of the outcome groups were very tentative (i.e. diet-related cancers, OC use-related cancers and other cancers), as none of the fitted models for these groups differed significantly from the constant-only model. Thus, survival analysis was performed for only three outcome groups: any malignant neoplasm, smoking-related cancers and breast cancers (see section 5.4).

Incomplete data affected the reproductive cancer groups in particular, reducing the number of observations for regression models. Phase 5 reproductive data was by no means complete for all participants and reported use of oral contraceptives and HRT (both from phase 1) tended to be low in the sample. Further analysis of breast cancers used a cruder measure of parity from phase 1 in preference to phase 5 data, as it provided information for more participants (see section 5.4.3).

5.3.2 Depressive Symptoms

Similarly, there was little indication from preliminary analyses of an association between high depressive symptoms sub-scale score and cancer incidence (see Table 5.3d). Indeed, the results from fitting Poisson regression models indicated that depressive symptoms conferred a reduction in cancer risk for cancer overall (unadjusted IRR 0.55, 95% CI 0.36 – 0.84; adjusted IRR 0.52, 95% CI 0.34 – 0.81; see also Appendix IV Additional Results).

Table 5.3d Cancer events over follow up and depressive symptoms at phase 1

Depressive symptoms at baseline		Cancer incidence[a]		
		Any malignant neoplasm †	**No cancer**	n
	High (4)	22 (1.63)	1325 (98.37)	1347
	Low (0-3)	245 (2.82)	8428 (97.18)	8673
N = 10020				
		Smoking-related cancer	**No cancer**	
	High (4)	4 (0.30)	1343 (99.70)	1347
	Low (0-3)	44 (0.51)	8629 (99.49)	8673
N = 10020				
		Diet-related cancers	**No cancer**	
	High (4)	8 (0.59)	1339 (99.41)	1347
	Low (0-3)	74 (0.85)	8599 (99.15)	8673
N = 10020				
		OC use-related cancers	**No cancer**	
	High (4)	8 (1.69)	466 (98.31)	474
	Low (0-3)	75 (2.70)	2707 (97.30)	2782
N = 3256				
		Breast cancer	**No cancer**	
	High (4)	6 (1.27)	468 (98.73)	474
	Low (0-3)	68 (2.44)	2714 (97.56)	2782
N = 3256				
		Other cancer	**No cancer**	
	High (4)	4 (0.30)	1343 (99.70)	1347
	Low (0-3)	68 (0.78)	8605 (99.22)	8673
N = 10020				

[a] n (%) † Excluding non-melanoma skin cancers

5.4 Psychological Distress and Cancer Incidence: Survival Analyses

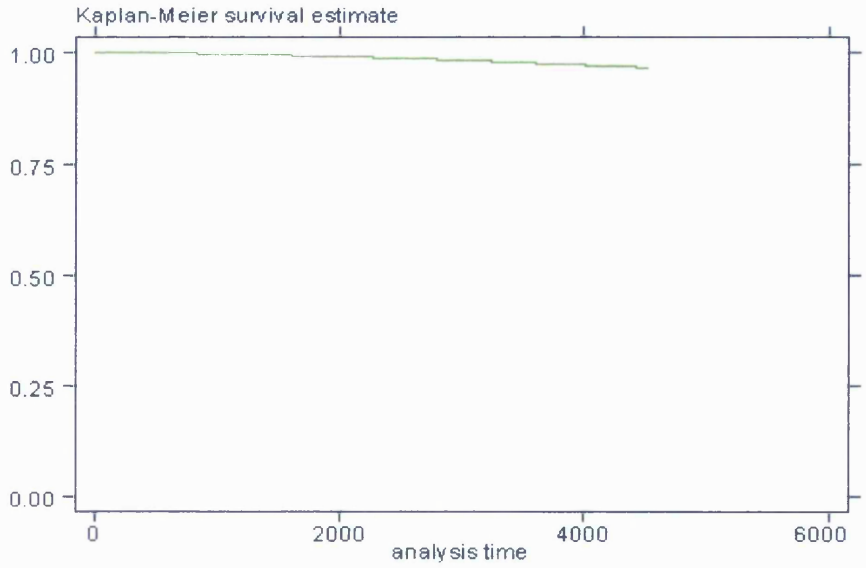
Survival regression models were fitted for three outcome groups: any malignant neoplasm (excluding non-melanoma skin cancers), smoking related cancers and breast cancers. Univariate results are reported in full in Appendix IV Additional Results for each outcome group. A Weibull distribution was assumed when each survival model was fitted, as the sample was ageing over follow up and therefore at increased risk of developing cancer over time.

Models were fitted for each outcome group in three steps (1) distress only; (2) distress plus health behaviours or other explanatory variables; and (3) distress and explanatory variables adjusted for age, grade and sex (where appropriate). Improvement in fit was assessed using the likelihood ratio test.

5.4.1 Any Malignant Neoplasm

Excluding non-melanoma skin cancers, 267 malignant neoplasms occurred over follow up (mean time at risk, 3911.5 days, range 0 to 4509 days). A graph of the overall Kaplan-Meier estimate of cumulative probability of developing cancer by time at risk since entry to the study (measured in days) is presented in Figure 5.4a.

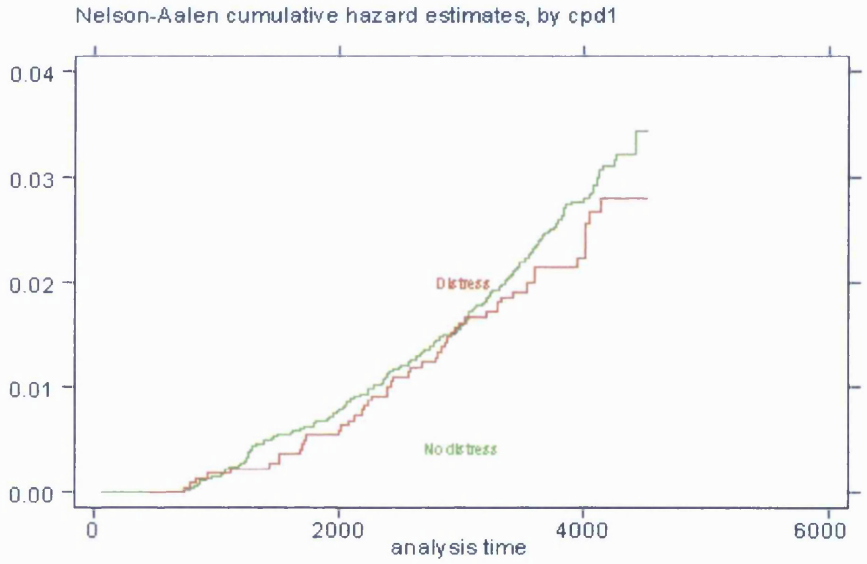
Figure 5.4a Kaplan-Meier curve for all malignant neoplasms (excluding NMSC)



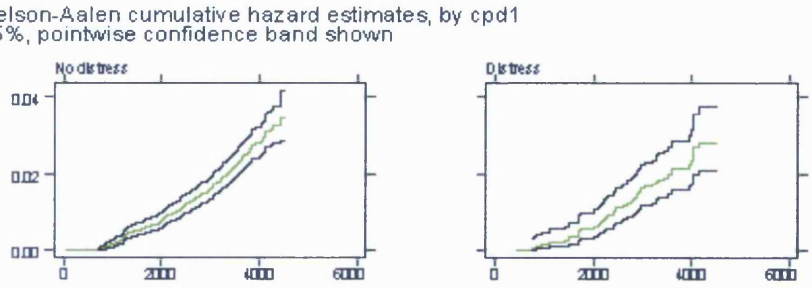
52 malignant neoplastic events occurred among 2210 individuals who were distressed at baseline and there were 215 events among 7846 non-distressed participants. The cumulative hazard estimates over follow up for those with psychological distress and those without distress at phase 1 are compared in Figure 5.4b. Note the scale of the y-axis (cumulative hazard): 0.00 to 0.04, in increments of 0.01.The hazards cross several times over follow up, which supports the choice of an alternative to the proportional hazards model.

Figure 5.4b Any malignant neoplasm: Cumulative hazard estimates of (i) psychological distress (cpd1) over time (days), and (ii) 95% confidence intervals for no distress, distress

(i)



(ii)



Univariate results showed that there was an increased risk of cancer with each year of age (HR 1.09, 95% CI 1.07 – 1.12), current smoking (HR 1.72, 95% CI 1.28 – 2.32), a family history of cancer (HR 1.35, 95% CI 1.04 – 1.75), poorer self-assessed health (HR 1.42, 95% CI 1.10 – 1.83), being female (HR 2.31, 95% CI 1.82 – 2.94) and lower grade status (HR 1.77, 95% CI 1.27 – 2.45).

The fitted survival models for any malignant neoplasm (excluding non-melanoma skin cancer) are presented in Table 5.4a. Only the most general conclusions may be drawn from this, the most general outcome, given that it considers all cancers together irrespective of site and aetiology. Thus, the common observation of increasing risk of developing cancer with increasing age was supported ($p < 0.001$) and the previous finding of more cancers occurring among women than men over follow up was borne out ($p < 0.001$; see Table 5.2d). Only smoking, alone of the health behaviours, influenced overall risk (current smoking, adjusted HR 1.49, $p < 0.01$). Psychological distress was not associated with an increased risk for developing cancer over follow up (unadjusted HR 0.86, $p > 0.05$; adjusted HR 0.84, $p > 0.05$). Self-assessed health was disregarded from the models on the grounds of collinearity, as it was closely correlated with psychological distress.

The distress-only model (model 1) did not differ significantly from its constant-only model, unlike models 2 ($p < 0.01$) and 3 ($p < 0.001$). The addition of smoking bestowed a significant improvement in fit (as was the adjustment for age, sex and grade; see Notes, Table 5.4a) and resulted in a 10.6% change in the coefficient for psychological distress between models 1 and 2.

Table 5.4a Survival models for any malignant neoplasm (excluding NMSC) and psychological distress

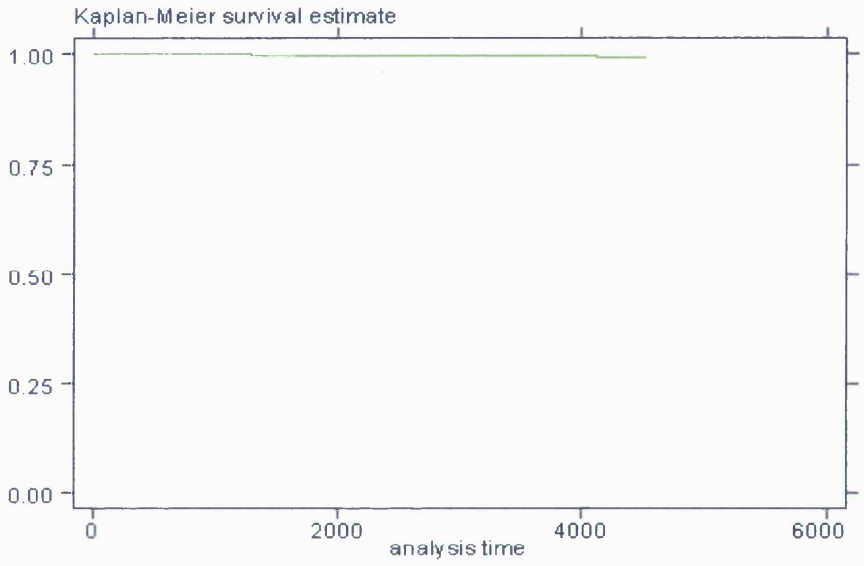
Model	Covariates	Adjusted Coefficient (SE)	Hazard Ratio (95% CI)
1	Psychological Distress		
	No distress		1
	Distress	*-0.151 (0.154)*	0.859 (0.634 – 1.163)
	Intercept **	*-19.955 (0.990)*	
2	Psychological Distress		
	No distress		1
	Distress	*-0.167 (0.154)*	0.845 (0.624 – 1.145)
	Smoking		
	Never / Ex		1
	Current **	*0.499 (0.138)*	**1.648 (1.256 – 2.163)**
	Intercept **	*-20.072 (0.991)*	
3	Psychological Distress		
	No distress		1
	Distress	*-0.168 (0.154)*	0.845 (0.623 – 1.145)
	Smoking		
	Never / Ex		1
	Current *	*0.402 (0.141)*	**1.495 (1.133 – 1.974)**
	Sex		
	Male		1
	Female **	*0.759 (0.141)*	**2.137 (1.618 – 2.823)**
	Age group		
	35-39 years		1
	40-44 years	*0.418 (0.231)*	1.519 (0.964 – 2.392)
	45-49 years **	*1.049 (0.215)*	**2.855 (1.872 – 4.354)**
	50-55 years **	*1.339 (0.201)*	**3.815 (2.570 – 5.662)**
	Grade		
	Administrative		1
	Prof.-Exec.	*0.110 (0.161)*	1.117 (0.814 – 1.532)
	Clerical	*-0.094 (0.194)*	0.909 (0.621 – 1.331)
	Intercept **	*-21.225 (1.012)*	

N = 9960
* $p < 0.01$; ** $p < 0.001$
df, degrees of freedom; SE, standard error; CI, confidence interval
Notes Model fit using likelihood ratio statistic: (1) v (2), df = 1, 11.96 **; (2) v (3), df = 6, 108.36 **; (1) v (3), df = 7, 120.32 **

5.4.2 Smoking Related Cancers

Only 48 smoking related cancers occurred over follow up (mean time at risk, 3911.5 days, range 0 to 4509 days). There were 5 events among 2209 distressed persons and 43 events in 7833 non-distressed persons over that time. A graph of the overall Kaplan-Meier estimate of cumulative probability of developing cancer by time at risk since entry to the study (measured in days) is presented in Figure 5.4c.

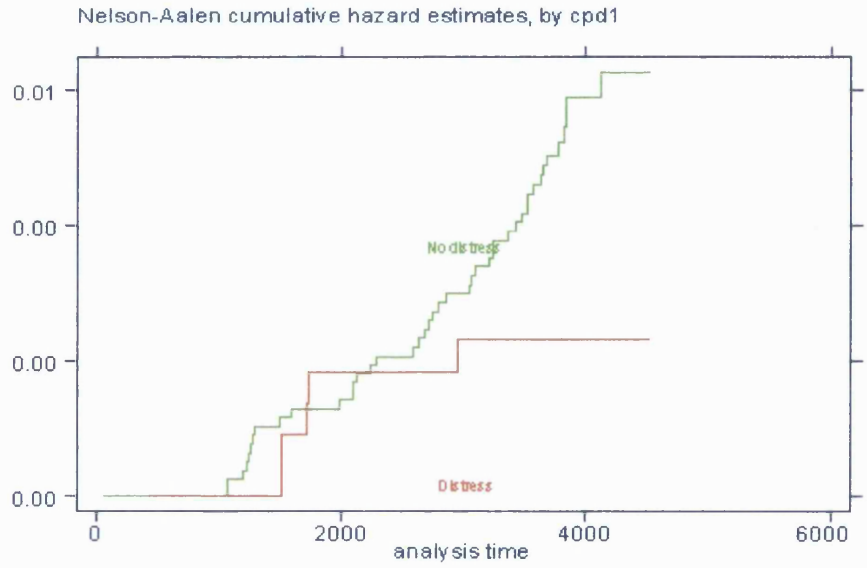
Figure 5.4c Kaplan-Meier curve for smoking related cancers



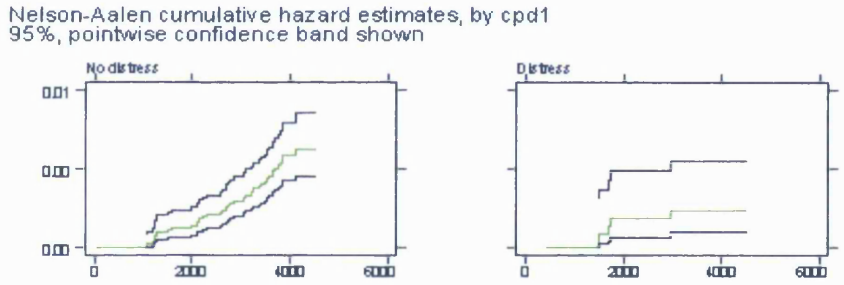
The cumulative hazard estimates over follow up for those with psychological distress and those without distress at phase 1 are compared in Figure 5.4d. The relative paucity of smoking related events is illustrated by the scale of the y-axis (0.00 to 0.01, as compared with 0.01 to 0.04 in Figure 5.4b). Indeed, there seemed to be greater hazard among participants who were not distressed at baseline and very wide confidence intervals for the hazard estimate of the distressed, reflecting the low number of events in this group.

Figure 5.4d Smoking related cancers: Cumulative hazard estimates of (i) psychological distress (cpd1) over time (days) and (ii) 95% confidence intervals for no distress, distress

(i)



(ii)



Univariate regression analyses showed elevated risk in the oldest age group (50-55 years: HR 5.59, 95% CI 2.34 – 13.42), current smokers (HR 3.77, 95% CI 1.85 – 7.70), participants with a family history of cancer (HR 2.07, 95% CI 1.16 – 3.69). There was reduced risk for daily consumption of fruits or vegetables (HR 0.45, 95% CI 0.22 – 0.93) and higher healthy eating index score (HEIWE, HR 0.70, 95% CI 0.54 – 0.92).

The fitted survival models for smoking-related cancers are summarised in Table 5.4b. There was no evidence for an increased risk of smoking related cancers associated with psychological distress (unadjusted HR 0.43, 95% CI 0.17 – 1.09; adjusted HR 0.43, 95% CI 0.15 – 1.22). Risk for smoking related cancers increased with age, being highest in the oldest age group ($p < 0.001$), and with levels of self-reported smoking behaviour (medium, $p < 0.05$; heavy, $p < 0.001$), with ex-smokers still at some risk. However, a higher healthy eating index score seemed to confer a reduction in risk ($p < 0.05$).

The distress-only model differed significantly from the null model ($p < 0.05$), but the addition of health behaviour variables improved fit significantly (see Notes, Table 5.4b), while the distress coefficient decreased by 11%. There was some change in the number of observations between model 1 and the later models, but reducing the number of observations for the first model to the same level does not change the given results markedly.

Table 5.4b Survival models for smoking-related cancers and psychological distress

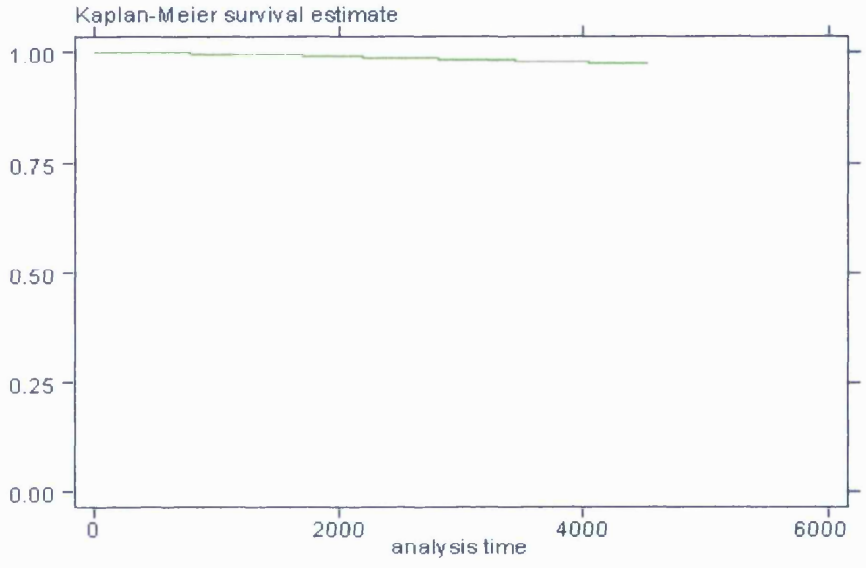
Model	Covariates	Adjusted Coefficient (SE)	Hazard Ratio (95% CI)
1	Psychological Distress		
	No distress		1
	Distress	*-0.840 (0.473)*	0.431 (0.170– 1.091)
	Intercept **	*-21.020 (2.301)*	
2	Psychological Distress		
	No distress		1
	Distress	*-0.933 (0.528)*	0.393 (0.139 – 1.106)
	Smoking		
	Never		1
	Ex-smoker §	*0.826 (0.408)*	**2.284 (1.025 – 5.089)**
	Light	*0.659 (0.774)*	1.934 (0.423 – 8.832)
	Medium §	*1.178 (0.547)*	**3.248 (1.109 – 9.507)**
	Heavy **	*2.107 (0.493)*	**8.223 (3.124 – 21.646)**
	HEIWE		
	(mean) §	*-0.344 (0.140)*	**0.708 (0.537 – 0.934)**
	Family History of Cancer		
	No		1
	Yes §	*0.794 (0.323)*	**2.213 (1.174 – 4.173)**
	Intercept **	*-21.821 (2.653)*	
3	Psychological Distress		
	No distress		1
	Distress	*-0.837 (0.529)*	0.432 (0.153 – 1.220)
	Smoking		
	Never		1
	Ex-smoker	*0.742 (0.410)*	2.101 (0.939 – 4.702)
	Light	*0.672 (0.777)*	1.958 (0.426 – 8.995)
	Medium §	*1.244 (0.558)*	**3.469 (1.160 – 10.370)**
	Heavy **	*2.136 (0.499)*	**8.470 (3.182 – 22.542)**
	HEIWE		
	(mean) §	*-0.309 (0.139)*	**0.734 (0.558 – 0.965)**
	Family History of Cancer		
	No		1
	Yes	*0.619 (0.326)*	1.858 (0.981 – 3.521)
	Sex		
	Male		1
	Female	*-0.038 (0.415)*	0.962 (0.426 – 2.173)
	Age group		
	35-44 years		1
	45-49 years	*0.738 (0.520)*	2.092 (0.754 – 5.804)
	50-55 years **	*1.727 (0.415)*	**5.627 (2.494 – 12.696)**
	Grade		
	Administrative		1
	Prof.-Exec.	*-0.126 (0.376)*	0.880 (0.421 – 1.842)
	Clerical	*-0.418 (0.539)*	0.657 (0.228 – 1.894)
	Intercept **	*-22.631 (2.684)*	

N = 9813 (model 1); N = 9051 (models 2 & 3)
§ $p < 0.05$; ** $p < 0.001$
df, degrees of freedom; SE, standard error; CI, confidence interval
Notes
Model fit using likelihood ratio statistic: (1) v (2), df = 6, 120.53 **; (2) v (3), df = 5, 21.23 **; (1) v (3), df = 11, 142.06 **

5.4.3 Breast Cancers

There were 74 breast cancer events in 3269 women over the course of follow up. Time at risk ranged from 0 to 4508 days, with mean time at risk 3910.1 days. The Kaplan-Meier estimate for these events is presented in Figure 5.4e. Over follow up, there were 19 breast cancers among 797 women defined as distressed at baseline, compared with 55 cancers of that site among 2472 non-distressed women.

Figure 5.4e Kaplan-Meier curve for breast cancers

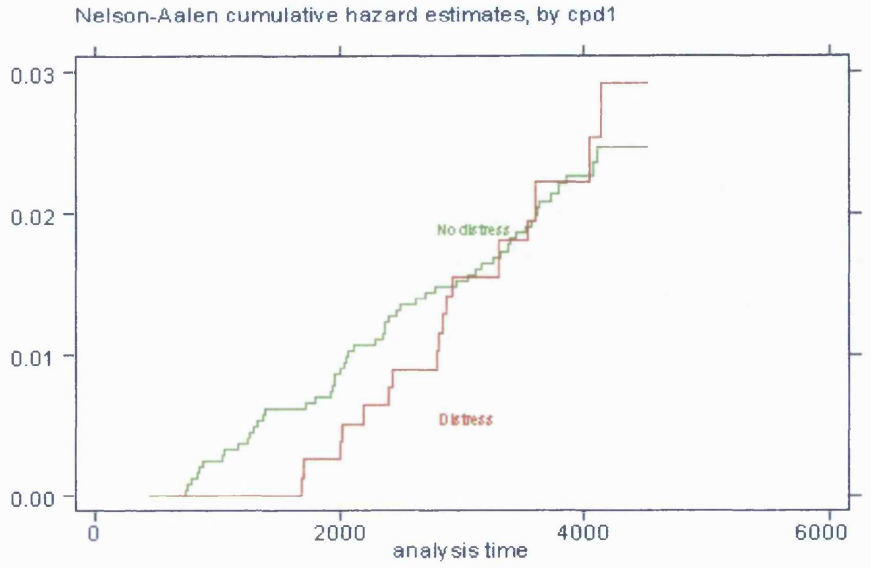


The cumulative hazard estimates for distressed and non-distressed participants are compared in Figure 5.4f. Note the scale on the y-axis (cumulative hazard) ranged from 0.00 to 0.03, and that the confidence intervals around the hazard estimate for distressed were quite wide, as they were for smoking-related cancers previously (Figure 5.4d).

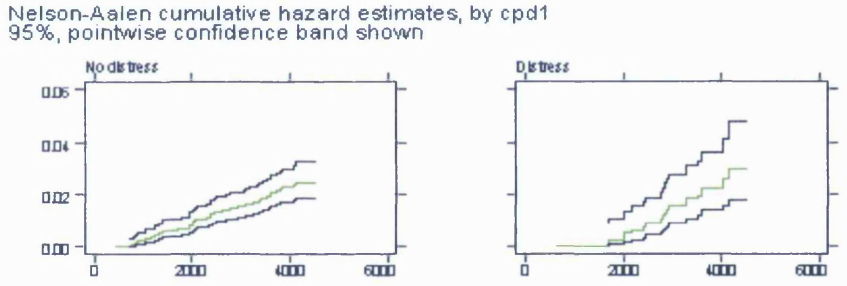
Univariate analyses showed that there was increased risk of breast cancer among current smokers (HR 1.68, 95% CI 1.04 – 2.72) and women aged 45 to 49 years (HR 2.26, 95% CI 1.06 – 4.80).

Figure 5.4f Breast cancers: Cumulative hazard estimates of (i) psychological distress (cpd1) over time (days) and (ii) 95% confidence intervals for no distress, distress

(i)



(ii)



It was not possible to successfully fit a survival model to the data, i.e. that had a model LR χ^2 value that was significantly different from the constant-only model; the best-fitting models are summarised in Table 5.4c. Note that grade is reversed and that there is a reduction in numbers of observations with models 2 and 3, requiring cautious interpretation of these findings. As such, only those variables which were significant

when considered alone had hazards ratios that were significant or approached significance in the third model (current smoking, p = 0.05; 45 – 49 years, p < 0.05).

Table 5.4c Survival models for breast cancers and psychological distress, excluding parity

Model	Covariates	Adjusted Coefficient (SE)	Hazard Ratio (95% CI)
1	Psychological Distress		
	No distress		1
	Distress	*0.076 (0.266)*	1.079 (0.640– 1.818)
	Intercept **	*-18.285 (1.665)*	
2	Psychological Distress		
	No distress		1
	Distress	*-0.015 (0.296)*	0.984 (0.550 – 1.759)
	Smoking		
	Never/ Ex		1
	Current	*0.511 (0.268)*	1.667 (0.984 – 2.824)
	Menopausal status		
	Premenopause		1
	Natural menopause	*-0.021 (0.308)*	0.978 (0.534 – 1.791)
	Surgical menopause	*-0.398 (0.437)*	0.671 (0.284 – 1.582)
	Mild exercise		
	5 hours or less		1
	More than 5 hours	*0.271 (0.332)*	1.312 (0.683 – 2.517)
	Intercept **	*-20.14 (2.017)*	
3	Psychological Distress		
	No distress		1
	Distress	*-0.004 (0.297)*	0.995 (0.555 – 1.783)
	Smoking		
	Never/ Ex		1
	Current	*0.531 (0.270)*	1.701 (1.000 – 2.892)
	Menopausal status		
	Premenopause		1
	Natural menopause	*-0.261 (0.415)*	0.770 (0.341 – 1.737)
	Surgical menopause	*-0.551 (0.472)*	0.575 (0.227 – 1.454)
	Mild exercise (per week)		
	5 hours or less		1
	More than 5 hours	*0.274 (0.332)*	1.315 (0.684 – 2.526)
	Age group		
	35-39 years		1
	40-44 years	*0.462 (0.409)*	1.587 (0.711 – 3.541)
	45-49 years §	*0.848 (0.400)*	**2.336 (1.066 – 5.121)**
	50-55 years	*0.725 (0.486)*	2.066 (0.796 – 5.359)
	Grade †		
	Clerical		1
	Prof.-Exec.	*0.108 (0.282)*	1.114 (0.641 – 1.937)
	Administrative	*0.505 (0.376)*	1.657 (0.793 – 3.465)
	Intercept **	*-20.742 (2.045)*	

N = 3269 (model 1); 2852 (models 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
df, degrees of freedom; SE, standard error; CI, confidence interval
† Grade level reversed for breast cancers.
Notes
Model fit using likelihood ratio statistic: (1) v (2), df = 4, 129.11 **; (2) v (3), df = 5, 6.07; (1) v (3), df = 9, 135.18 **

The third model in Table 5.4c took into consideration only one of the reproductive factors, menopausal status. As discovered in preliminary analyses with the Poisson regression models, including more reproductive risk factors dramatically reduced the number of observations and events contributing to the regression model, particularly when HRT use or parity (phase 5 data) was considered. When the survival analyses for breast cancers were repeated using a much cruder measure of parity from phase 1, the number of observations drops from 2852 to 2157 (as opposed to 1804 using the phase 5 data), but the fitted model did not differ from the null model and the hazard ratios for current smoking and being aged 45 to 49 years at baseline were no longer significantly different from unity.

5.4.4 Further Analyses

The results thus far have shown that there was increased risk of developing cancer with increasing age (see Tables 5.4a, 5.4b & to a lesser degree, but in a manner congruent with the literature for breast cancer, Table 5.4c), but not for psychological distress at baseline. Earlier, it was shown that younger participants exhibited more psychological distress (see section 4.4.1). It may well be the case that any increased risk due to psychological distress has been obscured by the increased cancer risk in older participants. Therefore the sample was divided into younger (aged 35 to 44 years) and older participants (aged 45 to 55 years) and the survival analysis was repeated for the most general outcome, any malignant neoplasm (sections 5.4.4.1-2).

5.4.4.1 Any malignant neoplasm, older participants

The pattern of psychological distress by age group at phase 1 supported the earlier finding of less distress in the older participants ($p = 0.05$, see Table 5.4d), although when the sample was separated into older and younger participants, there was only a significant difference in proportions for the older participants (45 – 49 years v 50 – 55 years, $n = 4685$, $\chi^2 = 4.02$, $df = 1$, $p < 0.05$).

Table 5.4d Proportions of psychological distress by age group

	Age groups				
	35 – 39 years	*40 – 44 years*	*45 – 49 years*	*50 -55 years*	
Distress	631 (22.85)	588 (22.66)	461 (22.49)	529 (20.08)	$\chi^2 = 7.77$
No distress	2131 (77.15)	2007 (77.34)	1589 (77.51)	2106 (79.92)	df = 3

N = 10042

df, degrees of freedom

There were 2946 men and 1739 women aged between 45 and 55 years at baseline. Over follow up, there were 39 events among 990 participants with psychological distress, as compared with 150 events among 3695 participants who were not distressed, i.e. a total of 189 events over 18 174 259 days at risk (see Figure 5.4g for the Kaplan-Meier curve). The cumulative hazard for distressed and non-distressed was very close (see Figure 5.4h).

Figure 5.4g Kaplan-Meier curve for any malignant neoplasm, participants aged 45-55 years

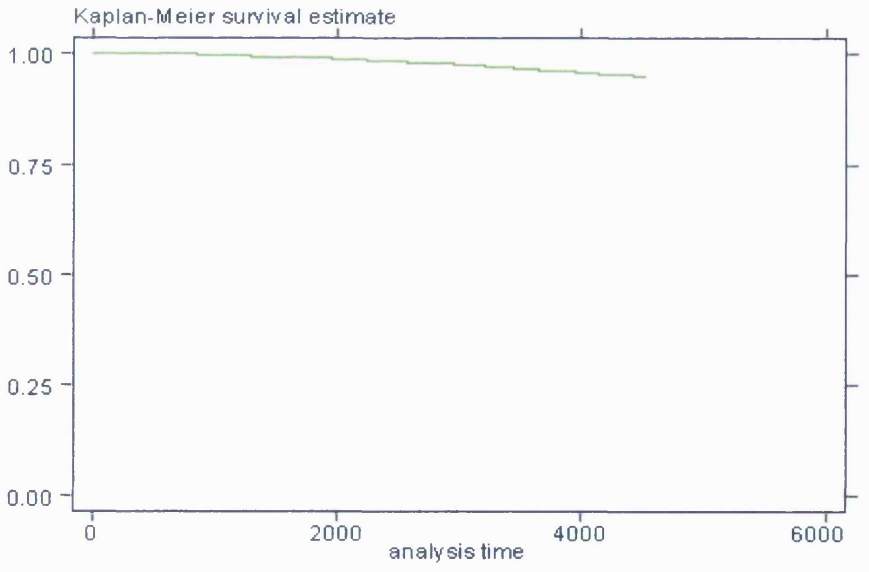
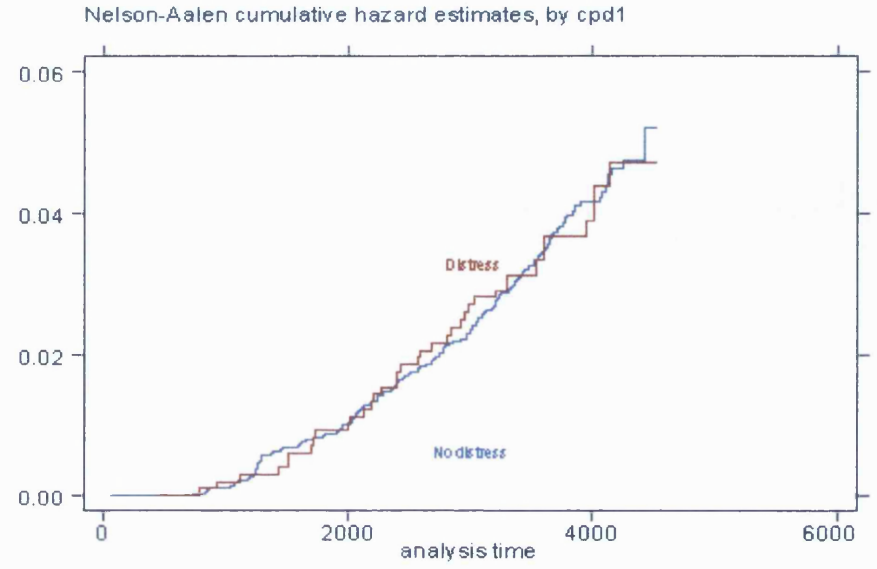
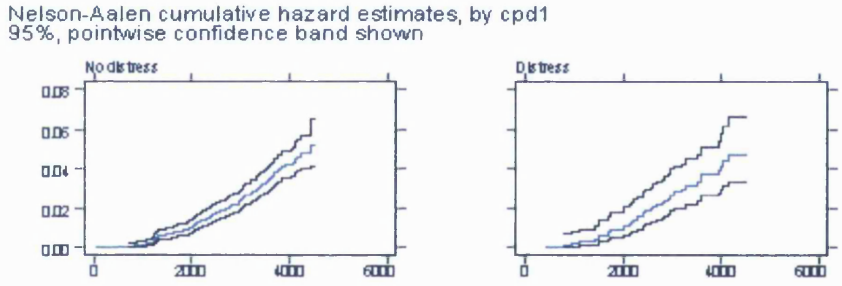


Figure 5.4h Any malignant neoplasm, participants aged 45-55 years: Cumulative hazard estimates of (i) psychological distress (cpd1) over time (days) and (ii) 95% confidence intervals for no distress, distress

(i)



(ii)



The unadjusted hazards ratio for psychological distress amongst older participants was 0.97 (95% CI 0.68 – 1.38, see Table 5.4e), rising to 0.98 HR after adjusting for age (years, 95% CI 0.69 – 1.40). Adjusting for health behaviours such as current smoking and healthy eating score elevated the coefficient for distress by 19%; adjusting further for age, sex and grade had minimal effect. The strongest risk factors for cancer in older participants were being female ($p < 0.01$), smoking and older ($p < 0.05$), while a higher healthy eating score was associated with a reduction in risk ($p < 0.05$).

Table 5.4e Survival models for any malignant neoplasm and psychological distress, older participants

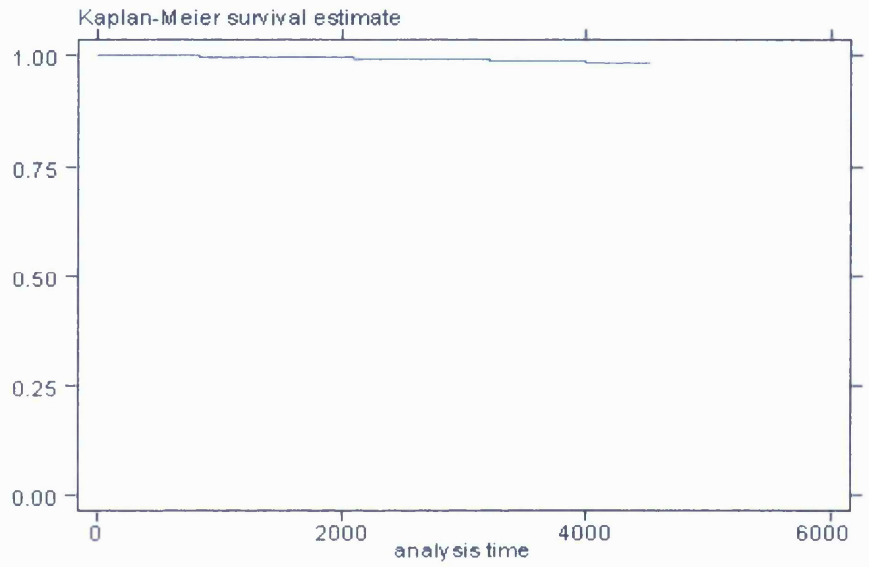
Model	Covariates	Adjusted Coefficient (SE)	Hazard Ratio (95% CI)
1	Psychological Distress		
	No distress		1
	Distress	*0.031 (0.179)*	0.969 (0.681– 1.378)
	Intercept **	*-20.424 (1.234)*	
2	Psychological Distress		
	No distress		1
	Distress	*0.037(0.185)*	1.038 (0.721 – 1.495)
	Smoking		
	Never/ Ex		1
	Current	*0.507 (0.171)*	1.661 (1.186– 2.324)
	HEIWE		
	(mean)	*-0.109 (0.065)*	0.896 (0.788 – 1.019)
	Intercept **	*-20.522 (1.335)*	
3	Psychological Distress		
	No distress		1
	Distress	*-0.038 (0.186)*	1.039 (0.721 – 1.497)
	Smoking		
	Never/ Ex		1
	Current §	*0.368 (0.175)*	**1.446 (1.025 – 2.038)**
	HEIWE		
	(mean) §	*-0.135 (0.065)*	**0.872 (0.767 – 0.993)**
	Sex		
	Male		1
	Female *	*0.491 (0.183)*	**1.634 (1.141 – 2.341)**
	Age		
	(mean) §	*0.057 (0.025)*	**1.059 (1.008 – 1.112)**
	Grade †		
	Administrative		1
	Prof.-Exec.	*0.433 (0.218)*	1.114 (0.641 – 1.937)
	Clerical	*0.412 (0.255)*	1.657 (0.793 – 3.465)
	Intercept **	*-23.848 (1.852)*	

N = 4649 (model 1), 4271 (models 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
df, degrees of freedom; SE, standard error; CI, confidence interval
Notes
Model fit using likelihood ratio statistic: (1) v (2), df = 2, 177.2 **; (2) v (3), df = 4, 26.13 **; (1) v (3), df = 6, 203.33 **

5.4.4.2 Any malignant neoplasm, younger participants

There were 5357 participants aged between 35 and 44 years at entry to the study (men, n = 3827; women, n = 1530). 78 events occurred over 21 104 740 days at risk (mean 3939.6 days, range 0 to 4509; see Figure 5.4i for Kaplan-Meier curve).

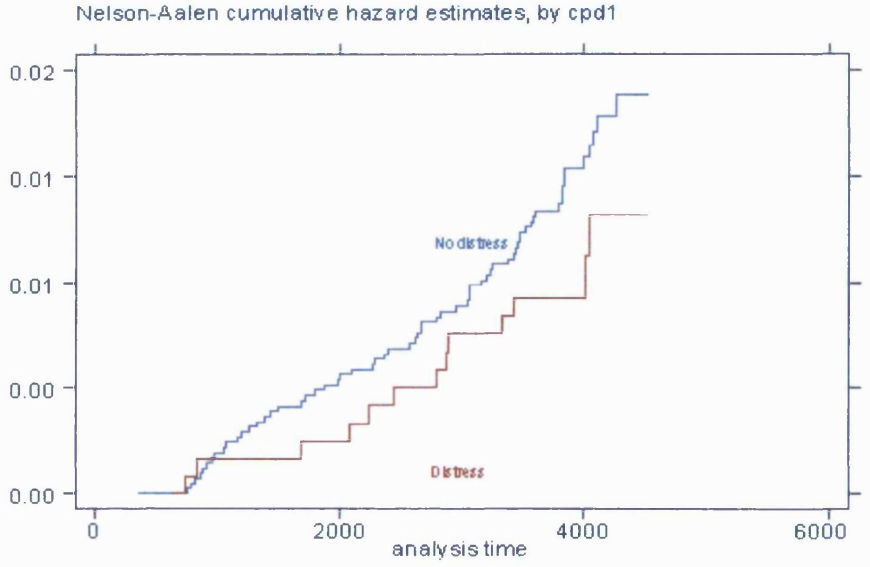
Figure 5.4i Kaplan-Meier curve for any malignant neoplasm, participants aged 35-44 years



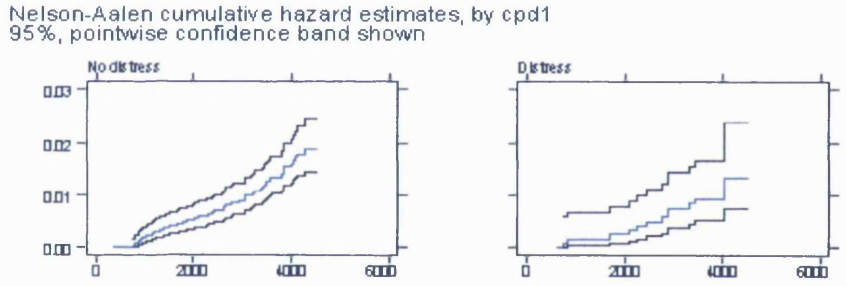
There were 13 cancer events among 1219 distressed persons, and 65 events among 4138 non-distressed persons (see Figure 5.4j for cumulative hazard estimates of distressed and non-distressed). The pattern of hazard in both groups is not as similar as it had been for the older participants (see Figure 5.4h), although the confidence intervals for the hazard estimate of the distressed were wider in the younger participants. Moreover, the y-axis in this Figure ranged from 0.00 to 0.02, in contrast to the range of cumulative hazard of 0.00 to 0.06 for older participants, in Figure 5.4h.

Figure 5.4j Any malignant neoplasm, participants aged 35-44 years: Cumulative hazard estimates of (i) psychological distress over time (days) and (ii) 95% confidence intervals for no distress, distress

(i)



(ii)



When survival models were fitted, although the addition of health behaviours to the distress-only model was a significant improvement in fit ($p < 0.001$; see Table 5.4f), neither model differed significantly from the constant-only model. The final model did differ significantly from its null model (LR $\chi^2 = 41.02$, $p < 0.001$), but only age and gender played key roles in the model (1.13 HR with each year, $p < 0.01$; and 4.21 HR, $p < 0.001$), the latter with wide confidence intervals (95% CI 2.51 – 7.08). Note the loss of 395 observations between the distress-only model and the other models, which qualifies these findings.

Table 5.4f Survival models for any malignant neoplasm and psychological distress, younger participants

Model	Covariates	Adjusted Coefficient (SE)	Hazard Ratio (95% CI)
1	Psychological Distress		
	No distress		1
	Distress	*-0.374 (0.304)*	0.687 (0.378 – 1.248)
	Intercept **	*-18.796 (1.655)*	
2	Psychological Distress		
	No distress		1
	Distress	*-0.326 (0.318)*	0.721 (0.386 – 1.348)
	Smoking		
	Never/ Ex		1
	Current	*0.407 (0.287)*	1.502 (0.855 – 2.639)
	HEIWE		
	(mean)	*0.085 (0.107)*	1.089 (0.883 – 1.344)
	Intercept **	*-18.889 (1.773)*	
3	Psychological Distress		
	No distress		1
	Distress	*-0.394 (0.319)*	0.674 (0.360 – 1.261)
	Smoking		
	Never/ Ex		1
	Current	*0.350 (0.291)*	1.419 (0.801 – 2.514)
	HEIWE		
	(mean)	*0.030 (0.105)*	1.030 (0.837 – 1.268)
	Sex		
	Male		1
	Female **	*1.439 (0.264)*	**4.216 (2.509 – 7.086)**
	Age		
	(mean) *	*0.124 (0.045)*	**1.132 (1.036 – 1.238)**
	Grade †		
	Administrative		1
	Prof.-Exec.	*-0.260 (0.287)*	0.770 (0.438 – 1.354)
	Clerical	*-0.692 (0.382)*	0.500 (0.236 – 1.060)
	Intercept **	*-24.064 (2.575)*	

N = 5311 (model 1), 4916 (models 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
df, degrees of freedom; SE, standard error; CI, confidence interval
Notes
Model fit using likelihood ratio statistic: (1) v (2), df = 2, 103.2 **; (2) v (3), df = 4, 37.64 **; (1) v (3), df = 6, 140.87 **

5.4.4.3 Other analyses

One consequence of the lack of evidence from the present study for an association between distress and cancer incidence, was the inability to satisfactorily assess the role of health behaviours as intervening variables between the two. This issue is addressed in the next section of this chapter (5.5).

5.4.5 Depressive symptoms and outcome groups

The survival models were run for each of the three outcomes, comparing low and high scorers on the depressive symptoms sub-scale. These results are sketched in brief here; the graphs of the cumulative hazard estimates are available in Appendix IV.

The hazards ratio for depressive symptoms was less than unity in each of the regression models (any malignant neoplasm, 0.56; smoking related cancers, 0.74; and breast cancers, 0.54), but not significantly so. Otherwise, the covariates which had been significant contributors to each of the models for psychological distress maintained those roles for depressive symptoms. See Appendix IV Additional Results for graphs of the cumulative hazard estimates for each of the three models.

5.5 Psychological Distress and Health Behaviours over Time

Since no association was demonstrated between psychological distress and cancer risk in the present study, it was not possible to test conclusively the role that might be played by health behaviours in that relationship.

Previously, the association between psychological distress and health behaviours was considered at phase 1 using a cross-sectional design (section 4.3). Since there were health behaviour data available at phases 2 and 3, there was an opportunity to examine whether psychological distress at baseline predicted health behaviours at later phases, using logistic regression (section 5.5.2).

However, there was some loss to follow up at these later phases and thus no health behaviour data for those participants who did not return completed questionnaires at phase 2 and/or phase 3. Before examining how psychological distress at baseline might have predicted health behaviours over time, first the nature of this non-response must be clarified in terms of characteristics at baseline (section 5.5.1).

5.5.1 Non-response at Phases 2 & 3

At Phase 1, the sample consisted of 10056 participants, after excluding individuals with pre-baseline registrations (n = 90), absence of CGHQ score (n = 119), or a registration within the first two years of follow up (n = 43). But at Phase 2, response dropped to 7960 (79.15%), before rising at Phase 3 to 8470 (84.23%). Responders and non-responders were compared using baseline data for age, sex, grade and level of education, as well as for CGHQ score (mean), psychological distress and the depressive symptoms sub-scale (see Appendix IV Additional Results for more details).

At phase 2 there were 2096 non-responders. These non-responders were younger ($p < 0.01$) and more likely to be female ($p < 0.001$) and drawn from the clerical grades ($p < 0.001$). Non-responders had higher mean CGHQ scores ($p < 0.01$) at baseline compared with responders, as well as being more likely to have had psychological distress ($p < 0.001$) or score highly on the depressive symptoms sub-scale ($p < 0.001$).

Non-responders at phase 3 (n = 1586) did not differ from responders with regard to age, but were more likely to be female ($p < 0.001$), from the clerical grades ($p < 0.001$) and have spent fewer years in full-time education ($p < 0.001$). Although non-responders at phase 3 did not differ significantly from responders in terms of mean CGHQ score or psychological distress, they were more likely to have more depressive symptoms ($p < 0.001$).

965 participants did not respond at either phase 2 or at phase 3. These consistent non-responders were more likely to be female ($p < 0.001$), from the clerical grades ($p < 0.001$) and have spent fewer years in full-time education ($p < 0.01$). While they did not differ significantly from responders in mean CGHQ score, consistent non-responders were more likely to be psychological distressed ($p < 0.01$) and have more depressive symptoms ($p < 0.001$) than responders.

5.5.2 Psychological Distress and Health Behaviours

Logistic regression analysis was performed to investigate the relationship between psychological distress and other variables at baseline (age group, sex, and grade as well as specific covariates where appropriate), with health behaviours at later phases. Since past behaviour for each health behaviour outcome was the strongest predictor, results were reported first for the fitted model without it, and then adjusted for previous behaviour (NB: 'adjusted OR' is used throughout the text in this section specifically in reference to this adjustment). Results were abbreviated for diet and exercise variables because there were three variables for each of these behaviours.

5.5.2.1 Current smoking

Logistic regression analyses were performed on current smoking at phases 2 and 3 as outcomes and the above predictors in addition to alcohol consumption. When smoking at phase 1 was excluded from the model, there was a slight but significant increase in odds for current smoking at phase 2 among those with psychological distress (OR 1.19, 95% CI 1.03 – 1.39; see Table 5.5a). However, once current smoking at phase 1 was taken into consideration, this odds ratio fell to 1.05 (95% CI 0.79 – 1.38).

Table 5.5a Psychological distress at phase 1 and health behaviours at phases 2 and 3: Current smoking

PHASE 2	OR (95% CI)	OR (95% CI)	PHASE 3	OR (95% CI)	OR (95% CI)
		Adjusted for smoking at phase 1			Adjusted for smoking at phase 2
	n = 7811	n = 7757		n = 6985	n = 6921
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	**1.199 (1.032 – 1.392) §**	1.050 (0.795 – 1.388)	*Distress*	**1.209 (1.023 – 1.429) §**	1.408 (0.945 – 2.096)
Alcohol intake			Alcohol intake (phase 2)		
Non-drinker	1	1	*Non-drinker*	1	1
Light	1.099 (0.915 – 1.319)	0.988 (0.706 – 1.382)	*Light*	0.893 (0.734 – 1.088)	1.216 (0.755 – 1.957)
Moderate	**1.611 (1.305 – 1.990) ****	1.156 (0.783 – 1.708)	*Moderate*	1.256 (0.997 – 1.583)	1.120 (0.639 – 1.962)
Heavy	**2.490 (2.002 – 3.097) ****	1.256 (0.838 – 1.884)	*Heavy*	**2.049 (1.617 – 2.597) ****	**2.053 (1.150 – 3.663) §**
Age Group			Age Group		
35-39 years	1	1	*35-39 years*	1	1
40-44 years	**1.212 (1.018 – 1.443) §**	0.964 (0.698 – 1.333)	*40-44 years*	**1.212 (1.000 – 1.469) §**	1.271 (0.810 – 1.995)
45-49 years	1.079 (0.894 – 1.303)	0.926 (0.654 – 1.312)	*45-49 years*	1.041 (0.844 – 1.284)	0.794 (0.480 – 1.314)
50-55 years	1.036 (0.867 – 1.238)	0.789 (0.568 – 1.096)	*50-55 years*	0.942 (0.769 – 1.154)	0.802 (0.496 – 1.299)
Sex			Sex		
Male	1	1	*Male*	1	1
Female	1.118 (0.963 – 1.298)	0.935 (0.711 – 1.231)	*Female*	1.060 (0.895 – 1.256)	0.943 (0.630 – 1.411)
Grade level			Grade level		
Administrative	1	1	*Administrative*	1	1
Prof.- Exec.	**2.042 (1.718 – 2.426) ****	**1.420 (1.055 – 1.911) §**	*Prof.- Exec.*	**2.171 (1.787 – 2.638) ****	**1.870 (1.218 – 2.871) ***
Clerical	**4.714 (3.822 – 5.815) ****	**2.893 (1.975 – 4.237) ****	*Clerical*	**4.407 (3.467 – 5.602) ****	**2.629 (1.499 – 4.611) ***

§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
OR, odds ratio; CI, confidence interval

At phase 3, when smoking at phase 2 was left out of the fitted model as before, there was a significant increase in odds for current smoking if distressed at phase 1 (OR 1.21, 95% CI 1.02 – 1.42). Once the model was adjusted for current smoking at phase 2, the odds associated with distress at phase 1 increased, but this ratio was not significant (OR 1.40, 95% CI 0.94 – 2.09).

5.5.2.2 Alcohol intake

Heavy alcohol consumption was defined as more than 21 units per week for men, and more than 14 units per week for women. The strongest predictor of heavy alcohol consumption at phase 2 was consumption at phase 1. Similarly, moderate or heavy consumption of alcohol at phase 2 were the strongest predictors of heavy consumption phase 3.

Persons with psychological distress had a significantly elevated odds ratio of 1.31 (95% CI 1.13 – 1.52; see Table 5.5b) for heavy consumption at phase 2; this odds ratio reduced but remained significant after adjusting for alcohol consumption at phase 1 (OR 1.21, 95% CI 1.00 – 1.46). However, psychological distress at phase 1 did not significantly increase risk of heavy alcohol consumption at phase 3 (OR 1.12, 95% CI 0.95 – 1.31; adjusted OR 0.96, 95% CI 0.78 – 1.17). Psychological distress at phase 2 was not associated with elevated risk for heavy consumption at phase 3 (OR 0.89, 95% CI 0.76 – 1.05; adjusted OR 0.87, 95% CI 0.70 – 1.07).

Table 5.5b Psychological distress at phase 1 and health behaviours at phases 2 and 3: Heavy alcohol consumption

PHASE 2	OR (95% CI)	OR (95% CI)	PHASE 3	OR (95% CI)	OR (95% CI)
		Adjusted for alcohol intake at Phase 1			Adjusted for alcohol intake at Phase 2
	n = 7884	n = 7817		n = 7047	n = 7034
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	**1.312 (1.128 – 1.525) ****	**1.213 (1.007 – 1.462) §**	*Distress*	1.116 (0.952 – 1.309)	0.957 (0.781 – 1.173)
Smoking			Smoking (phase 2)		
Never	1	1	*Never*	1	1
Ex-smoker	**2.225 (1.919 – 2.579) ****	**1.494 (1.248 – 1.789) ****	*Ex-smoker*	**2.360 (2.033 – 2.739) ****	**1.506 (1.247 – 1.818) ****
Current	**3.130 (2.621 – 3.738) ****	**1.839 (1.475 – 2.292) ****	*Current*	**2.967 (2.440 – 3.608) ****	**1.747 (1.356 – 2.250) ****
Age Group			Age Group		
35-39 years	1	1	*35-39 years*	1	1
40-44 years	**0.766 (0.647 – 0.905) ***	0.887 (0.720 – 1.093)	*40-44 years*	**0.835 (0.702 – 0.992) §**	0.949 (0.760 – 1.186)
45-49 years	**0.699 (0.582 – 0.841) ****	0.875 (0.696 – 1.100)	*45-49 years*	**0.724 (0.597 – 0.877) ***	0.845 (0.660 – 1.081)
50-55 years	**0.456 (0.377 – 0.550) ****	**0.607 (0.483 – 0.763) ****	*50-55 years*	**0.496 (0.407 – 0.603) ****	**0.720 (0.563 – 0.922) ***
Sex			Sex		
Male	1	1	*Male*	1	1
Female	0.583 (0.490 – 0.695)	**0.656 (0.534 – 0.807) ****	*Female*	**0.686 (0.574 – 0.819) ****	0.888 (0.713 – 1.105)
Grade level			Grade level		
Administrative	1	1	*Administrative*	1	1
Prof.- Exec.	**0.759 (0.658 – 0.874) ****	0.921 (0.744 – 1.095)	*Prof.- Exec.*	**0.732 (0.633 – 0.846) ****	0.934 (0.776 – 1.123)
Clerical	**0.373 (0.290 – 0.480) ****	0.844 (0.626 – 1.138)	*Clerical*	**0.256 (0.191 – 0.341) ****	**0.435 (0.307 – 0.616) ****

§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ OR, odds ratio; CI, confidence interval

5.5.2.3 Diet

Focusing first on intake of fruits or vegetables as the dietary variable most consistently associated with cancer risk, logistic regression analysis was carried out for less than daily intake of these foodstuffs, with five predictors from phase 1 data: psychological distress, healthy eating index (HEIWE), age group, gender and grade.

Past intake of fruits or vegetables was the most significant predictor of consumption at phases 2 and 3. Psychological distress at phase 1 was associated with a 16% increase in likelihood of less than daily consumption of fruits or vegetables at phase 2 ($p < 0.01$; see Table 5.5c). However, after adjusting for consumption at phase 1, the effect was reduced to null (adjusted OR 1.00, 95% CI 0.88 – 1.15). Consumption at phase 3 was less related to psychological distress at phase 1 (OR 1.11, 95% CI 0.99 – 1.24; adjusted OR 1.02, 95% CI 0.88 – 1.18) or at phase 2 (OR 1.14, 95% CI 1.00 – 1.28; adjusted OR 1.05, 95% CI 0.92 – 1.21).

Two other variables were assessed at all three phases: type of milk and type of bread. Logistic regression analysis was carried out for type of milk consumed (semi-skimmed or skimmed milk versus whole milk) and then for type of bread consumed (wholemeal versus other) with the same set of predictors as for intake of fruits or vegetables. Psychological distress at phase 1 did not predict type of bread consumed at later phases, nor of type of milk (see Table 5.5c).

Table 5.5c Psychological distress at phase 1 and health behaviours at phases 2 and 3: dietary variables

PHASE 2	OR (95% CI) [1]	OR (95% CI) [2]	PHASE 3	OR (95% CI) [1]	OR (95% CI) [2]
	n = 7364	n = 7353		n = 7557	n = 6608
Fruits or vegetables			**Fruits or vegetables** (phase 2)		
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	**1.166 (1.039 – 1.309) ***	1.009 (0.883 – 1.152)	*Distress*	1.112 (0.992 – 1.248)	1.024 (0.889 – 1.180)
Milk type	n = 7290	n = 7290	**Milk type** (phase 2)	n = 7552	n = 6541
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	0.938 (0.829 – 1.060)	0.927 (0.808 – 1.065)	*Distress*	1.023 (0.907 – 1.154)	1.138 (0.966 – 1.342)
Bread type	n = 7333	n = 7310	**Bread type** (phase 2)	n = 7542	n = 7519
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	1.025 (0.913 – 1.152)	1.042 (0.916 – 1.186)	*Distress*	0.970 (0.865 – 1.087)	0.989 (0.873 – 1.120)

§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ OR, odds ratio; CI, confidence interval

[1] Adjusted for age group, sex, grade and healthy eating index (HEIWE) score.

[2] Adjusted for age group, sex, grade and specific health behaviour at previous phase.

5.5.2.4 Exercise

There were three levels of exercise measure: mild, moderate and vigorous activity. The median split categorical variables were used as outcomes for logistic regression analysis (e.g. 5 hours or less mild exercise per week, more than 5 hours per week) with the reference category set as the greater amount of time spent at that particular level of exercise. Psychological distress, age group, sex and grade, as well as exercise at the previous phase were used as predictors in the regression analysis.

The strongest predictor of exercise at each level at each phase was previous physical exercise. Psychological distress was not a significant predictor of mild exercise at phase 2 or phase 3 (see Table 5.5d). Nor was it a significant predictor of moderate exercise at phase 2, but at phase 3, psychological distress at phase 1 predicted less moderate exercise (OR 1.13, 95% CI 1.01 – 1.26; adjusted OR 1.15, 95% CI 1.00 – 1.32). As for vigorous exercise, psychological distress at phase 1 was associated with a 21% increase in likelihood of less frequent exercise at phase 2 ($p < 0.01$), dropping to non-significance when controlling for vigorous exercise at phase 1. But psychological distress at phase 1 significantly predicted less vigorous activity at phase 3 (OR 1.33, 95% CI 1.18 – 1.49; adjusted OR 1.28, 95% CI 1.10 – 1.49).

Table 5.5d Psychological distress at phase 1 and health behaviours at phases 2 and 3: exercise

PHASE 2	OR (95% CI) [1]	OR (95% CI) [2]	PHASE 3	OR (95% CI) [1]	OR (95% CI) [2]
Mild exercise	n = 7366	n = 7265	**Mild exercise** (Phase 2)	n = 8161	n = 6617
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	1.051 (0.938 – 1.177)	1.036 (0.921 – 1.166)	*Distress*	1.037 (0.932 – 1.153)	1.006 (0.887 – 1.141)
Moderate exercise	n = 7039	n = 6856	**Moderate exercise** (Phase 2)	n = 8161	n = 6333
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	1.123 (0.994 – 1.266)	1.058 (0.930 – 1.203)	*Distress*	**1.131 (1.012 – 1.265) §**	**1.155 (1.008 – 1.324) §**
Vigorous exercise	n = 6988	n = 6774	**Vigorous exercise** (Phase 2)	n = 8161	n = 6293
Psychological distress			Psychological distress		
No distress	1	1	*No distress*	1	1
Distress	**1.217 (1.077 – 1.375) ***	1.102 (0.958 – 1.267)	*Distress*	**1.329 (1.179 – 1.498) ****	**1.286 (1.104 – 1.497) ***

§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ OR, odds ratio; CI, confidence interval

[1] Adjusted for age group, sex and grade.

[2] Adjusted for age group, sex, grade and exercise at previous phase.

5.5.3 Depressive Symptoms & Health Behaviours

When distress was defined as a high score on the depressive symptoms sub-scale at phase 1, the relationship with health behaviours over time was most apparent for moderate and vigorous exercise, and to a lesser extent for intake of fruits or vegetables (see summary table 5.5e). Nevertheless, the strength of these odds tended to diminish when previous behaviour was taken into account.

Table 5.5e Summary: depressive symptoms & health behaviours at phases 2 & 3

	Phase 2		Phase 3	
	OR (95% CI) [a]	OR (95% CI) [b]	OR (95% CI) [a]	OR (95% CI) [b]
Current smoking	1.14 (0.95 – 1.37)	1.00 (0.71 – 1.40)	1.04 (0.83 – 1.29)	0.93 (0.55 – 1.59)
Heavy alcohol intake	1.22 (1.01 – 1.47) §	1.13 (0.89 – 1.43)	1.21 (0.99 – 1.47)	1.13 (0.87 – 1.46)
Low fruits or vegetables intake	1.17 (1.02 – 1.35) §	1.02 (0.87 – 1.21)	1.16 (1.01 – 1.34) §	1.03 (0.87 – 1.23)
Whole milk intake	1.09 (0.94 – 1.27)	1.06 (0.90 – 1.26)	1.16 (1.00 – 1.34) §	1.15 (0.94 – 1.41)
White bread intake	1.05 (0.91 – 1.21)	1.10 (0.93 – 1.29)	0.88 (0.76 – 1.02)	0.89 (0.75 – 1.06)
Infrequent mild exercise	1.09 (0.95 – 1.26)	1.05 (0.91 – 1.21)	1.05 (0.92 – 1.19)	0.95 (0.81 – 1.11)
Infrequent moderate exercise	1.21 (1.04 – 1.41) §	1.08 (0.92 – 1.27)	1.26 (1.09 – 1.44) *	1.21 (1.02 – 1.44) §
Infrequent vigorous exercise	1.31 (1.13 – 1.53) **	1.19 (1.00 – 1.43) §	1.45 (1.24 – 1.68) **	1.30 (1.07 – 1.58) *

§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ OR, odds ratio; CI, confidence interval

[a] Adjusted for age group, sex, grade and covariate (smoking: alcohol use; alcohol intake: smoking; diet variables: healthy eating index, HEIWE).

[b] Adjusted for variables listed and previous health behaviour.

5.6 Summary

Over follow up, there were 126 neoplastic events among men and 141 neoplastic events among women that were eligible for analysis. The risk of developing cancer increased with age and being female; grade did not seem to be associated with cancer risk, except inversely for breast cancers. Preliminary investigations of the association between psychological distress and cancer risk indicated that survival analyses could most reliably be carried out for three of the original six outcome groups (any malignant neoplasm, excluding non-melanoma skin cancers; smoking related cancers; breast cancers). Survival models were fitted for these three outcome groups, but unsuccessfully for the last group, the only single site analysis performed in the present study.

Overall, there was no evidence that psychological distress was associated with increased cancer risk. Since the prevalence of distress was highest among younger participants, while older participants were at greater risk of developing cancer as a result of age, the survival analyses were repeated for younger (aged 35 to 44 years) and older (45 to 55 years) participants separately.

In the absence of evidence of an association between psychological distress and cancer risk, the relationship over time between psychological distress and health behaviours was explored using logistic regression analysis and health behaviour data from phases 2 and 3. Psychological distress at phase 1 was associated with current smoking at phases 2 & 3 ($p < 0.05$), heavy alcohol consumption at phase 2 ($p < 0.001$), less than daily consumption of fruits or vegetables at phase 2 ($p < 0.01$) and less frequent participation in moderate exercise at phase 3 ($p < 0.05$) and vigorous exercise at phases 2 and 3 ($p < 0.01$ and $p < 0.001$ respectively). However, after controlling for health behaviour at phase 1, psychological distress at baseline predicted heavy alcohol consumption at phase 2 (OR1.21, $p < 0.05$) but not at phase 3 (OR 0.96, $p > 0.05$), and reduced physical activity at phase 3 (moderate, OR 1.15, $p < 0.05$; vigorous, OR 1.28, $p < 0.01$).

Chapter 6

Discussion

6.1 Introduction

The main aim of this thesis was to investigate the association between psychological distress and cancer incidence in the Whitehall II Study. A secondary aim was to assess the relationship between psychological distress and health behaviours, particularly those which may be supposed to have a bearing on cancer risk. This chapter discusses whether the results from the present research were successful in testing the hypotheses of the research and in addressing these aims in particular (section 6.2).

The present study was based on the premise that the manner of association between distress and cancer incidence could be hypothesised as either null or direct or indirect. Positive findings from the earlier cross-sectional literature and from a number of cohort studies prevented unhesitating acceptance of the null hypothesis. Further, supposing that the association was not null, Steptoe's (1991) framework of psychobiological stress response and illness was used to model the alternative hypotheses (section 2.2.3.2). A direct association might be represented by the processes of the psycho-physiological pathway and an indirect association through the cognitive-behavioural pathway. The present study focused on the role of health behaviours, part of the latter pathway, as a means of explaining the association, if any, between distress and cancer incidence.

In order to address the foremost aims above, this study undertook to establish the prevalence of psychological distress using the chronic scoring of the GHQ-30 at baseline and the association of distress with four self-reported health behaviours (smoking, alcohol use, diet and exercise). The influence of key confounders such as gender, age and socioeconomic status (measured by employment grade) on both distress and health behaviours at baseline was also established. Cancer events occurring over follow up were processed to exclude individuals with pre-baseline registrations, and disregard events after the conclusion of follow up, and tabulated before being collated into the outcome groups.

This chapter concludes by revisiting the conceptual framework (6.4) and providing suggestions for further research (section 6.5).

6.2 Results & comment on the present study

Beginning with an overview of psychological distress and cancer events in the Whitehall II Study (section 6.2.1), this section summarises the main results of the present study in the light of the hypotheses tested (section 6.2.2). A discussion of the issues affecting the interpretation of the results follows, with some elaboration on the strengths and weakness of the research (section 6.2.3).

6.2.1 Summary of main results

Secondary analysis was carried out using baseline data from the Whitehall II Study to identify cancer risk in individuals with distress and those without, over a maximum of 10 to 12 years of follow up. Numbers of cancer events for specific sites tended to be low over that follow up period and a strategy of grouping sites was employed for analysis. No association between psychological distress measured at entry to the study and cancer risk over follow up was observed, but this may well be as a result of the age profile of the sample. There were some indications that distress was associated with health behaviours conducive to increased cancer risk, but it was not possible to demonstrate the existence of a pathway between distress and cancer risk in the present study.

6.2.1.1 Psychological Distress

The General Health Questionnaire (Goldberg 1972) was used to screen for psychiatric disorder in the Whitehall II Study sample. The chronic scoring of the General Health Questionnaire (Goodchild & Duncan-Jones 1985) was used in the present study in order to detect recent and more long-term distress. Psychological distress was defined as obtaining a score of 15 or more using this method. This threshold approximated to the top quartile of the overall distribution of CGHQ scores.

At phase 1, women were more likely to be designated as having psychological distress than men (24.4% v 20.8%, $p < 0.001$). As in a previous examination of the Whitehall II Study, participants with psychological distress tended to be younger rather than older participants ($p < 0.001$; Stansfeld, Head & Marmot 1998).

Another measure of distress used in the present study was the depressive symptoms sub-scale of the GHQ (Stansfeld, Head, & Marmot 1998). The proportions of individuals with high scores on this sub-scale at phase 1 were 14.5% of women and 12.9% of men ($p < 0.05$). Unlike the psychological distress measure, there was no association between age and high score on the depressive symptoms sub-scale. Items assessing depressive symptoms referred only to the past few weeks and so may not be as feasibly associated with cancer risk as the chronic scoring of the GHQ. Nevertheless, the presence of depressive symptoms may indicate a serious long term condition.

6.2.1.2 Cancer Events

A total of 302 malignant neoplastic events eligible for analysis occurred in 10 042 adults over a mean number of 10.7 years (range: 67 – 4509 days; total time at risk: 39 278 999 days). Overall, cancer incidence was highest among the older participants, with a steady rise in standardised rates with each age group, a result confirmed by the general survival regression model. Excluding non-melanoma skin cancers, women had just over twice the risk of men for developing any cancer over follow up (adjusted HR 2.14, 95% CI 1.62 – 2.82). These patterns tally with contemporary data on cancer incidence in the general population (Quinn et al. 2001; see Table 6.2a), although rates among men may be expected to catch up and indeed overtake those of women in the coming years.

Table 6.2a Cancer incidence rates, England & Wales, 1994, C00 – C97 excl C44†

Age Group	Rates per 100 000 population	
	M	F
35-39 years	63.2	135.0
40-44 years	99.6	220.1
45-49 years	175.1	343.8
50-54 years	329.5	501.6
55-59 years	581.7	642.7
60-64 years	966.8	860.0
65-69 years	1541.9	1036.8
70-74 years	2243.4	1317.9
75-79 years	2870.1	1515.7

† Non-melanoma skin cancer

The most commonly occurring neoplasm in women was breast cancer (86), followed by ovarian and endometrial cancers (11 and 10 events respectively). After non-melanoma

skin cancer (31), the most frequent cancer sites in men were prostate (21) and cancers of the colon (17) and rectum (12).

Although information on cancer morbidity and mortality among the Whitehall II participants came from objective national recording programmes, the morbidity data (registrations) were subject to a 4 year delay before national coverage could be assumed to be complete, cutting short follow up time. As cancer incidence was expected at the start of the study to be too low for analysis of any one site, an *a priori* strategy of grouping cancers according to aetiological factors was devised and implemented. Moreover, deaths which occurred without prior registration were included in the number of events eligible for analysis. After discarding non-melanoma skin cancers and events within the first two years of follow up, six outcome groups were chosen for analysis: any malignant neoplasm (267), smoking-related cancers (48), diet-related cancers (82), other cancers (72) and in women only, cancers related to use of oral contraceptives (83) and breast cancer (74).

6.2.1.3 Health Behaviour

Reflecting population trends (Swerdlow et al. 2001), at baseline men drank more alcohol than women and partook more often in moderate and vigorous physical activity. Although fewer than 20% of the sample reported being current smokers at baseline, and proportionately more women reported never having taken up the habit, women were more likely to have been current smokers. This is unfortunately in line with predictions about secular change in tobacco use (Baron & Rohan 1996; IARC 1990). However, in comparison with men, women were more likely to have been frequent consumers of fruits or vegetables, have eaten meat less often and scored more highly on the healthy eating index (HEIWE).

6.2.2 The main hypotheses

Three hypotheses were tested by the present study. The evidence produced by testing each of these hypotheses is summarised here in turn, before considering the strengths and weaknesses of the present research in more detail (section 6.2.3).

6.2.2.1 Hypothesis I: Psychological distress and cancer risk over follow up

The first hypothesis stated that psychological distress at baseline would be associated with increased risk of cancer incidence over follow up in the Whitehall II Study. Analyses were restricted to three outcomes: any malignant neoplasm (the general model), smoking-related cancers and breast cancers.

This study found no increased risk of developing cancer associated with psychological distress measured at entry to the study. This was the case for all three outcomes: any malignant neoplasm (adjusted HR 0.84, 95% CI 0.62 – 1.14), smoking-related cancers (adjusted HR 0.43, 95% CI 0.15 – 1.22) and breast cancers (adjusted HR 0.99, 95% CI 0.55 – 1.78). There was no evidence of a direct association between distress and cancer risk. The first hypothesis was therefore rejected and the null hypothesis of no association not rejected.

The strongest predictors of cancer risk overall were increasing age ($p < 0.001$), being female ($p < 0.001$) and current smoking ($p < 0.01$). Smoking was indisputably a powerful predictor of risk for smoking-related cancers, increasing with increasing tobacco use (medium, adjusted HR 3.45, 95% CI 1.16 – 10.37; heavy, adjusted HR 8.47, 95% CI 3.18 – 22.54), with risk peaking in the oldest age group (50 – 55 years, adjusted HR 5.63, 95% CI 2.49 – 12.69). Unfortunately, it was not possible to reliably estimate the parameters in the survival model for breast cancers and all that could be discerned was that women aged 45 – 49 years were at increased risk over follow up (adjusted HR 2.33, 95% CI 1.07 – 5.12).

As there was increased cancer risk with age, but a preponderance of distress among younger adults in the sample, it was possible that the effect of distress was being masked. Therefore the survival regression analyses were repeated separately for the general model among older participants (aged 45 – 55 years) and younger participants (aged 35 – 44 years). Nevertheless, psychological distress was not associated with increased risk for cancer in either group, with the risk in older participants very close to unity (adjusted HR 1.04, 95% CI 0.72 – 1.49). Amongst younger participants, the risk was lower than unity, but not significantly so (adjusted HR 0.67, 95% CI 0.36 – 1.26).

Hypothesis I: Depressive symptoms

There was no evidence to support an association of depressive symptoms with increased cancer risk over follow up of up to 12 years. Indeed, the hazards ratio for depressive symptoms for each of the three outcomes was consistently less than unity, although not significantly so.

6.2.2.2 Hypothesis II: Psychological distress and cancer risk – the role of health behaviours

The second hypothesis stated that increased risk for developing cancer arising from psychological distress would be at least partially explained by the health behaviours of those with psychological distress. Testing this hypothesis satisfactorily relies upon the first hypothesis being supported. But since the first hypothesis was not corroborated (see section 6.2.2.1), this second hypothesis could not be tested in the present study and by default, the null hypothesis not rejected.

However, there were indications from the results of regression analyses that certain health behaviours were associated with increased cancer risk (e.g. smoking for all three outcomes, and mild exercise for breast cancer), and others with decreased risk (healthy eating as measured by the healthy eating index, HEIWE, for smoking related cancers). However, the addition of health behaviours to distress-only survival regression models did not noticeably affect the coefficient for psychological distress in such a way as to provide some support for this hypothesis.

Hypothesis II: Depressive symptoms

As with psychological distress, the second hypothesis could not be tested to see whether health behaviours served as intervening variables between depressive symptoms and cancer risk.

6.2.2.3 Hypothesis III: Psychological distress and health behaviours

The third hypothesis stated that individuals with psychological distress exhibited demonstrably poorer health behaviours compared to individuals who were free of distress. This was tested by examining the association between distress and health behaviours at phase 1.

Amongst men, there were significant associations between distress and several key health behaviours: current smoking ($p < 0.01$); moderate and heavy alcohol consumption ($p < 0.01$); less frequent consumption of fruits or vegetables ($p < 0.001$) and fish ($p < 0.05$); as well as consistently spending less time in physical activity, whether mild ($p < 0.05$), moderate or vigorous (both $p < 0.001$). However, men with psychological distress did not differ significantly from men without distress on other dietary measures, including the healthy eating index (HEIWE). Furthermore, men with distress who were current smokers were not more likely to smoke more heavily than men free of distress.

In contrast, women with psychological distress were not more likely to have been smokers at phase 1 and although they were more likely to report being moderate and heavy consumers of alcohol, this was not as marked as amongst men ($p < 0.05$). They did not differ from women free of distress on dietary measures, except for frequency of consumption of meat (less, $p < 0.05$) and cheese (more, $p < 0.01$). Women with psychological distress only differed from women free of distress in participating in lower levels of moderate activity ($p < 0.05$).

Further evidence for this hypothesis may be gleaned from examining how distress at baseline predicted specific health behaviours at phases 2 and 3. Psychological distress at baseline predicted current smoking, lower intake of fruits or vegetables and less time reported engaging in vigorous exercise at phase 2. However, after adjusting for the relevant health behaviour at phase 1, distress only significantly predicted heavy alcohol intake at phase 2 (OR 1.21, 95% CI 1.01 – 1.46). Similarly, distress at phase 1 predicted current smoking and reduced participation in moderate and vigorous exercise at phase 3, but of these odds ratios, only those for the two types of exercise (moderate, OR 1.15, 95% CI 1.01 – 1.32; vigorous, OR 1.28, 95% CI 1.10 – 1.49) remained significantly different from unity after adjusting for behaviour at phase 2.

Thus, the cross-sectional results from baseline data would support the hypothesis among men, but not amongst women. Moreover, the findings from prediction of behaviour at later phases from distress at phase 1 were qualified to some degree by the

issue of non-response at these two later phases, particularly among women. Non-responders at these phases were more likely to have been distressed or have more depressive symptoms than responders. They were also more likely to be female and drawn from the clerical grades, introducing bias at the levels of gender and socioeconomic status. Therefore, only an incomplete picture of the health behaviour over time of those distressed at baseline may be grasped and the hypothesis not reliably tested with this data.

Hypothesis III: Depressive symptoms

As with psychological distress, men with high depressive symptoms were more likely to be current smokers at phase 1 ($p < 0.01$), but the similarity was not as marked for alcohol consumption ($p < 0.05$). Men with high depressive symptoms did not differ from men with low depressive symptoms on the healthy eating index (HEIWE), but they did report consuming significantly less fruits or vegetables ($p < 0.001$), skimmed or semi-skimmed milk ($p < 0.001$), eggs ($p < 0.01$) and fish ($p < 0.05$). They also participated less frequently in all types of activity ($p < 0.001$) as compared with men with low scores on the depressive symptoms sub-scale.

Women with high depressive symptoms did not differ substantially from women with low symptoms with respect to smoking, alcohol intake or diet (except for fish consumption), but they did report partaking in significantly less mild and vigorous physical activity (both $p < 0.05$). The third hypothesis was supported in men but not in women, in a similar fashion to the relationship between psychological distress and health behaviours (6.2.3).

Bearing in mind the provisos stated earlier about non-response at later phases, depressive symptoms at phase 1 only predicted infrequent vigorous activity at phase 2 after adjusting for previous health behaviour (OR 1.19, 95% CI 1.00 – 1.43), and infrequent moderate and vigorous exercise at phase 3 (OR 1.21, 95% CI 1.02 – 1.44; OR 1.30, 95% CI 1.07 – 1.58).

6.2.3 Issues affecting interpretation of the present research

The results of this study add to the body of cohort research investigating the relationship between psychological distress and cancer incidence. Almost uniquely in that body of literature, it considered an intervening pathway, i.e. health behaviours, and attempted to measure the contribution of this pathway in that relationship. While the study had its strengths and innovations, there remained key issues, primarily of methodology, affecting the reliability and potentially threatening the validity of its results. These included sample characteristics, measurement error, bias and confounding, statistical issues, generalisability and the appropriateness of the design and methodology. Some of these issues are the inevitable consequences of undertaking secondary analysis of an existing cohort (Clarke & Cossette 2000) and it was not possible to surpass the original design, or collect more data; it is hoped, nevertheless, that the strengths of the parent cohort were not diminished by the present analysis.

6.2.3.1 Sample characteristics

The Whitehall II Study sample was originally chosen as an occupational group with a relatively stable, probably long term, career within the civil service. However, in the intervening twenty years or so, the employment climate has changed in the UK and the civil service have proved no more immune to these changes than many other occupations (Ferrie 1999). By the Spring of 2002, less than half of the original sample still worked as civil servants, with about a fifth working elsewhere and a third having retired (Stress & Health Study 2002). While this has a limited impact on the quality of outcome data, it may have had a deleterious effect on response and participation at subsequent waves of follow up. Nonetheless, as an ageing cohort, the Whitehall II sample constitutes an invaluable source of information about risk factors and cancer incidence.

Being originally an occupational cohort, those too ill to work would in effect have been excluded, so the Whitehall II sample as selected may be regarded as being on average healthier than the general population (Kelsey, Thompson, & Evans 1986). On balance, one might expect to find less distress and lower numbers of cancer events in this predominantly healthy cohort, thus reducing the possibility of finding a positive association between distress and cancer incidence. This healthy worker effect extends

to members of the cohort being more economically advantaged and perhaps more likely to have made changes in their lifestyle to benefit their health better able to seek appropriate care (Wen, Tsai, & Gibson 1983). As time goes by and as members of the sample move to other jobs or retire, one might expect this effect to be diluted by any reduction in circumstances. Nevertheless, these features of the sample may have contributed to a lower number of neoplastic events than might have been expected in the general population, as well as influencing the distribution of psychological distress and depressive symptoms. Moreover, these features would be subject to the effects of socioeconomic status within the cohort.

Importantly, given the age range of the Whitehall II sample, limited to between 35 and 55 years at baseline and taking into account the limited follow up time in the present study, many of the cancers which typically occur at later ages would simply not have had the chance to happen. Although approximately one person in three will develop cancer eventually (Quinn et al. 2001), 'only 7% of males (one fifth of the total cases) and 10% of females (just under a third) would be registered before the age of 60' (Quinn et al. 2001, p. 15). The increase in incidence rates with advancing age is illustrated for a selection of sites in Table 6.2b, based on 1994 data published by the ONS (data from subsequent years were provisional). It is clear that data from the present study only begin to tell the story of cancer incidence in the sample.

Table 6.2b Incidence rates per 100 000 population, England & Wales, 1994, selected sites

(From Quinn, Babb et al. (2001) *Cancer Trends in England & Wales 1950-1999*. ONS)

	All cancers excluding NMSC		Colorectal		Lung		Breast	Uterus	Prostate
ICD-10	C00-C97		C18-C21		C33-C34		C50	C54	C61
	M	**F**	**M**	**F**	**M**	**F**	**F**	**F**	**M**
ESR†	400.8	327.0	53.0	35.6	82.6	33.7	104.7	12.8	66.1
WSR‡	268.2	233.2	34.9	23.6	54.2	23.0	76.5	9.0	40.4
(age strata)									
35-39	63.2	135.0	4.7	4.9	2.7	2.5	60.7	2.0	0.2
40-44	99.6	220.1	9.8	8.2	10.2	7.2	112.6	4.2	0.4
45-49	175.1	343.8	22.6	17.3	26.9	17.3	180.3	9.6	2.3
50-54	329.5	501.6	45.4	35.6	63.4	33.3	244.2	23.7	14.8
55-59	581.7	642.7	84.0	62.1	123.4	54.8	256.5	38.4	48.2
60-64	966.8	860.0	141.9	95.1	215.7	101.4	277.1	50.3	120.5
65-69	1541.9	1036.8	215.2	137.8	374.2	171.1	244.3	47.6	250.2
70-74	2243.4	1317.9	301.0	187.3	531.2	219.9	283.1	45.2	447.6
75-79	2870.1	1515.7	379.2	229.9	638.1	210.4	294.2	49.8	657.7

† Directly age-standardised rate using the European standard population
‡ Directly age-standardised rate using the World standard population

Similarly, distress was more common among younger participants at baseline, the majority of whom would have been unlikely to have entered the 'window' of age within which they would be most likely to be diagnosed with cancer, as cancer is primarily a disease of older adults (IARC 1990; Quinn & Babb 2000). The effect of distress (if any) on cancer risk in this younger group may well be more readily deduced with another ten years of follow up, as cancer rates rise within the Whitehall II Study sample in line with population risk.

6.2.3.2 Measurement error

Much of the data used for the present study derived from questionnaire items or measures (i.e. self-reported data) and so was vulnerable to errors in recall and reporting bias on the part of the participants, to a degree commensurate with other studies of this type, but not as a result of developing or not developing cancer.

There was a lack of corresponding objective measures for exercise or diet, although the range of questions for alcohol intake allowed for some cross-checking of responses. Under-reporting of tobacco use is a well-recognised phenomenon (Baron & Rohan 1996), but a small sub-study undertaken previously within Whitehall II to compare responses to items about smoking with serum cotinine found that participants were responding reliably with little evidence of differential bias by employment grade

(Brunner 2002). One might expect a degree of social desirability bias in responses to questions on alcohol intake, diet and exercise. However, the validity of the measures is not entirely in question; for example, in line with expectations from the literature about dose-response relationships (Baron & Rohan 1996), risk for smoking-related cancer was higher in ex-smokers (adjusted HR 2.1) than in light smokers (adjusted HR 1.95) in the present study, and higher in heavy smokers (adjusted HR 8.47) compared with moderate smokers (adjusted HR 3.47).

Some items were devised specifically for use in the Whitehall II Study, perhaps because suitable measures had yet to be developed or were too cumbersome to include, and some devised for the present study. An example of the latter is the composite variable, the healthy eating index (HEIWE), which was created in order to abstract information from the wide variety of dietary variables assessed at phase 1 in the Whitehall II Study. Although this index seemed to perform well in summarising that data, it has not been validated against similar dietary indices or assessed for nutrient quality or energy intake.

In addition, for some of the data, such as family history of cancer or reproductive information, the variables have been taken at their simplest level for the current study (e.g. duration of oral contraceptive use). This was the case not least because of the sheer size of the data set, but also due to the difficulty of managing the complexity of more informative data (e.g. oral contraceptive drug type, level of dose, etc.) in relation to the number of relevant events. Certainly, low numbers reporting these and other reproductive characteristics mitigated their relevance to the data set overall. But key aspects of relevant exposures were abridged, potentially at some cost to the validity of the findings.

On a practical level, in a major study like the Whitehall II Study, there is competition for space within questionnaires and for time and resources within screening assessments. So evaluation of a specific area may prove somewhat less than ideal in retrospect or over time become condensed and simplified (as with dietary items between S1 / S2 and S3). Some data may only be elicited later in the life of the study, e.g. as with some reproductive information at Phase 5 in the Whitehall II Study, which

may be dated and applied to the data retrospectively, but because of sample attrition, only be available for a smaller subset of the original sample. Equally some questions pertinent to cancer risk may not be asked, for example age at menarche or history of sexual relations, or be nearly impossible to assess, e.g. exposure to viruses. Finally, some assessments of the sample may only be viewed with respect to the sample and not to external standards, such as the spectrum of psychological distress or depressive symptoms.

Issues relating to measurement error are considered next in this section with respect to the independent and dependent variables, distress and cancer.

Psychological Distress

The measurement of the independent variable is very important in establishing a relationship with cancer risk, as discussed elsewhere (section 1.2.3.3). The General Health Questionnaire is a widely used, reliable and validated screening instrument for psychiatric disorder. While the GHQ does not provide a DSM- or ICD-based psychiatric diagnosis, its use has been validated against the Clinical Interview Schedule in a sub-sample of the Whitehall II study (Stansfeld & Marmot 1992). In common with other instruments of its type, such as the Beck Depression Inventory (Beck et al. 1961), the recommended administration of the GHQ requires a clinician interview to confirm its findings (Goldberg & Williams 1988), but often in large survey studies these kinds of measures are used alone.

The chronic scoring of the GHQ has been used elsewhere with satisfactory results (Goldberg & Williams 1988; Goodchild & Duncan-Jones 1985), for example in a community sample (Huppert, Gore, & Elliot 1988), but less successfully in a clinical sample (Koeter, Van Den Brink, & Ormel 1989), which used the GHQ-28 rather than the GHQ-30. Its great advantage for the present study was the opportunity to identify distress over a longer period of time, as it is more plausible to relate a weak exposure over a longer period to cancer risk than a weak exposure over a shorter period of time. The factor analysis of the scale showed that it did not substantially diverge from the original GHQ scale in structure and that it had sufficient scale reliability.

The choice of threshold for the present study was arbitrary, but not unrealistic. There is the possibility that individuals were wrongly designated as distressed, or overlooked and presumed to be without distress; but few instruments can be determined to have perfect specificity and sensitivity. Unfortunately, it was not possible to validate the measure further in the present study. However, a computer-administered version of the Composite International Diagnostic Inventory (WHO 1993) was performed at phase 5 and it is hoped that when these diagnostic results become available, the CGHQ scoring at phase 5 can be validated against them.

The depressive symptoms sub-scale from the GHQ was used to establish a more clinically relevant group, but perhaps fails to meet Temoshok & Heller's (1984) suggestion of converging methodological perspectives to address the research question, as the sub-scale derives from the same measure used for psychological distress. Also, since the symptoms were reported for a shorter time period than with the chronic GHQ scoring, in terms of cancer risk, the sub-scale had a lesser profile in the present research. Even so, the sub-scale identified a smaller proportion of the sample than the psychological distress measure, as one might expect given the co-mixed anxiety and depression detected by the latter.

Cancer

Fortunately, this study relied on objective reporting of cancer registrations from the ONS and of cause of death from the NHS Central Register, rather than on the self-report of participants. Ascertainment of follow up for cancer registrations or mortality was missing for only 15 individuals (0.14% of the original sample of 10308). However, this is not necessarily the opportunity for comfort it might appear to be. Cancer registration is a 'dynamic process ... [and] total cases for a particular year can never be regarded as final and definitive' (NCRI 2001, p. 16). One cannot be sure of registrations that occur outside the UK health care system except by self-report (e.g. a study member who is diagnosed with cancer who has moved to work in or retired to another country). Indeed, the cancer registration system within institutions in the UK is voluntary and not compulsory, and Swerdlow and his colleagues have rated coverage at about 90% (Swerdlow, dos Santos Silva, & Doll 2001). Registries around the United Kingdom do not report cancer registrations simultaneously, which leads to a delay of

several years before data can be considered complete. This unavoidably reduced the amount of follow up time available for the current analysis and required a further 55 events to be ignored.

Another effect of the delay is that mortality information tends to arrive more quickly, hence the category of 'deaths without prior registration'. Counting deaths into the outcomes introduces some uncertainty, but these made up a small quantity of the overall number of events and it may be hoped that any ill-effects arising from their inclusion were minor.

In order to compensate for small numbers of malignant neoplasms, this study extended the innovation of previous researchers by grouping cancers of different sites together which shared common aetiological factors (Davey Smith, Shipley, & Leon 1998; Gunnell et al. 1998; Linkins & Comstock 1990). It seemed a reasonable and literature-based strategy to deal with the potentially low numbers expected for any one site over follow up. Grouping undoubtedly resulted in some generalising across different sites. Risk factors might overlap in affecting risk for the same sites, but caution was exercised in pursuing further analysis with particular groups. First, only those groups with a minimum of twenty events were examined in initial analyses. Then, only those outcomes for which Poisson regression models could be fitted that differed significantly from constant-only models were retained for survival analysis.

It reflected the low numbers of events over follow up and perhaps the imprecision of the grouping strategy, that only two groups and one site were analysed using survival models. In common with much of the cohort literature, the largest group of events and thus the most reliable analysis in the present study was of any malignant neoplasm, or all cancers combined excluding non-melanoma skin cancer (if you like, the original grouping strategy). The present study is no more immune to the criticisms and disadvantages of analysing all events together as a homogenous outcome (Bieliauskas & Garron 1982; Fox 1978; Fox 1998b; Perrin & Pierce 1959; Temoshok & Heller 1984). Thus, as a general model, analysis of that outcome can only indicate the most general aspects of cancer risk in this sample, such as that pertaining to age, gender and smoking. Nationally, cancer rates among women in the 40-44 age group are double

those of males (Quinn & Babb 2000) and this may have been reflected in the higher risk for cancer in women in this sample. It could be that this grouping strategy can only be an interim measure, to be used while waiting for more cases to be registered.

The smoking-related cancer group had relatively few events (48), by comparison with overall events (267), although smoking was determined to be the most powerful predictor of risk for this outcome. Typically, the carcinogenic effects of smoking are revealed in incidence rates over many years. The low number of events might therefore arise in part from the age distribution of the sample (see 6.2.3.1).

Finally, even as it was possible to analyse breast cancers as a single site, it was not possible to fit a model successfully in the analyses. To some degree this may be due to the lack of time dependent covariates being included in the model, such as information about menopause and related factors from later phases of data collection. The failure in fitting a model could be construed as indicating that an alternative approach to the data, using a nested case control design comparing the history of distress in women with breast cancer with matched cancer-free controls, might have proved more fruitful (see 6.2.3.5 below).

6.2.3.3 Other sources of bias and confounding

Because there were several versions of the phase 1 questionnaire administered over time, there are gaps in this part of the data: this data is not so much missing, as never asked. However, the effect of missing data can be seen in the drop in numbers of cases in the survival models as more variables are added, as STATA will only use records with complete data. This represents a fall of less than 10% for smoking-related cancers and it can only be assumed that this data is missing completely at random. However, there was a drop of more than 10% for the breast cancers analysis and allowing for the significant gaps in data and use of data from later phases (nulliparity, use of exogenous hormones), it would be unwise to assume that these data were missing at random. This issue also affects the logistic regression analyses of distress and health behaviour over time. It is more difficult to assume for these latter analyses that these data were missing completely at random given the pattern of non-response observed.

The impact of gender and of socioeconomic status cannot be overlooked. Differences in health behaviours across grades have been observed previously in Whitehall II (Marmot & Feeney 1997), with a higher prevalence of obesity in lower grades and a more protective diet reported in higher grades (increased consumption of semi-skimmed and skimmed milk, wholemeal bread and fruit and vegetables). An inverse gradient with grade was also apparent for smoking. However, in the present research, the measure of socioeconomic status, grade, played very little role in the survival models, with the exception of breast cancers, where an inverse relationship, consistent with the literature, was demonstrated (Henderson et al. 1996).

6.2.3.4 Statistical Issues

The first and paramount issue affecting the present study was the number of events available for analysis. The Kaplan-Meier curves for each of the three main survival analyses shows the paucity of events over follow up, and the wide confidence intervals for each of the cumulative hazard estimates for the distressed participants further demonstrates the effects of low numbers on the results. Nevertheless, the confidence intervals for the distress hazards ratio (adjusted) in each of the models were not unduly wide. The results of the analysis of all cancers combined can only be viewed as illustrative of general risk and not a legitimate test of the first hypothesis. It was not possible to fit a survival model successfully to the breast cancer data and so only the smoking-related model afforded an opportunity to test the first two hypotheses.

Poisson regression models were used for the initial analyses and while the Poisson distribution is appropriate for rare events such as cancer, this technique assumes that the cancer events followed a Poisson distribution, i.e. were independent events occurring at a constant probability rate in continuous time (Rabe-Hesketh & Everitt 2000). However, it is not necessarily realistic to assume as this technique requires that the hazard for cancer is the same before and after an event (registration); the odds of further malignant disease may be slightly increased by diagnosis (McKinnell et al. 1998). It is fitting that this was not the technique relied upon to test the first hypotheses, but it may well have misled the model generation for the survival analyses, since the choice of variables for these models was directed by the Poisson regression results.

The Weibull distribution was deemed appropriate for the main analyses, although some researchers might have preferred the semi-parametric analytic method of Cox's regression with the proportional hazards model. This method would also have enabled the consideration of time-dependent covariates, features of risk that changed over the course of the study, e.g. giving up smoking at phase 2, or taking up HRT or more radically, undergoing hysterectomy after phase 1. Nevertheless, these sorts of analyses would have been prey to the effects of non-response at later phases (see Table 3.2a in Chapter 3).

The procedure of fitting statistical models for both the Poisson regression analyses and the survival analyses may have been inappropriately ordered. The sequence observed for this study was distress only, followed by distress and health behaviours (and explanatory variables) and only then taking into account the effect of confounders such as age, gender and grade. This method was chosen because a key aim was to observe the effect on the distress coefficient of the addition of the health behaviour and other explanatory variables to the model. It may well have been more appropriate to determine the influence of the confounding variables on distress and on health behaviour variables separately to begin with and then follow the sequence: distress only; distress plus confounders; distress plus confounders plus health behaviours.

6.2.3.5 Design and methodology

As previously discussed (section 2.3.2), the cohort design has considerable advantages over the traditional case-control design, although Breslow & Day (1987) have argued that the two methods can, 'under favourable circumstances, give the same results' (p. 9). Used in conjunction with survival analysis, the cohort design constitutes a very powerful tool to examine aetiology and address issues of causation. In this instance, given the infrequency of occurrence of cancers of any one site and allowing for the length of the follow up, the cohort design may have proved to be too general to address the research question.

Unfortunately, it was not possible to collect further data for the present study in order to address the research questions. Otherwise, a nested case-control design, either

specifically examining the effects of distress on breast cancer in women, or smoking-related cancers in men, may well have been productive, notwithstanding the potential loss of power. A study of this sort could have taken into account both data from later phases and newly sourced data to address gaps in the current data set (such as age at menarche, quitting behaviour, etc.). This alternative would also have permitted the collection of data specifically relevant to the other pathways in the conceptual framework (see section 6.4). However, the cohort design retains significant advantages in its capacity to demonstrate the full range of long-term effects of a health exposure, as well as the elimination of recall and selection bias (Breslow & Day 1987).

The examination of the association between psychological distress and health behaviours at baseline was limited by the cross-sectional nature of the data. When considering the characteristics of participants with distress at baseline (sections 4.4 and 6.2.2.3), one cannot reliably choose between two statements of this type: 'Men with psychological distress were more likely to be current smokers' and 'Men who were current smokers were more likely to exhibit psychological distress'. The results of logistic regression analyses performed to assess the prediction of health behaviour at later phases were affected to some degree in women but not in men by the levels of non-response at these later phases.

6.2.3.6 Comment on methodological issues

Some of the reservations expressed here are not unique to this study and may be made for a great deal of cohort research with respect to measurement or design (irrespective of whether primary or secondary analysis has been undertaken). For example, a related issue to measurement error is the matter of data entry and management, which in a sample of this size, cannot but be subject to some element of random error, in addition to that introduced by the researcher undertaking secondary data analysis. But the key concern is whether these issues constitute shortcomings of the study, or seriously compromise the validity of the findings. This will be explored further in the next section (6.3).

6.3 The Present Research in Context

The results of this study support those from the Alameda County Study (Kaplan & Reynolds 1988), the Walnut Creek Contraceptive Study (Hahn & Petitti 1988), the National Health and Nutrition Examination Survey (Zonderman et al. 1989) and the Osteoporotic Fractures Cohort (Whooley & Browner 1998) in finding no association between depression, or distress, and cancer incidence. More years of follow up with the Whitehall sample may well confirm the findings of the present study.

However, it may not be stated with confidence that this study furnishes conclusive evidence of no association between psychological distress and cancer incidence. The possibility that analysis of the present study after another 10 years might yield a positive association between distress and cancer risk cannot be excluded at this time. The Western Electric Health Study reported a positive association with mortality after 17 years (Shekelle et al. 1981) and incidence after 20 years (Persky et al. 1987). Of the other cohort studies, only the Alameda County Study had more than 15 years of follow up.

In common with the Mini Finland Health Study (Knekt et al. 1996) and the WEHS, the sample for the present study were in middle age, excluding younger adults who would be at much lower risk for developing cancer. The null findings of the WCCDS are undermined by the relatively young population in that study and the absence of oral contraceptive use from the estimation of breast cancer risk. Equally, it may be argued that the age range of the samples from the NHANES study, the ECA study (Gallo et al. 2000) and the Alameda County Study were too wide to address the issue effectively, although Zonderman et al. (1989) did examine risk in a sub-group of older adults and found no evidence of an association. In contrast, the much older sample of the Established Populations for Epidemiologic Study of the Elderly did show an association between depression and cancer risk, but for repeated measures (i.e. chronic depression) rather than a single measure of depression (Penninx et al. 1998).

Apart from the WEHS, there remain findings of positive associations between chronic depression and cancer incidence (Penninx et al. 1998), depression and cancer risk in heavy smokers (Washington County Study; Linkins & Comstock 1990) and depression

and lung cancer risk in men (Knekt et al. 1996). These studies have not been without criticism (Covey, Glassman, & Dalack 1991; Friedman 1996), leading to the suggestion that the association, if any, is confounded by smoking behaviour.

With regard to the Washington County Study, Covey et al. (1991) have argued that the non-depressed will find smoking cessation easier than the depressed, leading to a reduction in risk over time in the former group, a possibility not accounted for in that study. In response, Linkins and Comstock noted that the limited assessment of smoking status after baseline 'applies to almost all prospective studies' (Linkins & Comstock 1991, p.325). An effort was made in the present study to predict current smoking as a function of distress and after controlling for previous smoking behaviour, the distressed were no more likely to be smoking at later phases, but at phase 3, while remaining non-significant, the odds ratio had increased from 1.05 to 1.4 (95% CI 0.95 – 2.09). This suggests that this is an issue which deserves closer inspection, particularly over longer periods of follow up.

The present study benefited from objective national reporting of cancer incidence and mortality. In common with most of the previous cohort studies, participants with a history of cancer at baseline were excluded. However, a number of studies either failed to do so or failed to report having done so (the NHANES, OFPC and ECA studies). Low numbers of events have prevented analysis by site in previous studies (Kaplan & Reynolds 1988; Linkins & Comstock 1990; Penninx et al. 1998; Persky et al. 1987; Shekelle et al. 1981; Whooley & Browner 1998; Zonderman et al. 1989), but the present study extended the grouping strategy of Linkins & Comstock (1990) and others (Davey Smith, Shipley & Leon 1998; Gunnell, Davey Smith et al. 1998). As it turned out, the success of this innovation was limited by the small numbers of events, but it is proposed that grouping can only be an interim strategy at present and single site analysis preferred where possible (e.g. WCCDS, MFHS, ECA).

Furthermore, there is still the question about the nature of the independent variable: is it distress, or clinical depression that is salient to cancer risk? The lack of association found between overall psychiatric diagnosis and cancer risk found elsewhere (Knekt et al. 1996; Dalton et al. 2002) suggests that the focus on depressive illness is appropriate.

The present study was limited in measuring distress (albeit chronic) rather than depression *per se*, although the distress measure (GHQ) has been validated against the Clinical Interview Schedule previously (Stansfeld & Marmot 1992). There was an assessment of depressive symptoms, using the sub-scale from the GHQ, but this was, if anything, found to be less likely to be associated with cancer risk over follow up. The distress measure did identify a slightly larger proportion of the sample as distressed compared with inventory measures of depression in other studies (Kaplan & Reynolds 1988; Knekt et al. 1996; Linkins & Comstock 1990; Penninx et al. 1998; Zonderman et al. 1989). In contrast, the proportion identified in these studies was similar to that scoring highly on the depressive symptoms sub-scale in the present research. Previous studies which did find an association used a variety of measures, including the MMPI (WEHS), the GHQ-36 (MFHS) and the CES-D (EPESE and WCS). Notably, the EPESE study used a stricter cut-off on the CES-D scale, as well as repeated measures over 6 years prior to baseline to establish chronic depression. This use of the measure, unlike a one-off assessment of depression in the same study, found a significantly elevated hazards ratio for risk of cancer.

Musselman et al. (1998) note that dimensional measures are advantaged by having 'increased statistical power to detect smaller "effects"' and this has been borne out in the depression and cancer literature (see 1.2.3.3), but these authors go on to caution that 'such epidemiologic data are not equivalent to clinical data' (p. 581). It may well be that the timing is the most important element, rather than whether one uses a continuous or dichotomous means of assessment (Horwitz & Scheid 1999).

Health behaviour, principally smoking, was implicated by the findings of the WCS, MFHS and Danish Psychiatric Cohort studies and in the commentary of a variety of authors (Croyle 1998; Friedman1996; McGee, Williams, & Elwood 1994). The present study explicitly identified health behaviour as a pathway between distress and cancer risk, rather than considering it as another variable or covariate to adjust for, or to be 'controlled out' in the analyses. The key assumption was that health behaviours are shaped by the experience of distress or depressive illness; since these behaviours tend to be habitual, there is the possibility that they outlast the affective exposure,

perpetuating risk. The evidence from the present study is suggestive in this regard, but further research is required.

Even if the research model was not successfully tested (i.e. the failure to address hypothesis II), there is merit in the attempt to clarify the relationship between distress and cancer risk. If distress, or even depression, can have significant associations with health behaviours associated with cancer risk, why not distress and cancer? This issue is explored further in the next section, which revisits the conceptual framework for the present study.

6.4 The conceptual framework revisited

The explicit investigation of health behaviours as a pathway through which distress might affect cancer risk is a novel step in the literature on depression and cancer risk. As mentioned, it has been more usual to consider health behaviours as covariates, or even confounders, if at all, rather than as conceptually essential to determining the relationship between depression and cancer risk. However, the difficulty in investigating this indirect means of association in the absence of evidence for a direct association between cancer and depression may go some way to explaining a seeming lack of attention to the issue.

6.4.1 The cognitive-behavioural pathway

Health behaviours make up only one part of the cognitive-behavioural pathway in Steptoe's (1991) framework, which is complemented by the psycho-physiological pathway. The definition of health behaviours has been rather narrow in the present study, limited to the conventional use of the term and what was measured in the parent study. But the term also subsumes behaviours such as screening uptake and help-seeking, both relevant to the timing of incidence. A technique such as path analysis might be used to identify latent variables; but it could be argued this would tap not so much the unknown as the unmeasured. A more inclusive definition of the cognitive-behavioural pathway would include assessment of health cognition such as illness representations (Leventhal & Nerenz 1985), as well as assessment of social cognition models.

This thesis does not suppose that depression (or distress) is the sole risk factor for cancer, or that it has a greater contribution to make; there are many other risk factors for cancer. All other things being equal, the question is how its effects might work, and moderate or limit the effect of other established risk factors.

A curvilinear relationship between age and many health behaviours has been shown, with higher incidences of health-risking behaviours in younger adults and much lower incidences in children and older adults (Blaxter 1990). In mid-life, one might be expected to have settled with a lifetime's habits; but encroaching age and morbidity may require lifestyle changes for a variety of reasons, from elevated blood cholesterol

and high BMI to the onset of hypertension, type II diabetes and so on. But a person with depressive disorder in their younger years might have developed a range of poorer health behaviours, from smoking and alcohol use, to diet and exercise, with greater implications for behaviour change. Since persons with depression tend to have, for example, difficulties with smoking cessation (Anda et al. 1990; Hughes et al 1986), it may well be the case that rather than the distressed or depressed person having particularly poor health behaviours, the relevant issue is their ability to change their health behaviours as they age and as their circumstances change.

There were demonstrable differences in health behaviours as a function of distress in the present study, although these were less apparent in women. Men who were distressed were more likely than their non-distressed fellows to be current smokers, consume more alcohol, eat fruits or vegetables less frequently and participate in less regular exercise. Distressed women tended to consume alcohol more heavily and partake in less moderate physical activity. Whether these differences translated into differences in risk was not observed.

6.4.2 The psycho-physiological pathway

Interestingly, the Alameda County Study and the OPFC study both found depression to be associated with increased risk for cardiovascular mortality and non-cancer non-cardiovascular mortality (Kaplan & Reynolds 1988; Whooley & Browner 1998). Other studies have also shown an association between depression and mortality (Bruce et al. 1994; Zheng et al. 1997). An interpretation of the psycho-physiological pathway processes for depression might be that hyperreactivity is most relevant to cardiovascular disease risk while the disease stability process is more relevant to depression and cancer progression, post diagnosis. This leaves the host susceptibility process as the most promising avenue for a direct association between depression and cancer incidence over a long period of follow up.

This understanding of the psycho-physiological processes suggests a reinterpretation of the practice whereby neoplastic events from the first years of follow up are eliminated from the analyses. This was done in the present study in order to exclude the charge that distress arose from preclinical neoplastic disease processes, that is

identifying the fore-runner of disease rather than a possible cause. This was a strategy preferred in other cohort studies (e.g. WEHS, MFHS), although it made little difference to their results. But the Danish Psychiatric Cohort found increased risk in their sample for a number of cancers (non-tobacco related) within the first year of follow up (Dalton et al. 2002). On the one hand, utilisation of this strategy may, in fact, be an instance of incidence-prevalence bias, in that those individuals at increased risk had already been removed from consideration. On the other, it may be that two distinct processes underlie short term and longer term risk and without the elimination of early events, the contribution of the two processes of disease stability and host susceptibility overlap.

This development also casts new light on the issue of competing causes. As is so often typical of a large cohort, a number of the original sample are lost to follow up through migration, withdrawal or some other reason, while another proportion succumb to a disease other than the one of interest. Conventional wisdom regards the first group to be at no less risk of the outcome of interest simply because they are no longer part of the study, and that the second group are censored and considered 'no longer at risk from the failure of interest' (Clayton & Hills 1993, p. 63). But in relation to the research question of this thesis, this censoring may be more informative than is normally assumed; 'losses' of participants to heart disease may reflect the action of the hyperreactivity process.

The psychobiological framework as used here does not exclude the possibility that other sources of stress, or exposure to recognised carcinogens, act over and above the effects of distress or depression. One might level the charge that this framework may prove too simplistic to represent the variety of sequences of events and interactions that might occur. Similarly, it remains unclear as to whether the effects on cancer risk are uniform across sites, which is implicit in the construction of the grouping strategy, or particular, as Gallo et al. (2000) suggest, for hormone-related neoplasms.

6.4.3 Implications for research

Cohort epidemiological designs have proved influential in establishing the distribution and determinants of disease, in particular developing our understanding of the

multifactorial causes of chronic disease. In a cohort study, the temporal arrangement of exposures and events may be determined and taken into account in the analysis, a clear advantage over the cross-sectional data from the mid-twentieth century. But these are nonetheless descriptive or observational types of study design, and tend to be slow to produce results. On a practical level, one cannot randomise individuals to have depression or psychological distress. But nor is it possible to determine with accuracy the exposure context or history of the person with distress or depression prior to entry to the study and it is a particular point of concern that another unmeasured factor might be confounding the results (Fox 1998b). This observation applies to the present study as well as previous ones.

A tremendous strength of cohort studies is the richness of data they offer (Wardle 2000), not least in secondary analysis (Clarke & Cossette 2000). But for secondary analysis, which is the fundamental nature of nearly all cohort studies in this area, there are limits on availability and access to data and it is difficult to augment the original study design. It can be even more difficult to impose theory *post hoc*. Commenting on stress research, but relevant here, Marmot and Madge (1987) remarked that epidemiology may be guilty of 'not taking biological and physiological mechanisms sufficiently into account' (p. 10). A true test of the research model of this study requires the collection of much more data.

The majority of the cohort literature reviewed in this thesis is marked out by the lack of a theoretical background to explain the presence or absence of an association. Many left that to their discussion of their research; others failed to consider it at all. Perhaps this was due to editorial requirements in publication, or sprang from natural caution and an understandable desire to distance one's work from some of the wilder enthusiasms of earlier twentieth century research. But anyone can investigate whether a factor is associated with a disease outcome, if x is associated with y; indeed, the epidemiology of heart disease is cluttered with variables and factors that have been associated with that outcome. What matters is that research proceeds on a theoretical basis and tests a particular model of association (Marmot & Madge 1987). Steptoe's (1991) framework provides a more than useful starting point for research in this area.

It may well be the case that there is only a tenuous link between psychological distress and cancer, and that investigating its association with heart disease would prove more productive, and that indeed seems to be the current direction in the literature e.g. (Stansfeld et al. 2002). A key limitation of the present study was the inability to test the second hypothesis in the absence of evidence for the first hypothesis. In fact, further research in relation to cancer risk might be better served by abandoning the cohort design for smaller studies geared towards establishing the nature and contribution of the different pathways. Smaller-scale research also tends to be in a better position to respond to novel developments in the literature. For example, some recent research would appear to indicate that smoking may in itself increase the risk for depressive disorder (Lasser et al. 2000). Although this has been found in a younger population than the Whitehall II Study, it does have implications for the model underlying the present research and the research question itself, as it upsets the temporal arrangements assumed here and elsewhere.

6.5 Concluding remarks and future research

The present study succeeded in assessing the association between distress and cancer incidence, albeit in accepting the null hypothesis, with the proviso that further follow up was needed to confirm the results. This was mainly because the younger participants, who were more likely to be distressed, had yet to reach the median and upper reaches of population rates of cancer risk. The present study was moderately successful in ascertaining the relationship of psychological distress with health behaviours. The hypothesis was corroborated in men but not in women and the results of this study establish a case for further research in this area. Hypotheses I and III were successfully tested; however, hypothesis II was not. As such, the quality of evidence in the present study is only suggestive of a means by which distress could affect cancer risk, if at all.

6.5.1 Directions for future research

Despite some limitations which have been touched upon in this thesis, the Whitehall II Study remains an important source of evidence, both for this area and in addressing other research questions. There are several possible directions for further research within the Whitehall II Study.

A major conclusion of the present study is that further analysis is required in the future, in order to allow the sample to reach a more appropriate age range in terms of cancer risk. A repeat of the analysis of the present study, performed when there has been 15 to 20 years of follow up, may prove more productive in testing both the first and second hypotheses.

Alternatively, one could emulate the work of Penninx et al. (1998) and investigate the effects of chronic distress on cancer risk. The repeated measures of psychological distress at phases 1, 2 and 3 could be used to establish a measure of chronic distress. Excluding participants who have developed or died from cancer by the end of the current follow up period, the sample could then be followed over time to assess the association with cancer incidence. Also, incidence could be compared in those who were distressed at one time point compared with those who were chronically distressed. Unfortunately, this approach suffers from the pattern of non-response at

phases 2 and 3, in that individuals with distress may well be missed and the sample size will be reduced, but the idea still has some merit; it is likely that the EPESE study faced similar issues.

As cautioned by Breslow and Day (1987), the rarity of cancers may have proved too much for the cohort design to address the research question successfully. The opportunity remains to conduct a matched nested case-control study within the Whitehall II Study, as suggested in section 6.3, with breast cancer as the most promising site. Being undertaken on a much smaller scale, it would be more feasible to collect additional data on these cases and matched controls, particularly with respect to reproductive information, which was incomplete at phase 5 and which gravely limited some of the regression analyses in the present study.

Sadly, this study did not provide the opportunity to fully investigate the relationships between psychological distress and health behaviours, and cancer risk. But it did provide compelling indications that further research is required, not least for the relationship between distress and health behaviour. Staying within Whitehall II, further study could examine more closely the persistence of health-risking behaviours (such as smoking, heavy alcohol use, poor diet etc.) amongst the distressed as compared with the non-distressed. The availability of lifetime psychiatric diagnoses at phase 5 from the CIDI would enable the comparison of psychiatric definitions of depression with distress, both in terms of health behaviours and subsequent cancer risk. Future cohort studies should endeavour to compare dimensional and categorical types of measurement where possible to settle this issue (Temoshok & Heller 1984).

In terms of the conceptual framework which guided the present study, there are a number of directions which require, and which might already be receiving, clarification. New research might compare the health behaviours of individuals with distress and those without distress over time, and compare those findings with a similar study looking at clinical diagnoses of depression. Such studies would also present the opportunity to consider intervening variables on the health cognition, such as social cognition models (Connor & Norman 1995). Altogether this would lay a foundation for intervention studies, to facilitate changes in health-risking behaviour as

required. It is clearly apparent that more research is needed and that there are strong suggestions that the health behaviours of people with depression leave somewhat to be desired. Moreover, as Dalton et al. (2002) imply, there should be greater effort to intervene and ensure the best possible 'lifestyle' for this group.

Investigating the different aspects of the psycho-physiological pathways is more dependent on inter-disciplinary cooperation and understanding and necessitates a coordinated programme of research. This would be greatly assisted by developments that facilitated inexpensive and ideally minimally intrusive monitoring of the immune and neuroendocrine systems and the HPA axis. Above all, this requires a biopsychosocial approach, to try to encompass the influence of all levels on the aetiology and progress of disease. This may require strenuous attempts to resist the pull of one's own field, and the judicious application of reductionism. Moreover, with no less difficulty implied, it may well be necessary to look not just at cancer risk, but at risk for heart disease in tandem.

6.5.2 Concluding remarks

Reflecting on the historical literature, one is struck by the extraordinary persistence of an idea about emotion and the development of cancer in a variety of forms, over history and over diverse paradigms. There has been a great variety of perspectives: from humours, grief, helplessness, apathy, suppression of emotion, traits, personality and latterly to depression and distress. Is this latest focus of interest, depression, driven by pragmatism or paradigm? It is in some ways more convenient because it is a definable measurable construct and amenable to intervention on many levels (while one might argue that trait and personality aspects are not so amenable to change and smack a little of victim-blaming). But is it research setting the agenda, or theory?

Fox, a leading commentator on this field, has seemed increasingly scathing about the relevance of psychological factors (Fox 1995; Fox 1998a). He has stated, 'if a psychological factor is associated with a physical carcinogen, it will not be considered an independent variable, although it may be regarded as a possible confounder' (Fox 1995). In strict epidemiological terms he may well be quite right. But surely it is foolhardy to disregard the context of risk factors and behaviours, especially in

considering the potential for intervention. Writing on ethnicity, Nazroo (2001) warns that the technical advances and expertise of epidemiological techniques cannot balance a lack of examination of explanatory factors and clues to aetiology (Nazroo 2001).

If anything, this study and the body of research to which it belongs, raises questions about the health behaviours of people with depression or distress, especially with respect to smoking. By necessity, this translates into a healthcare goal for secondary treatment of individuals with depression in order to prevent further ill-health. Leaving aside the specifics of the psycho-physiological pathway for a moment, one might be moved to conclude that '...depression itself cannot harm you, only what *you* do about it can' (Lewis 2002, p. 203).

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Appendix I

Cancer Grouping

Rationale & Literature Review

Summary of Groups

This appendix marshals the literature in support of the grouping rationale used in this thesis (see Chapter 2, section 2.3.1.2; Chapter 3, section 3.3.4.3). The variables associated with cancer risk are summarised in Table I.1. Cancer sites are grouped according to the explanatory variables (health behaviours) and covariates (e.g. reproductive factors) in terms of increased risk first (section 1). Then the protective effects of specific factors for specific sites are considered (section 2).

Table I.1 List of variables associated with cancer risk

Explanatory Variables	Covariates	Key Confounders
Smoking	Family history of cancer	Age
Alcohol use	Reproductive factors	Gender
Diet	Obesity	Socioeconomic status (SES)
Exercise		

1 Increased cancer risk

The risk factors associated with increased cancer risk are smoking, diet, alcohol intake, low exercise, obesity, reproductive factors and other factors, as outlined in Table I.2. The nature of each of these aetiological factors is explored in this section, followed by a brief introduction to the cancer site and an overview of the evidence for its association with the risk factor. The sites associated with these risk factor groups are summarised in Figure I.a at the end of this section.

Table I.2 Grouping by risk factor for increased cancer risk.

	GROUPING 1	
1	SMOKING	Cigarette smoking
2	DIETARY FACTORS	High fat intake High animal protein intake Foods with nitrate (salted, cured, pickled, smoked) Low fibre intake High starch intake
3	ALCOHOL INTAKE	Increased intake
4	EXERCISE	Low physical activity
5	OBESITY & BMI	Increased obesity & BMI
6	REPRODUCTIVE	High oestrogen exposure Nulliparity Oral contraceptive use
7	OTHER	Height Weight Viruses

1.1 Smoking

The carcinogenic effects of smoking tobacco were traditionally considered to be restricted to the lung, pancreas, bladder and kidney, as well as the larynx, mouth, pharynx (except nasopharynx) and the oesophagus through the synergistic effect of alcohol consumption (Peto 2001). However, recent evidence indicates that risk for other types of cancer are also increased by smoking, such as stomach, liver and probably cervix, although one should take into account the relative importance of different smoking-related diseases varies between populations (Peto 2001). Moreover, newly published research indicates that risk of breast cancer is increased in women who take up smoking within 5 years of menarche (Band, Nhu et al. 2002), confirming earlier suggestions in the literature (Khuder, Mutgi et al. 2001).

There are over 2 000 chemical compounds in the tobacco leaf and nicotine is responsible for the addiction and the withdrawal symptoms of smoking cessation (Baron & Rohan 1996). Unless otherwise stated, smoking refers to smoking cigarettes, rather than cigars or pipes. The degree of exposure from smoking varies due to inhalation and duration, the amount and type of tobacco smoked, as well as its interaction with other factors such as age, alcohol and diet. Most individuals start smoking between the ages of 14 and 21, so ageing confounds the duration of smoking over the lifetime. Smoking cessation complicates the picture further (Baron & Rohan 1996). While cessation avoids further exposure and reduces the excess risk from past exposure, individuals may give up because of ill health, suggesting that investigators should treat recent quitters as current smokers. Former smokers may well differ from current smokers in diet, exercise or other health-related behaviours, contributing to a change in risk.

Smoking-related cancers have been grouped in the Washington County Study (Linkins & Comstock 1990), and in analyses of the Boyd Orr (Gunnell et al. 1998) and Whitehall I cohorts (Davey Smith et al. 1998). Linkins & Comstock (1990) identified seven sites related to cigarette smoking, while the other two studies classified 17 sites (see Table I.3). Those sites to be considered here which are most strongly related to smoking include: trachea, bronchus and lung; renal pelvis and ureter; renal cell; bladder; oesophagus; and pancreas. There is evidence for some effect of smoking on cancers of

the stomach, brain, vulva, cervix uteri, colon-rectum, as well as on acute leukaemia, and these will be considered last.

Table I.3 Groups of smoking-related cancers in other research

Washington County Study (1990)	Boyd Orr & Whitehall I Cohort Studies (1998) [a]
Buccal cavity & pharynx, Larynx	Lip, tongue [140-141], gum, floor of mouth, mouth other & unspecified, oropharynx, nasopharynx, hypopharynx, buccal cavity other & unspecified, oesophagus [143-150]
Pancreas	Pancreas [157]
Bronchus & lung	Nasal cavities, middle ear & accessory sinuses, larynx, trachea, bronchus & lung, pleura [160-163]
Bladder	Bladder, kidney [188-189]
Kidney	
Cervix	

[a] ICD-9 codes (WHO 1977) in square brackets.

Lung cancer

Most who develop lung cancer will die from it, and 5-year survival rates are quite low, except for localised tumours, which have a slightly brighter prognosis. Virtually all cancers of the lung arise from the epithelial tissue, most commonly being squamous cell carcinomas, adenocarcinomas and small (oat) cell carcinomas (Blot & Fraumeni 1996). Incidence and mortality rates of lung cancer rose enormously over the 20th century before slowing more recently (Blot & Fraumeni 1996). Research shows that tobacco smoking explains the steady rise in lung cancer incidence (Doll et al. 1994; Hammond 1966; McLaughlin et al. 1995). In 1989 the American Surgeon General estimated that 90% of male and 79% of female lung cancer in the US was due to smoking (Surgeon General 1989). Throughout the world, there is twice the incidence of lung cancer in men than women, understood to be due to different rates of smoking in women, although this pattern is changing as women match men's smoking behaviour. The rates of lung cancer increase with age, although the current plateau and fall after age 80 in men and age 70 in women is attributed to smoking prevalence in earlier born cohorts.

There is an inverse association between lung cancer and socioeconomic status (SES), especially in men (Blot & Fraumeni 1996). Diet and nutrition also influence lung cancer risk (Blot & Fraumeni 1996; Colditz, Stampfer, & Willet 1987), with those in the upper

quartile of consumption of fruits and vegetables tending to have half the risk of those in the lower quartile. Moreover, those with high dietary intake of foods rich in fat and cholesterol demonstrate excess lung cancer risk (Byers et al. 1987; Goodman et al. 1989; Hinds et al. 1987; Jain et al. 1990; Mettlin 1989; Shekelle, Rossof, & Stamler 1991), but this relationship has not been found for elevated serum cholesterol (Schatzkin et al. 1988). Despite this association with dietary fat, lung cancer tends to be inversely related to body mass (see Obesity section below). Other risk factors include prior lung disease, specific occupational exposures, radiation (therapeutic or radon gas in the home) and possibly familial factors, although the latter tends to be disguised by smoking behaviour.

Renal cancer

Cancers of the kidney may be subdivided into three sub-sites for our purposes: renal cell (70%), renal pelvis (15%), and ureter (8%). Renal cell cancers are nearly all adenocarcinomas while transitional cell carcinomas make up the majority of cancers of the renal pelvis, ureter and urethra. Survival rates are improving, reaching over 50% in the 1980's (McLaughlin et al. 1996). The aetiology of cancers of the kidney remains to be explained, except for cancers of the renal pelvis and ureter, which are mostly related to smoking (McLaughlin, Blot, Devesa, & Fraumeni 1996). Rates in England and Wales are relatively low (1983-7 figures), but since not all Registers are consistent in their coding to the 4th digit of ICD-9, we cannot always be certain about the exact site of a kidney cancer. The ICD-10 coding classifies the sites separately (WHO 1992).

In keeping with a common source of causation, the descriptive epidemiologies of renal pelvis and ureter cancers resemble that of bladder cancer rather than renal cell cancer (Devesa et al. 1990). There is more kidney cancer in urban rather than rural areas, but otherwise little association with income, education or other SES factors (McLaughlin, Blot, Devesa, & Fraumeni 1996). Renal cell cancer shows a moderate relationship with cigarette smoking, although rates are not always consistent: 30% – 37% attributable risk in men, 14% – 24% in women (McCredie & Stewart 1992; McLaughlin et al. 1984). Nearly every study that has examined the relationship with body weight and renal cell cancer has shown an association, slightly more so in women, though the underlying mechanism is unclear (McLaughlin, Blot, Devesa, & Fraumeni 1996). Use of diuretics

has been associated with a five-fold increase in risk of renal cell cancer in women, although the relationship between this cancer and hormone-related variables, if any, is unclear.

Smoking related risks for cancers of the renal pelvis and ureter are higher than they are for renal cell cancer or bladder cancer, with smokers having 2 to 7 times the risk of non-smokers. This figure rises to 5 to 11 times the risk for heavy smokers. The population attributable risk for cancers of the renal pelvis and ureter is 70% - 82% in men, and 37% - 61% in women (McLaughlin et al. 1983; McLaughlin et al. 1992). There is a pronounced reduction in risk with smoking cessation, which suggests that the effect of smoking occurs at a late stage in carcinogenesis. Phenacetin-containing drugs have been associated with tumours of the kidney, ureter and bladder (IARC 1980; IARC 1987), but in most industrial countries from the 1960's on this chemical has been removed from analgesics. Other risk factors include dietary factors (see below), medical radiation (for cancers of renal pelvis and ureter), haemodialysis and tea drinking, although evidence for an association with coffee consumption did not persist after controlling for cigarette smoking (McLaughlin, Blot, Devesa, & Fraumeni 1996).

Bladder cancer

The majority of cancers of the bladder are histologically confirmed as transitional cell carcinomas (93%). There has been an increase in incidence of cancers diagnosed 'in situ' and the 5-year survival rate for localised disease is 91%, dropping to 9% for distant disease (Silverman, Morrison, & Devesa 1996). Bladder cancer occurs more often in men than in women, at a ratio of 3:1 (Silverman, Morrison, & Devesa 1996). Both incidence and mortality rates rise sharply with age, with two thirds of cases occurring in people aged 65 or older (Silverman, Morrison, & Devesa 1996). Rates are higher amongst white men than in other ethnic groups and while there seems to be little or no association with SES (at least in the US) there is a suggestion of greater mortality in urban rather than rural areas (Silverman, Morrison, & Devesa 1996). Although there are established occupational risk factors, these would be arguably less applicable to a predominantly non-industrial cohort like Whitehall II. Otherwise smoking is the most established risk factor, demonstrated in over 30 case-control and

10 cohort studies and the proportion of cases attributable to smoking is greater than for other preventable risk factors (IARC 1980; IARC 1987; Silverman et al. 1989).

Current smokers have 2 to 3 times the risk of non-smokers (Silverman, Morrison, & Devesa 1996). Smoking cessation is associated with a 30% – 60% fall in cancer risk for this site (IARC 1986), which suggests that cigarette smoke contains agents which act at a later stage of bladder carcinogenesis (Hartge et al. 1987). The attributable risk due to smoking is 48% of bladder cancer in men and 32% in women (Hartge et al.1987). The risk associated with smoking varies with delivery exposure (unfiltered versus filtered cigarettes, dark versus lighter tobacco, deeper versus more shallow inhalation) and there is a clearer relationship with pipe rather than with cigar smoking. Most research investigating an association with alcohol consumption indicates a positive relationship, but this is likely to be confounded by smoking. Other risk factors include dietary factors (see 1.2 below), drugs containing phenacetin, some chemotherapy treatment drugs, urinary stasis, and radiation (typically from medical exposures).

Oesophageal cancer

The 9th most common cancer in the world, cancer of the oesophagus is rapidly fatal for most, even with access to the best medical facilities (Muñoz & Day 1996). It is an epithelial type of cancer with over 90% classified as squamous cell carcinoma. It is a disease of the poor in most parts of the world. Heavy consumption of alcohol and cigarette smoking are the main culprits for increased risk, with 90% of risk in Western Europe being attributable to these agents (Muñoz & Day 1996). Breslow and Day generated a multiplicative model to explain the relationship (Breslow & Day 1980) and the main effect is amount of ethanol consumed rather than type of drink per se. There is an exponential increase in risk with alcohol intake as opposed to a less than linear increase in risk due to smoking tobacco on its own (Muñoz & Day 1996). Nevertheless, heavy smokers have a relative risk in the region of 5 for cancers of the oesophagus (Baron & Rohan 1996), but low SES and poor nutrition are also important. Other suggested risk factors include drinking very hot drinks (such as hot maté through a pipe to the back of the throat), consumption of pickles, human papilloma virus (HPV) and some occupational exposures.

Cancer of the pancreas

This is one of the most rapidly fatal cancers, its presentation and course marked typically by great pain. Patients have a less than 1 in 5 chance of surviving for a year after diagnosis, with median survival of 3 months and a 5-year survival rate of less than 3% (Anderson, Potter, & Mack 1996). Fortunately it is a relatively uncommon cancer, with age-adjusted incidence rates per 100,000 of 7.4 in men and 4.9 in women in England and Wales (Parkin et al. 1992). Most cancers arise in the exocrine part of the pancreas and are typed as adenocarcinomas. Age is the most reliable and important known predictor of cancer incidence (Anderson, Potter & Mack 1996). Pancreatic cancer is very uncommon in the first three decades, but after age 30 rates increases in a log-linear fashion (i.e. in the 8th decade one has 40 times risk of those in the 4th decade). The majority of cases occur between 65 and 79 years, while the median age at diagnosis in the US is 71 (Miller et al. 1992). It is 50% more common in men than women (Anderson, Potter & Mack 1996). There is no particular association with SES although there are slightly higher rates in urban rather than rural areas.

The most consistent individual risk factor for pancreatic cancer is smoking (IARC 1986). This is supported by evidence from 9 cohort studies and 8 case-control studies. The first major step in prevention is to reduce cigarette smoking. Smokers have twice the risk or more of non-smokers for developing pancreatic cancer (Baron & Rohan 1996). Given the function of the pancreas in the digestive system the role of diet is emphasised, but there is no contact between the pancreas and either foodstuffs or waste. Therefore risk comes from metabolites or metabolic change in the organ, or from blood-borne agents, or indeed both (Anderson, Potter & Mack 1996). The results from this research have been less consistent than for smoking, but there seems to be increased risk from animal protein and fat consumption and reduced risk with fruit and vegetable intake (Anderson, Potter & Mack 1996). Other sources of risk include some industrial exposures, diabetes mellitus and pancreatitis.

Cancer of the tongue

Cancer of the tongue is the most common primary site of cancer of the oral cavity (Ries et al. 1996). This cancer occurs less frequently in women than men and shares common

causal factors with cancers of the sites that make up the oral cavity and pharynx, namely tobacco and alcohol (Muir & Nectoux 1996).

Cancer of the oropharynx

Cancers of the oropharynx, in common with other sinonasal cancers, derive from epithelial tissue and tend to be of squamous cell type (Roush 1996). Rates of this cancer increase with age, although it is rare and the role of occupational exposures is prominent. However, tobacco smoking has been identified as a risk factor from descriptive epidemiology and case-control studies (Roush 1996).

Other sites: brain, stomach, cervix uteri, vulva, leukaemia, colon-rectum

Taken together, these latter sites do not have strong enough associations with smoking to argue successfully for their inclusion in the smoking group for the present research. It would however be unwise to fail to note the nature of these associations. Tobacco smoke is a potential source of the *N*-nitroso compounds (NOC) that have been found to be the most potent experimental carcinogen for cancer of the brain (Preston-Martin & Mack 1996), although there are other endogenous and exogenous sources (e.g. cosmetics, car interiors, cured meats). Other risk factors include radiation, trauma and diet (NOC containing foods), although as Preston-Martin and Mack remark, 'we simply have no idea what causes most nervous system cancers' (1996, p. 1272).

The evidence for an association between cigarette smoking and stomach cancer is equivocal. Some studies show an increased risk for heavy smokers (Hu et al. 1988; McLaughlin et al. 1990; Risch et al. 1985; Wu-Williams, Yu, & Mack 1990; You, Blot, & Chang 1988), while others support an association but without any dose-response relationship (Correa et al. 1985; Haenszel et al. 1972; Hoshiyama & Sasaba 1992; Kato, Tominaga, & Matsumoto 1992; Nomura et al. 1990). Still others do not support any association (Buiatti et al. 1989; Jedrychowski et al. 1986; La Vecchia et al. 1987; Wynder et al. 1963) but more research is needed given the contribution of NOCs in food to the development of cancer at this site (Nomura 1996).

While the association of cervical cancer with HPV is well acknowledged (Schiffman et al. 1996) there is some suggestion of smoking as a lesser risk factor, given the excess

risk of this cancer amongst smokers. Studies that controlled for age at first intercourse, number of sexual partners and/or social class, found the association persisted (Schiffman et al. 1996). Little is known about the causes of cancer of the vulva, which primarily afflicts elderly women with rates higher in lower social classes. However, the few studies that have examined cigarette smoking as a risk factor have consistently shown an increased risk (Daling & Sherman 1996). Other risk factors that have shown a positive association include exposure to human papilloma virus (HPV) and oral contraceptive use.

There is some evidence for a modest association between smoking and acute leukaemia, with most studies supporting this particularly for acute myelogenous leukaemia (Baron & Rohan 1996; Linet & Cartwright 1996). However, evidence for other exposures is stronger (i.e. occupation, radiation, viruses). Smoking also seems to be associated with increased colorectal adenoma, which are precursor neoplastic lesions in the bowel, but not with colorectal carcinoma itself (Schottenfeld & Winawer 1996).

1.2 Dietary Factors

Doll and Peto suggested in their seminal paper that some 35% of cancer in the US had a dietary origin or contribution (Doll & Peto 1981). While no single factor emerges as carcinogenic or anti-carcinogenic (Peto 2001), this has not prevented some authorities from pronouncing quantitative recommendations (American Institute for Cancer Research / World Cancer Research Fund 1997). However, the methodology of dietary epidemiology is very complex and encompasses a diverse range of variables. It is extremely difficult to measure nutrient intake with reliability and validity, never mind control for confounding by other nutrients and total energy consumption (Schottenfeld & Winawer 1996).

Dietary factors cannot be considered in the same unified fashion as used in the grouping of smoking-related cancers and so this group becomes a catchall for a range of sub-groups, listed in Table I.4. Key risk factors appear to be total energy intake (sometimes assessed by measures of obesity), dietary fat, and salt (Willett 1996). Dietary fat seems the most clearly related to colon and breast cancer, illustrated by

international studies of per capita fat intake and rates of malignancy, while salt appears to act as a local irritant (Willett 1996). The association between fat and meat intake and colon cancer is far clearer than that between dietary fat and breast cancer risk. The protective role of a high fibre diet has been highlighted by Burkitt's work in Africa, and indeed high fibre intake is associated with reduced colon cancer risk in case-control studies, this being especially the case for fruit and vegetable sources, less so for cereal sources (Willett 1996).

Table I.4 Dietary factors summarised for increased cancer risk at related sites

Dietary Factor	Sites with established evidence	Sites with less established or suggestive evidence
High fat intake, elevated animal protein intake	COLORECTAL PROSTATE BLADDER BODY OF UTERUS RENAL CELL	Trachea, bronchus & lung Ovary Pancreas Breast
Foods with nitrate, salted, cured, pickled	STOMACH	Brain
Low fibre intake	COLORECTAL	
High starch intake		Stomach

Vitamin A plays an important role in cell differentiation. Total vitamin A (from animal and vegetable sources) is inversely related to risk of cancers of the bladder, oral cavity, larynx, oesophagus and breast, but positively related to risk of prostate cancer (Willett 1996). It is not clear whether these findings are confounded by other compound ingredients of the foodstuffs which also contain Vitamin A, as results from trials using supplements have been poor (Schottenfeld & Winawer 1996). This might suggest that the chemopreventive properties of fruit and vegetables in the diet require more than the presence of particular vitamins alone and may bear some relation to their correlates (Blot & Fraumeni 1996). Some reduction in risk also seems to be conferred by intake of vitamin C, vitamin E, and selenium, but more research is required.

Colorectal cancer

69% of cancers in the large intestine occur in the colon, while the remaining 31% occur in the rectum and rectosigmoid junction. Colorectal cancer is the fourth most common cancer worldwide (Boyle & Langman 2000). More common in economically

advantaged populations with Westernised lifestyle practices, it is sometimes termed an 'environmental' disease (Boyle & Langman 2000). Research shows a positive association of meat or animal fat intake with colorectal cancer, as well as a positive association with total energy intake (Schottenfeld & Winawer 1996). The incidence of these cancers increases exponentially in the general population with age. The UK is regarded as a 'high risk' country for colorectal cancer (Schottenfeld & Winawer 1996) and in such countries between the ages of 35 and 60 incidence rates are higher in women, while after the age of 65, rates are higher in men. Rectal cancer is more common in men than women of all ages. Colorectal cancer is more common in urban rather than rural populations and is not considered an occupational disease. However, in the US, mortality is highest among those in the higher SES category and those with the highest median years of education (Schottenfeld & Winawer 1996).

As precursor neoplastic lesions, the presence of adenomatous polyps in the large intestine is associated with increased risk of colorectal cancer. The risk of these polyps occurring is associated with a diet high in saturated fat or in the ratio of red meat to poultry and fish combined (after adjusting for total energy intake; Giovannucci et al. 1992) and low in fibre (Schottenfeld & Winawer 1996). The risk is reduced by a high fibre diet with regular intake of fruits, vegetables and grains even after adjusting for saturated fat, total calories and micronutrients (Giovannucci et al. 1992). Other influential diet factors include mutagens from cooking foods at high temperatures, particularly animal proteins, and fat intake versus energy expenditure (see Exercise section below). Other risk factors include hereditary disease, and inflammatory bowel diseases. There is also a suggestion that non-steroidal anti-inflammatory drugs (NSAIDs) confer a protective effect, as might hormone replacement therapy (Boyle & Langman 2000), but this is still under investigation. Risk factors for anal cancer tend to be sexual behaviour, HPV infection and cigarette smoking (Schottenfeld & Winawer 1996).

Prostate cancer

Cancer of the prostate is one of the leading causes of death due to cancer among men. The aetiology of prostate cancer remains unknown, although leading hypotheses concern hormonal patterns, family history and dietary practices (Ross & Schottenfeld

1996). This cancer is an adenocarcinoma, arising in glandular aciti, which spreads through the lymphatics and blood. While rare before the age of 40, incidence rates double for each subsequent decade of life and prostate cancer predominantly affects the older population. There is no clear association with SES however it is defined, but there is a slight excess of the disease in urban areas. There seems to be higher rates among white married men in the US versus never married men (Ross & Schottenfeld 1996). In terms of dietary factors, a strong correlation has been demonstrated between per capita fat consumption and international prostate cancer age-standardised mortality rates (Armstrong & Doll 1975; Carroll & Khor 1975), as well as on a regional basis (Kolonel et al. 1983). Overall research supports a positive association between high fat intake and prostate cancer (Ross & Schottenfeld 1996). The role of vitamin A in preventing prostate cancer (through daily consumption of green and yellow vegetables) requires further research (Ross & Schottenfeld 1996). Other risk factors include endogenous hormones (circulating testosterone, in-utero exposures), sexual activity and exposure to cadmium.

Bladder cancer

This cancer is described in more detail in the Smoking section above. As regards dietary factors, an increased risk of bladder cancer has been associated with high intake of total fat (Vena et al. 1992), saturated fat (Riboli et al. 1991), fatty meals (Claude, Kunze, Frentzel-Beyme, Paczkowski, Schneider, & Schubert 1986) and fried food (Steineck et al. 1990). Higher consumption of fruit and vegetables has been associated with lower risk in some studies (Chyou, Nomura, & Stemmermann 1993; Claude et al. 1986; La Vecchia, Negri, Decarli, D'Avanzo, Liberati, & Franceschi 1989; Mettlin & Graham 1979; Mills, Beeson, Phillips, & Fraser 1991), but not in others (Steineck, Norell, & Feychting 1988). There is some suggestion of an association with coffee drinking (Cole 1971), but this is weak at best and probably residually confounded by smoking (Silverman, Morrison, & Devesa 1996).

Cancer of the uterine corpus

This cancer is described in more detail in the Reproductive section that follows. The incidence of endometrial cancer increases in areas with high total dietary fat

consumption (Armstrong & Doll 1975), although the consumption of complex carbohydrates might reduce risk (Grady & Ernster 1996).

Renal cell (kidney) cancer

This cancer is described in more detail in the preceding section on smoking. Increased risk of renal cell cancer is associated with greater consumption of meat, milk, margarine and oils (McLaughlin, Blot, Devesa, & Fraumeni 1996), although Chow and colleagues have shown an association with higher animal protein consumption independent of fat and calorific intake (Chow et al. 1994). There is some biological plausibility in this finding about protein intake affecting risk, given the results of animal experiments (McLaughlin et al. 1996). Greater consumption of fruit and vegetables however is associated with decreased risk (McLaughlin et al. 1996).

Stomach cancer

95% of stomach cancers are histologically typed as adenocarcinomas, although there are different sub-types which may be associated with different kinds of exposures (Nomura 1996). The 5-year survival rate for this site is the fifth poorest, after cancers of the pancreas, liver, oesophagus and lung (Miller et al. 1993), although there has been a significant decline in the mortality rate over the second half of the twentieth century due to changes in environmental causes (Nomura 1996). Incidence increases greatly with age and the ratio between men and women ranges between 1.5 and 2.5 (Nomura 1996). Typically a disease of the poor, there is consistent evidence of association between gastric cancer and low SES (Haenszel, Kurihara, Segi, & et al 1972; Jedrychowski et al. 1993; Tajima & Tominaga 1985; Torgersen & Peterson 1956; You, Blot, & Chang 1988) with lower classes having up to twice the risk of those in higher classes. Nomura has argued that low social class is 'an indirect indicator of a shared experience that places subjects at higher risk' (1996, p. 719).

Increased risk of stomach cancer from foods containing nitrates and salted foods is well established. Nitrates are found in drinking water, green vegetables, cured meats and some cheeses, which convert to nitrites with the addition of saliva, which in turn can combine with other food contents to become *N*-nitroso compounds (Nomura 1996). These potent carcinogens are already present in smoked or salt-dried fish, bacon,

sausages, other cured meats, beer, pickled vegetables and mushrooms. Salt added to food can act as an irritant to linings, or as a promoter, or even facilitate the absorption of carcinogens. Over the twentieth century, the rise in use of refrigeration, which obviates the necessity to salt or cure food and the corresponding fall in stomach cancer rates has been taken as fair evidence to support both of these as risk factors. There was also a drop in starch consumption over the same period, but it is not clear if this association is either valid or real. On the other hand, an inverse association between stomach cancer and intake of fruit and vegetables has been shown by many studies (Nomura 1996) and this consistency is apparent despite the imprecision of questionnaire measurement of intake. Other risk factors include exposure to *helicobacter pylori*, radiation and antecedent conditions (such as gastric polyps, gastric ulcers, gastroenterostomy, chronic atrophic gastritis and intestinal metaplasia).

Other sites: trachea, bronchus & lung, ovary, pancreas, breast

The association of dietary factors with cancers of these sites is not sufficiently robust to warrant their inclusion in the dietary sub-groups for analysis. Nevertheless, it is appropriate to summarise the relevant findings here. There is some evidence of increased risk for lung cancers through consumption of foods rich in fat and cholesterol, including whole milk and eggs, but this risk is not associated with elevated levels of serum cholesterol (Blot & Fraumeni 1996). There is some suggestion of an association between ovarian cancer risk and high dietary fat intake, as well as with high coffee intake (Weiss et al. 1996). A diet high in animal protein and fat intake is also associated with some increased risk for cancer of the pancreas (Anderson, Potter, & Mack 1996). Howe and colleagues performed combined analysis from 12 large case-control studies of diverse populations and found a positive association between total fat and saturated fat intake with breast cancer risk in premenopausal women (Howe et al. 1990), but three cohort studies have not supported this association (Hunter & Willett 1994; Mills et al. 1989; Willett et al. 1987).

1.3 Alcohol

Understanding of the carcinogenic effect of alcohol is incomplete, but it is accepted to exist (Jensen et al. 1996). Alcohol is associated with liver disease, as well as pancreatitis and diseases of the gastrointestinal tract and evidence from a variety of epidemiological studies

supports the role of alcohol in several human cancers (see Table I.5). While moderate levels of alcohol consumption are protective against developing heart disease, alcohol consumption is associated with increased risk of cancers of the oral cavity, pharynx, larynx, oesophagus and liver (Jensen et al. 1996). All types of alcoholic drink affect risk, reflecting total amount of ethanol consumed. Smoking and alcohol consumption together have a synergistic effect for cancers of the upper aerodigestive tract. Heavy drinkers tend to be heavy smokers, which complicates the relationship further.

Cancers of the oesophagus and tongue have been described elsewhere in the section on Smoking. There is a suggestion, but inconsistent evidence, of a causal association between beer drinking and rectal cancer (Schottenfeld & Winawer 1996) and there seems to be some association between smoking and colorectal adenoma but not colorectal carcinoma (Schottenfeld & Winawer 1996). Although alcohol and hepatitis B infection seem to act together in liver carcinogenesis (Jensen et al. 1996), alcohol consumption is usually associated with cirrhosis that in turn is associated with hepatic cancer.

Table I.5 Alcohol related cancer sites

Sites strongly related to alcohol intake	Sites less strongly related to alcohol intake
OESOPHAGUS	Stomach
TONGUE	Liver
BREAST	Rectal
	Bladder

The evidence for an association with stomach cancer is weak (Nomura 1996) and most research indicates a positive association with cancer of the bladder although with little sense of dose or type of alcohol, it is likely this relationship is due to residual confounding with smoking, or chance (Silverman, Morrison & Devesa 1996). A positive association between breast cancer and alcohol consumption has been observed (Howe et al. 1991; Longnecker et al. 1988), with women consuming three or more drinks a day having 50% – 70% increased risk for the disease by comparison with non-drinkers (this effect was not confounded by fat intake or caloric intake). Lower levels of intake had no significant effect on breast cancer risk. Relevant to this last finding, and indeed

those for other cancers, is the routine under-reporting of alcohol intake, so actual risks might be higher than those observed (Henderson et al. 1996).

1.4 Exercise

Lower levels of physical exercise in the form of sedentary work seem to be associated with increased colorectal cancer risk (Garabrant et al. 1984). There is conflicting evidence as to whether low physical activity is an independent risk factor for cancer of the prostate(Wannamethee, Shaper et al. 2001), as it is associated with a positive energy balance, higher levels of circulating testosterone as well as increased fat distribution and body mass index (Ross & Schottenfeld 1996). The protective role of exercise on cancer risk will be explored in the next section, Group Set 2.

1.5 Obesity, BMI & Weight

Increasingly, commentators underline the importance of obesity as a risk factor for cancer (Peto 2001). Obesity is measured using body mass index (BMI), a ratio of weight over height squared using metric measurements. The evidence is strongest for post-menopausal breast cancer, then endometrial, gall-bladder and kidney cancers, as well as other cancer sites (Bergstrom et al. 2001; Helmrich et al. 1983; Josefson 2001). Under age 50, there is little or no increased risk for breast cancer with increased weight. By the age of 60, a 10 kilogram increase in weight results in almost 80% increase in risk (de Waard et al. 1977), although it is unclear if this is weight due to body fat, or weight per se (Henderson, Pike, Bernstein, & Ross 1996). The increased risk associated with endometrial cancer may be confined to older women (Grady & Ernster 1996). The positive association between body weight and renal cell cancer is slightly more pronounced in women (McLaughlin et al. 1996). An inverse relationship has also been observed between lung cancer risk and BMI, with risks twice as high in both sexes in the lowest compared with the highest quartiles of BMI (Kabat & Wynder 1992; Knekt et al. 1991). However, this was BMI 5 years prior to diagnosis, rather than earlier in life at age 20-29, which suggests either some aetiological role or signals early disease process (Blot & Fraumeni 1996). Overweight men also tend to be worse off for mortality from prostate cancer (Ross & Schottenfeld 1996).

1.6 Reproductive factors

This grouping is not related to the explanatory variables per se, but includes the most commonly occurring cancer in women: breast cancer. Hormonal processes, both endogenous and exogenous, are assumed to effect risk for cancers of the breast, endometrium, and ovaries, particularly through behavioural or reproductive correlates, but less so for risk of cancers of the prostate and testis (Peto 2001). Neoplasia result from excessive hormonal stimulation of target organs. Rather than combine all sex hormone-related cancers together as this would ignore their diverse aetiologies, this grouping, like that for dietary factors, contains sub-groups for more specific risk factors. For the purposes of the present work, reproductive factors can be summarised as oestrogen exposure, nulliparity (never having given birth) and oral contraceptive use.

Table I.6 Reproductive factors summarised for increased cancer risk at related sites

Reproductive Factor	Site
HIGH OESTROGEN EXPOSURE	Breast (Melanoma of skin)
NULLIPARITY	Corpus uteri Ovary
ORAL CONTRACEPTIVE USE	Breast Corpus uteri Vulva (Cervix Uteri)

Breast cancer

The most common cancer in women worldwide, breast cancer is comparatively rare in men, with male-female ratios of 70:1 to 130:1 typically reported (Henderson et al. 1996). The role of hormones in the development of this cancer is very established, but as genotoxins, rather than in affecting cell division. As with other epithelial cancers, risk in women increases with age, with the rate of increase very high up until age 50, and then declines. Incidence rates are positively associated to SES, most likely due to differences in reproductive risk factors, with the highest social class having 50% greater risk than the lowest (Henderson, Pike, & et al. 1984). Risk is increased with greater exposure to oestrogen and/or progesterone (Henderson et al. 1996), and this is brought about by a greater amount of time spent in regular ovulatory cycles, i.e. early menarche

and late menopause. Obesity and use of hormone replacement therapy (HRT) are also associated with increased risk. Long term use of HRT is associated with elevated risk for breast cancer (but not as much as it increases risk for cancer of the endometrium). Women with over 40 years of active menstruation have twice the breast cancer risk of women with less than 30 years of menstrual activity (Henderson et al. 1996). Without the interruption resulting from pregnancy, single and nulliparous women have increased risk compared with parous women. However this effect seems restricted to early first term pregnancies. A late first full-term pregnancy was associated with greater risk for breast cancer than in nulliparous women (MacMahon et al. 1970). Other risk factors include a family history of the disease, benign breast disease, alcohol consumption and dietary factors.

Cancer of the corpus uteri

Cancer of the corpus uteri (body of uterus) is the most common gynaecological cancer and usually is not fatal, with 5-year survival rates at 85% for whites and 55% for blacks in the US (Grady & Ernster 1996). The uterine corpus is made up of the lining and the muscle tissue, the endometrium and the myometrium respectively. The most common histological type of cancer at this site is adenocarcinoma. Incidence is typically stated in terms of cervix, uterus, and uterus 'not otherwise specified' (NOS), and if a woman's uterus has been removed (hysterectomy) then she is no longer at risk for this disease. Incidence rises steadily with age until about 65 or 70 years and then declines. There is a small increase in risk in higher SES groups, but this could reflect confounding by oestrogen use or access to healthcare. Nulliparity is associated with two or three times the risk of endometrial cancer compared with parous women, and most studies show a reduction in risk with increasing numbers of children (Grady & Ernster 1996). Furthermore, a later age at menopause is associated with greater risk for cancer of this site.

Exogenous hormones can increase the risk for this cancer by producing endometrial hyperplasia, but the risk depends on the dose and type of oral contraceptive therapy (Grady & Ernster 1996). Other risk factors include obesity, dietary factors, diabetes, hypertension or gallbladder disease. Rates of this cancer correlate highly with breast and ovarian cancers across populations, which may reflect shared risk factors such as

nulliparity and late menopause (Grady & Ernster 1996). Curiously, endometrial cancer is the only cancer that smoking seems to confer a protective effect (see protective groupings below).

Ovarian cancer

In the region of 1% – 2% of women will develop ovarian cancer in developed countries, with rates typically quoted between ages 35-64 years, as this is the best period for ascertainment (Weiss, Cook, Farrow, & Rosenblatt 1996). Incidence rates tend to be low in early life, rising into mid-life, and then reach a plateau as oocytes are used up. Rates of ovarian cancer are 50% higher in never married versus married women, with parous women showing less risk compared with nulliparous women (not confounded by age at first birth). The use of oral contraceptives should have the same effect as pregnancy, and indeed a negative association is consistently observed between oral contraceptive use and incidence of ovarian cancer (Weiss et al. 1996). Other risk factors include ionising radiation exposure, height, and dietary factors.

Other sites: melanoma of skin, vulva, cervix uteri

Cutaneous malignant melanoma occurs most frequently among the young and middle-aged, incidence rising until age 50, then slowing, especially in women (Magnus 1981). Incidence rates are slightly higher in women than in men (Parkin et al. 1992) and while the main risk factor appears to be sunlight UVB exposure combined with skin complexion type, there is some suggestion of an association with oral contraceptive use. This relies on the putative role of some hormonal factor related to childbearing which increases the risk of this cancer in premenopausal women, but the evidence is weak and inconsistent (Armstrong & English 1996) and perhaps better explained by patterns of sun exposure at different ages. Cancer of the vulva has been positively associated with oral contraceptive use (Daling & Sherman 1996), as has cervical cancer, although this latter is considered confounded by sexual behaviour and exposure to human papillomavirus (Schiffman et al. 1996).

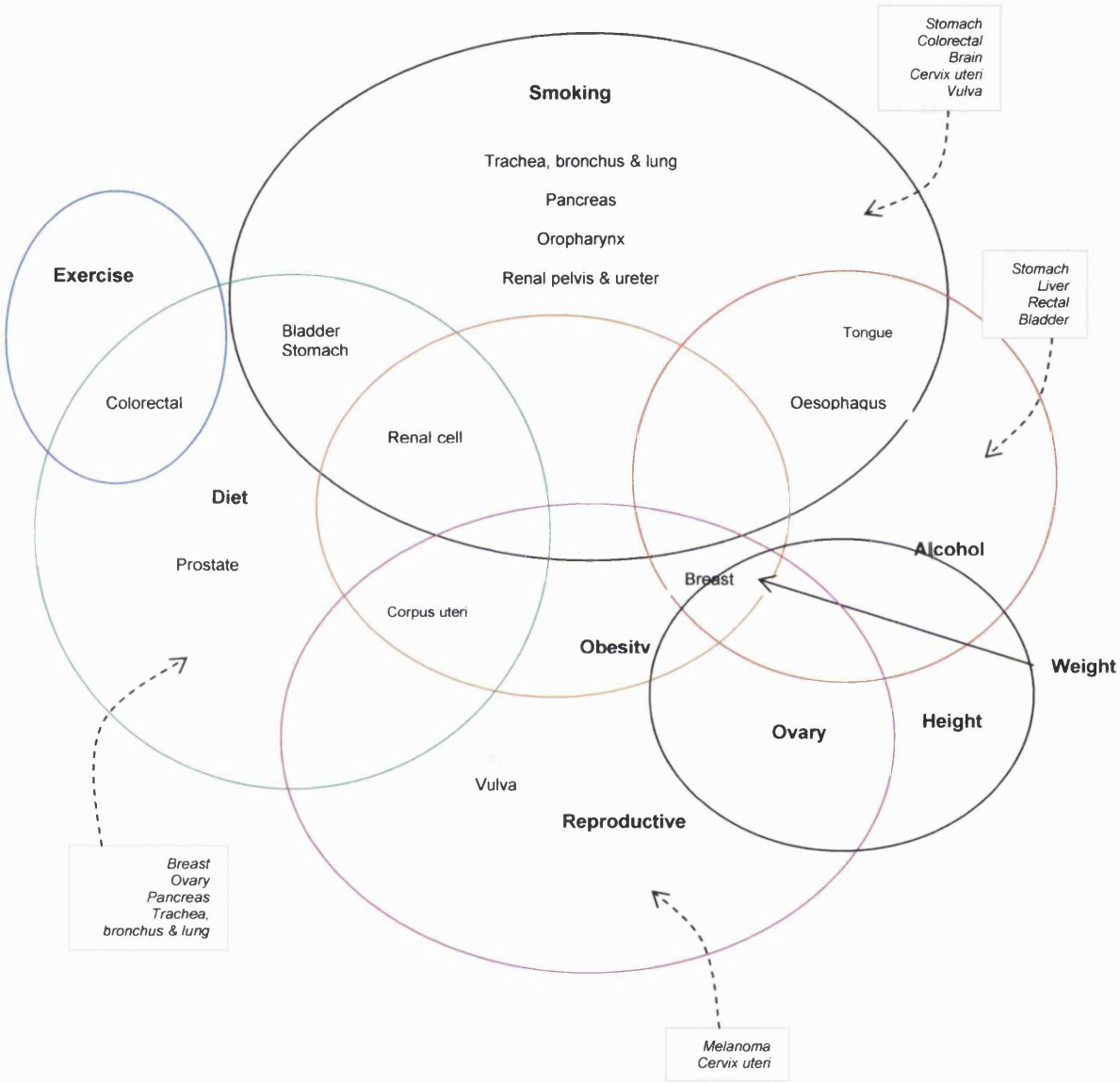
1.7 Other: Height, Viruses

Height has been investigated as an index of childhood energy intake (Davey Smith, Shipley, & Leon 1998; Gunnell et al. 1998) with regard to cancer risk, and there is some

evidence of increased risk for ovarian cancer with increased height (Weiss et al. 1996). Substantial roles for height or weight are not envisaged in the current research, although their contribution in the calculation of BMI should prove interesting. A number of viruses have been shown to be associated with increased risk of cancer for particular sites. The retrovirus HTLV-1 is associated with adult T-cell leukaemia and lymphoma. Hepatitis B and more recently Hepatitis C are associated with hepatocellular carcinoma, with hepatitis B linked to 80% of liver cancer worldwide. All the herpesviruses have the potential to cause cancer, but there is only consistent evidence for Epstein-Barr virus, which is associated with increased risk for Burkitt's Lymphoma, nasopharyngeal carcinoma and Hodgkin's disease. Human papillomavirus 16/18 has been convincingly linked with carcinoma of the cervix, but is also associated with other cancers (oesophagus, oral, anal). Unfortunately it was not possible to assess viral exposure in the present research.

Figure I.a Group Set 1

Overlapping of sub-groups for sites associated with increased cancer risk. Sites listed in grey text boxes connected by dashed arrows have only suggested or inconsistent evidence of association with the indicated factor.



2 Protective factors

This section explores the factors which have been shown to have the effect of reducing cancer risk for particular sites. These factors are listed in Table I.7, and include the protective effect of smoking for endometrial cancer in postmenopausal women, dietary factors such as high fruit and vegetable intake, and the reduction in cancer risk in women due to curtailed exposure to oestrogens and/or progesterone. These groupings are summarised in Figure I.b at the end of this section.

Table I.7 Grouping by risk factor for decreased cancer risk

GROUPING 2	
SMOKING	
DIET	Low fat High F&V Foods containing Vitamin A Foods containing Vitamin E
EXERCISE	Moderate to high
REPRODUCTIVE FACTORS	Low oestrogen exposure Oral contraceptive use Parity

It should be apparent that for some of these, such as the reproductive factor of low oestrogen exposure, a protective effect is derived from the elimination of risk exposures indicated in the previous section (albeit achieved by events such as menarche and menopause, which may not be deemed entirely voluntary acts). On the other hand, the protective effects of an intake of fresh fruits and vegetables and other key nutrients is well established (World Cancer Research Fund/American Institute for Cancer Research 1997), and more likely to be under behavioural control (discounting, for the meantime, the confounding effects of social class).

2.1 Smoking

Cancer of the corpus uteri is the only malignant neoplasm whose incidence may be reduced by cigarette smoking, although this effect might be limited to postmenopausal women only (Weiss & Sayvetz 1980). Smoking may modify the relationship between other risk factors and endometrial cancer (Grady & Ernster 1996). Of course any benefit

is far outweighed by the fact that smoking is a major risk factor for many other cancers, in addition to coronary heart disease and other lung diseases.

2.2 Dietary Factors

The US National Institute of Cancer advises that individuals should reduce their fat intake, increase their intake of fruit and vegetables and wholegrain cereal products, consume alcohol in moderation and cut down on salt-cured or smoked foods (American Institute for Cancer Research / World Cancer Research Fund 1997). The Institute has predicted that if these guidelines were adopted in the US, within 10 years there would be a 50% fall in colon cancers, 25% less breast cancers, and a 15% reduction of cancers of the prostate, endometrium and gallbladder (Greenwald & Sondick 1986). Results from epidemiological research seem to indicate that increased fibre intake and consumption of vitamins A, C and E and the mineral selenium also confer a protective effect.

The most common malignant neoplasm in Caucasian populations around the world is non-melanoma skin cancer, which can be one of two types: the more common basal cell carcinoma, or the more invasive squamous cell carcinoma (Scotto et al. 1996). The most established risk factor is UV radiation in sunlight combined with host factors (such as pigmentation or the presence of precursor lesions). However, there is some evidence that a low fat diet might be associated with reduced risk (Black, Herd, Goldberg et al. 1994; Kune et al. 1992; Wei, Matanoski, Farmer, & et al 1994), which is in line with experimental research (Scotto et al. 1996) though not all studies agree (Hunter et al. 1992).

The risk of adenomatous polyps (precursor neoplastic lesions) occurring in the gut has been shown to be reduced through consumption of a diet high in fibre, with regular intake of fruits, vegetables and grains, even after adjusting for saturated fat and total calorie intake and micronutrients in the fruit and vegetables (Giovannucci et al. 1992). High or moderate levels of fruit and vegetable consumption, compared with the lowest level of intake, have been associated with lower risks of carcinoma in the large intestine in case-control and cohort research (Schottenfeld & Winawer 1996). The beneficial effects of a diet rich in fibre have also been demonstrated for colorectal cancer. Two

separate reviews have found a relatively consistent inverse relationship between fibre intake and colon cancer (Lanza & Greenwald 1989; Trock, Lanza, & Greenwald 1990). Multiple case-control and cohort studies have also shown a reduction in risk for lung cancer associated with fresh fruit and vegetable intake (Colditz, Stampfer, & Willet 1987). The risk in the top quantile of intake tends to be half that of those in the lower intake categories. Carotenoids have been the focus of research attention investigating the nature of this association, but the finding of increased risk for lung cancer in research populations taking beta-carotene supplements suggests that correlates may be responsible for the protective effect (Blot & Fraumeni 1996). Other ingredients of these foods which may be important include vitamin C, phenols, flavones, isothiocynates and potentially vitamin E.

Elevated levels of fruit and vegetable intake have also been found to have protective effect for renal cell cancer (McLaughlin et al. 1996), stomach cancer (Nomura 1996), pancreatic cancer (Anderson, Potter & Mack 1996) and cancer of the thyroid (Ron 1996). There is some suggestion of a similar effect for cancer of the brain (Preston-Martin & Mack 1996) and the bladder (Silverman, Morrison & Devesa 1996), but further research is required. Daily consumption of green and yellow fruit (containing vitamin A) has been associated with a 60% reduction in risk of prostate cancer (Hirayama 1979). A protective effect of vitamin E for malignant melanoma has also been suggested (Armstrong & English 1996).

2.3 Exercise

Subsequent to Garabrant and colleagues' finding of increased colorectal cancer risk amongst men with a sedentary job (1984), the protective effect of increased physical activity was confirmed by other research (Arbman et al. 1993; Ballard-Barbasch et al. 1990; Chow et al. 1993; Fredriksson et al. 1989; Gerhardsson et al. 1986; Vena et al. 1985; Wu et al. 1987). For breast cancer, there seems to be an uncertain but probably negative relation to risk (Frisch et al. 1985) and exercise does seem to be protective in adolescence and adulthood. Risk for breast cancer among women averaging over four hours of exercise per week during their reproductive years was nearly 60% lower than that of inactive women (Trichopoulos, MacMahon, & Cole 1972). Physical activity may

delay menarche in schoolgirls, thus reducing the oestrogen exposure from active menstruation over the lifespan.

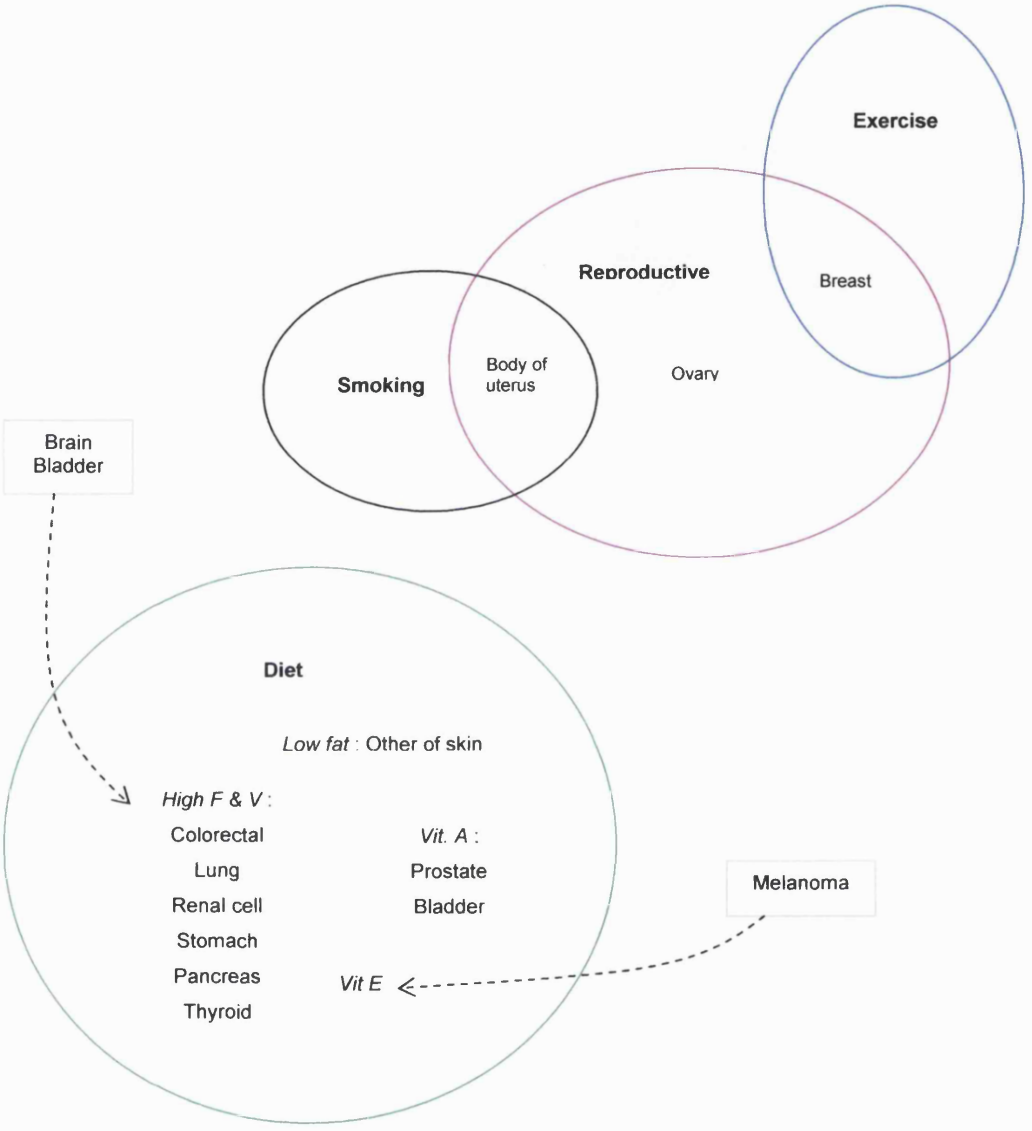
2.4 Reproductive Factors

Hormones are important for their role in breast cancer risk, with a reduced risk associated with less exposure to oestrogen and/or progesterone (Henderson et al. 1996). There is a 20% reduction in risk of breast cancer for each year that menarche is delayed (Henderson et al. 1985). Attainment of a critical level of height to weight ratio is crucial to the start of the menarche and it seems this is being reached at increasingly younger ages, affecting the lifetime cumulative oestrogen exposure and possibly contributing to incidence rates (Henderson et al. 1996). Better nutrition and control of childhood infectious diseases also contributes to an earlier age at menarche. Use of oral contraceptives has a similar effect in reducing the amount of hormone exposure, and a negative association between it and incidence of ovarian cancer has been consistently observed (Weiss et al. 1996).

MacMahon et al. (1970) showed that women who had had an early first full term pregnancy under the age of 20 demonstrated half the risk of nulliparous women for breast cancer. Higher parity is also associated with reduced risk of cancer of the endometrium (Grady & Ernster 1996) and of ovarian cancer (Weiss et al. 1996). Lactation is protective but few women in Western cultures carry it out over a long duration. In other cultures more accustomed to breast feeding, a progressive reduction in risk with more years of nursing was observed (Ross & Yu 1994; Yuan et al. 1988). Any protective effect of lactation on ovarian cancer is unclear (Weiss et al. 1996).

Figure I.b Group Set 2

Overlapping of sub-groups of sites associated with decreased cancer risk. Sites listed in grey text boxes connected by dashed arrows have only suggested or inconsistent evidence of association with the indicated factor.



3 Remaining cancer sites

This last set of cancers comprises the remaining cancer sites that do not fit the categorisation requirements of the other two sets (Table I.8). There is little evidence for associating any of these cancers with the risk or protective factors in the groupings above. This is by no means a homogenous group, comprising skin cancers, lymphomas and leukaemias, as well as miscellaneous other sites. It also includes events which in all likelihood reflect the lack of precision possible for pathologists or clinicians to code the cancers: malignant neoplasm without specification of site, and secondary and unspecified malignant neoplasms of the lymph glands and of the respiratory and digestive systems.

Table I.8 Examples of remaining cancer sites, with summaries of their incidence patterns by demographic characteristics, and of their main risk factors

GROUPING 3	Demographic patterns & Main risk factors
OTHER OF SKIN	More risk with greater age. Sunlight (UVB)
MELANOMA	Slightly higher in women, especially of reproductive age; most common in young and middle-aged; positive association with sunlight
MN without specification of site	
HODGKIN'S DISEASE	More common in M than W; high incidence in young adults, fall in those over 40, with increase again in later years, 65+ (bimodal distribution); higher in higher SES, but not always consistent; higher rates in built up areas. EBV, chemicals.
CONNECTIVE TISSUE	Radiation, chemicals, medicinal agents, viruses; precursor lesions, genetic factors, immuno-compromised
TESTIS	Peak <> 25 – 34 years, lesser peak after age 70; highest in higher SES groups. Gonadal embryogenesis, dysgenesis, cryptorchism, prenatal exp. to oestrogens, etc.
MULTIPLE MYELOMA	Slightly higher in men. Auto-immune disease, chronic immune stimulation, radiation
EYE	Rare
OTHER LYMPHOID & HISTIOCYTIC TISSUE	Higher in men. Virus, radiation, occupation
LYMPHOID LEUKAEMIA	Occupation, radiation, viruses. ? SMK for acute disease
MYELOID LEUKAEMIA	Occupation, radiation, viruses.
LIVER	↑ in M than W (4:1 to 9:1); peak 45-55 years in UK. HBV,HCV, aflatoxins; ↑ ALC →cirrhosis, ↑ cirrhosis → cancer. ?SMK – equivocal
THYROID GLAND	3× in W than M; young age groups. Radiation, etc. (high F&V intake ↓ risk)
SECONDARY & UNSPECIFIED, LYMPH GLANDS	
SECONDARY & UNSPECIFIED, RESPIRATORY & DIGESTIVE SYSTEMS	
LYMPHOSARCOMA/ RETICULOSARCOMA	Slightly ↑ in men. Virus, radiation, occupation.

Abbreviations: M, men; W, women; SMK, smoking; SES, socioeconomic status; ALC, alcohol; HBV, hepatitis B; HCV, hepatitis C; F&V, fruits and vegetables; < >, between.

Appendix II

Factor Analysis of the GHQ-30 (GHQ and CGHQ scoring)

The General Health Questionnaire

The 30-item General Health Questionnaire (GHQ; Goldberg 1972) is a screening instrument designed to detect transient disorder as the first step of a two-stage procedure, followed by psychiatric evaluation in order to establish diagnoses. Respondents are asked if they have 'recently' experienced any of the phenomena the items describe, with a four point response scale. These responses typically take the form 'not at all', 'no more than usual', 'rather more than usual' and 'much more than usual', although the wording changes depending on the item content and whether it is negative or positive. Responses may be scored on a Likert scale, but for screening use the GHQ scoring is employed: 0-0-1-1. Features of psychological distress which seem common and picked up by the GHQ include sleep difficulties due to worry, feeling under strain, being unable to concentrate, or feeling unable to face up to one's problems. The measure should detect the inability to carry out normal functions and the appearance of new and distressing phenomena. It is less suitable for assessing psychotic depression or schizophrenia, but tends to pick up these conditions through the less differentiated ways these disorders incorporate symptoms of anxiety and depression. Although intended to be culturally specific, i.e. for Londoners, the GHQ has performed well elsewhere and has been validated in a variety of populations (Goldberg & Williams 1988). Its concurrent validity is good, but it does not perform as well against methods such as the Diagnostic Interview Schedule (DIS; Robins et al. 1981) in terms of sensitivity, but this is explained in part by the differing objectives of the two measures.

The chronic scoring of the GHQ (CGHQ; Goodchild & Duncan-Jones 1985) was used in the present study in order to detect ongoing psychological distress rather than transient disorder. Long term exposure to psychological disorder is more salient to cancer risk than transient disorder. Therefore, rather than use the GHQ scoring for all items the fifteen negative items were scored 0-1-1-1 targeting the 'same as usual' response category, thereby identifying more chronic features of distress (Goodchild & Duncan-Jones 1985). See Table II.1 for a list of the GHQ items indicating which are negative and positive.

Table II.1 Positive (P) and negative (N) items of the GHQ, with short-hand identifiers

Question Number	ITEMS		
	Have you recently:-		
GHQ01	Been able to concentrate on whatever you are doing?	P	CONCENTR
GHQ02	Lost much sleep over worry?	N	LOSTSLEEP
GHQ03	Been having restless, disturbed nights?	N	RESTLESS
GHQ04	Been managing to keep your self busy & occupied?	P	KEEPBUSY
GHQ05	Been getting out of the house as much as usual?	P	GETTINGOUT
GHQ06	Been managing as well as most people would in your shoes?	P	MANAGING
GHQ07	Felt that on the whole you were doing things well?	P	DOINGWELL
GHQ08	Been satisfied with the way you've carried out your task?	P	SATISFIED
GHQ09	Been able to feel warmth & affection for those near to you?	P	WARMTH
GHQ10	Been finding it easy to get on with other people?	P	EASYGETON
GHQ11	Spend much time chatting with people?	P	TIMECHAT
GHQ12	Felt that you are playing a useful part in things?	P	USEFUL
GHQ13	Felt capable of making decisions about things/	P	DECISION
GHQ14	Felt constantly under strain?	N	STRAIN
GHQ15	Felt you couldn't overcome your difficulties?	N	OVERCOME
GHQ16	Been finding life a struggle all the time?	N	STRUGGLE
GHQ17	Been able to enjoy your normal day-to-day activities?	P	ENJOY
GHQ18	Been taking things hard?	N	TAKEHARD
GHQ19	Been getting scared or panicky for no good reason?	N	SCARED
GHQ20	Been able to face up to your problems?	P	FACEUP
GHQ21	Found everything getting on top of you?	N	ONTOPOFU
GHQ22	Been feeling unhappy and depressed?	N	UNHAPPY
GHQ23	Been losing confidence in yourself?	N	LOSECONF
GHQ24	Been thinking of yourself as a worthless person?	N	WORTHLESS
GHQ25	Felt that life is entirely hopeless?	N	HOPELESS
GHQ26	Been feeling hopeful about your own future?	P	HOPEFUL
GHQ27	Been feeling reasonably happy, all things considered?	P	HAPPY
GHQ28	Been feeling nervous and strung-up all the time?	N	NERVOUS
GHQ29	Felt that life isn't worth living?	N	WRTHLIVING
GHQ30	Found at times you couldn't do anything because your nerves were too bad?	N	COULDNTDO

Principal components analysis

Exploratory factor analysis was used to assess whether the structure of the scale was substantially altered by the different methods of scoring. Data from Phase 1 was used, in addition to data from Phases 2 & 3. The results of the factor analysis of the GHQ scoring method are presented here first, followed by the chronic scoring (CGHQ) method. On inspection the inter-item correlation matrices (chronic & GHQ scoring) for each of the three phases showed many values above 0.3, so principal components analysis (PCA) was judged appropriate.

Orthogonal rotation using the varimax procedure was preferred for the sake of simplicity, since these were exploratory analyses to describe the scale only. Rotated

factor loadings were interpreted with respect to the following recommendations (Comrey & Lee 1992): greater than 0.71, excellent; 0.63, very good; 0.55, good; 0.45, fair; and 0.32, poor. Tolerance scores, or as the STATA package terms it, uniqueness scores, were also presented in these tables. These scores are equivalent to unity minus the sum of the squared factor loadings for the variable. If this value is high, the variable is highly related to others in the set and multicollinearity is indicated; if it is equal to 1, then the variables is perfectly related to others in the set and singularity is indicated (Tabachnick & Fidell 2001).

GHQ scoring of General Health Questionnaire (GHQ)

GHQ data were available from 9936 participants at Phase 1 (96.4% of 10308) and from smaller numbers of participants at Phases 2 & 3 (80.3% and 74.05% of the original sample, respectively). The principal components extracted from each data set and their eigenvalues (greater than 1) are presented in Table II.2. The proportion values in the table refer to the amount of variance in the measure accounted for by each of the factors. Thus the first six factors together accounted for 54.95% of the variance in the measure at Phase 1, 56.06% of the variance at Phase 2, and the first five factors accounted for 52.94% of the variance in the measure at Phase 3.

Table II.2 GHQ data: Principal components and eigenvalues, Phases 1-3

Phase 1			Phase 2			Phase 3		
N = 9936			N = 8276			N = 7633		
Factor	**Eigenvalue**	**Proportion**	**Factor**	**Eigenvalue**	**Proportion**	**Factor**	**Eigenvalue**	**Proportion**
1	9.99656	0.3332	1	10.44923	0.3483	1	10.43619	0.3479
2	1.71452	0.0572	2	1.60132	0.0534	2	1.69152	0.0564
3	1.51649	0.0505	3	1.53486	0.0512	3	1.54773	0.0516
4	1.19025	0.0397	4	1.18665	0.0396	4	1.14790	0.0383
5	1.06082	0.0354	5	1.02222	0.0341	5	1.05601	0.0352
6	1.00546	0.0335	6	1.02124	0.0340			

At all phases of data collection the majority of items loaded on the first factor. The scree plots of the factors before rotation for each phase are presented in Figure II.1, with a horizontal line indicating where the eigenvalues equal 1. Despite only five factors being extracted at Phase 3, there was great similarity among the scree plots. The factor solutions of the three data sets after orthogonal rotation are presented in Tables II.3-5 (factor loadings greater than 0.32 are indicated in each table in bold).

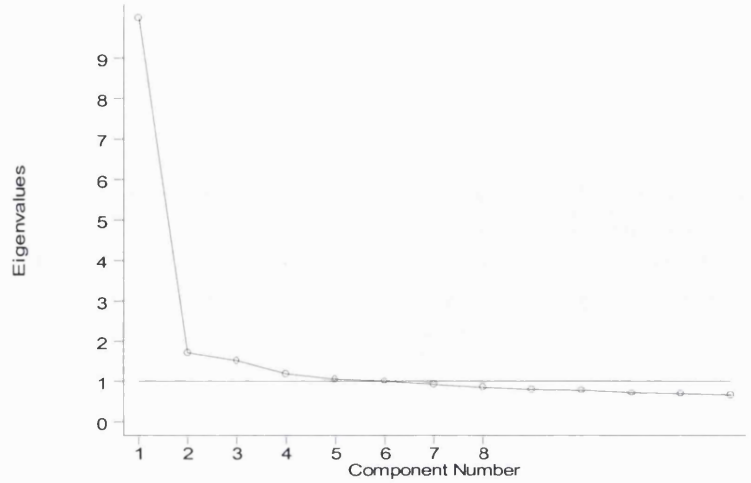
At Phase 1 thirteen items loaded on the first factor, seven on the second, nine on the third, five on the fourth, three on the fifth and four items loaded on the sixth factor. Nine variables may be considered complex, loading on more than one factor (GHQ01, 06, 13, 17, 19, 20, 23, 27 and 30).

Twelve items loaded on the first factor in the Phase 2 solution, three on the second (negatively), five on the third factor (again negatively), six items on the fourth, five on the fifth and nine on the sixth factor. This solution had twelve complex variables (ZGHQ01, 04, 09, 13, 17, 20, 22, 23, 24, 26, 27 and 28).

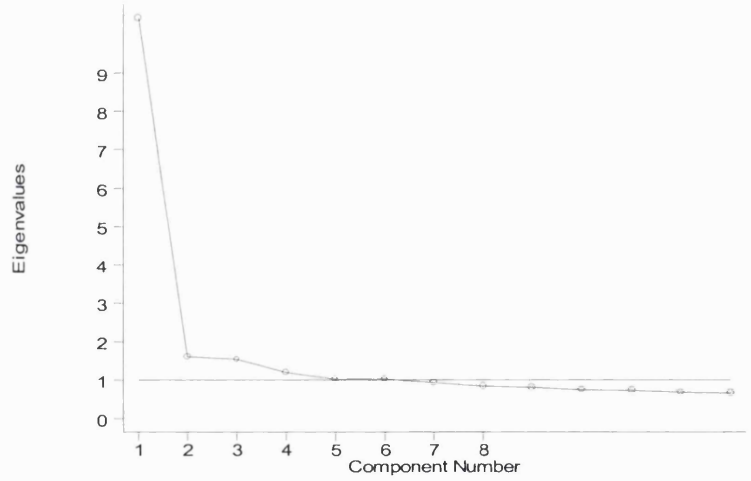
Sixteen items loaded on the first factor in the five factor solution of the Phase 3 data. Eight items loaded on the second factor, ten on the third, five on the fourth and six on the fifth. Thirteen items loaded on more than one factor (XGHQ01, 02, 05, 09, 10, 14, 15, 17, 19, 20, 23, 26 & 27).

Figure II.1 GHQ data (Phases 1-3): Scree plots of eigenvalues against principal components (before rotation)

a) Phase 1



b) Phase 2



c) Phase 3

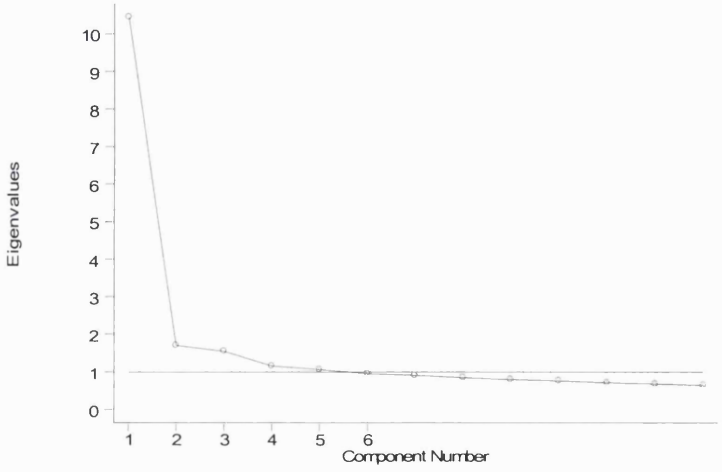


Table II.3 GHQ (Phase 1): Factor loadings for six factor rotated solution (orthogonal)

Variable		1	2	3	4	5	6	*Uniqueness*
GHQ01	CONCENTR	0.31800	0.06664	**0.49376**	0.08490	**0.32264**	0.10095	*0.52914*
GHQ02	LOSTSLEEP	0.24003	0.10419	0.08939	0.05450	**0.84294**	0.05469	*0.20702*
GHQ03	RESTLESS	0.17281	0.09438	0.10048	0.05559	**0.86390**	0.03439	*0.20053*
GHQ04	KEEPBUSY	-0.16266	0.19303	**0.46051**	0.27976	0.18998	0.19061	*0.57352*
GHQ05	GETTINGOUT	0.05081	0.03111	0.09597	**0.69534**	0.09028	0.20377	*0.45406*
GHQ06	MANAGING	0.08552	0.14400	**0.42164**	0.09067	-0.01075	**0.39027**	*0.63352*
GHQ07	DOINGWELL	0.25302	0.11608	**0.73890**	0.07357	0.11502	0.10509	*0.34685*
GHQ08	SATISFIED	0.23936	0.04064	**0.74301**	0.07405	0.10567	0.03238	*0.37129*
GHQ09	WARMTH	0.28611	0.31217	0.18841	**0.34083**	0.07054	-0.20644	*0.62144*
GHQ10	EASYGETON	0.21848	0.27918	0.22265	**0.43017**	0.05099	-0.07886	*0.63088*
GHQ11	TIMECHAT	0.23959	0.04536	0.07878	**0.66312**	0.06764	-0.06786	*0.48542*
GHQ12	USEFUL	0.10989	0.29021	**0.61169**	0.17735	0.07080	-0.06934	*0.48826*
GHQ13	DECISION	**0.33127**	0.17664	**0.52963**	0.03973	0.05486	0.18606	*0.53934*
GHQ14	STRAIN	**0.66371**	-0.00043	0.13553	0.14655	0.28405	0.02965	*0.43808*
GHQ15	OVERCOME	**0.56718**	0.27417	0.25593	0.04577	0.13582	0.16726	*0.48912*
GHQ16	STRUGGLE	**0.64114**	0.22889	0.19786	0.14912	0.17641	0.11890	*0.42991*
GHQ17	ENJOY	**0.51092**	0.08620	0.27584	**0.37747**	0.19472	0.02315	*0.47451*
GHQ18	TAKEHARD	**0.56094**	0.22285	0.08488	0.17399	0.20047	0.11175	*0.54553*
GHQ19	SCARED	**0.40611**	0.19584	0.10921	0.05204	0.16973	**0.48085**	*0.52206*
GHQ20	FACEUP	**0.38736**	0.28607	0.29528	0.04636	0.07391	**0.44756**	*0.47300*
GHQ21	ONTOPOFU	**0.70797**	0.14891	0.19279	0.06640	0.15453	0.18209	*0.37799*
GHQ22	UNHAPPY	**0.59776**	0.31175	0.26571	0.05895	0.26476	-0.04270	*0.39950*
GHQ23	LOSECONF	**0.40462**	**0.37708**	**0.45138**	-0.05631	0.11021	0.09715	*0.46559*
GHQ24	WORTHLESS	0.20628	**0.66500**	0.22565	-0.00582	0.07965	0.11311	*0.44513*
GHQ25	HOPELESS	0.13926	**0.81069**	0.06206	0.05718	0.09593	0.13336	*0.28927*
GHQ26	HOPEFUL	0.29209	**0.56221**	0.28220	0.02183	0.10723	-0.18893	*0.47130*
GHQ27	HAPPY	**0.55499**	**0.37101**	**0.32424**	0.08221	0.18238	-0.12301	*0.39406*
GHQ28	NERVOUS	**0.62242**	0.18544	0.13342	0.06648	0.28822	0.20556	*0.43067*
GHQ29	WRTHLIVING	0.12637	**0.77820**	0.06051	0.08751	0.09694	0.15367	*0.33410*
GHQ30	COULDNTDO	0.21294	**0.36469**	0.09510	0.08830	0.13297	**0.57650**	*0.45478*

Table II.4 GHQ (Phase 2): Factor loadings for six factor rotated solution (orthogonal)

Variable		1	2	3	4	5	6	*Uniqueness*
ZGHQ01	CONCENTR	0.23428	**-0.33460**	-0.05995	0.13409	0.19621	**0.49563**	*0.52743*
ZGHQ02	LOSTSLEEP	0.23746	**-0.82872**	-0.10062	0.04897	0.10024	0.10108	*0.22405*
ZGHQ03	RESTLESS	0.17176	**-0.85493**	-0.07855	0.05541	0.07834	0.09765	*0.21469*
ZGHQ04	KEEPBUSY	-0.19678	-0.20502	-0.15520	**0.39146**	0.19643	**0.41521**	*0.53094*
ZGHQ05	GETTINGOUT	0.07143	-0.12453	-0.04557	**0.65660**	0.05506	0.10471	*0.53220*
ZGHQ06	MANAGING	0.06954	0.00674	-0.20089	0.09768	0.26940	**0.41491**	*0.70049*
ZGHQ07	DOINGWELL	0.27142	-0.11955	-0.12055	0.06452	0.09131	**0.74019**	*0.33713*
ZGHQ08	SATISFIED	0.26725	-0.13359	-0.05817	0.02952	0.00876	**0.75704**	*0.33329*
ZGHQ09	WARMTH	0.25992	-0.11627	**-0.35444**	**0.36373**	-0.14502	0.14088	*0.62012*
ZGHQ10	EASYGETON	0.19798	-0.05686	-0.19629	**0.51114**	0.13209	0.17359	*0.61019*
ZGHQ11	TIMECHAT	0.26578	-0.00952	-0.01723	**0.66874**	0.07232	0.07310	*0.47119*
ZGHQ12	USEFUL	0.12119	-0.04132	-0.24624	0.24854	0.02545	**0.61134**	*0.48681*
ZGHQ13	DECISION	0.22124	-0.05354	-0.11223	0.11625	**0.32415**	**0.56961**	*0.49255*
ZGHQ14	STRAIN	**0.68304**	-0.26691	-0.00968	0.13036	0.07535	0.15362	*0.41586*
ZGHQ15	OVERCOME	**0.62226**	-0.10782	-0.25304	0.04798	0.22078	0.25499	*0.42107*
ZGHQ16	STRUGGLE	**0.64249**	-0.16281	-0.22575	0.13597	0.18099	0.20678	*0.41573*
ZGHQ17	ENJOY	**0.49383**	-0.23304	-0.16660	**0.35759**	0.07489	0.27228	*0.46645*
ZGHQ18	TAKEHARD	**0.54498**	-0.20341	-0.22523	0.18703	0.24664	0.16982	*0.48624*
ZGHQ19	SCARED	0.26704	-0.18994	-0.15977	0.05087	**0.68058**	0.12229	*0.38636*
ZGHQ20	FACEUP	**0.36259**	-0.04586	-0.28528	0.11907	**0.52320**	0.28391	*0.41653*
ZGHQ21	ONTOPOFU	**0.65533**	-0.21148	-0.13468	0.06733	0.23112	0.26765	*0.37809*
ZGHQ22	UNHAPPY	**0.57277**	-0.28954	**-0.32371**	0.09005	0.08506	0.28032	*0.38940*
ZGHQ23	LOSECONF	**0.37716**	-0.10435	**-0.35083**	0.06460	0.24073	**0.46980**	*0.44094*
ZGHQ24	WORTHLESS	0.18240	-0.03246	**-0.62003**	0.02819	0.14608	**0.32868**	*0.45108*
ZGHQ25	HOPELESS	0.15012	-0.08714	**-0.79755**	0.04900	0.17344	0.06786	*0.29670*
ZGHQ26	HOPEFUL	**0.33324**	-0.13067	**-0.49527**	0.07650	-0.07764	0.30392	*0.52233*
ZGHQ27	HAPPY	**0.49988**	-0.21483	**-0.42527**	0.14695	-0.01183	0.29002	*0.41727*
ZGHQ28	NERVOUS	**0.55447**	-0.26896	-0.20849	0.07627	**0.36459**	0.11343	*0.42515*
ZGHQ29	WRTHLIVING	0.13320	-0.10213	**-0.77023**	0.06698	0.20503	0.05250	*0.32929*
ZGHQ30	COULDNTDO	0.16822	-0.13637	-0.31410	0.06910	**0.63346**	0.05902	*0.44491*

Table II.5 GHQ (Phase 3): Factor loadings for five factor rotated solution (orthogonal)

Variable		1	2	3	4	5	*Uniqueness*
XGHQ01	CONCENTR	0.26589	0.05756	**0.46329**	0.09727	**0.41269**	*0.53158*
XGHQ02	LOSTSLEEP	**0.33736**	0.09347	0.08212	0.02442	**0.75727**	*0.29665*
XGHQ03	RESTLESS	0.24521	0.08324	0.08147	0.05393	**0.77414**	*0.32410*
XGHQ04	KEEPBUSY	-0.22560	0.29560	**0.43093**	0.30085	0.29205	*0.50022*
XGHQ05	GETTINGOUT	-0.10137	0.13348	0.19400	**0.58854**	**0.36871**	*0.45194*
XGHQ06	MANAGING	0.03884	0.21781	**0.49105**	0.09396	0.03889	*0.69958*
XGHQ07	DOINGWELL	0.28180	0.07921	**0.73217**	0.11809	0.12111	*0.34962*
XGHQ08	SATISFIED	0.27101	0.02797	**0.74802**	0.07995	0.11180	*0.34735*
XGHQ09	WARMTH	**0.37719**	0.18585	0.05469	**0.51658**	-0.05215	*0.55062*
XGHQ10	EASYGETON	**0.35850**	0.20531	0.15118	**0.51345**	-0.02930	*0.54198*
XGHQ11	TIMECHAT	0.23336	0.00976	0.15327	**0.62773**	0.01149	*0.52778*
XGHQ12	USEFUL	0.14570	0.23404	**0.56925**	0.29144	-0.00082	*0.51502*
XGHQ13	DECISION	0.29417	0.22596	**0.56448**	0.11459	0.07460	*0.52507*
XGHQ14	STRAIN	**0.63589**	0.02277	0.15592	0.16754	**0.35757**	*0.41488*
XGHQ15	OVERCOME	**0.57174**	0.27801	**0.33349**	0.02056	0.18308	*0.45067*
XGHQ16	STRUGGLE	**0.60863**	0.24302	0.25487	0.13725	0.24251	*0.42791*
XGHQ17	ENJOY	**0.34715**	0.08998	0.30088	**0.38881**	**0.36541**	*0.49616*
XGHQ18	TAKEHARD	**0.57176**	0.23392	0.17708	0.14868	0.26202	*0.49626*
XGHQ19	SCARED	**0.37133**	**0.35995**	0.18578	-0.04068	0.24999	*0.63389*
XGHQ20	FACEUP	**0.38171**	**0.39393**	**0.35713**	0.01524	0.13176	*0.55399*
XGHQ21	ONTOPOFU	**0.65268**	0.18380	0.25618	0.08291	0.23735	*0.41139*
XGHQ22	UNHAPPY	**0.61015**	0.27849	0.25737	0.12725	0.25885	*0.40073*
XGHQ23	LOSECONF	**0.42350**	**0.39250**	**0.44608**	-0.01912	0.11779	*0.45336*
XGHQ24	WORTHLESS	0.22406	**0.64459**	0.29186	0.01887	0.00652	*0.44872*
XGHQ25	HOPELESS	0.17217	**0.79203**	0.05301	0.09876	0.07935	*0.32419*
XGHQ26	HOPEFUL	**0.34898**	**0.36509**	0.30737	0.12341	0.04862	*0.63285*
XGHQ27	HAPPY	**0.56072**	**0.32384**	0.29646	0.19946	0.14877	*0.43091*
XGHQ28	NERVOUS	**0.57813**	0.30777	0.15060	0.09817	0.28509	*0.45745*
XGHQ29	WRTHLIVING	0.17401	**0.77388**	0.05573	0.12681	0.05944	*0.34811*
XGHQ30	COULDNTDO	0.15671	**0.57668**	0.09968	0.03439	0.23257	*0.57768*

Comparison of GHQ Factor Structures across Phases

While it is not unreasonable to expect some change between the different scoring methods, one might expect little difference in the measure structure over time for a given method of scoring. However, this assumes the samples remain comparable, and sample attrition over time in the Whitehall II Study may not be assumed to be random. Therefore comparisons over time should be treated with caution and what follows is primarily illustrative, rather than conclusive.

The rotated factors from each Phase data set were compared in terms of the distribution of items in Tables II.6-12. The order of the first phase rotated data defined the numbering of factors, although their position in the solution may differ in later phase data, and this is indicated in parentheses after the phase number in the tables. Items common for each factor (loading above 0.45, for convenience of presentation) are also displayed in these tables.

Table II.6 GHQ data: Items loading on Factor 1 across phases, and their content

	Phases			
Loadings	**1 (1)**	**2 (1)**	**3 (1)**	**Item Content**
> 0.71				GHQ14 'felt constantly under strain?'
> 0.63	GHQ21	ZGHQ14	XGHQ21	GHQ15 'felt you couldn't overcome your difficulties?'
	GHQ14	ZGHQ21	XGHQ14	GHQ16 'been finding life a struggle all the time?'
	GHQ16	ZGHQ16		GHQ18 'been taking things hard?'
> 0.55	GHQ28	ZGHQ15	XGHQ22	GHQ21 'found everything getting on top of you?'
	GHQ22	ZGHQ22	XGHQ16	GHQ22 'been feeling unhappy and depressed?'
	GHQ18	ZGHQ28	XGHQ28	
	GHQ15		XGHQ18	GHQ17 'been able to enjoy your normal day-to-day activities?'
	GHQ27		XGHQ15	
			XGHQ27	GHQ19 'been getting scared or panicky for no good reason?'
> 0.45		ZGHQ18		
		ZGHQ27		GHQ27 'been feeling reasonably happy, all things considered?'
		ZGHQ17		
> 0.32	GHQ19	ZGHQ23	XGHQ23	GHQ28 'been feeling nervous and strung-up all the time?'
	GHQ23	ZGHQ20	XGHQ20	
	GHQ20	ZGHQ26	XGHQ09	
	GHQ13		XGHQ19	
			XGHQ10	
			XGHQ26	
			XGHQ17	
			XGHQ02	

Table II.7 GHQ data: Items loading on Factor 2 across phases, and their content

	Phases			
Loadings	**1 (2)**	**2 (3) §**	**3 (2)**	**Item Content**
> 0.71	GHQ25	*ZGHQ25*	XGHQ25	GHQ24 'been thinking of yourself as a worthless person?'
	GHQ29	*ZGHQ29*	XGHQ29	GHQ25 'felt that life is entirely hopeless?'
> 0.63	GHQ24		XGHQ24	GHQ29 'felt that life wasn't worth living?'
> 0.55	GHQ26	*ZGHQ24*	XGHQ30	GHQ30 'found at times you couldn't do anything because your nerves were so bad?'
> 0.45		*ZGHQ26*		
> 0.32	GHQ23	*ZGHQ27*	XGHQ20	GHQ26 'been feeling hopeful about your own future?'
	GHQ27		XGHQ26	
	GHQ30		XGHQ19	
			XGHQ27	

§ Negative factor loadings in italics.

Table II.8 GHQ data: Items loading on Factor 3 across phases, and their content

	Phases			
Loadings	**1 (3)**	**2 (6)**	**3 (1)**	**Item Content**
> 0.71	GHQ08	ZGHQ08	XGHQ08	GHQ07 'felt on the whole you were doing things well?'
	GHQ09	ZGHQ07	XGHQ07	GHQ08 'been satisfied with the way you've carried out your task?'
> 0.63				
> 0.55	GHQ12	ZGHQ12	XGHQ12	GHQ09 'been able to feel warmth & affection for those near to you?'
		ZGHQ13	XGHQ13	
> 0.45	GHQ13	ZGHQ01	XGHQ06	GHQ12 'felt that you are playing a useful part in things?'
	GHQ01	ZGHQ23	XGHQ01	GHQ13 'felt capable of making decisions about things?'
	GHQ04			
	GHQ23			GHQ01 'been able to concentrate on whatever you're doing?'
> 0.32	GHQ06	ZGHQ04	XGHQ23	
	GHQ27	ZGHQ06	XGHQ05	GHQ04 'been managing to keep yourself busy and occupied?'
		ZGHQ24	XGHQ20	
			XGHQ15	GHQ06 'been managing as well as most people would in your shoes?'
				GHQ23 'been losing confidence in yourself?'

Table II.9 GHQ data: Items loading on Factor 4 across phases, and their content

	Phases			
Loadings	**1 (4)**	**2 (4)**	**3 (2)**	**Item Content**
> 0.71				GHQ05 'been getting out of the house as much as usual?'
> 0.63	GHQ05	ZGHQ11	XGHQ11	GHQ09 'been able to feel warmth and affection for those near to you?'
	GHQ11	ZGHQ05	XGHQ05	GHQ10 'been finding it easy to get on with other people?'
> 0.55				GHQ11 'spent much time chatting with people?'
> 0.45		ZGHQ10	XGHQ09	
			XGHQ10	
> 0.32	GHQ10	ZGHQ04	XGHQ17	
	GHQ17	ZGHQ09		
	GHQ09	ZGHQ17		

Table II.10 GHQ data: Items loading on Factor 5 across phases, and their content

	Phases			
Loadings	**1 (5)**	**2 (2) §**	**3 (5)**	**Item Content**
> 0.71	GHQ03	*ZGHQ03*	XGHQ03	GHQ02 'lost much sleep over worry?'
	GHQ02	*ZGHQ02*	XGHQ02	GHQ03 'been having restless, disturbed nights?'
> 0.63				
> 0.55				
> 0.45				
> 0.32	GHQ01	*ZGHQ01*	XGHQ17	

§ Negative factor loadings in italics.

Table II.11 GHQ data: Items loading on Factor 6 across phases, and their content

	Phases			
Loadings	**1 (6)**	**2 (5)**	**3 (2)**	**Item Content**
> 0.71			XGHQ25	GHQ30 'found at times you couldn't do anything because your nerves were so bad?'
			XGHQ29	
> 0.63		ZGHQ19	XGHQ24	GHQ19 'been getting scared or panicky for no good reason?'
		ZGHQ30		
> 0.55	GHQ30		XGHQ30	GHQ20 'been able to face up to your problems?'
> 0.45	GHQ19	ZGHQ20		
> 0.32	GHQ20	ZGHQ28	XGHQ20	
	GHQ06	ZGHQ13	XGHQ26	
			XGHQ19	
			XGHQ27	

It would appear that the five factor solution for Phase 3 data absorbed the sixth factor from the previous data sets into its second factor (see Table II.7 & II.11). Otherwise the factor structure for the GHQ derived from the GHQ scoring remained very similar across phases of data collection.

Chronic scoring of General Health Questionnaire (CGHQ)

Data were available on the CGHQ from 9936 participants at Phase 1 (96.4% of 10308) and from smaller numbers of participants at Phases 2 & 3, as was the case with the GHQ data sets. The principal components extracted from each data set and their eigenvalues (greater than 1) are presented in Table II.12. The proportion values in the table refer to the amount of variance in the measure accounted for by each of the factors. Thus the first five factors together accounted for 51.13% of the variance in the measure at Phase 1, 52.17% at Phase 2, and 53.38% at Phase 3.

Table II.12 CGHQ data: Principal components and eigenvalues, Phases 1-3

Phase 1			Phase 2			Phase 3		
N = 9936			N = 8276			N = 7633		
Factor	**Eigenvalue**	**Proportion**	**Factor**	**Eigenvalue**	**Proportion**	**Factor**	**Eigenvalue**	**Proportion**
1	8.34590	0.2782	1	8.71374	0.2905	1	8.85655	0.2952
2	3.04721	0.1016	2	3.00143	0.1000	2	3.25935	0.1086
3	1.62120	0.0540	3	1.62798	0.0543	3	1.72058	0.0574
4	1.19888	0.0400	4	1.17736	0.0392	4	1.10791	0.0369
5	1.12355	0.0375	5	1.13180	0.0377	5	1.07177	0.0357

At all phases of data collection the majority of items loaded on the first factor. The scree plots of the factors before rotation for each phase are presented in Figure II.2, with a horizontal line indicating where the eigenvalues equal 1. The three plots were very similar. The factor solutions of the three data sets after orthogonal rotation are presented in Tables II.13-15 (factor loadings greater than 0.32 are indicated in each table in bold).

At Phase 1 nine items loaded on the first factor, eleven on the second, eight on the third (negatively), six on the fourth, and two items loaded negatively on the fifth factor. Six items were complex, loading on more than one factor (GHQ17, 19, 23, 26, 27 and 28).

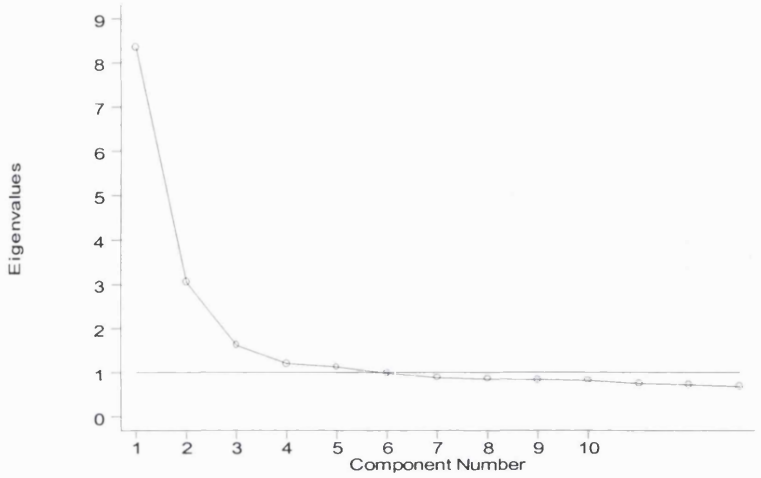
Nine items loaded on the first factor in the Phase 2 solution, eleven on the second, and eight on the third factor (negatively), with six items loading on the fourth, and two loaded negatively on the fifth factor. This solution had six complex variables (ZGHQ17, 19, 22, 23, 27 and 28).

Finally, at Phase 3, ten items loaded on the first factor, eleven on the second, eight on the third (negatively), six on the fourth and two on the fifth (negatively). Seven items loaded on more than one factor (XGHQ17, 19, 22, 23, 24, 27 & 28).

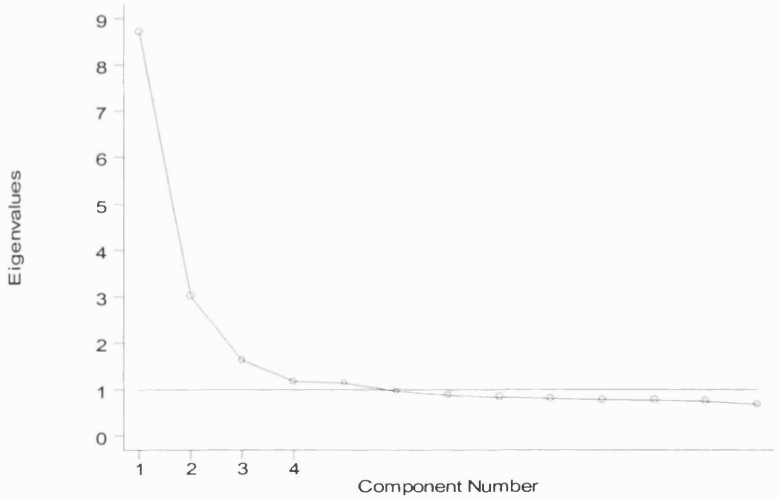
Comparing across phases, the factor structures extracted by PCA seem fairly consistent, with more of the variance shared between the two first factors (before rotation).

Figure II.2 CGHQ data (Phases 1-3): Scree plots of eigenvalues against principal components (before rotation)

a) Phase 1



b) Phase 2



c) Phase 3

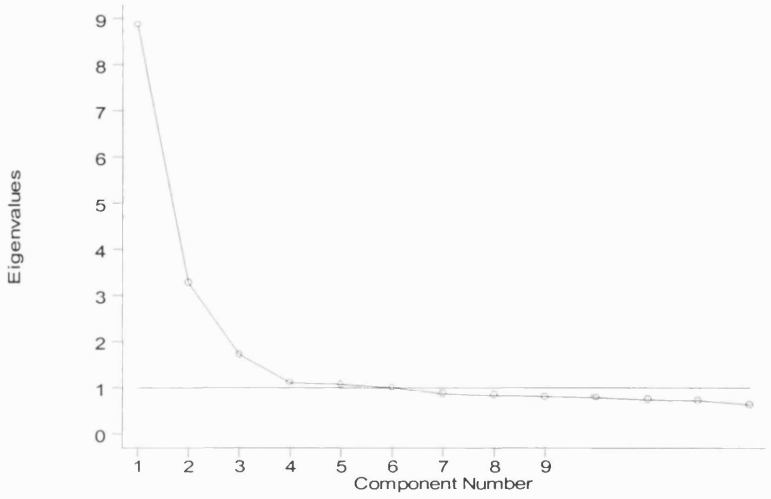


Table II.13 CGHQ (Phase 1): Factor loadings for five factor rotated solution (orthogonal)

Variable		1	2	3	4	5	*Uniqueness*
GHQ01	CONCENTR	0.18026	**0.60675**	-0.05711	0.15073	-0.13827	*0.55426*
GHQ02	LOSTSLEEP	0.23896	0.05453	-0.12970	0.06184	**-0.82592**	*0.23714*
GHQ03	RESTLESS	0.14315	0.07936	-0.10134	0.04162	**-0.86795**	*0.20786*
GHQ04	KEEPBUSY	-0.03657	**0.43988**	-0.09607	0.13730	-0.08657	*0.76959*
GHQ05	GETTINGOUT	0.06075	0.12366	-0.02054	**0.52893**	-0.11125	*0.68845*
GHQ06	MANAGING	0.05165	**0.49152**	-0.19017	-0.03132	-0.03042	*0.71767*
GHQ07	DOINGWELL	0.12435	**0.77815**	-0.08589	0.06072	-0.05547	*0.36487*
GHQ08	SATISFIED	0.15475	**0.74086**	-0.02721	0.04921	-0.06652	*0.41960*
GHQ09	WARMTH	0.07369	0.24628	-0.15985	**0.53092**	-0.03180	*0.62548*
GHQ10	EASYGETON	0.03422	0.26472	-0.17145	**0.54338**	-0.02115	*0.60365*
GHQ11	TIMECHAT	0.10901	0.09126	0.00353	**0.68541**	-0.08767	*0.50230*
GHQ12	USEFUL	0.03544	**0.58061**	-0.17171	0.22096	-0.02384	*0.58276*
GHQ13	DECISION	0.10639	**0.64668**	-0.13022	0.11930	-0.04214	*0.53751*
GHQ14	STRAIN	**0.66681**	0.05129	0.02736	0.06629	-0.14672	*0.52607*
GHQ15	OVERCOME	**0.70660**	0.10709	-0.15969	0.00754	-0.10486	*0.45269*
GHQ16	STRUGGLE	**0.71608**	0.10124	-0.21065	0.08468	-0.09491	*0.41642*
GHQ17	ENJOY	0.21427	**0.45168**	-0.03784	**0.47045**	-0.10270	*0.51677*
GHQ18	TAKEHARD	**0.67534**	0.06533	-0.16247	0.08940	-0.09345	*0.49653*
GHQ19	SCARED	**0.55935**	0.11810	**-0.36819**	-0.03349	-0.22525	*0.48576*
GHQ20	FACEUP	0.06310	**0.56195**	-0.23381	0.13339	-0.06079	*0.60407*
GHQ21	ONTOPOFU	**0.72082**	0.11770	-0.22952	0.07613	-0.14656	*0.38661*
GHQ22	UNHAPPY	**0.60957**	0.14032	-0.31799	0.10070	-0.19155	*0.46079*
GHQ23	LOSECONF	**0.53765**	0.18529	**-0.42583**	0.01120	-0.12144	*0.48040*
GHQ24	WORTHLESS	0.31168	0.14586	**-0.71469**	0.00794	-0.05874	*0.36729*
GHQ25	HOPELESS	0.20362	0.08643	**-0.82762**	0.06755	-0.08612	*0.25413*
GHQ26	HOPEFUL	0.06769	**0.39589**	**-0.34060**	0.28912	-0.02672	*0.63838*
GHQ27	HAPPY	0.15005	**0.51982**	-0.24372	**0.35996**	-0.06300	*0.51433*
GHQ28	NERVOUS	**0.55645**	0.11280	**-0.34906**	0.07639	-0.26487	*0.47980*
GHQ29	WRTHLIVING	0.15633	0.05915	**-0.82504**	0.08283	-0.08595	*0.27713*
GHQ30	COULDNTDO	0.17878	0.14028	**-0.65655**	-0.01125	-0.14911	*0.49493*

Table II.14 CGHQ (Phase 2): Factor loadings for five factor rotated solution (orthogonal)

Variable		1	2	3	4	5	*Uniqueness*
ZGHQ01	CONCENTR	0.16354	**0.59240**	-0.08754	0.17126	-0.15372	*0.56169*
ZGHQ02	LOSTSLEEP	0.25593	0.06691	-0.12388	0.05034	**-0.82278**	*0.23517*
ZGHQ03	RESTLESS	0.15492	0.06892	-0.09647	0.03140	**-0.87263**	*0.19947*
ZGHQ04	KEEPBUSY	-0.06881	**0.38602**	-0.11581	0.25492	-0.15035	*0.74525*
ZGHQ05	GETTINGOUT	0.04309	0.10565	-0.04185	**0.59125**	-0.12027	*0.62119*
ZGHQ06	MANAGING	0.03704	**0.47898**	-0.19814	0.04861	-0.03505	*0.72635*
ZGHQ07	DOINGWELL	0.14016	**0.78526**	-0.10301	0.06132	-0.06501	*0.34513*
ZGHQ08	SATISFIED	0.16327	**0.77673**	-0.03321	0.01762	-0.06661	*0.36419*
ZGHQ09	WARMTH	0.10287	0.20965	-0.17684	**0.51577**	0.01423	*0.64797*
ZGHQ10	EASYGETON	0.08250	0.24314	-0.14785	**0.55143**	-0.02877	*0.60731*
ZGHQ11	TIMECHAT	0.12363	0.12482	0.00099	**0.66911**	-0.03710	*0.52004*
ZGHQ12	USEFUL	0.07887	**0.59350**	-0.15313	0.22907	-0.01435	*0.56541*
ZGHQ13	DECISION	0.09126	**0.65881**	-0.14080	0.12693	-0.02348	*0.52115*
ZGHQ14	STRAIN	**0.65512**	0.05257	0.03161	0.07100	-0.19806	*0.52279*
ZGHQ15	OVERCOME	**0.72623**	0.12362	-0.14719	0.03713	-0.10214	*0.42383*
ZGHQ16	STRUGGLE	**0.72129**	0.11979	-0.22082	0.08003	-0.11805	*0.39629*
ZGHQ17	ENJOY	0.19208	**0.45243**	-0.11797	**0.47548**	-0.12112	*0.50374*
ZGHQ18	TAKEHARD	**0.68205**	0.07908	-0.17222	0.09394	-0.13463	*0.47194*
ZGHQ19	SCARED	**0.54769**	0.09730	**-0.40036**	0.00655	-0.21047	*0.48594*
ZGHQ20	FACEUP	0.07437	**0.52905**	-0.25647	0.26133	-0.03773	*0.57909*
ZGHQ21	ONTOPOFU	**0.71517**	0.13798	-0.21298	0.08255	-0.13517	*0.39904*
ZGHQ22	UNHAPPY	**0.60927**	0.14814	**-0.32305**	0.07998	-0.19139	*0.45945*
ZGHQ23	LOSECONF	**0.55764**	0.19269	**-0.42209**	0.00400	-0.10100	*0.46353*
ZGHQ24	WORTHLESS	0.31768	0.17234	**-0.69213**	0.01119	-0.04443	*0.38824*
ZGHQ25	HOPELESS	0.20645	0.10127	**-0.82459**	0.06290	-0.08446	*0.25608*
ZGHQ26	HOPEFUL	0.09975	**0.42721**	-0.31194	0.26956	-0.03094	*0.63662*
ZGHQ27	HAPPY	0.14749	**0.49206**	-0.27059	**0.37837**	-0.05334	*0.51690*
ZGHQ28	NERVOUS	**0.53466**	0.10627	**-0.40671**	0.11095	-0.24599	*0.46461*
ZGHQ29	WRTHLIVING	0.14605	0.08470	**-0.82665**	0.08060	-0.07115	*0.27658*
ZGHQ30	COULDNTDO	0.17544	0.11393	**-0.70060**	0.05970	-0.13847	*0.44267*

Table II.15 CGHQ (Phase 3): Factor loadings for five factor rotated solution (orthogonal)

Variable		1	2	3	4	5	*Uniqueness*
XGHQ01	CONCENTR	0.20240	**0.59753**	-0.05270	0.11832	-0.14591	*0.56393*
XGHQ02	LOSTSLEEP	0.30840	0.06372	-0.14212	0.06358	**-0.80030**	*0.23611*
XGHQ03	RESTLESS	0.16381	0.07437	-0.08927	0.01872	**-0.88312**	*0.17941*
XGHQ04	KEEPBUSY	-0.05141	**0.38856**	-0.10682	0.26437	-0.10840	*0.75332*
XGHQ05	GETTINGOUT	0.05706	0.18095	-0.03413	**0.55486**	-0.10457	*0.64404*
XGHQ06	MANAGING	0.03416	**0.46974**	-0.20598	0.04752	-0.02492	*0.73287*
XGHQ07	DOINGWELL	0.14171	**0.78207**	-0.07688	0.08335	-0.05080	*0.35285*
XGHQ08	SATISFIED	0.16112	**0.77738**	-0.05090	0.03648	-0.04808	*0.36349*
XGHQ09	WARMTH	0.07892	0.17531	-0.14962	**0.58621**	-0.04458	*0.59502*
XGHQ10	EASYGETON	0.08362	0.26003	-0.14511	**0.59485**	0.00007	*0.55049*
XGHQ11	TIMECHAT	0.12579	0.14885	0.00303	**0.63788**	-0.03456	*0.55392*
XGHQ12	USEFUL	0.04339	**0.55732**	-0.15234	0.29122	-0.04088	*0.57782*
XGHQ13	DECISION	0.09242	**0.64412**	-0.14660	0.16932	-0.03684	*0.52505*
XGHQ14	STRAIN	**0.67639**	0.04599	-0.00908	0.08451	-0.23818	*0.47643*
XGHQ15	OVERCOME	**0.73410**	0.09584	-0.15534	0.05301	-0.11812	*0.41101*
XGHQ16	STRUGGLE	**0.73918**	0.10411	-0.22239	0.07510	-0.12202	*0.37279*
XGHQ17	ENJOY	0.18082	**0.46361**	-0.03948	**0.44212**	-0.12287	*0.54025*
XGHQ18	TAKEHARD	**0.69661**	0.09204	-0.17863	0.06392	-0.11844	*0.45624*
XGHQ19	SCARED	**0.57041**	0.11664	**-0.41817**	-0.00769	-0.16234	*0.45974*
XGHQ20	FACEUP	0.04890	**0.53865**	-0.23773	0.19703	-0.05787	*0.60878*
XGHQ21	ONTOPOFU	**0.73622**	0.13163	-0.25138	0.05972	-0.14833	*0.35190*
XGHQ22	UNHAPPY	**0.61568**	0.13032	**-0.34910**	0.08401	-0.19313	*0.43773*
XGHQ23	LOSECONF	**0.57101**	0.17908	**-0.43891**	0.00387	-0.09018	*0.44109*
XGHQ24	WORTHLESS	**0.32071**	0.14054	**-0.73746**	0.03642	-0.02802	*0.33144*
XGHQ25	HOPELESS	0.21944	0.08805	**-0.84024**	0.07096	-0.06905	*0.22829*
XGHQ26	HOPEFUL	0.08699	**0.44851**	-0.29517	0.23783	-0.07737	*0.64160*
XGHQ27	HAPPY	0.14234	**0.52498**	-0.25680	**0.35476**	-0.09002	*0.50423*
XGHQ28	NERVOUS	**0.55985**	0.11547	**-0.42894**	0.06849	-0.21048	*0.44026*
XGHQ29	WRTHLIVING	0.15438	0.07607	**-0.83977**	0.06027	-0.07942	*0.25523*
XGHQ30	COULDNTDO	0.19459	0.08630	**-0.73329**	0.03571	-0.13107	*0.39852*

Comparison of CGHQ Factor Structures across Phases

The same cautions stated earlier about comparing across phases in the light of sample attrition apply equally to the CGHQ scoring. The rotated factors from each Phase data set were compared in terms of the distribution of items in Tables II.16-20. The order of the first phase rotated data defined the numbering of factors and where their position in the solution differed in the data from later phases, which is indicated in parentheses after the phase number in the tables. Items common for each factor (loading above 0.45, for convenience of presentation) are also displayed in these tables.

The consistency in factor structures before rotation was conserved after varimax orthogonal rotation. Allowing for some variation in the order of precedence of items, they appeared to load consistently on the same factors and in the same order of factors across phases of data collection.

Table II.16 CGHQ data: Items loading on Factor 1 across phases, and their content

	Phases			
Loadings	**1 (1)**	**2 (1)**	**3 (1)**	**Item Content**
> 0.71	GHQ21	ZGHQ15	XGHQ16	GHQ14 'felt constantly under strain?'
	GHQ16	ZGHQ16	XGHQ21	GHQ15 'felt you couldn't overcome your difficulties?'
		ZGHQ21	XGHQ15	GHQ16 'been finding life a struggle all the time?'
> 0.63	GHQ15	ZGHQ18	XGHQ18	GHQ18 'been taking things hard?'
	GHQ18	ZGHQ14	XGHQ14	GHQ21 'found everything getting on top of you?'
	GHQ14	ZGHQ22		GHQ22 'been feeling unhappy and depressed?'
		ZGHQ23		GHQ23 'been losing confidence in yourself?'
> 0.55	GHQ22	ZGHQ19	XGHQ22	
	GHQ19	ZGHQ28	XGHQ23	
	GHQ28		XGHQ19	GHQ19 'been getting scared or panicky for no good reason?'
			XGHQ28	
> 0.45	GHQ23			GHQ28 'been feeling nervous and strung-up all the time?'
> 0.32			XGHQ24	

Table II.17 CGHQ data: Items loading on Factor2 across phases, and their content

	Phases			
Loadings	**S1 (2)**	**S2 (2)**	**S3 (2)**	**Item Content**
> 0.71	GHQ07	ZGHQ07	XGHQ07	GHQ01 'been able to concentrate on whatever you're doing?'
	GHQ08	ZGHQ08	XGHQ08	GHQ07 'felt on the whole you were doing things well?'
> 0.63	GHQ13	ZGHQ13	XGHQ13	GHQ08 'been satisfied with the way you've carried out your task?'
> 0.55	GHQ01	ZGHQ12	XGHQ01	GHQ12 'felt that you are playing a useful part in things?'
	GHQ12	ZGHQ01	XGHQ12	GHQ13 'felt capable of making decisions about things?'
	GHQ20			
> 0.45	GHQ27	ZGHQ20	XGHQ20	
	GHQ06	ZGHQ27	XGHQ27	GHQ06 'been managing as well as most people would in your shoes?'
	GHQ17	ZGHQ06	XGHQ06	GHQ17 'been able to enjoy your normal day-to-day activities?'
		ZGHQ17	XGHQ17	GHQ20 'been able to face up to your problems?'
> 0.32	GHQ04	ZGHQ26	XGHQ26	GHQ27 'been feeling reasonably happy, all things considered?'
	GHQ26	ZGHQ04	XGHQ04	

Table II.18 CGHQ data: Items loading on Factor 3 across phases, and their content

	Phases §			
Loadings	**S1 (3)**	**S2 (3)**	**S3 (3)**	**Item Content**
> 0.71	*GHQ25*	*ZGHQ29*	*ZGHQ29*	GHQ24 'been thinking of yourself as a worthless person?'
	GHQ29	*ZGHQ25*	*ZGHQ25*	GHQ25 'felt that life is entirely hopeless?'
	GHQ24			GHQ29 'felt that life wasn't worth living?'
> 0.63	*GHQ30*	*ZGHQ30*	*ZGHQ30*	GHQ30 'found at times you couldn't do anything because your nerves were so bad?'
		ZGHQ24	*ZGHQ24*	
> 0.55				
> 0.45				
> 0.32	*GHQ23*	*ZGHQ23*	*ZGHQ23*	
	GHQ19	*ZGHQ28*	*ZGHQ28*	
	GHQ28	*ZGHQ19*	*ZGHQ19*	
	GHQ26	*ZGHQ22*	*ZGHQ22*	

§ Negative factor loadings in italics.

Table II.19 CGHQ data: Items loading on Factor 4 across phases, and their content

	Phases			
Loadings	**S1 (4)**	**S2 (4)**	**S3 (4)**	**Item Content**
> 0.71				GHQ05 'been getting out of the house as much as usual?'
> 0.63	GHQ11	ZGHQ11	XGHQ11	GHQ09 'been able to feel warmth and affection for those near to you?'
> 0.55		ZGHQ05	XGHQ10	GHQ10 'been finding it easy to get on with other people?'
		ZGHQ10	XGHQ09	GHQ11 'spent much time chatting with people?'
			XGHQ05	
> 0.45	GHQ10	ZGHQ09		
	GHQ09	ZGHQ17		GHQ17 'been able to enjoy your normal day-to-day activities?'
	GHQ05	ZGHQ27		GHQ27 'been feeling reasonably happy, all things considered?'
	GHQ17			
> 0.32	GHQ27		XGHQ17	
			XGHQ27	

Table II.20 CGHQ data: Items loading on Factor 5 across phases, and their content

	Phases §			
Loadings	**S1 (5)**	**S2 (2)**	**S3 (5)**	**Item Content**
> 0.71	*GHQ03*	*ZGHQ03*	*XGHQ03*	GHQ02 'lost much sleep over worry?'
	GHQ02	*ZGHQ02*	*XGHQ02*	GHQ03 'been having restless, disturbed nights?'
> 0.63				
> 0.55				
> 0.45				
> 0.32				

§ Negative factor loadings in italics.

Comparison of GHQ and CGHQ Factor Structures

Comparing GHQ and CGHQ solutions, the differences in stability of factor structure might give rise to some concern. Tables II.21-25 show how the items for each CGHQ factor corresponded with the GHQ factors and their items across phases of data collection (for ease of reading excluding CGHQ items with factor loadings less than 0.45).

The items from the first CGHQ factor corresponded well with the first GHQ factor, as did the third CGHQ factor items and the second GHQ factor. The same might be said of the items of the fifth CGHQ factor and the fifth GHQ factor. The picture was slightly less clear cut for the second and fourth CGHQ factors. For the most part the CGHQ Factor 2 items corresponded with the third GHQ factor, but there was also overlap with GHQ factors 1, 2 and 6 (items GHQ17, 20 & 27, loading fairly or less on these other factors). A similar situation occurred with the fourth CGHQ factor, with GHQ17 & GHQ 27 loading fairly or worse the first two GHQ factors.

Certainly it would appear that the depressive symptoms sub-scale (GHQ24, 25, 29 & 30) derived elsewhere (Stansfeld et al. 1995) and sharing face validity with the depression sub-scale of the GHQ-28 (Stansfeld, Head, & Marmot 1998), was replicated for GHQ scoring across phases (Table II.7) and for CGHQ scoring across phases (Table II.18). The factor loadings for each of these items on the CGHQ ranged from 0.69 to 0.74 (GHQ24); 0.82 to 0.84 (GHQ25); 0.83 to 0.84 (GHQ29), 0.65 to 0.73 (GHQ30).

Table II.21 Comparison of CGHQ Factor 2 Items with GHQ Factors across Phases

CGHQ Factor 1			GHQ Factors					
Items			1	2	3	4	5	6
CGHQ14	STRAIN	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	×	×	×	×
CGHQ15	OVERCOME	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	✓	×	×	×
CGHQ16	STRUGGLE	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	×	×	×	×
CGHQ18	TAKEHARD	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	×	×	×	×
CGHQ19	SCARED	S1	✓	×	×	×	×	✓
		S2	×	×	×	×	×	✓
		S3	✓	✓	×	×	×	✓
CGHQ21	ONTOPOFU	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	×	×	×	×
CGHQ22	UNHAPPY	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	×
		S3	✓	×	×	×	×	×
CGHQ23	LOSECONF	S1	✓	✓	✓	×	×	×
		S2	✓	×	✓	×	×	×
		S3	✓	×	✓	×	×	×
CGHQ28	NERVOUS	S1	✓	×	×	×	×	×
		S2	✓	×	×	×	×	✓
		S3	✓	×	×	×	×	×

Table II.22 Comparison of CGHQ Factor 2 Items with GHQ Factors across Phases

CGHQ Factor 2			GHQ Factors					
Items		Phase	1	2	3	4	5	6
CGHQ01	CONCENTR	S1	✗	✗	✓	✗	✓	✗
		S2	✗	✗	✓	✗	✓	✗
		S3	✗	✗	✓	✗	✗	✗
CGHQ06	MANAGING	S1	✗	✗	✓	✗	✗	✓
		S2	✗	✗	✓	✗	✗	✗
		S3	✗	✗	✓	✗	✗	✗
CGHQ07	DOINGWELL	S1	✗	✗	✓	✗	✗	✗
		S2	✗	✗	✓	✗	✗	✗
		S3	✗	✗	✓	✗	✗	✗
CGHQ08	SATISFIED	S1	✗	✗	✓	✗	✗	✗
		S2	✗	✗	✓	✗	✗	✗
		S3	✗	✗	✓	✗	✗	✗
CGHQ12	USEFUL	S1	✗	✗	✓	✗	✗	✗
		S2	✗	✗	✓	✗	✗	✗
		S3	✗	✓	✓	✗	✗	✗
CGHQ13	DECISION	S1	✓	✗	✓	✗	✗	✗
		S2	✗	✗	✓	✗	✗	✓
		S3	✗	✗	✓	✗	✗	✗
CGHQ17	ENJOY	S1	✗	✗	✗	✓	✗	✗
		S2	✓	✗	✗	✓	✗	✗
		S3	✓	✗	✗	✓	✓	✗
CGHQ20	FACEUP	S1	✓	✓	✓	✗	✗	✓
		S2	✓	✗	✗	✗	✗	✓
		S3	✓	✓	✓	✗	✗	✓
CGHQ27	HAPPY	S1	✓	✓	✗	✗	✗	✗
		S2	✓	✓	✗	✗	✗	✗
		S3	✓	✓	✗	✗	✗	✓

Table II.23 Comparison of CGHQ Factor 3 Items with GHQ Factors across Phases

CGHQ Factor 3			GHQ Factors					
Items		Phase	1	2	3	4	5	6
CGHQ24	WORTHLESS	S1	✗	✓	✓	✗	✗	✗
		S2	✗	✓	✗	✗	✗	✗
		S3	✗	✓	✗	✗	✗	✓
CGHQ25	HOPELESS	S1	✗	✓	✗	✗	✗	✗
		S2	✗	✓	✗	✗	✗	✗
		S3	✗	✓	✗	✗	✗	✓
CGHQ29	WRTHLIVING	S1	✗	✓	✗	✗	✗	✗
		S2	✗	✓	✗	✗	✗	✗
		S3	✗	✓	✗	✗	✗	✓
CGHQ30	COULDNTDO	S1	✗	✓	✗	✗	✗	✓
		S2	✗	✓	✗	✗	✗	✓
		S3	✗	✓	✗	✗	✗	✓

Table II.24 Comparison of CGHQ Factor 4 Items with GHQ Factors across Phases

CGHQ Factor 4			GHQ Factors					
Items		Phase	1	2	3	4	5	6
CGHQ05	GETTINGOUT	S1	✗	✗	✗	✓	✗	✗
		S2	✗	✗	✗	✓	✗	✗
		S3	✗	✗	✓	✓	✗	✗
CGHQ09	WARMTH	S1	✗	✗	✗	✓	✗	✗
		S2	✗	✗	✗	✓	✗	✗
		S3	✓	✗	✗	✓	✗	✗
CGHQ10	EASYGETON	S1	✗	✗	✗	✓	✗	✗
		S2	✗	✗	✗	✓	✗	✗
		S3	✓	✗	✗	✓	✗	✗
CGHQ11	TIMECHAT	S1	✗	✗	✗	✓	✗	✗
		S2	✗	✗	✗	✓	✗	✗
		S3	✗	✗	✗	✓	✗	✗
CGHQ17	ENJOY	S1	✓	✗	✗	✓	✗	✗
		S2	✓	✗	✗	✓	✗	✗
		S3	✓	✗	✗	✓	✓	✗
CGHQ27	HAPPY	S1	✓	✓	✗	✗	✗	✗
		S2	✓	✓	✗	✗	✗	✗
		S3	✓	✓	✗	✗	✗	✓

Table II.25 Comparison of CGHQ Factor 5 Items with GHQ Factors across Phases

CGHQ Factor 5			GHQ Factors					
Items		Phase	1	2	3	4	5	6
CGHQ02	LOSTSLEEP	S1	✗	✗	✗	✗	✓	✗
		S2	✗	✗	✗	✗	✓	✗
		S3	✗	✗	✗	✗	✓	✗
CGHQ03	RESTLESS	S1	✗	✗	✗	✗	✓	✗
		S2	✗	✗	✗	✗	✓	✗
		S3	✗	✗	✗	✗	✓	✗

Discussion of Factor Structures

Although there have been a lot of factor analyses performed on the GHQ-30 over the years there has been no clear agreement on its structure. Some studies present a main factor dubbed depression, with another for anxiety, while findings from other studies are not so differentiated (Goldberg & Williams 1988). It is not surprising, then, that there have been some inconsistencies observed here, not least because the scale was never designed to have any particular sub-scales (Goldberg 1972; Goldberg & Williams 1988). This was notably the case with regard to the GHQ scoring, with six factors extracted at Phases 1 & 2 and only five at Phase 3. However, the factor structures over phases for the CGHQ scoring appeared to be robust and more consistent than that of the GHQ scoring. Factors were chosen for rotation in order to produce the simplest structure, although there were also a number of complex

variables for each scoring method across phases (retention and orthogonal rotation of five and four factors were also carried out but not reported here).

The constraints of the response values for items (0 or 1), no doubt affected the factor structure, and use of the Likert scoring (1-2-3-4) might have produced a clearer picture. However, it would not have been representative of the measurement strategy of either method of administration of the scale. The large sample perhaps offset the constraints of the response categories, but the heterogeneity of the non-clinical Whitehall II Study sample may also have contributed to the variation in results across phases, as well as attrition (which was not unrelated to distress, see Chapter 5, section 5.5.1), as men and women of all ages and backgrounds were considered together. Similarly, the orthogonal varimax rotation might force the data to be more uncorrelated than is perhaps the case; an oblique rotation may reap more rewards, but this analysis was intended as exploratory work only and the orthogonal rotation has been applied successfully elsewhere (Huppert et al. 1989).

It would be rash to assign titles to the factors extracted for each of the two scoring methods, as this is always a subjective exercise, but it does not seem inappropriate to give some rough characterisation of the items here (Table II.26). The first factor in each method might be broadly characterised as signifying distress and vulnerability. The second factor under the GHQ scoring (and third in the CGHQ scoring) comprised the depressiveness items identified elsewhere (Stansfeld, Head, & Marmot 1998). The third factor in the GHQ scoring (second in the CGHQ scoring factor structure) might reflect self-esteem or productivity, while the fourth factor in both structures seemed to have to do with socialising and relating to others. Finally, the sleep related items formed a distinct factor in their own right regardless of scoring method chosen.

Table II.26 GHQ & CGHQ Scoring: Factors extracted after orthogonal varimax rotation

GHQ		CGHQ	
1	Distress	1	Distress
2	Depressiveness	2	Productivity-related
3	Productivity-related	3	Depressiveness
4	Sociability-related	4	Sociability-related
5	Sleep related	5	Sleep related

Huppert and colleagues (Huppert, Walters, Day, & Elliot 1989) developed a five factor structure for the GHQ-30 based on a sample of 6000 men and women from the British

Health & Lifestyle Survey, and applied these as sub-scales to a variety of groups at high risk of psychiatric disorder (Huppert & Weinstein Garcia 1991). They labelled their five factors 'anxiety, worry and tension', 'feelings of incompetence, low self-esteem', 'depression, hopelessness', 'difficulty in coping, dispirited' and 'social dysfunction'. The factors extracted in the present study do not directly correspond to Huppert's factors. The 'social dysfunction' and 'depression' factors are broadly similar to the sociability-related and depressiveness factors, as are the 'anxiety' and distress factors. Sleep did not appear in that research as a factor in its own right, as in the present study, and only one of the sleep items appears in their schema and that of Stansfeld et al. (1998) and then as part of the 'anxiety' factor. The 'feelings of incompetence' factor has some similarity to the productivity-related factor but some of the 'difficulty in coping' items also load on this productivity factor.

In conclusion, the structure of the GHQ-30 was not diminished by choosing the CGHQ scoring and there was sufficient evidence that the depressiveness sub-scale could be usefully employed in the present study.

Appendix III

Cancer Events in the Whitehall II Study

This Appendix details the cancer events that occurred over follow up in the Whitehall II Study. As indicated in Chapter 3, follow up was curtailed at the end of 1997. Cancer events after that date are not reported in this thesis.

List of Tables

Events were divided into pre-baseline exclusions (as the sample had to be cancer-free at baseline), eligible events (registrations of malignant neoplasms and deaths without prior registration from malignant neoplastic disease) and other neoplastic events (neoplasms in situ, benign neoplasms, and neoplasms of uncertain or unknown behaviour). The eligible events for the cancer groups are presented here, after a list of those excluded because they occurred within the first two years of follow up. Finally, this appendix concludes with summary tables of the neoplastic disease sections of the 9th and 10th revisions of the International Classification of Diseases.

Table III.1 Pre-baseline exclusions: incidence by site & neoplastic type, Men

Type of Neoplastic Disease	Site	ICD code	Frequency
Malignant Neoplasm	Tongue	141	1
	Stomach	151	1
	Colon	153	1
	Rectum, rectosigmoid junction and anus	154	1
	Trachea, bronchus and lung	162	1
	Connective and other soft tissue	171	1
	Other of skin	173	16
	Testis	186	6
	Bladder	188	3
	Other, unspecified nervous system	192	1
	Hodgkin's Disease	201	4
Benign Neoplasm	Kidney and other urinary organs	223	1
Carcinoma In Situ	In situ of skin	232	1
Neoplasms of Uncertain or Unknown Behaviour	Genitourinary organs	236	1
			39

Table III.2 Pre-baseline exclusions: incidence by site & neoplastic type, Women

Type of Neoplastic Disease	Site	ICD Code	Frequency
Malignant Neoplasms	Mouth, other & unspecified parts	145	1
	Rectum, rectosigmoid junction and anus	154	1
	Melanoma of skin	172	4
	Other of skin	173	6
	Female Breast	174	18
	Cervix uteri	180	2
	Placenta	181	1
	Ovary and other uterine adnexa	183	1
	Bladder	188	1
	Thyroid gland	193	2
	Secondary & unspecified, lymph nodes	196	1
	Hodgkin's Disease	201	1
Benign Neoplasms	Brain and other nervous system	225	2
Carcinoma In Situ	In situ of breast, genitourinary system	233	6
	Other and unspecified sites	234	3
Neoplasms of Uncertain or Unknown Behaviour	Endocrine glands and nervous system	237	1
			51

Table III.3 Registrations of newly diagnosed cases of cancer over follow up: site, sex and age

ICD-9 *(ICD-10)*	Site Description		All Ages	Age Group			
				35-39	40-44	45-49	50-55
141 (C02)	Malignant neoplasm of tongue	**M**	**2**	1	-	-	1
		F	**0**	-	-	-	-
146 (C10)	Malignant neoplasm of oropharynx	**M**	**1**	1	-	-	-
		F	**1**	-	-	1	-
150 (C15)	Malignant neoplasm of oesophagus	**M**	**2**	-	-	1	1
		F	**1**	-	-	-	1
151 (C16)	Malignant neoplasm of stomach	**M**	**7**	-	-	2	5
		F	**1**	-	-	-	1
153 (C18)	Malignant neoplasm of colon	**M**	**15**	2	2	4	7
		F	**5**	-	2	2	1
154 (C19, C20)	Malignant neoplasm of rectum, rectosigmoid junction & anus	**M**	**12**	2	2	2	6
		F	**3**	-	-	3	-
155 (C22)	Malignant neoplasm of liver & intrahepatic bile ducts	**M**	**1**	1	-	-	-
		F	**0**	-	-	-	-
157 (C25)	Malignant neoplasm of pancreas	**M**	**3**	-	1	-	2
		F	**1**	-	-	-	1
160 (C30, C31)	Malignant neoplasm of nasal cavities, middle ear & accessory sinuses	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
162 (C34)	Malignant neoplasm of trachea, bronchus & lung	**M**	**12**	-	1	2	8
		F	**5**	-	-	2	3
(C45)	Mesothelioma	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
171 (C49)	Malignant neoplasm of connective & other soft tissue	**M**	**2**	-	1	-	1
		F	**2**	-	-	1	1
172 (C43)	Malignant melanoma of skin	**M**	**7**	2	3	1	1
		F	**6**	-	1	4	1
173 (C44)	Other malignant neoplasm of skin	**M**	**36**	1	5	11	19
		F	**6**	2	3	-	1
174 (C50)	Malignant neoplasm of female breast	**F**	**81**	11	17	23	30
180 (C53)	Malignant neoplasm of cervix uteri	**F**	**3**	1	-	-	2
182 (C54)	Malignant neoplasm of body of uterus	**F**	**10**	1	2	4	3
183 (C56)	Malignant neoplasm of ovary & other uterine adnexa	**F**	**10**	1	2	6	1
184 (C51)	Malignant neoplasm of other & unspecified female genital organs	**F**	**1**	-	-	-	1
185 (C61)	Malignant neoplasm of prostate	**M**	**21**	1	2	5	13
186 (C62)	Malignant neoplasm of testis	**M**	**4**	1	2	-	1
188 (C67)	Malignant neoplasm of bladder	**M**	**7**	2	-	1	4
		F	**4**	-	1	-	3
189 (C64, 65)	Malignant neoplasm of kidney & other & unspecified urinary organs	**M**	**8**	2	2	1	3
		F	**3**	1	-	-	2

Table III.3 Registrations *continued*

ICD-9 (ICD-10)	Site Description		All Ages	Age Group			
				35-39	40-44	45-49	50-55
190 (C69)	Malignant neoplasm of eye	**M**	**2**	-	1	-	1
		F	**0**	-	-	-	-
191 (C71)	Malignant neoplasm of brain	**M**	**6**	-	1	3	2
		F	**2**	-	-	-	2
193 (C73)	Malignant neoplasm of thyroid gland	**M**	**1**	1	-	-	-
		F	**1**	-	-	-	1
196 (C77)	Secondary & unspecified malignant neoplasm of lymph nodes	**M**	**1**	1	-	-	-
		F	**0**	-	-	-	
197 (C78)	Secondary malignant neoplasm of respiratory & digestive systems	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
198 (C79)	Secondary malignant neoplasm of other specified sites	**M**	**2**	-	1	-	1
		F	**1**	-	-	-	1
199 (C80)	Malignant neoplasm without specification of site	**M**	**3**	-	-	1	2
		F	**2**	1	-	-	1
200	Lymphosarcoma & reticulosarcoma	**M**	**0**	-	-	-	-
		F	**1**	-	-	1	-
201 (C81)	Hodgkin's disease	**M**	**2**	1	1	-	-
		F	**2**	-	1	-	1
202	Other malignant neoplasm of lymphoid & histiocytic tissue	**M**	**0**	-	-	-	-
		F	**2**	-	-	2	-
C85	Other & unspecified types of non-Hodgkin's lymphoma	**M**	**2**	-	1	1	-
		F	**1**	-	1	-	-
203 (CC90)	Multiple myeloma & immunoproliferative neoplasms	**M**	**2**	-	-	-	2
		F	**2**	-	-	1	1
204 (C91)	Lymphoid leukaemia	**M**	**2**	-	-	1	1
		F	**1**	-	-	-	1
205 (C92)	Myeloid leukaemia	**M**	**2**	1	-	-	1
		F	**0**	-	-	-	-

Table III.4 Deaths due to cancer without prior registration over follow up: site, sex and age

ICD-9 (ICD-10)	Site Description		All Ages	Age Group			
				35-39	40-44	45-49	50-55
150 (C15)	Malignant neoplasm of oesophagus	**M**	**1**	-	-	-	1
		F	**1**	-	-	-	1
151 (C16)	Malignant neoplasm of stomach	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
153 (C18)	Malignant neoplasm of colon	**M**	**2**	-	-	-	2
		F	**0**	-	-	-	-
154 (C19, C20)	Malignant neoplasm of rectum, rectosigmoid junction & anus	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
157 (C25)	Malignant neoplasm of pancreas	**M**	**1**	-	-	-	1
		F	**1**	-	-	-	1
162 (C34)	Malignant neoplasm of trachea, bronchus & lung	**M**	**0**	-	-	-	-
		F	**1**	-	-	1	-
172 (C43)	Malignant melanoma of skin	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-
173 (C44)	Other malignant neoplasm of skin	**M**	**1**	1	-	-	-
		F	**0**	-	-	-	-
174 (C50)	Malignant neoplasm of female breast	**F**	**5**	-	2	-	3
179 (C55)	Malignant neoplasm of uterus, part unspecified	**F**	**1**	-	1	-	-
183 (C56)	Malignant neoplasm of ovary & other uterine adnexa	**F**	**1**	-	-	-	1
185 (C61)	Malignant neoplasm of prostate	**M**	**1**	-	-	-	1
186 (C62)	Malignant neoplasm of testis	**M**	**1**	1	-	-	-
188 (C67)	Malignant neoplasm of bladder	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
189 (C64, 65)	Malignant neoplasm of kidney & other & unspecified urinary organs	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
191 (C71)	Malignant neoplasm of brain	**M**	**1**	-	1	-	-
		F	**1**	-	-	-	1
202	Other malignant neoplasm of lymphoid & histiocytic tissue	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-
205 (C92)	Myeloid leukaemia	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-
208 (C95)	Leukaemia of unspecified cell type	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1

Table III.5 Non-malignant neoplasms over follow up: site, sex and age

ICD-9 (ICD-10)	Site Description		All Ages
(D110)	Benign neoplasm of major salivary glands	**M**	0
		F	1
(D165)	Benign neoplasm of bone & articular cartilage	**M**	0
		F	1
(D320)	Benign neoplasm of meninges	**M**	1
		F	0
(D333)	Benign neoplasm of brain & other parts of the central nervous system	**M**	1
		F	0
232 (D04)	Carcinoma in situ of skin	**M**	0
		F	1
233	Carcinoma in situ of breast, genitourinary system	**M**	0
		F	15
(D05)	In situ of breast	**F**	2
(D06)	In situ of cervix uteri	**F**	6
(D07)	In situ of other & unspecified genital organs	**M**	0
		F	1
(D09)	In situ of other & unspecified sites	**M**	4
		F	0
236 (D39, D40)	Neoplasm of uncertain behaviour of genitourinary organs	**M**	0
		F	1
(D47)	Neoplasm of uncertain behaviour, other of lymphoid, haematopoietic & related tissue	**M**	1
		F	1
238 (D48)	Neoplasm of uncertain behaviour of other & unspecified sites & tissues	**M**	1
		F	1

Table III.6 Events occurring within first 2 years of follow up: site, sex and age

ICD-9 (ICD-10)	Site Description		All Ages	Age Groups			
				35-39	40-44	45-49	50-55
146 (C10)	Malignant neoplasm of oropharynx	**M**	**0**	-	-	-	-
		F	**1**	-	-	1	-
150 (C15)	Malignant neoplasm of oesophagus	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
151 (C16)	Malignant neoplasm of stomach	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
153 (C18)	Malignant neoplasm of colon	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
154 (C19, C20)	Malignant neoplasm of rectum, rectosigmoid junction & anus	**M**	**1**	-	1	-	-
		F	**1**	-	-	-	1
157 (C25)	Malignant neoplasm of pancreas	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
162 (C34)	Malignant neoplasm of trachea, bronchus & lung	**M**	**1**	-	-	-	1
		F	**1**	-	-	1	-
171 (C49)	Malignant neoplasm of connective & other soft tissue	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
172 (C43)	Malignant melanoma of skin	**M**	**0**	-	-	-	-
		F	**1**	-	-	1	-
173 (C44)	Other malignant neoplasm of skin	**M**	**5**	1	1	2	1
		F	**3**	-	1	-	2
174 (C50)	Malignant neoplasm of female breast	**F**	**9**	1	2	1	5
179 (C55)	Malignant neoplasm of uterus, part unspecified	**F**	**1**	-	1	-	-
180 (C53)	Malignant neoplasm of cervix uteri	**F**	**1**	1	-	-	-
182 (C54)	Malignant neoplasm of body of uterus	**F**	**1**	-	-	-	4
183 (C56)	Malignant neoplasm of ovary & other uterine adnexa	**F**	**2**	-	-	1	1
186 (C62)	Malignant neoplasm of testis	**M**	**2**	1	1	-	-
188 (C67)	Malignant neoplasm of bladder	**M**	**0**	-	-	-	-
		F	**1**	-	-	-	1
189 (C64, 65)	Malignant neoplasm of kidney & other & unspecified urinary organs	**M**	**2**	1	1	-	-
		F	**0**	-	-	-	-
201 (C81)	Hodgkin's disease	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-
202	Other malignant neoplasm of lymphoid & histiocytic tissue	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-
203 (CC90)	Multiple myeloma & immunoproliferative neoplasms	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
204 (C91)	Lymphoid leukaemia	**M**	**1**	-	-	-	1
		F	**0**	-	-	-	-
205 (C92)	Myeloid leukaemia	**M**	**1**	-	1	-	-
		F	**0**	-	-	-	-

Table III.7 Cancer groups: Men

GROUP	ICD-9 (ICD-10)		n	Total
Smoking	162 (C33-34)	Trachea, bronchus & lung	11	37
	157 (C25)	Pancreas	4	
	1891-2 (C65-66)	Kidney, renal pelvis & ureter	1	
	1890 (C64)	Kidney, renal cell	7	
	141 (C01-02)	Tongue	2	
	146 (C10)	Oropharynx	1	
	150 (C15)	Oesophagus	3	
	188 (C67)	Bladder	8	
Alcohol	141 (C01-02)	Tongue	2	5
	150 (C15)	Oesophagus	3	
Diet †	153-4 (C18-20)	Colorectal	29	66
	185 (C61)	Prostate	22	
	188 (C67)	Bladder	8	
	1890 (C64)	Kidney, renal cell	7	
		(Body of uterus)	-	
Diet ††	153-4 (C18-20)	Colorectal	29	29
Exercise	153 (C18)	Colon	17	17
Obesity	1890 (C64)	Kidney, renal cell	7	7
Others	151 155 160 172 186 190 191 193 198 199 201 202 203 204 205 (C02 C16 C43 C45 C49 C69 C71 C77 C79 C81 C90 C91 C92)	Miscellaneous sites, excluding NMSC		54

†High fat, high animal protein
†† Low Fibre

Table III.8 Cancer groups: Women

GROUP	ICD-9 (ICD-10)		n	Total
Smoking	162 (C33-34)	Trachea, bronchus & lung	6	19
	157 (C25)	Pancreas	2	
	1891-2 (C65-66)	Kidney, renal pelvis & ureter	1	
	1890 (C64)	Kidney, renal cell	3	
	141 (C01-02)	Tongue	0	
	146 (C10)	Oropharynx	1	
	150 (C15)	Oesophagus	2	
	188 (C67)	Bladder	4	
Alcohol	141 (C01-02)	Tongue	2	89
	150 (C15)	Oesophagus	0	
	174 (C50)	Breast	87	
Diet †	153-4 (C18-20)	Colorectal	9	26
		(Prostate)	-	
	188 (C67)	Bladder	4	
	1890 (C64)	Kidney, renal cell	3	
	182 (C54)	Body of uterus	10	
Diet ††	153-4 (C18-20)	Colorectal	9	9
Obesity	174 (C50)	Breast	87	100
	182 (C54)	Body of uterus	10	
	1890 (C64)	Kidney, renal cell	3	
Reproductive				
High oestrogen	174 (C50)	Breast	87	87
Nulliparity	182 (C54)	Body of uterus	10	21
	183 (C56)	Ovary	11	
OC use	174 (C50)	Breast	87	98
	182 (C54)	Body of uterus	10	
	184 (C51)	Other female genital organs	1	
Others				
	151 171 172 180 191 198 199 200 201 202 203 204 208 (C49 C53 C71 C73 C78 C80 C81 C85 C90)	Miscellaneous sites, excluding NMSC		27

†High fat, high animal protein
†† Low Fibre

Table III.9 International Classification of Diseases, Ninth Revision (ICD-9):

NEOPLASMS, 140 – 239

140 - 195 Malignant neoplasms, stated or presumed to be primary, of specified sites, except of lymphatic & haematopoietic tissue

lip, oral cavity and pharynx

140 lip
141 tongue
142 major salivary glands
143 gum
144 floor of mouth
145 mouth, other & unspecified parts
146 oropharynx
147 nasopharynx
148 hypopharynx
149 lip, oral cavity, pharynx, other & ill-defined

digestive organs and peritoneum

150 oesophagus
151 stomach
152 small intestine, duodenum
153 colon
154 rectum, rectosigmoid junction and anus
155 liver and intrahepatic bile ducts
156 gallbladder and extrahepatic bile ducts
157 pancreas
158 retroperitoneum, peritoneum
159 other, ill-defined sites in digestive organs

respiratory and intrathoracic organs

160 nasal cavities, middle ear & accessory sinuses
161 larynx
162 trachea, bronchus and lung
163 pleura
164 thymus, heart & mediastinum
165 other, ill-defined sites in respiratory system and intrathoracic organs

bone, connective tissue, skin and breast

170 bone and articular cartilage
171 connective and other soft tissue
172 melanoma of skin
173 other of skin
174 female breast
175 male breast

genitourinary organs

179 uterus, part unspecified
180 cervix uteri
181 placenta
182 body of uterus
183 ovary and other uterine adnexa
184 other, unspecified female genital organs
185 prostate
186 testis
187 penis and other male genital organs
188 bladder
189 kidney, other, unspecified urinary organs

other and unspecified sites

190 eye
191 brain
192 other, unspecified nervous system
193 thyroid gland
194 endocrine glands, related structures
195 other and ill-defined sites

196 - 198 Malignant neoplasms, stated or presumed to be secondary, or specified sites

196 secondary & unspecified, lymph nodes
197 secondary, respiratory & digestive systems
198 secondary, other specified sites

(not to be used for coding cause of death)

199 Malignant neoplasm without specification of site

199 without specification of site

200 - 208 Malignant neoplasms, stated or presumed to be primary, of lymphatic and haematopoietic tissue

200 Lymphosarcoma, reticulosarcoma
201 Hodgkin's Disease
202 other of lymphoid & histiocytic tissue
203 multiple myeloma & immunoproliferative neoplasms
204 lymphoid leukaemia
205 myeloid leukaemia
206 moncytic leukaemia
207 other specified leukaemia
208 leukaemia of unspecified cell type

210 - 229 Benign neoplasms

210 lip, oral cavity & pharynx
211 other parts of digestive system
212 respiratory and intrathoracic organs
213 bone and articular cartilage
214 lipoma
215 connective and other soft tissue
216 skin
217 breast
218 uterine leiomyoma
219 other of uterus
220 ovary
221 other female genital organs
222 male genital organs
223 kidney and other urinary organs
224 eye
225 brain & other nervous system
226 thyroid gland
227 other endocrine glands, related structures
228 haemangioma & lymphangioma, any site
229 other and unspecified sites

230 - 234 Carcinoma in situ

230 in situ of digestive organs
231 in situ of respiratory system
232 in situ of skin
233 in situ of breast, genitourinary system
234 other and unspecified sites

235 - 238 Neoplasms of uncertain behaviour

235 digestive & respiratory systems
236 genitourinary organs
237 endocrine glands & nervous system
238 other and unspecified sites and tissues

239 Neoplasms of unspecified nature

Table III.10 International Classification of Diseases, Tenth Revision (ICD-10):

MALIGNANT NEOPLASMS, C00 - C97

C00 - C75 Malignant neoplasms

lip, oral cavity and pharynx

C00 lip
C01 base of tongue
C02 other & unspecified parts of tongue
C03 gum
C04 floor of mouth
C05 palate
C06 other & unspecified parts of mouth
C07 parotid gland
C08 other & unspecified major salivary glands
C09 tonsil
C10 oropharynx
C11 nasopharynx
C12 pyriform sinus
C13 hypopharynx
C14 other & ill-defined sites of the lip, oral cavity and pharynx

digestive organs

C15 oesophagus
C16 stomach
C17 small intestine
C18 colon
C19 rectosigmoid junction
C20 rectum
C21 anus and anal canal
C22 liver and intrahepatic bile ducts
C23 gallbladder
C24 other & unspecified parts of biliary tract
C25 pancreas
C26 other & ill-defined digestive organs

respiratory and intrathoracic organs

C30 nasal cavity & middle ear
C31 accessory sinuses
C32 larynx
C33 trachea
C34 bronchus and lung
C37 thymus
C38 heart, mediastinum & pleura
C39 other & ill-defined sites in the respiratory system and intrathoracic organs

bone and articular cartilage

C40 bone and articular cartilage of limbs
C41 bone and articular cartilage of other and unspecified sites

skin

C43 melanoma of skin
C44 other of skin

mesothelial and soft tissue

C45 Mesothelioma
C46 Kaposi's sarcoma
C47 peripheral nerves & autonomic nervous system
C48 retroperitoneum & peritoneum
C49 other connective & soft tissue

breast

C50 breast

female genital organs

C51 vulva
C52 vagina
C53 cervix uteri
C54 corpus uteri
C55 uterus, part unspecified
C56 ovary
C57 other & unspecified female genital organs
C58 placenta

male genital organs

C60 penis
C61 prostate
C62 testis
C63 other & unspecified male genital organs

urinary tract

C64 kidney, except renal pelvis
C65 renal pelvis
C66 ureter
C67 bladder
C68 other & unspecified urinary organs

eye, brain & other parts of central nervous system

C69 eye
C70 meninges
C71 brain
C72 spinal cord, cranial nerves & other parts of the central nervous system

thyroid & other endocrine glands

C73 thyroid gland
C74 adrenal gland
C75 other endocrine glands & related structures

ill-defined, secondary, and unspecified sites

C76 other & ill-defined sites
C77 secondary & unspecified of lymph nodes
C78 secondary, respiratory & digestive systems
C79 secondary, other specified sites
C80 without specification of site

lymphoid, haematopoietic & related tissue

C81 Hodgkin's Disease
C82 follicular [nodular] non-Hodgkin's lymphoma
C83 diffuse non-Hodgkin's lymphoma
C84 peripheral & cutaneous T-cell lymphomas
C85 other & unspecified types of non-Hodgkin's lymphoma
C88 malignant immunoproliferative diseases
C90 multiple myeloma & malignant plasma cell
C91 lymphoid leukaemia
C92 myeloid leukaemia
C93 moncytic leukaemia
C94 other leukaemias of specified cell type
C95 leukaemia of unspecified cell type
C96 other & unspecified of lymphoid, haematopoietic & related tissue

independent (primary) multiple sites

C97 independent (primary) sites

Table III.11 International Classification of Diseases, Tenth Revision (ICD-10):

OTHER NEOPLASMS, D00 - D48

D00 - D09 In situ neoplasms

D00 oral cavity, oesophagus & stomach*
D01 other & unspecified digestive organs*
D02 middle ear & respiratory system*
D03 melanoma in situ
D04 skin*
D05 breast*
D06 cervix uteri*
D07 other & unspecified genital organs*
D09 other & unspecified sites*
(* carcinoma in situ)

D10 - D36 Benign neoplasms

D10 mouth & pharynx
D11 major salivary glands
D12 colon, rectum, anus & anal canal
D13 other & ill-defined sites of digestive system
D14 middle ear & respiratory system
D15 other & unspecified intrathoracic organs
D16 bone & articular cartilage
D17 lipomatous
D18 haemangioma & lymphangioma, any site
D19 mesothelial tissue
D20 soft tissue of retroperitoneum & peritoneum
D21 other of connective & other soft tissue
D22 melanocytic naevi
D23 other of skin
D24 breast
D25 leiomyoma of uterus
D26 other of uterus
D27 ovary
D28 other & unspecified female genital organs
D29 male genital organs
D30 urinary organs
D31 eye & adnexa
D32 meninges
D33 brain & other parts of the central nervous system
D34 thyroid gland
D35 other & unspecified endocrine glands
D36 other & unspecified sites

D37 - D48 Neoplasms of uncertain or unknown behaviour

D37 oral cavity & digestive organs
D38 middle ear & respiratory & intrathoracic organs
D39 female genital organs
D40 male genital organs
D41 urinary organs
D42 meninges
D43 brain & central nervous system
D44 endocrine glands
D45 polycythaemia vera
D46 myelodysplastic syndromes
D47 other of lymphoid, haematopoietic & related tissue
D48 other & unspecified sites

Appendix IV

Additional Results

1. Healthy Eating Index
2. CGHQ: Completed and Imputed Data
3. Descriptive Statistics: Psychological Distress and Other Variables
4. Total Cancer Cases over Follow Up
5. Poisson Regression: Psychological Distress
6. Poisson Regression: Depressive Symptoms Sub-scale
7. Survival Analysis: Univariate results
8. Survival Analysis (Graphs): Depressive Symptoms Sub-scale
9. Psychological Distress & Health Behaviours over time: Non-response

1. Healthy Eating Index

Reference: Chapter 4, Results I, section 4.2.2.5

Six dietary variables were combined to form the Healthy Eating Index (see Table IV.1a). This produced a normally distributed score ranging from 0 to 6. However, since there were not equivalent numbers responding to the item about egg consumption, this item was dropped. The resulting variable, Healthy Eating Index (Without Eggs) or HEIWE, was also normally distributed with a range of 0 to 5.

Table IV.1a Descriptive Statistics Whitehall II (Phase 1), Health behaviours: Healthy Eating Index

	n			Men[a]	Women[a]	df	
Healthy Eating Index							
Milk	10032		Whole milk [0]	4058 (60.03)	1711 (52.29)	1	χ^2 = 54.01 **
			Semi-skimmed / skimmed milk / do not use / other [1]	2702 (39.97)	1561 (47.71)		
Spread	9957		Butter or margarine [0]	3240 (48.26)	1639 (50.52)	1	χ^2 = 4.47 §
			Polyunsaturated / low calories spreads / rarely use [1]	3473 (51.74)	1605 (49.48)		
Cream	9507		Weekly or more often [0]	951 (14.75)	371 (12.12)	1	χ^2 = 12.01 *
			0-3 times a month or less [1]	5495 (85.25)	2690 (87.88)		
Cheese	9514		3-5 times a week or more [0]	3199 (49.58)	1152 (37.62)	1	χ^2 = 119.66 **
			1-2 times a week or less [1]	3253 (50.42)	1910 (62.38)		
Fish	10077		1-3 times a month or less often [0]	2690 (39.64)	1328 (40.35)	1	χ^2 = 0.47
			1-2 times a week or more [1]	4096 (60.36)	1963 (59.65)		
Eggs	7541		Once a week or more often [0]	3640 (71.07)	1569 (64.86)	1	χ^2 = 29.6 **
			1-3 times a month or less [1]	1482 (28.93)	850 (35.14)		
HEI Range 0-6	7399	Mean (SD) n		3.22 (1.265) *5040*	3.46 (1.276) *2359*	7397	t = -7.36 **
HEIWE Range 0-5	9309	Mean (SD) n		2.87 (1.153) *6326*	3.07 (1.171) *2983*	9307	t = -7.591 **

df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
[a] n (%) unless otherwise indicated

2. GHQ Data: comparison of complete and imputed data

Reference: Chapter 4 Results I, section 4.3.1.

250 participants completed 29 out of the 30 GHQ items at phase 1. Using the original Likert scoring of the scale (1 – 2 – 3 – 4), the missing values were imputed and total GHQ scores computed for these participants by a WII statistician.

Overall the two sets of data correlate perfectly ($r_{xy} = 1$) and there was no significant difference between the means achieved using complete data only, or using imputed data as well (two sample t-test, t = 0.565, n.s. one-tailed; see Table IV.2a). There were significant differences in mean CGHQ score between men and women irrespective of method of data utilisation (complete data only: t = -6.487, p <0.001; complete and imputed data: t = -6.246, p < 0.001). Similarly, there were no significant differences between men across the two scoring methods, or between women. Therefore the CGHQ scores incorporating imputed values could be used with confidence.

Table IV.2a Summary statistics for CGHQ for participants with complete and imputed data (Phase 1)

	CGHQ Complete data only	CGHQ Complete & imputed data	Between methods
Overall			
N	9849	10099	
Range	0-30	0-30	
Mean	9.513	9.527	t = 0.5658
Standard deviation	6.157	6.154	
Median	9	9	
Men			
N	6650	6799	
Range	0-30	0-30	
Mean	9.245	9.251	t = 0.0618
Standard deviation	6.121	6.122	
Std. error of mean	0.075	0.074	
Median	9	9	
Women			
N	3199	3300	
Range	0-29	0-29	
Mean	10.070	10.096	t = 0.168
Standard deviation	6.195	6.180	
Std. error of mean	0.109	0.107	
Median	10	10	

3. Descriptive Statistics: Psychological Distress & Other Variables

Reference: Chapter 4 Results I, section 4.4.4.

At baseline, there was no significant difference in body mass index or family history of cancer between those categorised as distressed and those who were non-distressed (men, Table IV.3a; women, Table IV.3b). Amongst women there were associations between distress and nulliparity, and greater duration of use of oral contraceptives ($p < 0.05$).

Table IV.3a Psychological distress & other variables: Men, Phase 1

	N		PD	Non-PD	df	
Body Mass Index	6771	Mean (SD)	24.52 (3.18)	24.58 (2.99)	6769	t = 0.705
		n	1410	5361		
			n (%)	n (%)		
Family History of Cancer	6779	None	1105 (78.26)	4091 (76.23)	1	$\chi^2 = 2.58$
		Yes	307 (21.74)	1276 (23.77)		

df = Degrees of freedom

Table IV.3b Psychological distress & other variables: Women, Phases 1 & 5

	N		PD	Non-PD	df	
Body Mass Index	3275	Mean (SD)	24.57 (4.5)	24.79 (4.14)	3273	t = 1.23
		n	798	2477		
			n (%)	n (%)		
Family History of Cancer	3277	None	598 (74.94)	1832 (73.9)	1	$\chi^2 = 0.33$
		Yes	200 (25.06)	647 (26.1)		
Parity	2060	Nulliparous	240 (46.88)	681 (43.99)	1	$\chi^2 = 1.29$
		Parous	272 (53.12)	867 (56.01)		
Parity overall ¶	2030	Nulliparous	240 (47.71)	681 (44.6)	2	$\chi^2 = 11.56$ *
		1st child after age 35	32 (6.36)	52 (3.4)		
		Parous	231 (45.92)	794 (52.0)		
Menopause status	2931	Premenopausal	466 (64.99)	1457 (65.81)	2	$\chi^2 = 6.29$ §
		Natural menopause	140 (19.53)	488 (22.04)		
		Surgical menopause	111 (15.48)	269 (12.15)		
Age at menopause	970	≤44 years	99 (39.76)	248 (34.4)	2	$\chi^2 = 3.36$
		45-49 years	91 (36.55)	264 (36.62)		
		≥50 years	59 (23.69)	209 (28.99)		
Duration of use of OC	2937	Never	278 (38.56)	1001 (45.17)	3	$\chi^2 = 10.97$ §
		1-5 years	211 (29.26)	579 (26.13)		
		6-10 years	123 (17.06)	364 (16.43)		
		11+ years	109 (15.12)	272 (12.27)		
Duration of use of HRT †	1418	0-12 months	330 (91.67)	1011 (95.56)		
		1-4 years	24 (6.67)	36 (3.4)		
		5+ years	6 (1.67)	11 (1.04)		

df = Degrees of freedom § $p < 0.05$; * $p < 0.01$

¶ From Phase 5 data

† Numbers in expected frequency too low for χ^2 analysis

In women, there were significant associations between psychological distress and overall parity, menopause status and duration of use of oral contraceptives. Logistic regression analyses were used to calculate odds ratios for each of these variables, and then to establish whether the associations remained significant after adjusting for age group. These results are summarised in Table IV.3c, including analysis of duration of HRT use (although the wide confidence intervals reflect the low numbers in some of the cells for this particular set of analyses).

Table IV.3c Psychological distress & other variables (age-adjusted odds ratios): Women, Phases 1 & 5

		OR (95% CI)	Adjusted OR (95% CI)
Parity overall ¶	Nulliparous	1	1
N = 2030	1st child after age 35	**1.746 (1.097 – 2.777)** §	**1.727 (1.082 – 2.757)** §
	Parous	0.825 (0.670 – 1.016)	0.836 (0.677 – 1.033)
Menopause status	Premenopausal	1	1
N = 2031	Natural menopause	0.893 (0.721 – 1.107)	1.267 (0.945 – 1.700)
	Surgical menopause	**1.285 (1.007 – 1.640)** §	**1.570 (1.198 – 2.056)** *
Duration of use of OC	Never	1	1
N = 2937	1-5 years	**1.312 (1.067 – 1.612)** §	**1.265 (1.022 – 1.565)** §
	6-10 years	1.216 (0.953 – 1.552)	1.163 (0.903 – 1.498)
	11+ years	**1.442 (1.113 – 1.869)** *	**1.376 (1.049 – 1.804)** §
Duration of use of HRT	0-12 months	1	1
N = 1418	1-4 years	**2.042 (1.200 – 3.474)** **	**2.144 (1.254 – 3.663)** *
	5+ years	1.671 (0.613 – 4.553)	1.740 (0.634 – 4.776)

df = Degrees of freedom
¶ From Phase 5 data
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

4. Total Cancer Cases over Follow Up

Reference: Chapter 5, Results II, section 5.2.3

For the outcome group 'any malignant neoplasm', non-melanoma skin cancers were incorporated into the numerator (these events were discarded in the main analyses). Table IV.4a summarises the distribution and crude rates of cancer events including non-melanoma skin cancers (men, n = 31; women, n = 4).

Table IV.4a Total cancer events over follow up, by sex, age and event type (including NMSC)

Age Group	Registrations	DWPR[a]	Cancer Events	N at risk	Crude rates over follow up per 1000
Men					
35-39 years	19	0	19	1994	9.53
40-44 years	21	2	23	1836	12.53
45-49 years	34	0	34	1319	25.77
50-55 years	76	5	81	1630	49.69
Total	*150*	*7*	*157*	*6779*	*23.16*
Women					
35-39 years	17	0	17	770	22.07
40-44 years	28	1	29	763	38.01
45-49 years	44	0	44	735	59.86
50-55 years	48	7	55	1009	54.51
Total	*137*	*8*	*145*	*3277*	*44.25*

[a] DWPR = deaths without prior registration

5. Poisson Regression: Psychological Distress

Reference: Chapter 5, Results II, section 5.3

Poisson regression analysis was carried out for each of the outcome groups in preparation for the survival analyses. This event-count method was used (1) to identify the key variables for each outcome group; (2) to clarify the models and calibration of variables; and (3) to assess the suitability of each outcome group model for further analysis. After steps (1) and (2), the regression models were compared over three models: distress only; distress plus explanatory variables; distress, explanatory variables plus key confounders. Step (3) was addressed by assessing the improvement in fit for each model over its corresponding null or constant-only model and the improvement in fit between models.

In order to carry out Poisson regression analysis, the data were grouped according to relevant variables. Any records with zero time at risk had to be eliminated from the data set before STATA could perform the analyses. These records or sub-groups are identified for each outcome group in this Appendix.

Any Malignant Neoplasm (including NMSC)

There were 302 events eligible for this outcome group. After collapsing the data into grouped data, eight sub-groups had zero time (6 sub-groups of women and 2 sub-groups of men) and these records were eliminated. The characteristics of these sub-groups are summarised in Table IV.5a.

Time at risk ranged from 136 days to 95460 days for the remaining records. Preliminary Poisson regression analyses eliminated consumption of fruits or vegetables, and the exercise variables. Age was categorised into three levels, collapsing the two younger levels into one reference group (35 – 44 years). Smoking was collapsed into two levels: never and ex-smokers combined, versus current smokers. Thus the explanatory variables considered in relation to this outcome were body mass index, the healthy eating index (without eggs; HEIWE), smoking, self-assessed health and family history of cancer.

Table IV.5a Poisson regression: characteristics of zero time sub-groups; any malignant neoplasm

	W1	W2	W3	W4	W5	W6	M1	M2
Age group (years)	40-44	45-49	40-44	50-55	45-49	45-49	40-44	50-55
Grade	A	C	C	P-E	P-E	C	A	A
Self-assessed health	-	-	+	+	+	-	+	+
Smoking	E	N	N	C	E	E	E	C
Fruits or vegetables	Daily	3-6 pw	3-6 pw	Daily	Daily	3-6 pw	3-6 pw	3-6 pw
Mild exercise	≤5 hrs	≤5 hrs	> 5hrs	> 5hrs	> 5hrs	> 5hrs	≤5hrs	> 5hrs
Moderate exercise	≤2 hrs	.	≤2 hrs	> 2 hrs	≤2 hrs	.	≤2 hrs	> 2 hrs
Vigorous exercise	< 1 hr	.	≥1 hr	< 1 hr	< 1 hr	< 1 hr	.	< 1 hr
Psychological Distress	Yes	No	No	No	No	No	No	No
Alcohol	H	N-D	N-D	L	L	M	H	L
Family history of cancer	Yes	Yes	None	None	Yes	None	None	Yes
ANYMN	No	No	No	No	No	No	No	No
HEIWE (mean)	1	2	4	5	5	2	2	2
BMI (mean)	27.4	24.5	26.2	30.2	27.4	29.1	28.0	27.6

Missing data = .
Grade: A = Administrative, P-E = Professional – Executive; C = Clerical; Self-assessed health: + = good or better, - = average or worse; Smoking: N = never, E = ex-smoker, C = current; Fruits or vegetables, pw = per week; Alcohol: N-D = non-drinker, L = light, M = medium, H = heavy; ANYMN = any malignant neoplasm.

In this first model, psychological distress had a non-significant incidence rate ratio less than unity (IRR = 0.85, 95% CI 0.63 – 1.16), which reduced to (IRR = 0.81, 95% CI 0.59 – 1.12) when the explanatory variables were taken into consideration (see Table IV.5b). In this second model, all of the explanatory variables had elevated incidence rate ratios, significantly so for current smoking ($p < 0.01$), mean healthy eating score ($p < 0.01$), mean body mass index ($p < 0.05$) and for a family history of cancer ($p < 0.05$).

Having adjusted for sex, age group and grade, the coefficient for psychological distress decreased further, but was not significantly different from unity (IRR = 0.76, 95% CI 0.55 – 1.05). The most significant risk factors in this third model were increasing age and sex. Being female was associated with a 87% increase in rate ratio ($p < 0.001$), and the rate ratio increased with increasing levels of age (45 – 49 years, IRR = 2.59, $p < 0.001$; 50 – 55 years, IRR = 3.66, $p < 0.001$).The rate ratios for current smoking and mean body mass index remained significantly elevated after adjustment for age, grade and gender (both $p < 0.05$), although the direction of the latter had reversed from 1.13 to 0.84, and self-assessed health was associated with an increased rate ratio (IRR = 1.36, 95% CI 1.02 – 1.80).

When non-melanoma skin cancers were included in the outcome group of any malignant neoplasm (thus totalling 302 events), psychological distress had an incidence rate ratio significantly lower than unity (adjusted IRR = 0.72, 95% CI 0.53 – 0.98), and age and sex remained the most significant predictors.

Table IV.5b Poisson regression models, any malignant neoplasm (including NMSC): coefficients & incidence rate ratios

Model		β, (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	-0.155 (0.154)	0.856	0.632-1.159
	Intercept **	-11.866 (0.068)		
2	Psychological Distress			
	No distress		1	
	Distress	-0.204 (0.158)	0.814	0.596-1.112
	BMI			
	(mean) §	0.127 (0.058)	**1.135**	**1.012-1.274**
	HEIWE			
	(mean) *	0.686 (0.232)	**1.986**	**1.259-3.134**
	Smoking			
	Never, Ex		1	
	Current **	0.562 (0.141)	**1.754**	**1.330-2.313**
	Self Assessed Health			
	Good or better		1	
	Average or worse	0.212 (0.143)	1.237	0.934-1.637
	Family History of Cancer			
	No		1	
	Yes §	0.287 (0.136)	**1.332**	**1.020-1.740**
	Intercept **	-17.296 (1.529)		
3	Psychological Distress			
	No distress		1	
	Distress	-0.265 (0.163)	0.766	0.556 – 1.056
	BMI			
	(mean) §	-0.172 (0.076)	**0.841**	**0.724 – 0.977**
	HEIWE			
	(mean)	0.327 (0.230)	1.386	0.882 – 2.180
	Smoking			
	Never, Ex		1	
	Current §	0.349 (0.155)	**1.418**	**1.046 – 1.922**
	Self-assessed Health			
	Good or better		1	
	Average or worse §	0.308 (0.144)	**1.361**	**1.026 – 1.805**
	Family History of Cancer			
	No		1	
	Yes	0.153 (0.137)	1.165	0.890 – 1.525
	Sex			
	Male		1	
	Female **	0.626 (0.151)	**1.870**	**1.390 – 2.516**
	Age Group			
	35-44 years		1	
	45-49 years **	0.954 (0.175)	**2.597**	**1.840 – 3.665**
	50-55 years **	1.299 (0.170)	**3.660**	**2.624 – 5.121**
	Grade			
	Administrative		1	
	Prof.-Exec.	0.123 (0.163)	1.130	0.820 – 1.558
	Clerical	0.030 (0.213)	1.030	0.677 – 1.567
	Intercept **	-9.778 (2.017)		

N (observations) = 339 (model 1); N (observations) = 274 (models 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a - ℓ_b) statistic: (1) v (2), df = 5, 63.46 **; (2) v (3) , df = 5, 89.32**; (1) v (3), df = 10, 152.79**

The Poisson regression model consisting of psychological distress alone had a log likelihood of -345.73, and did not differ significantly from the null model (LR $\chi^2 = 1.04$, df = 1). The addition of the explanatory variables (model 2) and key confounders (model 3) improved model fit significantly (see notes, Table IV.5b). Both of these models differed significantly from their null models (2: LR $\chi^2 = 37.82$, df = 6, $p < 0.001$; 3: LR $\chi^2 = 127.15$, df = 11, $p < 0.001$).

Any malignant neoplasm (excluding NMSC)

There were 267 events eligible for this outcome group. After collapsing the data into grouped data, time at risk ranged from 988 days to 3784304 days for the remaining records. Preliminary Poisson regression analyses eliminated consumption of fruits or vegetables, and the exercise variables. Age was categorised into three levels, collapsing the two younger age strata into one reference group (35 – 44 years). Smoking was collapsed into two levels, with never and ex-smokers combined as the reference category. Thus the explanatory variables considered in relation to this outcome were body mass index, the healthy eating index (without eggs; HEIWE), smoking, self-assessed health and family history of cancer.

In this first model (see Table IV.5c), psychological distress had a non-significant incidence rate ratio of 0.78 (0.58 – 1.05), which remained largely unchanged when the explanatory variables were taken into consideration (IRR 0.75, 95% CI 0.56 – 1.02). In this second model, all of the explanatory variables had elevated incidence rate ratios, significantly so for both current smoking ($p < 0.01$) and a family history of cancer ($p < 0.05$).

Having adjusted for sex, age group (3 levels) and grade, psychological distress was significantly lower than unity (IRR 0.72, 95% CI 0.53 – 0.98), as was mean BMI (IRR 0.85, 95% CI 0.75 – 0.95). The incidence rate ratios for the other explanatory variables remained elevated, but no longer significantly so for smoking (1.29, 95% CI 0.97 – 1.72) or family history of cancer (IRR 1.11, 95% CI 0.86 – 1.43). The strongest risk factors for this general model were gender and age. Being female was associated with a 66% increase in rate ratio ($p < 0.001$) and the rate ratio increased with increasing levels of age ($p < 0.001$).

Table IV.5c Poisson regression results, any malignant neoplasm (excluding NMSC): coefficients & incidence rate ratios

		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	-0.237 (0.149)	0.788	0.588-1.055
	Intercept **	-11.728 (0.063)		
2	Psychological Distress			
	No distress		1	
	Distress	-0.277 (0.153)	0.757	0.561-1.023
	BMI			
	(mean)	0.054 (0.048)	1.056	0.960-1.162
	HEIWE			
	(mean)	0.315 (0.190)	1.371	0.944-1.990
	Smoking			
	Never, Ex		1	
	Current *	0.399 (0.137)	**1.490**	**1.138-1.950**
	Self Assessed Health			
	Good or better		1	
	Average or worse	0.200 (0.133)	1.222	0.940-1.589
	Family History of Cancer			
	No		1	
	Yes §	0.254 (0.128)	**1.290**	**1.003-1.658**
	Intercept **	-14.210 (1.278)		
3	Psychological Distress			
	No distress		1	
	Distress §	-0.323 (0.155)	**0.723**	**0.532-0.982**
	BMI			
	(mean) *	-0.166 (0.058)	**0.846**	**0.755-0.948**
	HEIWE			
	(mean)	0.196 (0.181)	1.216	0.851-1.737
	Smoking			
	Never, Ex		1	
	Current	0.255 (0.146)	1.291	0.970-1.719
	Self Assessed Health			
	Good or better		1	
	Average or worse	0.241 (0.133)	1.272	0.978-1.654
	Family History of Cancer			
	No		1	
	Yes	0.107 (0.129)	1.113	0.864-1.435
	Sex			
	Male		1	
	Female **	0.512 (0.139)	**1.669**	**1.269-2.196**
	Age Group			
	35-44 years		1	
	45-49 years **	0.973 (0.162)	**2.646**	**1.923-3.641**
	50-55 years **	1.337 (0.154)	**3.808**	**2.815-5.150**
	Grade			
	Administrative		1	
	Prof.-Exec.	0.056 (0.147)	1.058	0.792-1.413
	Clerical	-0.073 (0.194)	0.929	0.634-1.359
	Intercept **	-9.240 (1.484)		

N (observations) = 558 (model 1); N (observations) = 473 (models 2 & 3)
df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
Notes Model fit using $-2(\ell_a - \ell_b)$ statistic: (1) v (2), df = 5, 46.6 **; (2) v (3), df = 5, 103.25**; (1) v (3), df = 10, 149.85 **

The poisson regression model consisting of psychological distress alone had a log likelihood of -417.32, and did not differ significantly from the null model (LR $\chi^2 = 2.67$, df = 1). The log likelihood of the second model was -394.02, and the log likelihood was -342.4 after adjusting for the key confounders (model 3). Both of these models differed significantly from the null models (2: LR $\chi^2 = 21.88$, df = 6, $p < 0.01$; 3: LR $\chi^2 = 125.13$, df = 11, $p < 0.001$). The addition of the explanatory variables and key confounders improved the model fit significantly (see notes, Table IV.5c).

Smoking related cancers

There were 48 eligible smoking related cancers over follow up. Preliminary Poisson regression analyses eliminated consumption of alcohol, self-assessed health and the exercise variables as covariates. Intake of fruits or vegetables was categorised over three levels, with the two categories indicating less consumption combined ('less than daily'). The five-level composite variable for reported smoking behaviour was categorised over four levels, with ex-smokers and light smokers combined. The same three levels of age group were used as with the outcome of any malignant neoplasm. After collapsing the data into grouped data, time at risk ranged from 1079 days to 1128959 days.

In the first model (see Table IV.5d), psychological distress had an unadjusted incidence rate ratio of 0.41 (95% CI 0.16 – 1.04), which increased to 0.43 (95% CI 0.16 – 1.09) when the explanatory variables were taken into consideration. In this second model, the incidence rate ratios increased for each level of reported tobacco use, up to a 7-fold increase in rate ratio among heavy smokers (95% CI, 2.81 – 19.02). A family history of cancer was associated with a significantly higher rate ratio ($p < 0.05$) and consumption of fruits or vegetables was significantly protective ($p < 0.01$).

After adjusting for age, sex and grade, the coefficient for psychological distress increased, but remained non-significant (IRR = 0.45, 95% CI 0.17 – 1.16). Meanwhile, the rate ratios for each level of smoking increased (medium, adjusted IRR = 2.97, 95% CI 1.02 – 8.61; heavy, adjusted IRR = 8.61, 95% CI 3.31 – 22.36) and intake of fruits or vegetables remained significantly protective (daily, adjusted IRR = 0.33, 95% CI 0.16 – 0.71; less than daily, adjusted IRR = 0.35, 95% CI 0.16 – 0.75). Although there was some

indication of a lower incidence rate for smoking related cancers among women as compared with men, this was not significant. As with the Poisson regression analysis of any malignant neoplasm previously, grade did not have a significantly higher or lower rate ratio.

Table IV.5d Poisson regression results, smoking related cancers: coefficients & incidence rate ratios

Model		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	-0.887 (0.472)	0.411	0.163 – 1.039
	Intercept **	-13.476 (0.152)		
2	Psychological Distress			
	No distress		1	
	Distress	-0.843 (0.474)	0.430	0.169 – 1.091
	BMI			
	(mean)	-0.085 (0.088)	1.088	0.915 – 1.294
	HEIWE			
	(mean)	-0.442 (0.299)	0.642	0.357 – 1.154
	Smoking			
	Never		1	
	Ex, Light	0.699 (0.360)	2.012	0.993 – 4.079
	Medium	0.991 (0.535)	2.695	0.944 – 7.691
	Heavy **	1.989 (0.487)	**7.311**	**2.811 – 19.018**
	Fruits or Vegetables			
	2+ servings daily		1	
	Daily *	-0.980 (0.375)	**0.375**	**0.179 – 0.782**
	Less than daily *	-1.021 (0.375)	**0.360**	**0.172 – 0.751**
	Family History of Cancer			
	No		1	
	Yes §	0.671 (0.301)	**1.958**	**1.083 – 3.538**
	Intercept **	-14.334 (2.427)		
3	Psychological Distress			
	No distress		1	
	Distress	-0.790 (0.478)	0.453	0.177 – 1.159
	BMI			
	(mean)	-0.058 (0.100)	0.943	0.775 – 1.147
	HEIWE			
	(mean)	-0.319 (0.323)	0.726	0.385 – 1.368
	Smoking			
	Never		1	
	Ex, Light	0.704 (0.362)	2.022	0.994 – 4.112
	Medium §	1.089 (0.542)	**2.973**	**1.026 – 8.616**
	Heavy **	2.152 (0.486)	**8.608**	**3.314 – 22.358**
	Fruits or Vegetables			
	2+ servings daily		1	
	Daily *	-1.082 (0.379)	**0.338**	**0.160 – 0.713**
	Less than daily *	-1.046 (0.389)	**0.351**	**0.163 – 0.753**
	Family History of Cancer			
	No		1	
	Yes	0.518 (0.302)	1.679	0.927 – 3.040
	Sex			
	Male		1	
	Female	-0.144 (0.379)	0.865	0.411 – 1.820
	Age Group			
	35-44 years		1	
	45-49 years	0.607 (0.498)	1.836	0.691 – 4.879
	50-55 years **	1.789 (0.386)	**5.984**	**2.805 – 12.765**
	Grade			
	Administrative		1	
	Prof.-Exec.	0.093 (0.356)	1.097	0.546 – 2.205
	Clerical	-0.071 (0.506)	0.930	0.344 – 2.514
	Intercept **	-11.9705 (2.699)		

N (observations) = 761 (model 1); N (observations) = 646 (models 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a - ℓ_b) statistic: (1) v (2), df = 8, 50.08 **; (2) v (3), df = 5, 25.73**; (1) v (3), df = 13, 75.81**

There was a significant increase in fit with each model (see notes, Table IV.5d). The first model, psychological distress only, had a log likelihood of -175.55, and differed significantly from the null model (LR $\chi^2 = 4.45$, df = 1, $p < 0.05$). Both the second and third models also differed significantly from their null models ($\ell_2 = -150.51$, LR $\chi^2 = 37.48$, df = 9, $p < 0.001$; $\ell_3 = -137.65$, LR $\chi^2 = 63.21$, df = 14, $p < 0.001$).

Diet related cancers

There were 82 diet-related cancers (high meat, high fat consumption) over follow up, 60 amongst men and 22 amongst women. Spread size and the exercise variables were dropped after initial analyses. The intake of meat was categorised over two levels, as was intake of fruits and vegetables. The effect of age was consistent across age groups, so the mean age was used in the regression models. After grouping the data, time at risk ranged from 1752 days to 1286275 days.

The incidence rate ratio for psychological distress ranged from 0.86 (model 1, IRR, 95% CI 0.49 – 1.48) to 0.88 (adjusted IRR, 95% CI 0.51 – 1.55) in the third model, largely unaltered by adjustment for either the explanatory variables or these in combination with the key confounders (see Table IV.5e). None of the explanatory variables or key confounders had significant incidence rate ratios and none of the fitted models differed from their null models (1: LR $\chi^2 = 0.31$, df = 1; 2: LR $\chi^2 = 5.32$, df = 8; 3: LR $\chi^2 = 6.29$, df = 12), nor was there any significant improvement in fit between each model (see notes, Table IV.5e). Nevertheless, the rate ratios of the explanatory variables did not deviate from the expected directions (e.g. IRR = 1.17 for less frequent consumption of fruits or vegetables, model 3).

Table IV.5e Poisson regression results, diet related cancers: coefficients & incidence rate ratios

Model		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	-0.152 (0.278)	0.858	0.497 – 1.481
	Intercept **	-13.047 (0.123)		
2	Psychological Distress			
	No distress		1	
	Distress	-0.133 (0.279)	0.874	0.505 – 1.514
	Fruits or Vegetables			
	Daily		1	
	Less than daily	0.155 (0.239)	1.168	0.730 – 1.869
	Meat intake			
	3-4 times a week or less		1	
	5+ times a week	0.105 (0.280)	1.111	0.640 – 1.927
	Bread			
	Wholemeal		1	
	Other brown	-0.199 (0.305)	0.819	0.450 – 1.489
	White	0.002 (0.420)	1.002	0.439 – 2.288
	HEIWE			
	(mean)	-0.082 (0.486)	0.921	0.354 – 2.392
	BMI			
	(mean)	0.027 (0.140)	1.027	0.780 – 1.353
	Family History of Cancer			
	No		1	
	Yes	0.440 (0.240)	1.553	0.969 – 2.487
	Intercept **	-13.658 (3.422)		
3	Psychological Distress			
	No distress		1	
	Distress	-0.116 (0.282)	0.889	0.511 – 1.547
	Fruits or Vegetables			
	Daily		1	
	Less than daily	0.159 (0.247)	1.173	0.722 – 1.906
	Meat intake			
	3-4 times a week or less		1	
	5+ times a week	0.110 (0.285)	1.116	0.637 – 1.954
	Bread			
	Wholemeal		1	
	Other brown	-0.190 (0.313)	0.826	0.446 – 1.529
	White	0.024 (0.437)	1.024	0.434 – 2.417
	HEIWE			
	(mean)	0.002 (0.517)	1.002	0.363 – 2.762
	BMI			
	(mean)	0.034 (0.162)	1.034	0.752 – 1.422
	Family History of Cancer			
	No		1	
	Yes	0.416 (0.289)	1.517	0.860 – 2.673
	Sex			
	Male		1	
	Female	-0.237 (0.313)	0.788	0.426 – 1.457
	Age			
	(mean)	0.022 (0.104)	1.022	0.832 – 1.255
	Grade			
	Administrative		1	
	Prof.-Exec.	0.117 (0.326)	1.124	0.592 – 2.133
	Clerical	-0.010 (0.398)	0.989	0.453 – 2.161
	Intercept **	-15.057 (5.501)		

N (observations) = 4504 (model 1); N (observations) = 3850 (models 2 & 3)
** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a - ℓ_b) statistic: (1) v (2), df = 7, 13.4; (2) v (3) , df = 4, 0.97; (1) v (3), df = 11, 14.37

Cancers related to use of oral contraceptives

There were 83 cancers amongst women which could be related to use of oral contraceptives (OC), after excluding women who had undergone hysterectomy or hysterectomy and oophorectomy (n = 2897). However, preliminary analyses showed that reported use of HRT was limited in the sample, hampering consideration of this source of exogenous hormones in the analyses. Thus the reproductive variables were limited to oral contraceptive use (3 levels), menopause status (premenopause v natural menopause) and nulliparity. The following variables were disregarded after initial analyses: intake of fruits or vegetables; moderate and vigorous exercise; BMI and the dietary variables except for HEIWE. Age was categorised over three levels, with the two younger age groups collapsed together as the reference category. After grouping the data, there was one record with zero time. The characteristics of the one sub-group with zero time are summarised in Table IV.5f.

Table IV.5f Poisson regression: characteristics of sub-groups with zero time data, diet related cancers

	W1
Age group (years)	45-49
Grade	P-E
Psychological Distress	No
Menopausal status	.
Parity	Yes
Family history of cancer	No
OC use	Never
OCUSEOUT	0
BMI (mean)	30.26

Missing data = .
Grade: A = Administrative, P-E = Professional – Executive; C = Clerical;

The incidence rate ratio for psychological distress in the first model was 1.21 (95% CI 0.73 – 2.00; see Table IV.5g), which increased to 1.78 (95% CI 0.88 – 3.62) after taking the explanatory variables into consideration. The rate ratio for psychological distress increased further after adjusting for age, sex and grade (IRR 1.82, 95% CI 0.89 – 3.72, p = 0.09). In the second model, only current smoking differed significantly from unity (IRR 2.32 95% CI 1.12 – 4.82), even after adjusting for age and grade (model 3: IRR 2.34 95% CI 1.12 – 4.91).

The rate ratio for mean HEIWE score was elevated, although attenuated after adjusting for age and grade, approaching significance (adjusted IRR = 1.39, 95% CI 0.99 – 2.03). Increased use of OC was associated with a falling rate ratio (models 2 & 3), but this

may reflect the numbers of women reporting use of these exogenous hormones (never, n = 1087; 1-5 years, n = 681; 6+ years, n = 803). The rate ratios increased with age and rate ratios were less than unity for parous women and women who reported natural menopause.

Table IV.5g Poisson regression results, OC use related cancers: coefficients & incidence rate ratios

Model		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	0.194 (0.255)	1.214	0.735 – 2.004
	Intercept **	-11.946 (0.133)		
2	Psychological Distress			
	No distress		1	
	Distress	0.579 (0.360)	1.785	0.881 – 3.620
	Use of Oral Contraceptives			
	Never		1	
	1-5 years	-0.211 (0.424)	0.809	0.352 – 1.858
	6+ years	-0.517 (0.439)	0.596	0.252 – 1.409
	Menopause status			
	Premenopause		1	
	Natural menopause	-0.264 (0.446)	0.767	0.319 – 1.842
	Nulliparity			
	Nulliparous		1	
	Parous	-0.190 (0.347)	0.826	0.418 – 1.631
	Smoking			
	Never / Ex		1	
	Current **§**	0.842 (0.372)	**2.321**	**1.119 – 4.816**
	HEIWE			
	(mean)	0.349 (0.183)	1.417	0.989 – 2.032
	Alcohol intake			
	Non-drinker		1	
	Light	0.731 (0.471)	2.077	0.824 – 5.232
	Medium/Heavy	0.413 (0.546)	1.512	0.518 – 4.416
	Mild exercise (per week)			
	5 hours or less		1	
	More than 5 hours	0.571 (0.488)	1.770	0.679 – 4.612
	Family History of Cancer			
	No		1	
	Yes	0.411 (0.370)	1.508	0.730 – 3.117
	Intercept **	-14.233 (0.939)		

Continued/

** $p < 0.001$ — β, parameter coefficient
CI, confidence interval — SE, standard error of the coefficient

Table IV.5g *Continued*

Model		β (SE)	IRR	95% CI
3	Psychological Distress			
	No distress		1	
	Distress	0.602 (0.362)	1.827	0.897 – 3.720
	Use of Oral Contraceptives			
	Never		1	
	1-5 years	-0.147 (0.433)	0.863	0.368 – 2.020
	6+ years	-0.414 (0.450)	0.660	0.273 – 1.598
	Menopause status			
	Premenopause		1	
	Natural menopause	-0.614 (0.581)	0.540	0.173 – 1.689
	Nulliparity			
	Nulliparous		1	
	Parous	-0.252 (0.368)	0.776	0.377 – 1.598
	Smoking			
	Never / Ex		1	
	Current **§**	0.852 (0.377)	**2.344**	**1.118 – 4.911**
	HEIWE			
	(mean)	0.334 (0.180)	1.396	0.980 – 1.988
	Alcohol intake			
	Non-drinker		1	
	Light	0.709 (0.474)	2.035	0.802 – 5.155
	Medium/Heavy	0.299 (0.573)	1.349	0.438 – 4.150
	Mild exercise (per week)			
	5 hours or less		1	
	More than 5 hours	0.582 (0.488)	1.790	0.686 – 4.669
	Family History of Cancer			
	No		1	
	Yes	0.351 (0.371)	1.420	0.685 – 2.943
	Age Group			
	35-44 years		1	
	45-49 years	0.533 (0.420)	1.704	0.747 – 3.889
	50-55 years	0.591 (0.583)	1.807	0.576 – 5.666
	Grade			
	Administrative		1	
	Prof.-Exec.	-0.476 (0.474)	0.621	0.244 – 1.575
	Clerical	-0.397 (0.526)	0.671	0.239 – 1.883
	Intercept **	-14.004 (1.042)		

N (observations) = 559 (model 1); N (observations) = 244 (models 2 & 3)
** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a - ℓ_b) statistic: (1) v (2), df = 10, 396.07 **; (2) v (3), df = 3, 2.81; (1) v (3), df = 14, 398.88 **

The addition of the explanatory variables was a significant improvement in fit over the first model ($p < 0.001$), although the addition of the key confounding variables did not improve fit significantly ($p > 0.05$, see notes, Table IV.5g) and none of the models was significantly different from the null model (1: LR $\chi^2 = 0.56$, df = 1; 2: LR $\chi^2 = 6.15$, df = 7; 3: LR $\chi^2 = 18.36$, df = 15). It should be noted that the numbers of records available for analysis almost halved between model 1 and model 2 (see Table IV.5g).

Breast cancers

74 of the breast cancers that occurred over follow up were eligible for analysis. Preliminary analyses indicated that the diet variables did not contribute, except for the healthy eating index (HEIWE). Further, only 84 women had children after age 35, so the general parity variable was used (nulliparous v parous). Grade was reversed for this Poisson regression analysis, with the clerical grades used as the reference category. Non-drinkers and light drinkers were considered together as the reference category for alcohol consumption. Never smokers and ex-smokers were considered together versus current smokers, and age was divided into two strata (35-44 years, and 45-55 years). After grouping the data, three records had zero time; after eliminating these records, the time at risk ranged from 793 days to 137783 days. The characteristics of the three sub-groups with zero time are summarised in Table IV.5h.

Table IV.5h Poisson regression: characteristics of sub-groups with zero time data, diet related cancers

	W1	W2	W3
Age group (years)	45-49	35-44	50-55
Grade	C	A	P-E
Mild exercise	≤5 hrs	> 5 hrs	> 5 hrs
Moderate exercise	.	> 2hrs	> 2hrs
Vigorous exercise	.	< 1 hr	< 1 hr
Psychological Distress	No	No	No
Menopausal status	.	.	.
Parity	.	No	Yes
Alcohol intake	Non-D/L	H	Non-D/L
MNBREAST	0	0	0
BMI (mean)	24.52	20.21	30.26

Missing data = .
Grade: A = Administrative, P-E = Professional – Executive; C = Clerical; Exercise, per week;
Alcohol: N-D = non-drinker, L = light, M = medium, H = heavy.

The incidence rate ratio for psychological distress reduced from 1.07 to 1.03 after adjusting for health behaviours (see Table IV.5i), but neither ratio deviated significantly from unity. None of the rate ratios for the health behaviours were significant, although risk appeared to be elevated amongst current smokers, heavy drinkers and those reporting more than 5 hours of mild exercise per week (model 2).

After adjusting for the key confounders (age, grade) and other risk factors for cancer (menopause status, parity, and body mass index), the rate ratio for psychological distress increased (adjusted IRR = 1.39, 95% CI 0.67 – 2.90; see Table IV.5i). There was a two-fold increase in rate ratio for current smoking (adjusted IRR = 2.36, 95% CI 1.13 – 4.94), and although the rate ratio for mild exercise had increased (adjusted IRR = 3.07, 95% CI 0.92 – 10.22), and that for heavy alcohol consumption fallen (adjusted IRR = 1.40,

95% CI 0.55 – 3.57), neither deviated significantly from unity. Being older was associated with an elevated rate ratio for breast cancer (IRR = 2.25, 95% CI 0.84 – 6.07), and as expected, being in the highest grades was associated with an increased rate ratio (administrative, IRR = 2.25, n.s.).

Table IV.5i Poisson regression results, breast cancers: coefficients & incidence rate ratios

Model		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	0.073 (0.266)	1.075	0.638 – 1.812
	Intercept **	-12.077 (0.134)		
2	Psychological Distress			
	No distress		1	
	Distress	0.030 (0.289)	1.030	0.584 – 1.819
	Smoking			
	Never / Ex		1	
	Current	0.442 (0.270)	1.557	0.916 – 2.647
	Mild exercise (per week)			
	5 hours or less		1	
	More than 5 hours	0.405 (0.348)	1.499	0.757 – 2.968
	Moderate exercise (per week)			
	2 hours or less		1	
	More than 2 hours	-0.005 (0.259)	0.999	0.600 – 1.662
	Vigorous exercise (per week)			
	Less than an hour		1	
	An hour or more	0.097 (0.292)	1.102	0.621 – 1.956
	Alcohol intake			
	Non-drinker / Light		1	
	Medium	-0.182 (0.384)	0.833	0.391 – 1.771
	Heavy	0.569 (0.341)	1.768	0.906 – 3.450
	HEIWE			
	(mean)	-0.083 (0.148)	0.919	0.687 – 1.231
	Intercept **	-12.318 (0.574)		

Continued/

** $p < 0.001$ — β, parameter coefficient
CI, confidence interval — SE, standard error of the coefficient

Table IV.5i Continued

Model		β (SE)	IRR	95% CI
3	Psychological Distress			
	No distress		1	
	Distress	0.331 (0.374)	1.393	0.668 – 2.905
	Smoking			
	Never / Ex		1	
	Current §	0.862 (0.375)	**2.369**	**1.134 – 4.948**
	Mild exercise (per week)			
	5 hours or less		1	
	More than 5 hours	1.123 (0.613)	3.074	0.924 – 10.223
	Moderate exercise (per week)			
	2 hours or less		1	
	More than 2 hours	-0.081 (0.355)	0.921	0.458 – 1.851
	Vigorous exercise (per week)			
	Less than an hour		1	
	An hour or more	-0.283 (0.426)	0.753	0.326 – 1.736
	Alcohol intake			
	Non-drinker / Light		1	
	Medium	-0.852 (0.636)	0.426	0.122 – 1.484
	Heavy	0.337 (0.477)	1.401	0.549 – 3.573
	HEIWE			
	(mean)	0.250 (0.202)	1.284	0.863 – 1.911
	Menopause Status			
	Premenopause		1	
	Natural menopause	-0.648 (0.497)	0.522	0.196 – 1.386
	Surgical menopause	-1.758 (1.035)	0.172	0.022 – 1.311
	Parity			
	Nulliparous		1	
	Parous	-0.038 (0.369)	0.961	0.466 – 1.983
	BMI			
	(mean)	-0.082 (0.070)	0.921	0.801 – 1.058
	Age Group			
	35-44 years		1	
	45-55 years §	0.835 (0.393)	**2.305**	**1.066 – 4.985**
	Grade			
	Clerical		1	
	Prof.-Exec.	-0.110 (0.432)	0.894	0.383 – 2.087
	Administrative	0.813 (0.505)	2.255	0.837 – 6.073
	Intercept **	-12.406 (1.879)		

N (observations) = 1726 (model 1); N (observations) = 1281 (model 2); N (observations) = 789 (model 3)
§ $p < 0.05$; ** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a - ℓ_b) statistic: (1) v (2), df = 7, 116.14 **; (2) v (3), df =7, 258.33 **; (1) v (3), df = 14, 374.47 **

Taking parity into account reduced the number of observations for analysis, as these data came from Phase 5 and were not complete for all of the women; however, it was essential to the model and could not be discarded (a cruder measure of parity at baseline was used in the survival analyses). It should be apparent that the model-fitting procedure differed from the previous sequence of model comparison by considering other risk factors for cancer along with the key confounders; this permitted consideration of distress and the health behaviours alone. The addition of the health behaviours brought a significant improvement in fit (see notes, Table IV.5i), and

similarly there was a significant improvement in fit between model 2 and model 3. When the reproductive and other risk factors were added to model 2, without the key confounders, the log likelihood was -136.17, and the likelihood ratio statistic was significant (250.2, df = 4, $p < 0.001$). The improvement in fit from adding the key confounders to this model was less significant (likelihood ratio statistic = 8.12, df = 3, $p < 0.05$), underlining the particular contribution of the reproductive variables.

Other cancers

There were 72 other cancers which occurred over follow up and did not fall into the grouping system described in the Methodology and Appendix I. These cancers were considered as one group, in order to assess the role of health behaviours in addition to psychological distress.

Preliminary analyses showed that the exercise variables could be disregarded. Age was categorised in three levels (35-44 years, 45-49 years and 50-55 years), intake of fruits and vegetables as two levels (daily, less often), and alcohol intake as 3 levels (non-drinker, light, medium/heavy), with never and ex-smokers considered together as the reference category for current smokers. After grouping the data, time at risk ranged from 988 days to 1591752 days.

The unadjusted incidence rate ratio for psychological distress was less than unity (IRR = 0.64, 95% CI 0.33 – 1.21; see Table IV.5j) and with each step of adding further variables, increased to 0.66 and 0.67. In the third model, the incidence rate ratio was only significantly elevated for the 50 to 55 years age group (2.98, 95% CI 1.58 – 5.61). Otherwise the direction of the rate ratios for the explanatory variables were as expected, except perhaps for HEIWE and body mass index, after adjusting for key confounders.

Table IV.5j Poisson regression results, other cancers: coefficients & incidence rate ratios

Model		β (SE)	IRR	95% CI
1	Psychological Distress			
	No distress		1	
	Distress	-0.448 (0.327)	0.638	0.335 – 1.213
	Intercept **	-13.126 (0.128)		
2	Psychological Distress			
	No distress		1	
	Distress	-0.418 (0.328)	0.658	0.345 – 1.252
	Smoking			
	Never / Ex		1	
	Current	0.312 (0.290)	1.366	0.773 – 2.414
	Alcohol Intake			
	Non-drinker		1	
	Light	0.541 (0.360)	1.718	0.847 – 3.486
	Medium / Heavy	0.158 (0.391)	1.171	0.544 – 2.522
	Fruits or Vegetables Intake			
	Daily		1	
	Less often	-0.070 (0.262)	0.931	0.556 – 1.558
	HEIWE			
	(mean)	-0.097 (0.466)	0.907	0.363 – 2.263
	BMI			
	(mean)	0.209 (0.107)	1.233	0.999 – 1.521
	Intercept **	-18.383 (3.048)		
3	Psychological Distress			
	No distress		1	
	Distress	-0.398 (0.330)	0.671	0.351 – 1.281
	Smoking			
	Never / Ex		1	
	Current	0.291 (0.303)	1.338	0.738 – 2.425
	Alcohol Intake			
	Non-drinker		1	
	Light	0.503 (0.362)	1.655	0.813 – 3.365
	Medium / Heavy	0.284 (0.401)	1.328	0.604 – 2.919
	Fruits or Vegetables Intake			
	Daily		1	
	Less often	-0.005 (0.263)	0.994	0.592 – 1.667
	HEIWE			
	(mean)	0.145 (0.471)	1.156	0.459 – 2.912
	BMI			
	(mean)	-0.025 (0.143)	0.974	0.735 – 1.290
	Sex			
	Male		1	
	Female	-0.004 (0.305)	0.995	0.547 – 1.811
	Age Group			
	35-44 years		1	
	45-49 years	0.637(0.345)	1.890	0.960 – 3.722
	50-55 years *	1.091 (0.323)	**2.979**	**1.581 – 5.615**
	Grade			
	Administrative		1	
	Prof.-Exec.	0.119 (0.295)	1.127	0.631 – 2.011
	Clerical	0.118 (0.415)	1.125	0.498 – 2.541
	Intercept **	-13.932 (3.699)		

N (observations) = 524 (model 1); N (observations) = 401 (model 2 & 3)
§ $p < 0.05$; * $p < 0.01$; ** $p < 0.001$ β, parameter coefficient
CI, confidence interval SE, standard error of the coefficient
Notes Model fit, using -2 (ℓ_a . ℓ_b) statistic: (1) v (2), df = 6, 18.38 *; (2) v (3), df = 5, 11.6 §; (1) v (3), df = 11, 29.98 *

The distress only model did not differ significantly from its null model (LR $\chi^2 = 2.08$, df = 1). The addition of the health behaviour variables in the second model provided a significant improvement in fit over the psychological distress only model ($p < 0.01$; see notes, Table IV.5j), but as with the distress-only model, this second model was not significantly different from its null model (LR $\chi^2 = 8.84$, df = 7). The expanded third model differed from the second model, but less significantly ($p < 0.05$), there being little role as such for sex or grade.

Psychological distress, health behaviours and cancer incidence

For each of the outcome groups, three Poisson regression models were fitted: (1) distress only; (2) distress plus explanatory variables (including health behaviours); and (3) distress plus explanatory variables adjusted for key confounders. The relationship between psychological distress and health behaviours in respect of cancer incidence was assessed in part by examining the percentage change in the distress coefficient between model (1) and model (2); see Table IV.5k. Three of the outcome groups had a model (2) which did not differ significantly from its constant-only model (diet related cancers, cancers related to oral contraceptive use, and other cancers), and so the percentage change for these models must be treated with caution.

Table IV.5k Percentage change in psychological distress coefficient (β) between model 1 (distress only) and model 2 (distress plus health behaviours) for each outcome group

Outcome group	Change in coefficient %
Model 2 differing from null model ($p < 0.001$)	
Any cancer	- 31.61
Smoking related cancers	+ 4.96
Breast cancers	- 58.9
Model 2 not differing from null model ($p > 0.05$)	
Diet related cancers	+ 1.86
OC use related cancers	+ 298.45
Other cancers	- 6.67

The addition of health behaviours to the distress-only model led to a reduction in the coefficients for any malignant neoplasm and breast cancers, indicating that the effect of distress on cancer incidence was reduced when health behaviours were taken into consideration. But while the incidence rate ratio for breast cancers approached unity (IRR 1.07 to IRR 1.03), the corresponding rate ratio decreased further from unity for any malignant neoplasm (IRR 0.86 to IRR 0.81). There was a small increase in the coefficient for smoking related cancers, but this represented a shift in the rate ratio towards unity when health behaviours were taken into account (IRR 0.41 to IRR 0.43). Moreover, none of these rate ratios deviated significantly from unity.

6. Poisson Regression: Depressive Symptoms Sub-scale

Reference: Chapter 5, Results II, section 5.3.2

Depressive symptoms and cancer

Poisson regression analyses were carried out over the same three steps of models for depressive symptoms in relation to three outcome groups: any malignant neoplasms; smoking related cancers; and breast cancers (see Table IV.6a). Overall, depressive symptoms had a reduced incidence rate ratio for each group, deviating significantly from unity only for the most general outcome, any malignant neoplasm, across all three models.

Table IV.6a Poisson regression results summary: depressive symptoms and cancer groups

Cancer Outcome Group	Model 1 Distress only IRR (95% CI)	Model 2 Distress & explanatory variables IRR (95% CI)	Model 3 Distress, explanatory variables & confounders IRR (95% CI)
Any malignant neoplasm	0.58 (0.37 – 0.89) *	0.55 (0.35 – 0.87) *	0.55 (0.35 – 0.86) §
Smoking related cancers	0.58 (0.21 – 1.63)	0.58 (0.20 – 1.62)	0.63 (0.22 – 1.76)
Breast cancers	0.52 (0.22 – 1.19)	0.66 (0.19 – 2.18)	0.69 (0.21 – 2.29)

df = Degrees of freedom
CI, confidence interval

§ $p < 0.05$; * $p < 0.01$

The full models for each outcome are presented over the following three pages (Tables IV.6b-d).

Table IV.6b Poisson regression results, any malignant neoplasm: coefficients & incidence rate ratios

Model	Covariate	IRR (95% CI)
1	Depressive Symptoms	
	Low (0-3)	1
	High (4) *	**0.579 (0.374 – 0.895)**
2	Depressive Symptoms	
	Low (0-3)	1
	High (4) *	**0.550 (0.348 – 0.870)**
	Intake of fruits or vegetables	
	Daily	1
	Less than daily	1.804 (0.871 – 3.735)
	Family History of Cancer	
	No	1
	Yes §	**1.346 (1.029 – 1.761)**
	Moderate exercise	
	2 hours or less	1
	More than 2 hours	0.810 (0.632 – 1.039)
3	Depressive Symptoms	
	Low (0-3)	
	High (4) §	**0.547 (0.346 – 0.864)**
	Intake of fruits or vegetables	
	Daily	1
	Less than daily	1.100 (0.853 – 1.418)
	Family History of Cancer	
	No	1
	Yes	1.162 (0.886 – 1.524)
	Moderate exercise	
	2 hours or less	1
	More than 2 hours	0.942 (0.731 – 1.214)
	Gender	
	Men	1
	Women **	**2.170 (1.624 – 2.901)**
	Age group	
	35 – 39 years	1
	40 – 44 years	1.566 (0.996 – 2.462)
	45 – 49 years **	**2.778 (1.817 – 4.248)**
	50 – 55 years **	**3.468 (2.323 – 5.179)**
	Grade	
	Administrative	1
	Prof.-Exec.	1.129 (0.819 – 1.555)
	Clerical	0.989 (0.669 – 1.461)

N = 4641 (model 1); N = 4277 (models 2 & 3)
df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
Notes Model fit using likelihood ratio statistic: (1) v (2), df = 3, 138.95 **; (2) v (3), df = 2, 94.7**; (1) v (3), df = 9, 233.64 **

Table IV.6c Poisson regression results, smoking-related cancers: coefficients & incidence rate ratios

Model	Covariate	IRR (95% CI)
1	Depressive Symptoms	
	Low (0-3)	
	High (4)	0.586 (0.210 – 1.631)
2	Depressive Symptoms	
	Low (0-3)	
	High (4)	0.579 (0.206 – 1.625)
	Smoking	
	Never	1
	Ex	1.804 (0.871 – 3.735)
	Light	2.159 (0.613 – 7.593)
	Medium	2.327 (0.822 – 6.591)
	Heavy **	**6.711 (2.712 – 16.602)**
	Family History of Cancer	
	No	1
	Yes §	**2.080 (1.154 – 3.747)**
	BMI	
	(mean) §	**1.139 (1.015 – 1.278)**
	HEIWE	
	(mean)	0.810 (0.490 – 1.340)
3	Depressive Symptoms	
	Low (0-3)	
	High (4)	0.630 (0.225 – 1.764)
	Smoking	
	Never	1
	Ex	1.748 (0.840 – 3.637)
	Light	2.271 (0.642 – 8.023)
	Medium	2.609 (0.914 – 7.446)
	Heavy **	**7.738 (3.112 – 19.241)**
	Family History of Cancer	
	No	1
	Yes	1.775 (0.982 – 3.210)
	BMI	
	(mean)	1.066 (0.933 – 1.219)
	HEIWE	
	(mean)	0.917 (0.552 – 1.523)
	Gender	
	Men	1
	Women	0.955 (0.454 – 2.006)
	Age group	
	35 – 44 years	1
	45 – 49 years	1.678 (0.632 – 4.455)
	50 – 55 years **	**5.410 (2.554 – 11.457)**
	Grade	
	Administrative	1
	Prof.-Exec.	1.003 (0.502 – 2.005)
	Clerical	0.709 (0.269 – 1.868)

N = 1655 (model 1); N = 1492 (models 2 & 3)
df = Degrees of freedom § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$
Notes Model fit using likelihood ratio statistic: (1) v (2), df = 7, 46.6 **; (2) v (3), df = 5, 24.34**; (1) v (3), df = 11, 70.94 **

Table IV.6d Poisson regression results, breast cancers: coefficients & incidence rate ratios

Model	Covariate		IRR (95% CI)
1	Depressive Symptoms	*Low (0-3)*	1
		High (4)	0.518 (0.225 – 1.195)
2	Depressive Symptoms	*Low (0-3)*	1
		High (4)	0.660 (0.199 – 2.188)
	Smoking	*Never / Ex*	1
		Current	2.213 (1.015 – 4.824)
	Mild exercise (per week)	*5 hours or less*	1
		More than 5 hours	2.707 (0.814 – 8.997)
	Alcohol intake	*Non-drinker/Light*	1
		Moderate	0.415 (0.096 – 1.786)
		Heavy	1.877 (0.722 – 4.879)
	HEIWE	*(mean)*	1.289 (0.880 – 1.888)
	Family history of cancer	*No*	1
		Yes	1.502 (0.696 – 3.240)
	Oral contraceptive use	*Never*	1
		1-5 years	0.687 (0.281 – 1.675)
		6+ years	0.514 (0.205 – 1.288)
	Menopausal status	*Premenopausal*	1
		Natural Menopause	0.734 (0.287 – 1.873)
		Surgical Menopause	0.219 (0.029 – 1.653)
	Parity	*Nulliparous*	1
		Parous	0.893 (0.433 – 1.843)
3	Depressive Symptoms	*Low (0-3)*	1
		High (4)	0.691 (0.207 – 2.298)
	Smoking	*Never / Ex*	1
		Current **§**	**2.245 (1.019 – 4.946)**
	Mild exercise (per week)	*5 hours or less*	1
		More than 5 hours	2.769 (0.832 – 9.214)
	Alcohol intake	*Non-drinker/Light*	1
		Moderate	0.371 (0.084 – 1.631)
		Heavy	1.528 (0.551 – 4.232)
	HEIWE	*(mean)*	1.273 (0.879 – 1.844)
	Family history of cancer	*No*	1
		Yes	1.431 (0.662 – 3.092)
	Oral contraceptive use	*Never*	1
		1-5 years	0.727 (0.292 – 1.808)
		6+ years	0.574 (0.224 – 1.469)
	Menopausal status	*Premenopausal*	1
		Natural Menopause	0.584 (0.175 – 1.949)
		Surgical Menopause	0.187 (0.023 – 1.496)
	Parity	*Nulliparous*	1
		Parous	0.862 (0.397 – 1.871)
	Age group	*35 – 44 years*	1
		45 – 49 years	1.871 (0.786 – 4.454)
		50 – 55 years	1.594 (0.472 – 5.382)
	Grade	*Clerical*	1
		Prof.-Exec.	0.911 (0.381 – 2.174)
		Administrative	1.943 (0.667 – 5.667)

N = 1655 (model 1); N = 1116 (models 2 & 3)
df = Degrees of freedom § $p < 0.05$; ** $p < 0.001$
Notes Model fit using likelihood ratio statistic: (1) v (2), df = 11, 423.5 **; (2) v (3), df = 4, 4.00; (1) v (3), df = 15, 427.49 **

7. Survival Analyses: Univariate Results

Reference: Chapter 5, Results II, section 5.4

Table IV.7a Univariate results, all cancers except non-melanoma skin cancers

	Events / N	HR	95% CI
Psychological Distress	267/10042		
No distress		1	
Distress		0.855	0.631 – 1.157
Depressive Symptoms	267/10020		
Low (0-3)		1	
High (4) §		**0.579**	**0.374 – 0.896**
Gender	267/10042		
Male		1	
Female **		**2.313**	**1.819 – 2.941**
Age group	267/10042		
35 – 39 years		1	
40 – 44 years		1.560	0.993 – 2.450
45 – 49 years **		**2.993**	**1.968 – 4.552**
50 – 55 years **		**4.064**	**2.752 – 6.003**
Grade	267/10042		
Administrative		1	
Prof.-Exec.		1.178	0.869 – 1.597
Clerical *		**1.771**	**1.276 – 2.457**
Smoking	266/9960		
Never		1	
Ex		1.134	0.854 – 1.506
Current **		**1.727**	**1.283 – 2.325**
Alcohol intake	262/9956		
Non-drinker		1	
Light		0.938	0.676 – 1.300
Medium		0.768	0.513 – 1.150
Heavy		1.015	0.679 – 1.515
Mild exercise (per week)	260/9856		
5 hours or less		1	
More than 5 hours		1.153	0.875 – 1.518
Moderate exercise (per week)	255/9687		
2 hours or less		1	
More than 2 hours		0.822	0.642 – 1.054
Vigorous exercise (per week)	256/9681		
Less than an hour		1	
An hour or more §		**0.734**	**0.570 – 0.946**
Intake of fruits or vegetables	266/10015		
2+ Daily		1	
Daily		0.808	0.578 – 1.130
3-6 times a week		0.850	0.598 – 1.207
Less often		0.862	0.552 – 1.348
HEIWE	238/9257		
(mean)		0.930	0.834 – 1.037
BMI	267/10032		
(mean)		1.013	0.980 – 1.048
Family history of cancer	267/10042		
No		1	
Yes §		**1.350**	**1.039 – 1.754**
Self-assessed health	265/10011		
Good or better		1	
Average or worse *		**1.424**	**1.105 – 1.835**

HR, hazard ratio; CI, confidence interval § $p < 0.05$; * $p < 0.01$; ** $p < 0.001$

Table IV.7b Univariate results, smoking related cancers

	Events / N	HR	95% CI
Smoking	46 / 9813		
Never		1	
Ex-smoker		2.001	0.972 – 4.120
Light		2.135	0.608 – 7.494
Medium		2.574	0.917 – 7.221
Heavy **		**7.661**	**3.175 – 18.485**
Ever smoked	48 / 9960		
Never		1	
Ex-smoker		2.001	0.972 – 4.121
Current **		**3.772**	**1.848 – 7.700**
Alcohol Consumption	48 / 9956		
Non-drinker		1	
Light		0.784	0.352 – 1.746
Moderate		0.891	0.353 – 2.244
Heavy		1.405	0.582 – 3.392
Intake of Fruit or Vegetables	48 / 10015		
2+ times a day		1	
Daily §		**0.453**	**0.221 – 0.928**
3-6 times a week		0.541	0.258 – 1.136
Once / twice a week or less		0.405	0.133 – 1.232
Intake of Meat (not poultry or fish)	48 / 10027		
1-2 a week or less often		1	
3-4 times a week §		**0.453**	**0.210 – 0.977**
5+ times a week		0.816	0.426 – 1.564
Intake of Bread	44 / 9983		
Wholemeal		1	
Other brown		1.162	0.593 – 2.277
White		1.625	0.801 – 3.296
HEIWE (mean) §	40 / 9257	**0.70**	**0.538 – 0.918**
Mild exercise per week	46 / 9856		
5 hours or less		1	
More than 5 hours		1.057	0.556 – 2.008
Moderate Exercise per week	44 / 9687		
2 hours or less		1	
More than 2 hours		0.761	0.420 – 1.377
Vigorous Exercise per week	44 / 9681		
Less than an hour		1	
More than an hour		0.730	0.401 – 1.329
Body Mass Index (mean)	48 / 10032	1.037	0.962 – 1.119
Family History of cancer	48 / 10042		
No		1	
Yes §		**2.068**	**1.159 – 3.688**
Self-assessed Health	48 / 10011		
Good or better		1	
Average or worse		1.121	0.601 – 2.090

HR, hazard ratio; CI, confidence interval § $p < 0.05$; ** $p < 0.001$

Univariate results for Psychological Distress and Depressive Symptoms available elsewhere (see Model 1, Table 5.4b).

Table IV.7c Univariate results, breast cancers

	Events/N	HR	95% CI
Psychological distress	74 / 3269		
Not distressed		1	
Distressed		1.079	0.640 – 1.818
Depressive symptoms sub-scale	74 / 3256		
0-3		1	
4		0.520	0.225 – 1.198
Age Groups	74 / 3269		
35-39 years		1	
40-44 years		1.764	0.808 – 3.854
45-49 years §		**2.260**	**1.064 – 4.800**
50-55 years		2.019	0.974 – 4.188
Grade	74 / 3269		
Clerical		1	
Prof.-Exec.		1.035	0.633 – 1.694
Administrative		1.226	0.607 – 2.476
Menopausal Status	65 / 2926		
Premenopausal		1	
Natural Menopause		1.058	0.589 – 1.901
Surgical Menopause		0.691	0.294 – 1.622
Parity	40 / 2054		
Nulliparous		1	
Parous		0.798	0.429 – 1.484
Use of oral contraceptives	70 / 2929		
Never		1	
1 – 5 years		0.691	0.384 – 1.242
6 – 10 years		0.569	0.265 – 1.222
11+ years		0.817	0.394 – 1.693
Ever used HRT [a]	29 / 1431		
No		1	
Yes		1.400	0.570 – 3.438

Continues/

HR, hazard ratio; CI, confidence interval § $p < 0.05$

[a] Numbers using HRT too small in duration categories previously used.

Table IV.7c *Continued.*

	Events / N	HR	95% CI
Ever smoked	74 / 3246		
Never		1	
Ex-smoker		1.301	0.728 – 2.326
Current §		**1.841**	**1.087 – 3.118**
Alcohol Consumption	72 / 3233		
Non-drinker		1	
Light		0.823	0.473 – 1.433
Moderate		0.774	0.356 – 1.681
Heavy		1.593	0.788 – 3.218
Intake of Fruit or Vegetables	73 / 3257		
2+ times a day		1	
Daily		0.956	0.516 – 1.772
3-6 times a week		0.810	0.400 – 1.638
Once / twice a week or less		1.606	0.738 – 3.498
HEIWE (mean)	68 / 2956	0.913	0.747 – 1.116
Mild exercise per week	71 / 3189		
5 hours or less		1	
More than 5 hours		1.575	0.846 – 2.930
Moderate Exercise per week	69 / 3092		
2 hours or less		1	
More than 2 hours		1.071	0.668 – 1.718
Vigorous Exercise per week	68 / 3136		
Less than an hour		1	
More than an hour		0.932	0.538 – 1.614
Body Mass Index (mean)	74 / 3267	0.994	0.941 – 1.050
Family History of cancer	74 / 3269		
No		1	
Yes		1.151	0.694 – 1.909
Self-assessed Health	73 / 3261		
Good or better		1	
Average or worse		1.248	0.783 – 1.989

SE, standard error; HR, hazard ratio; CI, confidence interval § $p < 0.05$

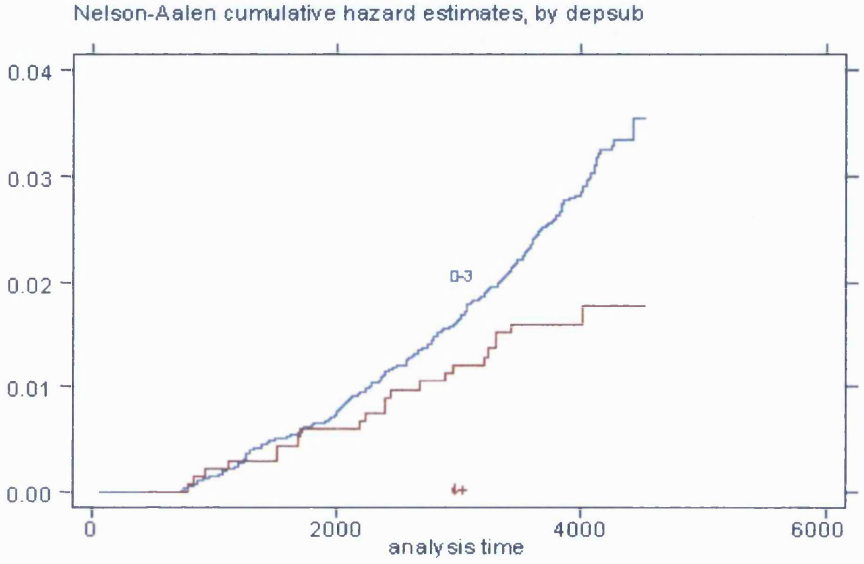
Univariate results for Psychological Distress and Depressive Symptoms available elsewhere (see Model 1, Table 5.4c).

8. Survival Analysis Figures: Depressive Symptoms Sub-Scale

Reference: Chapter 5, Results II, section 5.4.5

Figure IV.8a Cumulative hazard estimates for any malignant neoplasm (excluding NMSC): (i) depressive symptom subscale score (0-3, 4; depsub) over time (days) and (ii) 95% confidence intervals for cumulative hazard estimates of low and high scorers

(i)



(ii)

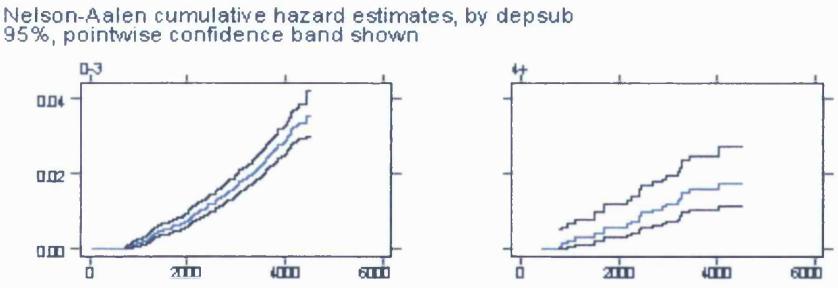
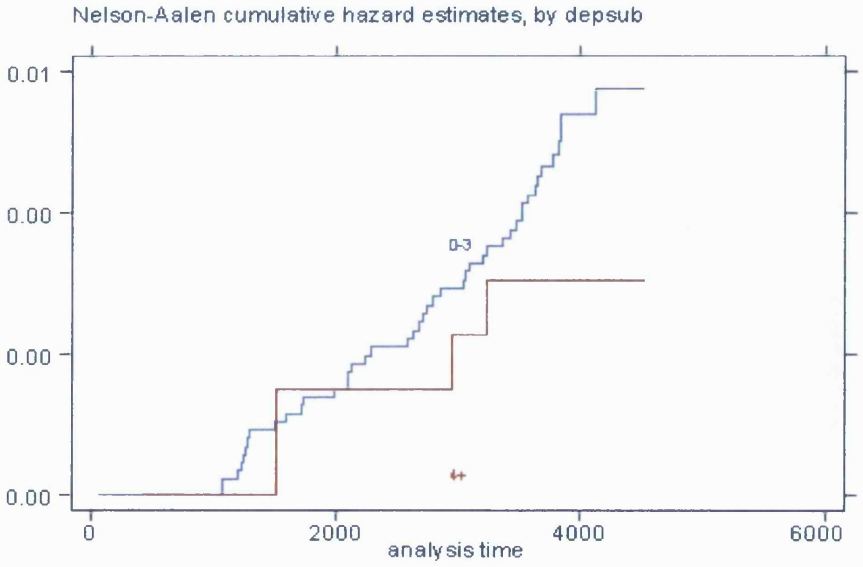


Figure IV.8b Cumulative hazard estimates for smoking related cancers: (i) depressive symptom subscale score (0-3, 4; depsub) over time (days) and (ii) 95% confidence intervals for cumulative hazard estimates of low and high scorers

(i)



(ii)

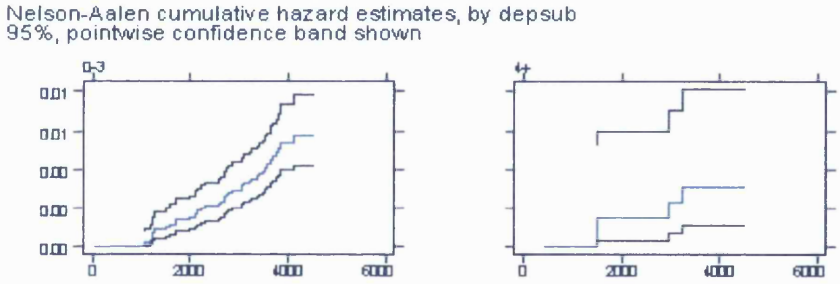
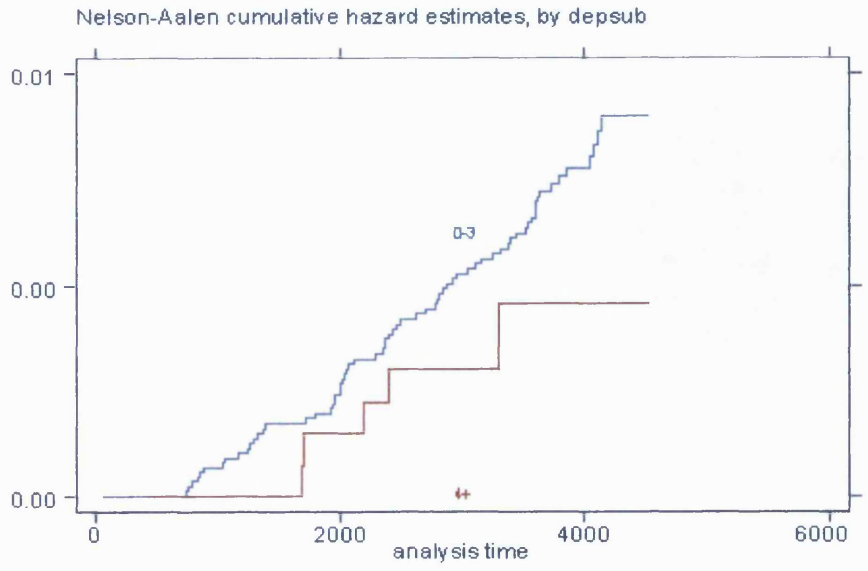
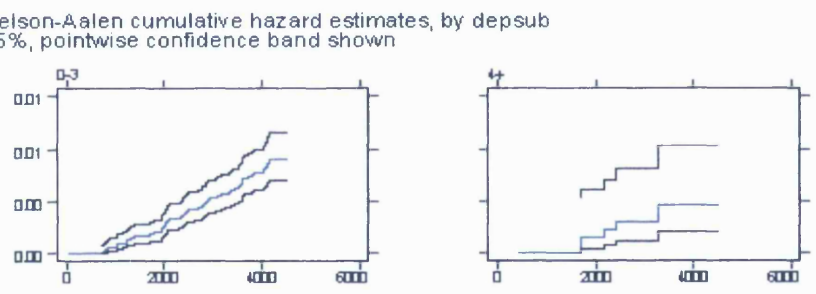


Figure IV.8c Cumulative hazard estimates for breast cancers: (i) depressive symptom subscale score (0-3, 4; depsub) over time (days) and (ii) 95% confidence intervals for cumulative hazard estimates of low and high scorers

(i)



(ii)



9. Psychological Distress & Health Behaviours over Time: Non-response

Reference: Chapter 5, Results II, section 5.5.1

For the purposes of these analyses, there were three groups of non-responders identified (see Table IV.9a) out of a total sample of 10 056 participants at baseline. There were 7960 (79.2%) responders at Phase 2 and 8470 (84.2%) responders at Phase 3. Tables IV.9b & IV.9c compare responders and non-responder on selected baseline data for each phase.

Table IV.9a Non-response groups at Phases 1, 2 and 3

		N
Phase 2	Non-response	2096
Phase 3	Non-response	1131
Phase 2 & 3	Non-response	965
	Response	7339

Table IV.9b Comparison of responders and non-responders at Phase 2 on baseline data

N = 10056				
Phase2		N	Mean (SD)	
CGHQ Score	Responders	7960	9.43 (6.11)	
	Non-responders	2096	9.89 (6.31)	t = -3.0968 *
Age	Responders	7960	44.51 (6.05)	
	Non-responders	2096	44.04 (6.02)	t = 3.1424 *
		Responders	*Non-responders*	
Gender	Men	5450 (68.47)	1329 (63.41)	χ^2 = 19.34 **
	Women	2510 (31.53)	767 (36.59)	df = 1
Grade	Administrative	2475 (31.09)	492 (23.47)	χ^2 = 120.7 **
	Prof.-Exec.	3892 (48.89)	961 (45.85)	df = 2
	Clerical	1593 (20.01)	643 (30.68)	
Education	Up to 16 years	2030 (34.00)	554 (36.14)	χ^2 = 2.47
n = 7504	17 – 18 years	1481 (24.80)	368 (24.01)	df = 2
	Over 18 years	2460 (41.20)	611 (39.86)	
Psychological Distress	No distress	6275 (78.83)	1571 (74.95)	χ^2 = 14.56 **
	Distress	1685 (21.17)	525 (25.05)	df = 1
Depressive Symptoms	Low (0-3)	6936 (87.32)	1751 (83.74)	χ^2 = 18.27 **
n = 10034	High (4)	1007 (12.68)	340 (16.26)	df = 1

df = Degrees of freedom * $p < 0.01$; ** $p < 0.001$

Table IV.9c Comparison of responders and non-responders at Phase 3 on baseline data

N = 10056				
Phase 3		N	Mean (SD)	
CGHQ Score	Responders	8470	9.52 (6.11)	
	Non-responders	1586	9.57 (6.36)	t = -0.3202
Age	Responders	8470	44.93 (6.03)	
	Non-responders	1586	44.51 (6.14)	t = -0.7235
		Responders	*Non-responders*	
Gender	Men	5856 (69.14)	923 (58.2)	χ^2 = 72.79 **
	Women	2614 (30.86)	663 (41.8)	df = 1
Grade	Administrative	2637 (31.13)	330 (20.81)	χ^2 = 232.88 **
	Prof.-Exec.	4176 (49.3)	677 (42.69)	df = 2
	Clerical	1657 (19.56)	579 (36.51)	
Education	Up to 16 years	2101 (33.15)	483 (41.39)	χ^2 = 29.62 **
n = 7504	17 – 18 years	1594 (25.15)	255 (21.85)	df = 2
	Over 18 years	2642 (41.69)	429 (36.76)	
Psychological Distress	No distress	6627 (78.24)	1219 (76.86)	χ^2 = 1.48
	Distress	1843 (21.76)	367 (23.14)	df = 1
Depressive Symptoms	Low (0-3)	7362 (87.13)	1325 (83.6)	χ^2 = 14.37 **
n = 10034	High (4)	1087 (12.87)	260 (16.4)	df = 1

df = Degrees of freedom * $p < 0.01$; ** $p < 0.001$

A total of 7339 from the original sample of 10056 responded at both Phase 2 and Phase 3, while 965 participants did not respond at either Phase. These consistent responders and non-responders are compared in Table IV.9d.

Table IV.9d Comparison of consistent[a] responders and non-responders on baseline data

N = 8304				
		N	Mean (SD)	
CGHQ Score	Responders	7339	9.44 (6.09)	
	Non-responders	965	9.77 (6.46)	t = -1.597
Age	Responders	7339	44.46 (6.04)	
	Non-responders	965	44.19 (6.07)	t = 1.294
		Responders	*Non-responders*	
Gender	Men	5075 (69.15)	548 (56.79)	χ^2 = 59.63 **
	Women	2264 (30.85)	417 (43.21)	df = 1
Grade	Administrative	2330 (31.75)	185 (19.17)	χ^2 = 206.19 **
	Prof.-Exec.	3625 (49.39)	410 (42.49)	df = 2
	Clerical	1384 (18.86)	370 (38.34)	
Education	Up to 16 years	1827 (33.14)	280 (36.49)	χ^2 = 11.33 *
n = 6222	17 – 18 years	1386 (25.14)	160 (22.57)	df = 2
	Over 18 years	2300 (41.72)	269 (37.94)	
Psychological Distress	No distress	5775 (78.69)	719 (74.51)	χ^2 = 8.75 *
	Distress	1564 (21.31)	246 (25.49)	df = 1
Depressive Symptoms	Low (0-3)	6406 (87.49)	795 (82.47)	χ^2 = 18.87 **
n = 8286	High (4)	916 (12.51)	169 (17.53)	df = 1

df = Degrees of freedom * $p < 0.01$; ** $p < 0.001$

[a] Consistent in responding or not responding at both Phase 2 and Phase 3

Appendix V

Questionnaire Materials

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

HEALTH SURVEY

Conducted by the University College London/Middlesex Hospital Medical School and the Civil Service Medical Advisory Service.

CONFIDENTIAL

We are interested in identifying the characteristics of work and personal environment which may adversely or beneficially affect people's health. We should, therefore, be grateful if you would complete this questionnaire which asks some general background questions as well as a few questions about your activities.
The answers to all these questions will, of course, be kept strictly confidential. All information on individuals will go into statistics for all men and women in the study and it will not be possible to identify your responses from any reports or publications.

PLEASE USE BLOCK LETTERS THROUGHOUT

Once returned, the personal identification section below will be removed. This will ensure the preservation of confidentiality in subsequent handling of the questionnaires.

FORENAMES (in full) .....

SURNAME .....

HOME ADDRESS .....

.....

MINISTRY/DEPARTMENT .....

DIVISION .....

BRANCH OR SECTION .....

Official telephone number
(if available) .....

Six to eight weeks following the examination you will be sent a letter about your results and appropriate advice. A letter for your general practitioner will be enclosed for you to give him/her

This questionnaire asks about features of your way of life which may affect your health. To study this we need to monitor your health over the next 5-7 years. Therefore, **we are asking your permission to obtain your sickness record from your department** and in cases of serious illness to obtain details from your general practitioner.
Again we wish to assure you that such information will be **absolutely confidential. Under no circumstances will an individual record be made available to anyone: either connected with the Civil Service or outside.** It will not be possible for anyone to be identified from any scientific publication.

Consent given: Yes No
(Please circle one)

If yes, please sign your name here .....

If you have given your consent, please could you provide the following information:

NATIONAL INSURANCE NUMBER .....
(you can get this from your payslip)

PAYROLL NUMBER/PAY REFERENCE .....
(also on your payslip)

NATIONAL HEALTH SERVICE NUMBER .....
(You can find your National Health Service No. on your medical card or obtain it from your general practitioner. Please note that it is not the same as your National Insurance No.)

Your General Practitioner's name and address

NAME .....

ADDRESS .....

.....

.....

THANK YOU

HEALTH SURVEY

General Instructions

Please read these notes before filling in the rest of the form

Please answer all the questions.

The answer to most questions can be indicated by circling the appropriate number.

e.g. What is your sex? Male (1)
Female 2

Where the answer requires you to write numbers, a rectangle is used.

e.g. What is your date of birth? [12] *Day* [3] *Month* 19 [45] *Year*

Where the answer is likely to involve a phrase or sentence lines are given.

e.g. What is your civil service grade? HEO

1. a) What is your date of birth?

[ ][ ] 19 [ ]

Day *Month* *Year*

b) Sex:

Male 1
Female 2

---

2 a) What is your civil service grade? (e.g. HEO or SEO)

.....

b) What was your first civil service grade?

.....

---

3. In what year did you first join the civil service?

19 [ ]

Year

---

4. a) How many changes of post within the civil service have you had during the last 5 years?

[ ]

Enter numbers

b) How many changes of grade have you had during the last 5 years?

[ ]

---

5. a) How old were you when you finished full-time education?

[ ]

Age

b) Now thinking just of your **full-time** education: what type of school or college did you **last** attend **full-time?**

	Circle one only
Elementary or secondary school	1
University/Polytechnic	2
Nursing School/Teaching Hospital	3
Some other type of college	4
Other, *(please specify)*	5

.....

---

6. What is your marital status

	Circle one only
Married	1
If **Yes,** go to Question 7a	
Cohabiting	2
If **Yes,** go to Question 7c	
Single (never married)	3
Divorced or separated	4
Widowed	5

If **Not now married or cohabiting,** go to Question 8

---

7. If **'now married'**

a) is this your first marriage?

Yes 1
No 2

If **Yes,** go to Question 7c

If **No**

b) How did your previous marriage end?

Widowed 1
Divorced 2

---

c) How old was your spouse [partner] when he/she finished full-time education?

[ ]

age

d) Now thinking just of your spouse's [partner's] **full-time** education: what type of school or college did he/she **last** attend **full-time?**

	Circle one only
Elementary or secondary school	1
University/Polytechnic	2
Nursing School/Teaching Hospital	3
Some other type of college	4
Other *(please specify)*	5

.....

Continued

Continued

e) Is your spouse [partner] currently doing any paid work?

	Circle one only
Yes: Full-time (over 30 hours/week)	1
Yes: Part-time (less than 30 hours/week)	2
No: Unemployed — seeking work	3
No: Looking after the house/family	4
No: Not working — other reasons	5

If, **Not Working,** go to Question 8

If spouse/partner is working:

f) What is your spouse's [partner's] main current job. What kind of work does he/she do in it?

g) What qualifications or training if any are necessary for that job?

h) Is he/she an employee 1

or: self employed 2

i) How many people work at his/her place of work?

Less than 25 employees 1

25 or more employees 2

j) Is he/she in charge of other people?

Yes 1

No 2

k) If **Yes,** how many? ☐

8. Is the accommodation in which you live owned or rented?

Own outright or have mortgage 1

Rent from local authority 2

Rent privately unfurnished 3

Rent privately furnished 4

9. Does anyone live in your household besides you?

Yes 1

No 2

If **No,** go to Question 11

If **Yes,**

10. Who lives in your household besides you?

	Answer all parts Yes	No
a) Spouse or partner	1	2
b) Your mother	1	2
c) Your father	1	2
d) Your spouse's mother	1	2
e) Your spouse's father	1	2

	number
f) Children under 5 *(If none write 0)*	☐
g) Children aged 5-15 *(If none write 0)*	☐
h) Children over 15 *(If none write 0)*	☐
i) Any other people? *(If none write 0)*	☐

11. Is there a car or van normally available for use by you or other members of your house-hold?

Yes 1

No 2

12. a) How old was your **father** when he finished full-time education? ☐ *age*

b) What is/was your **father's** main job, what kind of work does/did he do in it?

c) What qualifications or training, if any, are/were necessary for that job?

d) Is/was he an employee 1

or: self employed 2

e) How many people work/worked at his place of work?

Less than 25 employees 1

25 or more employees 2

f) Is/was he in charge of other people?

Yes 1

No 2

g) If **Yes,** how many? ☐

h) Is your natural father still alive?

Yes 1

No 2

If **Yes** go to Question 13

If **No**

i) how old were you when he died? ☐ *years*

j) how old was your father when he died? ☐ *years*

k) what did he die from?

Heart Attack (coronary) 1

Stroke 2

Other heart condition (not a coronary) 3

Cancer 4

Other causes *(please specify)* 5

.....

Don't know 6

13. a) How old was your **mother** when she finished full-time education? ☐ *age*

(b) Is your natural mother still alive?

Yes 1

No 2

If **Yes** go to Question 14

If **No**

c) how old were you when she died? ☐ *years*

d) how old was your mother when she died? ☐ *years*

e) what did she die from?

Heart Attack (coronary) 1

Stroke 2

Other heart condition (not a coronary) 3

Cancer 4

Other causes *(please specify)* 5

.....

Don't know 6

14. Has either of your parents suffered from the following?
(Please answer all questions)

	Yes	No/Don't know
a) Angina	1	2
b) Heart attack	1	2
c) Stroke	1	2
d) High blood pressure	1	2
e) Diabetes	1	2

15. Do you have any brothers or sisters?

Yes 1

No 2

If **No brothers or Sisters** go to Question 16

If **Yes**

Have any of your brothers or sisters suffered from the following?
(Please answer all questions)

	Yes	No/Don't know
a) Angina	1	2
b) Heart attack	1	2
c) Stroke	1	2
d) High blood pressure	1	2
e) Diabetes	1	2

THIS SECTION CONCERNS YOUR OWN HEALTH

16. Over the last 12 months would you say your health has been

Very good 1

Good 2

Average 3

Poor 4

Very poor 5

17. a) Do you have any longstanding illness, disability or infirmity?

(longstanding means anything that has troubled you over a period of time or that is likely to affect you over a period of time)

Yes 1

No 2

If **Yes**

b) What is the matter with you?

.....

18. There are some kinds of health problems that keep recurring and some that people have all the time. In the last 12 months have you suffered from any of the following health problems?
(Please answer all questions)

	Yes	No
a) Bronchitis	1	2
b) Arthritis or rheumatism	1	2
c) Sciatica, lumbago or recurring backache	1	2
d) Persistent skin trouble (e.g. eczema)	1	2
e) Asthma	1	2
f) Hay fever	1	2
g) Recurring stomach trouble/indigestion	1	2
h) Being constipated all or most of the time	1	2
i) Piles	1	2
j) Persistent foot trouble (e.g. bunions, ingrowing toenails)	1	2
k) Trouble with varicose veins	1	2
l) Nervous trouble or persistent depression	1	2
m) Persistent trouble with your gums or mouth	1	2
n) Any other recurring health problem *(Please specify)*	1	2

PLEASE MAKE SURE YOU HAVE ANSWERED **ALL** THE ABOVE QUESTIONS.

19. Have you had any of the following symptoms in the last fourteen days?
(Please answer all questions)

	Yes	No
a) A cough, catarrh or phlegm	1	2
b) Diarrhoea	1	2
c) Heartburn, wind or indigestion	1	2
d) Shortness of. breath	1	2
e) Dizziness or giddiness	1	2
f) Earache or discomfort in the ears	1	2
g) Swollen ankles	1	2
h) Nervy, tense or depressed	1	2
i) A cold or 'flu	1	2
j) A sore throat	1	2
k) Difficulty in sleeping	1	2
l) Pains in the chest	1	2
m) A backache or pains in the back	1	2
n) Nausea or vomiting	1	2
o) Feeling tired for no apparent reason	1	2
p) Rashes, itches or other skin trouble	1	2
q) Toothache or trouble with the gums	1	2
r) Any other complaint(s) in the last 14 days *(Please specify)*	1	2

PLEASE MAKE SURE YOU HAVE ANSWERED **ALL** THE ABOVE QUESTIONS.

20. a) Have you ever had any pain or discomfort in your chest?

Yes 1

No 2

If **No** go to Question 21

If **Yes**

b) do you get this pain or discomfort when you walk uphill or hurry?

Yes 1

No 2

c) do you get it when you walk at an ordinary pace on the level?

Yes 1

No 2

d) When you get any pain or discomfort in your chest, what do you do?

Stop 1

Slow down 2

Continue at the same pace 3

e) does it go away when you stand still?

Yes 1

No 2

f) how soon?

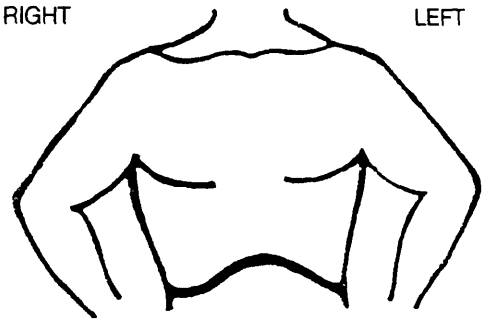
In 10 min. or less 1

More than 10 min. 2

g) Where do you get this pain or discomfort?

(mark the place(s) with a X on the diagram)

RIGHT LEFT



Front view

21. a) Have you ever had a severe pain across the front of your chest lasting for half an hour or more?

Yes 1

No 2

If **No** go to Question 22

If **Yes**

b) did you talk to a doctor about it?

Yes 1

No 2

If **No**, go to Question 22

If **Yes**,

c) What did he say it was?

.....

d) How many of these attacks have you had? [.]

number

22. a) Have you ever had heart trouble suspected or confirmed?

Yes 1

No 2

If **No**, go to Question 23

If **Yes**,

b) When was the first time? [give year] 19[ ]

year

c) What was the diagnosis?

Heart attack 1

Heart strain 2

High blood pressure 3

Valve disease 4

Hole in the heart 5

Other *(please specify)* 6

.....

d) Did you attend a hospital?

Yes 1

No 2

e) Are you still attending a doctor for heart trouble?

Yes 1

No 2

23. Has your blood pressure ever been checked?

Yes 1

No 2

If **No** go to Question 26

24. If **Yes,** who has it been checked by? *(circle all that apply)*

	Yes	No
a) General Practitioner (or practice nurse)	1	2
b) Hospital doctor (or nurse)	1	2
c) At work	1	2
d) Insurance exam	1	2
e) Others	1	2

25. a) Has a doctor ever told you that your blood pressure was above normal?

Yes 1

No 2

If **No,** go to Question 26

If **Yes**

b) when was the first time? ☐ *year*

c) Have you ever had treatment for high blood pressure?

Yes 1

No 2

d) Are you taking drug treatment for high blood pressure now?

Yes 1

No 2

26. a) Do you get any pains in either leg on walking?

Yes 1

No 2

If **No,** go to Question 27

If **Yes,**

b) Does this pain ever begin when you are standing still or sitting?

Yes 1

No 2

c) Do you get this pain in your calf or calves?

Yes 1

No 2

d) Do you get it when you walk uphill or hurry?

Yes 1

No 2

e) Do you get it when you walk at an ordinary pace or on the level?

Yes 1

No 2

f) Does this pain ever disappear while you are still walking?

Yes 1

No 2

g) What do you do if you get it when you are walking?

Stop 1

Slow down 2

Continue at the same pace 3

h) What happens to it if you stand still?

Usually continues more than 10 mins. 1

Usually disappears in 10 mins. or less 2

27. Do you suffer from Diabetes?

Yes 1

No 2

28. a) Do you usually bring up any phlegm from your chest first thing in the morning in winter?

Yes	1
No	2

If **No**, go to Question 29

If **Yes**,

b) Do you usually bring up phlegm in the morning on most days for as much as three months in the winter?

Yes	1
No	2

c) In the past three years have you had a period of increased cough and phlegm lasting for three weeks or more?

None	1
One period	2
Two or more periods	3

29. a) What is your present weight? [approximately]

Stones *lbs*

b) How much did you weigh at the age of 25? [approximately]

Stones *lbs*

30. In the last 12 months how many days were you off work for health reasons?

Days

31. How many hours of sleep do you have on an average week night?

5 hours or less	1
6 hours	2
7 hours	3
8 hours	4
9 hours or more	5

32. In the last 14 days have you taken any of these medicines **prescribed by a doctor?**

	Yes	No
a) Pain killers	1	2
b) Medicines for indigestion	1	2
c) Tranquillisers	1	2
d) Sleeping pills	1	2
e) Antidepressants	1	2
f) Laxatives (bowel opening medicine)	1	2
g) Other medicines prescribed by a doctor *(Please specify)*	1	2

.....

.....

h) In the last 2 weeks have you taken other medicines **not prescribed by a doctor** (e.g. tonics or cough syrup)

1 2

If **Yes**, *please specify:*

.....

.....

If **MALE** go to Question 38

FOR WOMEN ONLY

33. a) Are you taking any contraceptive pills?

Yes 1

No 2

If **No**, go to Question 34

If **Yes**

b) At what age did you first start? ☐ *age*

c) For how many years altogether have you taken the pill? ☐ *years*

d) Which pill are you currently taking? Specify brand

.....

GO TO QUESTION 35

IF NOT NOW TAKING CONTRACEPTIVE PILLS

34. a) Did you ever take contraceptive pills?

Yes 1

No 2

If **No**, go to Question 35

If **yes**,

b) For how many years altogether did you take contraceptive pills? ☐ *years*

---

35. a) Are you still having your periods?

Yes 1

No 2

If **Yes**, go to Question 36

If **No**,

b) At what age did you stop? ☐ *age*

c) What was the cause of menopause?

Natural menopause 1

Hysterectomy (removal of womb only) 2

Hysterectomy plus removal of ovaries 3

d) Have you ever had hormone replacement therapy?

Yes 1

No 2

If **No**, go to Question 36

If **Yes**,

e) For how many months? ☐ *number*

f) Please specify the name of the tablets

.....

.....

g) Are you still taking hormone replacement therapy?

Yes 1

No 2

36. a) Do you suffer from menopausal symptoms?
(Change of life)

Yes 1

No 2

If **No,** go to Question 37

If **Yes,**
What symptoms do you suffer from?

	Yes a lot	Yes Somewhat	Yes a little	No Not at all
b) Hot flushes	1	2	3	4
c) Depression	1	2	3	4
d) Sleep disturbance	1	2	3	4
e) Bone pains	1	2	3	4
f) Other	1	2	3	4

If **Other,** *please specify:*.....

37. If you are still having periods do you suffer from any premenstrual symptoms?

	Yes a lot	Yes Somewhat	Yes a little	No Not at all
a) Irritability	1	2	3	4
b) Swelling or weight gain (bloated feeling)	1	2	3	4
c) Breast tenderness	1	2	3	4
d) Other	1	2	3	4

If **Other,** *(please specify)* .....

38. a) All things considered how satisfied or dissatisfied are you with your present state of health?
Please circle one of the numbers on the 1-7 scale below to show how satisfied or dissatisfied you feel:—

Very dissatisfied	Moderately dissatisfied	Slightly dissatisfied	No feelings either way	Slightly satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

b) Which one of the following statements best reflects your view on reducing the chances of having a heart attack?

(circle one only)

There is very little you can do for yourself, it is fate or bad luck 1

There are certain things you can do for yourself, which **might** help reduce the chance of a heart attack 2

These are certain things you can do for yourself which will **definitely** help reduce the chance of a heart attack 3

SMOKING HABITS

39. a) Do you smoke cigarettes now? (i.e. not cigars/pipe)

Yes 1

No 2

If **No**, go to Question 40

If **Yes**,

b) What kind of cigarettes do you smoke?

circle all that apply

Manufactured with filters 1

Manufactured without filters 2

Hand rolled 3

c) How many manufactured cigarettes do you smoke per day? ☐ *cigarettes*

and/or

d) About how many ounces of tobacco do you use per week for handrolled cigarettes? ☐ *ounces*

GO TO QUESTION 41

---

40. a) **If not a present cigarette smoker** did you smoke in the past?

Yes 1

No 2

If **No**, go to Question 42

If **Yes**,

b) How many manufactured cigarettes did you smoke per day? ☐ *cigarettes*

and/or

c) How many ounces of tobacco did you use per week for handrolled cigarettes? ☐ *ounces*

d) How old were you when you stopped smoking? ☐ *age*

---

41. How old were you when you started smoking? ☐ *age*

---

42. a) Do you smoke cigars?

Yes 1

No 2

If **No**, go to Question 42c

If **Yes**,

b) How many cigars per week? ☐ *cigars*

---

c) Do you smoke a pipe?

Yes 1

No 2

If **Yes**,

d) How many ounces of tobacco do you smoke per week? ☐ *ounces*

DRINKING HABITS

43. a) In the past 12 months have you taken an alcoholic drink:

circle one only

Twice a day or more 1

Almost daily 2

Once or twice a week 3

Once or twice a month 4

Special occasions only 5

No 6

---

b) In the last 5 years have you changed your drinking habits?

Yes 1

No 2

If **No**, go to Question 44

If **Yes**,

c) Compared with your current habits did you drink?

A lot more 1

A bit more 2

A bit less 3

A lot less 4

Continued

Continued

d) If you have given up or reduced drinking, what was the main reason?

circle one only

Illness/doctor's orders	1
Health precautions	2
Finance	3
Other *(please specify)*	4

.....

IF YOU ARE A NON DRINKER PLEASE GO TO QUESTION 46

44. a) Have you had an alcoholic drink in the last seven days?

Yes	1
No	2

If **No**, go to Question 45

If **Yes,**

In the last seven days how many drinks have you had of each of the following?
[please remember that a drink poured at home could be equivalent to 2 or 3 pub measures]

[If none write 0]

b) Spirit (whisky, gin, rum, brandy, vodka etc) or liqueurs. ☐ *measures*

c) Wine (including sherry, port, vermouth) ☐ *glasses*

d) Beer (including lager or cider) ☐ *pints*

---

45. a) When you drink spirits or wine how many drinks do you **usually** have during one occasion?
[If you have both wine and spirits, add them together — e.g. 1 measure of whisky and 2 glasses of wine = 3]

1 - 2	1
3 - 4	2
5 or more	3
I don't drink spirits or wine	4

b) When you drink beer how many pints do you **usually** have during one occasion?

1 - 2	1
3 - 4	2
5 or more	3
I don't drink beer	4

---

c) What is the **maximum** quantity or wine/spirits you would drink at one sitting?
[*If none write 0*]

wine/spirits ☐ *No. of drinks*

d) What is the **maximum** quantity of beer you would drink during one occasion?
[*If none write 0*]

beer ☐ *pints*

---

e) In what circumstances are you most likely to drink the maximum you might drink?

	Yes	No
Social occasions	1	2
When bored	1	2
When under pressure	1	2
When upset about something	1	2
Other *(please specify)*	1	2

.....

COFFEE AND TEA CONSUMPTION

The following questions about your regular beverage apply to work as well as home.

IF YOU DO NOT DRINK TEA OR COFFEE GO TO QUESTION 47

46. How many cups of tea and coffee on average do you drink every day?

a) Tea
[*If none, write 0*] ☐ *cups*

b) Coffee
[*If none, write 0*] ☐ *cups*

IF YOU DO NOT DRINK COFFEE GO TO QUESTION 47

If you drink coffee:

46.c) What sort of coffee do you mostly drink?

(Circle one only)

Instant	1
Filtered	2
Percolated	3
Decaffeinated	4
Other (specify)	5

.....

FOOD CONSUMPTION

Please answer the following questions about your food habits (if you are not sure you may discuss this question with the person responsible for buying and cooking your food.)

47.a) What type of bread do you eat most frequently?

Circle one only

White	1
Wholemeal	2
Granary or wheatmeal	3
Other brown	4
Both brown and white	5

b) How many slices of bread do you usually eat daily?

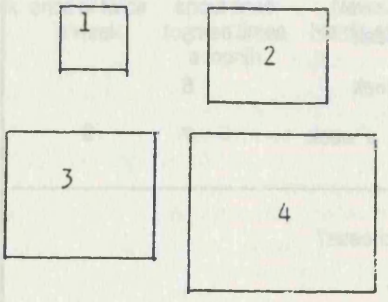
None	1
1 - 2	2
3 - 6	3
7 - 12	4
13 slices or more	5

c) What type of butter or margarine do you use most frequently?

Circle one only

Butter	1
Hard margarine	2
Soft margarine	3
Margarine high in polyunsaturates (e.g. Flora)	4
Low calorie spread (e.g Outline)	5
Rarely use butter or margarine	6

d) The drawing below shows cubes of butter or margarine in true scale. Pick the cube which most resembles the average amount you use for one slice of bread. If in doubt try buttering a slice [do not place butter or margarine on the questionnaire]



1
2
3
4

e) What type of milk do you usually use?

Circle one only

Do not use milk	1
Channel Islands Whole Milk (gold top)	2
Whole Milk (silver/ red top or sterilised)	3
Skimmed milk	4
Semi-Skimmed milk	5
Other *(please specify)*	6

.....

Continued

Continued

f) How much milk do you yourself use daily? (drinking and in cooking). Please estimate your share of the household supply and what you might drink at work or elsewhere.

None	1
Half a pint or less	2
Over half, up to one pint	3
Over 1, up to 2 pints	4
More than 2 pints	5

g) How often do you use cream?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

h) How often do you use cheese?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

i) How often does your meal consist of fish or fish dishes?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

j) How often do you eat fresh fruits or vegetables?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
Daily	7
2 or more times a day	8

k) How often do you eat meals containing meat (not fish or poultry)?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

l) How often do you eat eggs?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

m) How often do you eat breakfast cereals?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

If **Never**, go to Question 48

Continued

Continued

n) Which of the following breakfast cereals do you eat nowadays? *(Circle one only)*

Allbran	1
Muesli	2
Weetabix	3
Branflakes	4
Puffed wheat	5
Other cereal *(specify)*	6

PHYSICAL ACTIVITY

48. How often do you take part in sports or activities that are:

	3 times a week or more	once or twice a week	about once to three times a month	Never/ Hardly ever
a) **Mildly energetic** (e.g. walking, woodwork, weeding, hoeing, bicycle repair, playing darts, general housework)	1	2	3	4
b) **Moderately energetic** (e.g. scrubbing, polishing car, chopping, dancing, golf, cycling, decorating, lawn mowing, leisurely swimming).	1	2	3	4
c) **Vigorous** (e.g. running, hard swimming, tennis, squash, digging, cycle racing)	1	2	3	4

Please give the average number of hours per week you spend in such sports or activities.

d) Mildly energetic ☐ *hours*

e) Moderately energetic ☐ *hours*

f) Vigorous ☐ *hours*

Please give details of these activities:

.....

.....

.....

WORK CHARACTERISTICS

49. The following questions are about your work. For each please circle the one answer that best describes your job or the way you deal with problems occurring at work.

[*please answer all questions*]

Concerning your particular work:	Often	Sometimes	Seldom	Never/ Almost never
a) Do you have to work very fast?	1	2	3	4
b) Do you have to work very intensively?	1	2	3	4
c) Do you have enough time to do everything?	1	2	3	4
d) Are your tasks such that others can help you if you do not have enough time?	1	2	3	4
e) Do you have the possibility of learning new things through your work?	1	2	3	4
f) Does your work demand a high level of skill or expertise?	1	2	3	4
g) Does your job require you to take the initiative?	1	2	3	4
h) Do you have to do the same thing over and over again?	1	2	3	4
i) Do you have a choice in deciding HOW you do your work?	1	2	3	4
j) Do you have a choice in deciding WHAT you do at work?	1	2	3	4

50. About your position at work — how often do the following statements apply?
[please answer all questions]

	Often	Sometimes	Seldom	Never/ Almost never
a) Others take decisions concerning my work	1	2	3	4
b) I have a good deal of say in decisions about work	1	2	3	4
c) I have a say in my own work speed	1	2	3	4
d) My working time can be flexible	1	2	3	4
e) I can decide when to take a break	1	2	3	4
f) I can take my holidays more or less when I wish	1	2	3	4
g) I have a say in choosing with whom I work	1	2	3	4
h) I have a great deal of say in planning my work environment	1	2	3	4

51. If problems occur at work concerning the way the job should be done, how are they solved?
[please answer all questions]

	Often	Sometimes	Seldom	Never/ Almost never	Not Applicable
a) By discussing it at a meeting	1	2	3	4	5
b) By discussing it with a superior	1	2	3	4	5
c) By discussing it with colleagues at work	1	2	3	4	5
d) By discussing it with colleagues out of work time	1	2	3	4	5
e) By discussing it with trade union representatives	1	2	3	4	5
f) Others take decisions and just tell me how to do my job.	1	2	3	4	5

52. About consistency and clarity regarding your job

[please answer all questions]

	Often	Sometimes	Seldom	Never	Not Applicable
a) Do different groups at work demand things from you that you think are hard to combine?	1	2	3	4	5
b) Do you get sufficient information from line management? (your superiors)	1	2	3	4	5
c) Do you get consistent information from line management? (your superiors)	1	2	3	4	5
d) Are you uncertain about the best way of doing your job?	1	2	3	4	5
e) Do you ever get praised for your work?	1	2	3	4	5
f) Do you ever get criticised constructively?	1	2	3	4	5
g) Do you ever get criticised unfairly?	1	2	3	4	5

53. Regarding job involvement

[please answer all questions]

	Often	Sometimes	Seldom	Never	Not Applicable
a) Does your job provide you with a variety of interesting things?	1	2	3	4	5
b) Is your job too varied and split up?	1	2	3	4	5
c) Is your job boring?	1	2	3	4	5
d) Do you consider your job very important?	1	2	3	4	5
e) Do you feel your immediate superior considers your job very important?	1	2	3	4	5
f) Do your colleagues consider your job very important?	1	2	3	4	5
g) How often do you wish that you were doing a different job?	1	2	3	4	5
h) How often do you feel that you are doing your job only for the money?	1	2	3	4	5

54. When you are having difficulties in your work:

[please answer all questions]

	Often	Sometimes	Seldom	Never	Not Applicable
a) How often do you get help and support from your colleagues?	1	2	3	4	5
b) How often are your colleagues willing to listen to your work related problems?	1	2	3	4	5
c) How often do you get help and support from your immediate superior?	1	2	3	4	5
d) How often is your immediate superior willing to listen to your problems?	1	2	3	4	5
e) How often can you delegate work effectively to your juniors?	1	2	3	4	5
f) How often can you get support from your trade union representative?	1	2	3	4	5

55. If you were to be treated unfairly or to come into conflict with your boss or supervisor, what would be your immediate reaction?

[please answer all questions]

	Often	Sometimes	Seldom	Never or Almost Never
a) Let it pass without saying anything	1	2	3	4
b) Walk away feeling strongly but not saying anything	1	2	3	4
c) Say something at once	1	2	3	4
d) Reason with the person	1	2	3	4
e) Become angry	1	2	3	4
What happens then?	Often	Sometimes	Seldom	Never or Almost Never
f) Forget about it	1	2	3	4
g) Talk to the person when you have calmed down	1	2	3	4
h) Complain to a colleague	1	2	3	4
i) Go to someone higher in position	1	2	3	4
j) Go to trade union representative	1	2	3	4
k) Feel ill (headache, stomach ache etc.)	1	2	3	4
l) Become miserable	1	2	3	4
m) Get angry and short tempered at home	1	2	3	4
n) Contemplate revenge	1	2	3	4

56. About your job in general. How satisfied have you been with the following:

	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
a) Your usual take home pay	1	2	3	4
b) Your work prospects	1	2	3	4
c) The people you work with	1	2	3	4
d) Physical working conditions	1	2	3	4
e) The way your department is run	1	2	3	4
f) The way your abilities are used	1	2	3	4
g) The interest and skill involved in your job	1	2	3	4
h) Your job as a whole taking everything into consideration	1	2	3	4

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57. a) Do you work with visual display units (VDU's) or desk top television screens?

Yes 1

No 2

If **No,** go to Question 57e

If **Yes,**

b) When did you first start?

19 ☐

year

c) How many months you have worked with VDU?

☐

months

d) On average how many hours per week do you use a VDU?

☐

hours

e) Do you use a Home Computer or play video games?

Yes 1

No 2

If **No,** go to Question 58

If **Yes,**

f) On average how many hours do you spend on it per week?

☐

hours

HERE IS A LIST OF SEVERAL TRAITS OR QUALITIES

58. For each will you circle the appropriate number to show whether each trait describes you very well, fairly well, somewhat or not at all.
[*Please answer all questions*]

	Very Well	Fairly Well	Somewhat	Not at all
a) Being bossy or dominating	1	2	3	4
b) Having a strong need to excel (be best) in most things	1	2	3	4
c) Usually being pressed for time	1	2	3	4
d) Being hard driving and competitive	1	2	3	4
e) Eating too quickly	1	2	3	4

Now we want to know how you have generally felt at the end of an average day at work:

	Yes	No
f) Have you often felt very pressed for time?	1	2
g) Has your work often stayed with you so that you were thinking about it after working hours?	1	2
h) Has your work often stretched you to the very limits of energy and capacity?	1	2
i) Have you often felt uncertain, uncomfortable or dissatisfied with how well you were doing in your work?	1	2

Finally in this section:

j) Do you get quite upset when you have to wait for anything?	Yes	1
	No	2
k) When you are faced with slow people, do you feel agitated or irritable?	Not at all	1
	Somewhat	2
	Very much	3
l) When you are being held up in a queue do you feel agitated or irritable?	Not at all	1
	Somewhat	2
	Very much	3

SOCIAL LIFE

59. This section concerns people in your life who you feel close to and from whom you can obtain support (either emotional or practical) including close relatives and good friends.

How many people do you feel very close to? (It does not matter where they live or whether you have seen them recently).

PLEASE WRITE NUMBER IN THIS BOX ☐

Who have you felt **closest** to in the last 12 months? Please describe in terms of their relationship to you: (e.g. WIFE, SON, AUNT, BOYFRIEND, MALE FRIEND, FEMALE FRIEND). Remember these are just examples and we would like you to write in whoever you feel closest to. If you feel close to more than one person, please list up to four below:—

WRITE IN THE PEOPLE YOU ARE CLOSEST TO HERE:— Closest .....

Second person .....

Only one person on each line please

Third person .....

Fourth person .....

IF YOU ARE MARRIED NOW AND HAVE NOT PUT YOUR HUSBAND/WIFE IN ALREADY PLEASE INCLUDE HIM/HER ON THE FIFTH LINE

Fifth .....

On the opposite page please tell us how you would rate the practical and emotional support each of the people you have listed above provide for you. (Each column refers to one of the persons you listed above). Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support from (a - n) **IN THE LAST 12 MONTHS**

1	2	3	4
Not at all	A little	Quite a lot	A great deal

for example:—

If the person you are closest to is your wife and the second a male friend, the columns on the next page might look this:—

Write in the people you are closest to here:—	Closest Person Wife	Second Person Male friend
a) . . . How much in the last 12 months . . . did this person give you **information, suggestions** and **guidance** that you found helpful?	4	2

i.e. "a great deal" from wife, "a little" from friend. Of course, this is only an example. Please complete each row a - n on the 1 - 4 scale for the people listed above.

Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support:
1 = not at all, 2 = a little, 3 = quite a lot, 4 = a great deal

	Closest Person	Second Person	Third Person	Fourth Person	Spouse [if not already covered]
Write in the people you are closest to here:—	.....	.....	.....	.....	.....
a) . . . How much in the last 12 months . . . did this person give you **information, suggestions** and **guidance** that you found helpful?					
b) . . . How much in the last 12 months . . . could you **rely** on this person (was this person there when you needed him/her?)					
c) . . . How much in the last 12 months . . . did this person make you **feel good** about yourself?					
d) . . . How much in the last 12 months . . . did you **share** interests, hobbies and fun with this person?					
e) . . . How much in the last 12 months . . . did this person give you **worries, problems** and **stress?**					

This section is about **confiding** in people, that is talking frankly or sharing feelings with them.
Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support:
1 = not at all, 2 = a little, 3 = quite a lot, 4 = a great deal.

	Closest Person	Second Person	Third Person	Fourth Person	Spouse [if not already covered]
Write in the people you are closest to here:—	.....	.....	.....	.....	.....
f) . . . How much in the last 12 months . . . did you **want** to **confide in** (talk frankly, share feelings with this person)?					
g) . . . How much in the last 12 months . . . **did you confide in** this person?					
h) . . . How much in the last 12 months . . . did you trust this person with your most personal worries and problems?					
i) . . . How much in the last 12 months . . . would you have **liked to have confided more** in this person?					
j) . . . How much in the last 12 months . . . did talking to this person make things worse?					
k) . . . How much in the last 12 months . . . did he/she talk about his/her personal worries with you?					

This section is about major and minor **practical** support. Rate each person on the scale from 1 - 4 to show how well they provided each stated type of support:
1 = not at all, 2 = a little, 3 = quite a lot, 4 = a great deal.

	Closest Person	Second Person	Third Person	Fourth Person	Spouse [if not already covered]
Write in the people you are closest to here:—	.....	.....	.....	.....	.....
l) . . . How much in the last 12 months . . . did you **need** practical help from this person with **major** things (e.g. look after you when ill, help with finances, children)?					
m) . . . How much in the last 12 months . . . did this person give you **practical** help with **major** things?					
n) . . . How much in the last 12 months . . . would you have **liked more practical** help with major things from this person?					
o) . . . How much in the last 12 months . . . did this person give you **practical** help with **small** things when you needed it? (e.g. chores, shopping, watering plants etc.)					

Continued

ntinued

We would also like a few details on each of these people:-

Write in the people you are closest to here:—	Closest Person	Second Person	Third Person	Fourth Person	Spouse [if not already covered]
p) How old are they? (in years)?					
q) What sex are they? (male/female)	M F	M F	M F	M F	M F
r) What is their marital status (married, single other)?	M S O	M S O	M S O	M S O	
s) Do they have children aged 16 or under now? (Yes/No)	Yes No	Yes No	Yes No	Yes No	Yes No
t) How long have you known them? (in years)					
u) Did they have further education after 18 years?					
Yes	1	1	1	1	1
No	2	2	2	2	2
Don't know	3	3	3	3	3
Not applicable	4	4	4	4	4
v) Do they work with you? (Yes/No)	Yes No	Yes No	Yes No	Yes No	Yes No
w) About how many days did you see them in the last year (1 - 365)?					
x) How close do they live to you (with you, or number of miles away)?					

y) All things considered how satisfied or dissatisfied are you overall with your own personal relationships? Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:-

Very dissatisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

z) All things considered how satisfied or dissatisfied are you with the way you spend your leisure time? Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:—

Very dissatisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

60. a) Amongst your family and friends how many people are available to you with whom you talk frankly without having to watch what you say?

None	1
1 - 2	2
3 - 5	3
6 - 10	4
More than 10	5

b) Are there times when you are comforted by being held in someone's arms?

Almost daily	1
About once/week	2
About once/month	3
Never	4

61. a) Are there any relatives outside your household who you regularly visit or who visit you? [not necessarily the same person each time]

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5
No relatives outside household	6

If **No relatives outside household** go to Question 62

b) How many relatives do you see once a month or more?

None	1
1 - 2	2
3 - 5	3
6 - 10	4
More than 10	5

62. How often do you ever see anyone from work, socially out of work hours? (Excludes casual lunchtime meetings)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

63. a) Do you have any friends or acquaintances you visit or who visit you? (not necessarily the same person each time)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

b) How many friends or acquaintances do you see once a month or more?

None	1
1 - 2	2
3 - 5	3
6 - 10	4
More than 10	5

c) Do you have any friends or acquaintances with whom you are in contact only by telephone or letter?

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

64. How often do you attend religious services? (apart from weddings and funerals)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

65. Do you do any voluntary work for other people (e.g. visiting sick, disabled or elderly, belonging to Friends of the Hospital etc.)?

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

66. a) Do you belong to any clubs or organisations? (Social or recreational groups, trade union, commercial groups, professional organisations, political parties, sports clubs, cultural groups, pressure groups etc.)

Yes	1
No	2

If **No**, go to Question 67

If **Yes**,

b) Taking all of the above together, how often do you attend?

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

67. How often do you have parties at home? (including small dinner parties)

4 or more times a week	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

68. a) Do you have any hobbies? (other than watching TV or reading the newspaper)

Yes	1
No	2

If **No**, go to Question 69

If **Yes**,

b) In an average week how much time do you spend on your hobbies? ☐ *hours*

Please specify your hobbies.....

.....

69. How often do you have the feeling that there is little meaning in the things you do in your daily life?

Often	1
Sometimes	2
Seldom	3
Almost never	4

70. When you have difficulties in important aspects of your life, do you feel you will succeed in overcoming them?

Often	1
Sometimes	2
Seldom	3
Almost never	4

71. How often do you have the feeling that you do not have a clear idea of how your personal life will work out?

Often	1
Sometimes	2
Seldom	3
Almost never	4

72. a) All things considered how satisfied or dissatisfied are you with your standard of living?
Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:-

Very dissatisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

b) All things considered how satisfied or dissatisfied are you with your present accommodation?
Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:-

Very dissatisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

73. Below are five statements with which you may agree or disagree. Using the 1 - 7 scale below, indicate your agreement with each item by circling the appropriate number.

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
a) In most ways my life is close to my ideal	1	2	3	4	5	6	7
b) The conditions of my life are excellent	1	2	3	4	5	6	7
c) I am satisfied with my life	1	2	3	4	5	6	7
d) So far I have got the important things I want in life	1	2	3	4	5	6	7
e) If I could live my life over again I would change almost nothing	1	2	3	4	5	6	7

74. This Section is about the way you are feeling these days. Please answer each question by circling the number which most nearly applies to you.

During the past few weeks did you feel:

	Not at all	A little	Quite a lot	A great deal
a) Particularly excited or interested in something	1	2	3	4
b) So restless you could not sit long in a chair	1	2	3	4
c) Proud because someone complimented you on something you had done	1	2	3	4
d) Very lonely or remote from other people	1	2	3	4
e) Pleased about having accomplished something	1	2	3	4
f) Bored	1	2	3	4
g) On top of the world	1	2	3	4
h) Depressed or very unhappy	1	2	3	4
i) That things were going your way	1	2	3	4
j) Upset because someone criticised you	1	2	3	4

75-78. The following is a list of things that can happen to people. Try to think back over the past 12 months and remember if any of these things happened to you and, if so, how much you were upset or disturbed by it?

	Very much	Moderately	Not too much	Not at all
a) Personal serious illness, injury or operation Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
b) Death of a close relative or friend Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
c) Serious illness, injury or operation of a close relative or friend Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
d) Major financial difficulty Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
e) Divorce, separation or break up of personal intimate relationship Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
f) Other marital or family problem Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
g) Any mugging, robbery, accident or similar event Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4
h) Change of job or residence Yes 1 No 2 If **Yes,** How much did it upset you?	1	2	3	4

79. For each of the following questions on common concerns of everyday living circle one answer:
(If the question does not apply to you please circle not applicable)

a) How often do you wonder if your children are turning out the way you hoped?

Always	1
Often	2
Sometimes	3
Seldom	4
Never	5
Not Applicable	6

b) How often do your children fail to get along with others of the same age?

Always	1
Often	2
Sometimes	3
Seldom	4
Never	5
Not Applicable	6

c) How often do you have worries or problems with other relatives (e.g. parents or in-laws)?

Always	1
Often	2
Sometimes	3
Seldom	4
Never	5
Not Applicable	6

d) How often do you have to spend time looking after aged or disabled relatives?

Very often	1
Often	2
Sometimes	3
Seldom	4
Never	5
Not Applicable	6

e) How often does it happen that you do not have enough money to afford the kind of food or clothing you/your family should have?

Always	1
Often	2
Sometimes	3
Seldom	4
Never	5
Not Applicable	6

f) How much difficulty do you have in meeting the payment of bills?

Very great	1
Great	2
Some	3
Slight	4
Very little	5

g) To what extent do you have problems with your housing?
(e.g. too small, repairs, damp etc.)

Very great problems		1
Great	,,	2
Some	,,	3
Slight	,,	4
Very little	,,	5

h) To what extent do you have problems with the neighbourhood in which you live? (e.g. noise, unsafe street, few local facilities)

Very great problems		1
Great	,,	2
Some	,,	3
Slight	,,	4
Very little	,,	5

How strongly do you agree or disagree that:

i) Generally I give in more to my spouse's wishes than he/she gives in to mine

Strongly agree	1
Agree	2
Not sure	3
Disagree	4
Strongly disagree	5
Not applicable	6

GENERAL HEALTH QUESTIONS

Please read this carefully:

We should like to know if you have had any medical complaints, and how your health has been in general, **over the past few weeks.** Please answer **ALL** the questions on the following pages simply by circling the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past.

It is important that you try to answer **ALL** the questions.

HAVE YOU RECENTLY:—

80.	— been able to concentrate on whatever you're doing?	Better than usual 1	Same as usual 2	Less than usual 3	Much less than usual 4
81.	— lost much sleep over worry?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
82.	— been having restless, disturbed nights?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
83.	— been managing to keep yourself busy and occupied?	More so than usual 1	Same as usual 2	Rather less than usual 3	Much less than usual 4
84.	— been getting out of the house as much as usual?	More so than usual 1	Same as usual 2	Less than usual 3	Much less than usual 4
85.	— been managing as well as most people would in your shoes?	Better than most 1	About the same 2	Rather less well 3	Much less well 4
86.	— felt on the whole you were doing things well?	Better than usual 1	About the same 2	Less well than usual 3	Much less well 4
87.	— been satisfied with the way you've carried out your task?	More satisfied 1	About same as usual 2	Less satisfied than usual 3	Much less satisfied 4
88.	— been able to feel warmth and affection for those near to you?	Better than usual 1	About same as usual 2	Less well than usual 3	Much less well 4
89.	— been finding it easy to get on with other people?	Better than usual 1	About same as usual 2	Less well than usual 3	Much less well 4
90.	— spent much time chatting with people	More time than usual 1	About same as usual 2	Less time than usual 3	Much less than usual 4
91.	— felt that you are playing a useful part in things?	More so than usual 1	Same as usual 2	Less useful than usual 3	Much less useful 4

HAVE YOU RECENTLY:—

92.	— felt capable of making decisions about things?	More so than usual 1	Same as usual 2	Less so than usual 3	Much less capable 4
93.	— felt constantly under strain?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
94.	— felt you couldn't overcome your difficulties?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
95.	— been finding life a struggle all the time?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
96.	— been able to enjoy your normal day-to-day activities?	More so than usual 1	Same as usual 2	Less so than usual 3	Much less than usual 4
97.	— been taking things hard?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
98.	— been getting scared or panicky for no good reason	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
99.	— been able to face up to your problems?	More so than usual 1	Same as usual 2	Less able than usual 3	Much less able 4
100.	— found everything getting on top of you?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
101.	— been feeling unhappy and depressed	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
102.	— been losing confidence in yourself?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
103.	— been thinking of yourself as a worthless person?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
104.	— felt that life is entirely hopeless?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
105.	— been feeling hopeful about your own future?	More so than usual 1	About same as usual 2	Less so than usual 3	Much less hopeful 4

HAVE YOU RECENTLY:—

106.	— been feeling reasonably happy, all things considered?	More so than usual 1	About same as usual 2	Less so than usual 3	Much less than usual 4
107.	— been feeling nervous and strung-up all the time?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
108.	— felt that life isn't worth living?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4
109.	— found at times you couldn't do anything because your nerves were too bad?	Not at all 1	No more than usual 2	Rather more than usual 3	Much more than usual 4

110. Below are some of the statements which describe people's beliefs and attitudes and the way they might react to some situations. If the statement applies to you or describes you in general, circle "1" for True. If the statement does not describe you circle "2" for False.

	TRUE	FALSE
1) When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing.	1	2
2) I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first.	1	2
3) I have often had to take orders from someone who did not know as much as I did.	1	2
4) I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others.	1	2
5) It takes a lot of argument to convince most people of the truth.	1	2
6) I think most people would lie to get ahead.	1	2
7) Someone has it in for me.	1	2
8) Most people are honest chiefly through fear of being caught.	1	2
9) Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it.	1	2
10) I commonly wonder what hidden reason another person may have for doing something nice for me.	1	2
11) It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important.	1	2
12) I feel that I have often been punished without cause.	1	2
13) Some of my family have habits that bother and annoy me very much.	1	2
14) My way of doing things is apt to be misunderstood by others.	1	2
15) I don't blame anyone for trying to grab everything he can get in this world.	1	2
16) No one cares much what happens to you.	1	2
17) It is safer to trust nobody.	1	2
18) I do not blame a person for taking advantage of someone who lays himself open to it.	1	2

Continued

	TRUE	FALSE
19) I have often felt that strangers were looking at me critically.	1	2
20) Most people make friends because friends are likely to be useful to them.	1	2
21) I am sure I am being talked about.	1	2
22) I am likely not to speak to people until they speak to me.	1	2
23) Most people inwardly dislike putting themselves out to help other people.	1	2
24) I tend to be on my guard with people who are somewhat more friendly than I had expected.	1	2
25) I have sometimes stayed away from another person because I feared doing or saying something that I might regret afterwards.	1	2
26) People often disappoint me.	1	2
27) It makes me feel like a failure when I hear of the success of someone I know well.	1	2
28) I have at times had to be rough with people who were rude or annoying.	1	2
29) People generally demand more respect for their own rights than they are willing to allow for others.	1	2
30) There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done.	1	2
31) I am not easily angered.	1	2
32) I have often met people who were supposed to be experts who were no better than I.	1	2
33) I am often inclined to go out of my way to win a point with someone who has opposed me.	1	2
34) I have often found people jealous of my good ideas, just because they had not though of them first.	1	2
35) I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes on to those under them.	1	2
36) I strongly defend my own opinions as a rule.	1	2
37) People can pretty easily change me even though I thought that my mind was already made up on a subject.	1	2
38) Sometimes I am sure that other people can tell what I am thinking.	1	2

Date when form completed

day	*month*	*year*

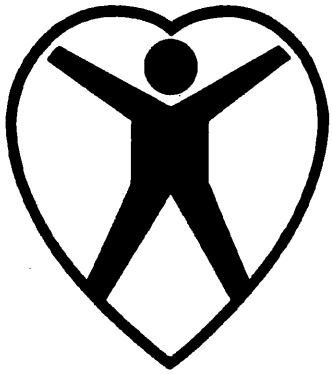
PLEASE ADD COMMENTS BELOW OR OVERLEAF, IF YOU WISH:—

TO ALL RESPONDENTS
THANK YOU VERY MUCH FOR YOUR COOPERATION

Printed by Central Services, University College London

CONFIDENTIAL

HEALTH SURVEY



Department of Community Medicine
University College London

Civil Service Occupational Health Service

S2/August 1989

HEALTH SURVEY

We are interested in identifying the characteristics of work and personal environment which may affect people's health. We should, therefore, be grateful if you would complete this questionnaire which asks for some general background information as well as questions about your activities.

The answers to all these questions will, of course, be kept strictly confidential. All information on individuals will go into statistics for all men and women in the study and it will not be possible to identify your responses from any reports or publications.

Under no circumstances will any information from an individual record be made available to anyone, either connected with the Civil Service or outside it.

PLEASE USE BLOCK LETTERS THROUGHOUT

Once returned, the personal identification section will be removed. This will ensure the preservation of confidentiality in subsequent handling of the questionnaires.

SURNAME _____

FORENAMES (in full) _____

HOME ADDRESS _____

_____

_____

MINISTRY/DEPARTMENT _____

ROOM NUMBER _____

WORK ADDRESS (in full) _____

_____

_____

WORK TELEPHONE NUMBER _____

This questionnaire asks about features of your way of life which may affect your health. To study this we need to monitor your health over the next 5-7 years.

In the last questionnaire we asked most of you to give us permission to monitor your health via your departmental sickness records. We would like to continue collecting this information for 5-7 years. We shall continue to treat all information with the strictest confidence.

If you agree, please indicate. Consent given: Yes No

(Please circle one)

If Yes, please sign your name here _____

If you have given consent, please could you provide the following information in order that we can check the accuracy of our records.

NATIONAL INSURANCE NUMBER _____
(you can get this from your payslip)

PAYROLL NUMBER/PAY REFERENCE _____
(this is given in the top left hand corner of your payslip)

Your General Practitioner's name and address

NAME _____

ADDRESS _____

_____

_____

THANK YOU

HEALTH SURVEY

General Instructions

Please read these notes before filling in the rest of the form

Please answer all the questions.

The answer to most questions can be indicated by circling the appropriate number.

e.g. What is your sex? Male (1)

Female 2

Where the question requires you to write numbers, a rectangle is used.

e.g. What is your date of birth? 12 (Day) 3 (Month) 19 45 (Year)

Where the answer is likely to involve a phrase or sentence lines are given.

e.g. What was the main reason for you being in hospital?

(please specify)

acute bronchitis

CODER'S INITIALS

1. a) Give your grade title - IN FULL

_____

_____

b) Is your grade title on the following list? If it is please circle one number.

Name of grade title

1 Senior Executive Officer
2 Higher Executive Officer
3 Executive Officer

4 Senior Scientific Officer
5 Higher Scientific Officer
6 Scientific Officer
7 Assistant Scientific Officer
8 Principal Professional Technology Officer
9 Higher Professional Technology Officer
10 Professional Technology Officer

11 Administrative Officer (formerly Clerical Officer)
12 Administrative Assistant (formerly Clerical Assistant)
13 Senior Personal Secretary
14 Personal Secretary
15 Typing Manager
16 Typist (including specialist, audio shorthand typists)

Support Staff (This includes Messengers, Paperkeepers, Telephonists, Security Officers, Porters, Reprographics Officers/Photoprinters and Cleaners)

17 Support Manager 1 (includes Reprographics/ Photoprinter Manager)
18 Support Manager 2 (includes Chief Reprographics/ Photoprinter Officer)
19 Support Manager 3 (includes Chief Paperkeeper and Assistant Chief Reprographics Officer)
20 Support Grade Band 1 (includes Senior Messenger, Senior Paperkeeper and Reprographics Operator 1)
21 Support Grade Band 2 (includes Messenger, Paperkeeper and Reprographics Operator 2)

22 Senior Information Officer
23 Information Officer
24 Assistant Information Officer

25 Unified Grade 1
26 Unified Grade 2
27 Unified Grade 3 (including Undersecre
28 Unified Grade 4
29 Unified Grade 5 (including Assistant Secretary)
30 Unified Grade 6 (formerly Senior Princ
31 Unified Grade 7 (formerly Principal Le

32 Superintendent of Specialist Teleprinter Operators
33 Specialist Teleprinter Operator
34 Superintendent of Teleprinter Operators
35 Teleprinter Operator

36 Director of Audit (National Audit Offic
37 Deputy Director of Audit (NAO)
38 Chief Auditor (NAO)
39 Senior Auditor (NAO)
40 Auditor (NAO)
41 Assistant Auditor (NAO)

42 Superintendent Examiner (Patents Office
43 Principal Examiner (Patents Office)
44 Senior Examiner (Patents Office)
45 Examiner (Patents Office)

46 Museum Warder Grade 1
47 Museum Warder Grade 2
48 Museum Warder Grade 3
49 Museum Warder Grade 4
50 Museum Warder Grade 5
51 Museum Warder Grade 6
52 Museum Warder Grade 7

53 Curatorial Officer Grade D
54 Curatorial Officer Grade E
55 Curatorial Officer Grade F
56 Curatorial Officer Grade G

57 Conservation Officer D
58 Conservation Officer E
59 Conservation Officer F
60 Conservation Officer G

c) If you DO NOT know your official grad title please give a brief description of your job, including level of seniority

_____

_____

_____

2. a) What is your date of birth?

		19	
Day	Month		Year

b) Sex:

Male	1
Female	2

3. What is your marital status?

Circle one only

Married	1
Cohabiting	2
Single (never married)	3
Divorced or separated	4
Widowed	5

4. Is the accommodation in which you live owned or rented?

Own outright or have mortgage	1
Rent from local authority	2
Rent privately: unfurnished	3
Rent privately: furnished	4

5. a) Does anyone live in your household besides you?

Yes	1
No	2

If No, go to Question 6

If Yes,

Who lives in your household besides you?

Answer all parts

		Yes	No
b)	Spouse or partner	1	2
c)	Other adult(s)	1	2

How many other adults? (if none write 0) ☐

d)	Children	1	2

How many? (if none write 0) ☐

6. Is there a car or van normally available for use by you or other members of your household?

Yes	1
No	2

7. a) Is your natural father still alive?

Yes	1
No	2

If Yes, go to Question 8

If No,

b) How old was your father when he died?

☐ Years

c) What did he die from?

Heart Attack (coronary)	1
Stroke	2
Other heart condition (not a coronary)	3
Cancer	4
Other causes (please specify)	5
Don't know	6

8. a) Is your natural mother still alive?

Yes 1

No 2

If Yes, go to Question 9

If No,

b) How old was your mother when she died? ☐ Years

c) What did she die from?

Heart attack (coronary)	1
Stroke	2
Other heart condition (not a coronary)	3
Cancer	4
Other causes (please specify)	5
Don't know	6

9. a) Do you have any brothers or sisters

Yes 1

No 2

If No brothers no sisters go to Question 10

If Yes

Have any of your brothers or sisters suffered with the following?

(Please answer all questions)

		Yes	No	Don't know
b)	Angina	1	2	3
c)	Heart Attack	1	2	3
d)	Stroke	1	2	3
e)	High Blood Pressure	1	2	3
f)	Diabetes	1	2	3

THIS SECTION CONCERNS YOUR OWN HEALTH

10. Over the last 12 months would you say your health has been

Very good	1
Good	2
Average	3
Poor	4
Very poor	5

11. a) Do you have any longstanding illness, disability or infirmity?

(longstanding means anything that has troubled you over a period of time or that is likely to affect you over a period of time)

Yes 1

No 2

If No, go to question 12

If Yes,

b) What is the matter with you?

_____

_____

_____

12. a) Have you ever had any pain or discomfort in your chest?

Yes 1

No 2

If No, go to Question 13

If Yes,

b) Do you get this pain or discomfort when you walk uphill or hurry?

Yes 1

No 2

c) Do you get it when you walk at an ordinary pace on the level?

Yes 1

No 2

d) When you get any pain or discomfort in your chest, what do you do?

Stop 1

Slow down 2

Continue at the same pace 3

e) Does it go away when you stand still?

Yes 1

No 2

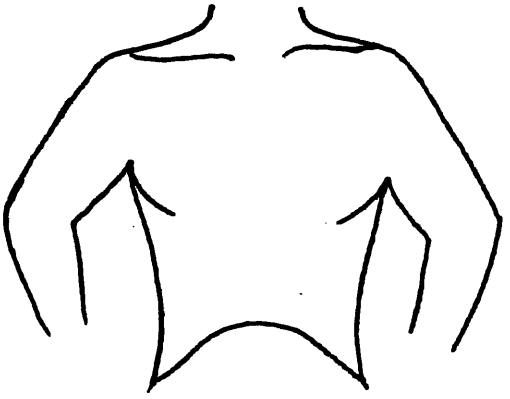
f) How soon?

In 10 mins or less 1

More than 10 mins 2

g) Where do you get this pain or discomfort? *(mark the place(s) with an X on the diagram)*

RIGHT LEFT



FRONT VIEW

13. a) Have you ever had a severe pain across the front of your chest lasting for half an hour or more?

Yes 1

No 2

If No, go to Question 14

If Yes,

b) Did you talk to a doctor about it?

Yes 1

No 2

If No, go to Question 14

If Yes,

c) What did he say it was?

---

d) How many of these attacks have you had?

number

14. a) Has a doctor ever told you that your blood pressure was above normal?

Yes 1

No 2

If No, go to part (c)

If Yes

b) when was the first time?

19 year

c) Have you ever had treatment for high blood pressure?

Yes 1

No 2

d) Are you taking drug treatment for high blood pressure now?

Yes 1

No 2

15. a) Have you ever had heart trouble suspected or confirmed?

Yes 1

No 2

If No, go to Question 16

If Yes,

b) When was the first time? (give year)

19 year

c) What was the diagnosis?

Heart attack 1

Heart strain 2

High blood pressure 3

Valve disease 4

Hole in heart 5

Other (please specify) 6

---

d) Did you attend a hospital?

Yes 1

No 2

e) Are you still attending a doctor for heart trouble?

Yes	1
No	2

16. There are some kinds of health problems that keep recurring and some that people have all the time. In the last 12 months have you suffered from any of the following health problems?

(Please answer all questions)

	Yes	No
a) Bronchitis	1	2
b) Arthritis or rheumatism	1	2
c) Sciatica, lumbago or recurring backache	1	2
d) Persistent skin trouble (e.g. eczema)	1	2
e) Asthma	1	2
f) Hay fever	1	2
g) Recurring stomach trouble/indigestion	1	2
h) Being constipated all or most of the time	1	2
i) Piles	1	2
j) Persistent foot trouble (e.g. bunions, ingrowing toenails)	1	2
k) Trouble with varicose veins	1	2
l) Nervous trouble or persistent depression	1	2
m) Persistent trouble with your gums or mouth	1	2
n) Any other recurring health problem (please specify)	1	2

_____

_____

_____

PLEASE MAKE SURE YOU HAVE ANSWERED ALL THE ABOVE QUESTIONS

17. Have you had any of the following symptoms in the last 14 days?

(Please answer all questions)

	Yes	No
a) A cough, catarrh or phlegm	1	2
b) Diarrhoea	1	2
c) Heartburn, wind or indigestion	1	2
d) Shortness of breath	1	2
e) Dizziness or giddiness	1	2
f) Earache or discomfort in the ears	1	2
g) Swollen ankles	1	2
h) Nervy, tense or depressed	1	2
i) A cold or 'flu'	1	2
j) A sore throat	1	2
k) Difficulty in sleeping	1	2
l) Pains in the chest	1	2
m) A backache or pains in the back	1	2
n) Nausea or vomiting	1	2
o) Feeling tired for no apparent reason	1	2
p) Rashes, itches or other skin trouble	1	2

q) Toothache or trouble with the gums 1 2

r) Any other complaints in the last 14 days (Please specify) 1 2

_____

_____

_____

PLEASE MAKE SURE YOU HAVE ANSWERED ALL THE ABOVE QUESTIONS

18. Do you suffer from Diabetes?

Yes 1

No 2

19. a) Do you usually bring up any phlegm from your chest first thing in the morning in winter?

Yes 1

No 2

If No, go to question 20

If Yes,

b) Do you usually bring up phlegm in the morning on most days for as much as three months in the winter?

Yes 1

No 2

20. In the past three years have you had a period of increased cough and phlegm lasting for three weeks or more?

None 1

One period 2

Two or more periods 3

21. What is your present weight? (approximately)

[ ] [ ]

Stones lbs

22. a) This question concerns any medicines prescribed by a doctor that you may have taken during the last fourteen days

Have you been taking any medicines, tablets, tonics or pills (including contraceptive pills) within the last fourteen days?

Yes 1

No 2

If Yes

b) Please list any medicines below:-

A. _____

B. _____

C. _____

D. _____

23. a) During the last 12 months, were you in hospital as a patient, overnight or longer?

Yes 1

No 2

If No go to question 24

If Yes

b) How many times did you go into hospital overnight or longer during the last 12 months?

[ ] number

c) How many days altogether were you in hospital during the last 12 months?

[ ] days

d) What were the main reasons for you being in hospital? (please specify)

_____

_____

_____

24. Which one of the following statements best reflects your view on reducing the chances of having a heart attack?

(circle one only)

There is very little you can do for yourself, it is fate or bad luck 1

There are certain things you can do for yourself which might help reduce the chance of a heart attack 2

There are certain things you can do for yourself which will definitely help reduce the chance of a heart attack 3

SMOKING HABITS

25. a) Do you smoke cigarettes now? (i.e. not cigars/pipe)

Yes 1

No 2

If No, go to Question 26

If Yes,

b) What kind of cigarettes do you smoke?

	Circle all that apply
Manufactured with filters	1
Manufactured without filters	2
Hand rolled	3

c) How many manufactured cigarettes do you smoke per day?

cigarettes

and/or

d) About how many ounces of tobacco do you use per week for hand-rolled cigarettes?

ounces

GO TO QUESTION 27

26. a) If not a present cigarette smoker did you smoke in the past?

Yes 1

No 2

If No, go to Question 28

If Yes,

b) How many manufactured cigarettes did you smoke per day?

cigarettes

and/or

c) How many ounces of tobacco did you use per week for hand-rolled cigarettes?

ounces

d) How old were you when you stopped smoking?

age

27. How old were you when you started smoking cigarettes

age

28. a) Do you smoke cigars?

Yes 1

No 2

If No, go to 28. c)

If Yes,

b) How many cigars per week?

cigars

c) Do you smoke a pipe?

Yes 1

No 2

If Yes,

d) How many ounces of tobacco do you smoke per week?

ounces

DRINKING HABITS

29. a) In the past 12 months have you taken an alcoholic drink:

(circle one only)

Twice a day or more	1
Almost daily	2
Once or twice a week	3
Once or twice a month	4
Special occasions only	5
No	6

b) In the last 5 years have you changed your drinking habits?

Yes	1
No	2

If No, go to Question 30

If Yes,

c) Compared with 5 years ago do you now drink:

A lot more	1
A bit more	2
A bit less	3
A lot less	4

d) If you have given up or reduced drinking, what was the main reason?

circle one only

Illness/doctor's orders	1
Health precautions	2
Finance	3
Other (please specify)	4

_____

30. a) Have you had an alcoholic drink in the last seven days?

Yes	1
No	2

If No, go to Question 31

If Yes,

In the last seven days how many drinks have you had of each of the following?

[please remember that a drink poured at home could be equivalent to 2 or 3 pub measures] [if none write 0]

b) Spirits (whisky, gin, rum, brandy, vodka etc) or liqueurs ☐ measures

c) Wine (including sherry, port, vermouth) ☐ glasses

d) Beer (including lager and cider) ☐ pints

31. a) When you drink spirits or wine how many drinks do you usually have during one occasion?

[If you have both wine and spirits, add them together e.g. 1 measure of whisky and 2 glasses of wine = 3]

1 - 2	1
3 - 4	2
5 or more	3
I don't drink spirits or wine	4

b) When you drink beer how many pints do you usually have during one occasion?

1 - 2	1
3 - 4	2
5 or more	3
I don't drink beer	4

c) What is the **maximum** quantity of wine/spirits you would drink at one sitting? [if none write 0]

wine/spirits ☐

no of drinks

d) What is the **maximum** quantity of beer you would drink during one occasion? [[if none write 0]

beer ☐

pints

FOOD CONSUMPTION

Please answer the following questions about your food habits. (if you are not sure you may discuss this question with the person responsible for buying and cooking your food).

32. a) What type of bread do you eat most frequently?

	Circle one only
White	1
Wholemeal	2
Granary or wheatmeal	3
Other brown	4
Both brown and white	5

b) What type of milk do you usually use?

	(circle one only)
Do not use milk	1
Channel Islands Whole milk (gold top)	2
Whole Milk (silver/ red top or sterilised)	3
Skimmed milk	4
Semi-skimmed milk	5
Other (please specify)	6

c) How often do you eat fresh fruits or vegetables?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
Daily	7
2 or more times daily	8

d) How often do you eat meals containing meat (not fish or poultry)?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

e) How often do you eat eggs?

Seldom or never	1
Less than once a month	2
1 - 3 times a month	3
1 - 2 times a week	4
3 - 4 times a week	5
5 - 6 times a week	6
7 or more times a week	7

33. a) Compared with four or five years ago, do you now eat more, less, or the same of the following.

CIRCLE ONE PER ITEM

	More	Same	Less	Don't know
White bread	1	2	3	4
Brown/wholemeal bread	1	2	3	4
Fruit	1	2	3	4
Butter	1	2	3	4
Vegetables	1	2	3	4
Meat products e.g. pies, sausages	1	2	3	4
Cod and other white fish	1	2	3	4
Poultry	1	2	3	4
Herring, mackerel, sardines etc	1	2	3	4
Beef, pork and lamb	1	2	3	4

b) Which of the following do you now do more often than four or five years ago?

	More	Same	Less	Don't know
Grill food rather than fry it	1	2	3	4
Trim fat off meat before cooking it	1	2	3	4
Avoid additives	1	2	3	4
Buy more fast food (like burgers, chicken pieces, etc)	1	2	3	4
Look for lower fat alternatives when shopping	1	2	3	4
Eat more chips	1	2	3	4

If your diet has not changed in the last four to five years, go to Question 35.

34. If you have changed your food habits, in the last four to five years what was the main reason?

(circle one only)

Taste	1
Health precautions	2
Availability	3
To lose weight	4
Finances	5
Other (please specify)	6

_____

PHYSICAL ACTIVITY

35. How often do you take part in sports or activities that are:

	3 times a week or more	once or twice a week	about once to 3 times a month	Never/ hardly ever
a) Mildly energetic				
(e.g. walking, woodwork, weeding, hoeing, bicycle repair, playing darts, general housework)	1	2	3	4
b) Moderately energetic				
(e.g. scrubbing, polishing car, chopping, dancing, golf, cycling, decorating, lawn mowing, leisurely swimming)	1	2	3	4
c) Vigorous				
(e.g. running, hard swimming, tennis, squash, digging, cycle racing)	1	2	3	4

Please give the average number of hours per week you spend in such sports or activities.

d) Mildly energetic [ ] e) Moderately energetic [ ] f) Vigorous [ ]

WORK CHARACTERISTICS

The following questions are about your work. For each please circle the one answer that best describes your job or the way you deal with problems occurring at work.

[Please answer all questions]

36. Concerning your particular work:

	Often	Sometimes	Seldom	Never/almost never
a) Do you have to work very fast?	1	2	3	4
b) Do you have to work very intensively?	1	2	3	4
c) Do you have enough time to do everything?	1	2	3	4
d) Are your tasks such that others can help you if you do not have enough time?	1	2	3	4
e) Do you have the possibility of learning new things through your work?	1	2	3	4
f) Does your work demand a high level of skill or expertise?	1	2	3	4
g) Does your job require you to take the initiative?	1	2	3	4
h) Do you have to do the same thing over and over again?	1	2	3	4
i) Do you have a choice in deciding HOW you do your work?	1	2	3	4
j) Do you have a choice in deciding WHAT you do at work?	1	2	3	4

37. About your position at work - how often do the following statements apply?

[Please answer all questions]

	Often	Sometimes	Seldom	Never/ Almost never
a) Others take decisions concerning my work	1	2	3	4
b) I have a good deal of say in decisions about work	1	2	3	4
c) I have a say in my own work speed	1	2	3	4
d) My working time can be flexible	1	2	3	4
e) I can decide when to take a break	1	2	3	4
f) I can take my holidays more or less when I wish	1	2	3	4
g) I have a say in choosing with whom I work	1	2	3	4
h) I have a great deal of say in planning my work environment	1	2	3	4

38. About consistency and clarity concerning your job

[Please answer all questions]

	Often	Sometimes	Seldom	Never
a) Do different groups at work demand things from you that you think are hard to combine?	1	2	3	4
b) Do you get sufficient information from line management? (your superiors)	1	2	3	4
c) Do you get consistent information from line management? (your superiors)	1	2	3	4
d) Are you uncertain about the best way of doing your job?	1	2	3	4
e) Do you ever get praised for your work?	1	2	3	4
f) Do you ever get criticised constructively?	1	2	3	4
g) Do you ever get criticised unfairly?	1	2	3	4

39. Regarding job involvement

[Please answer all questions]

	Often	Sometimes	Seldom	Never
a) Does your work provide you with a variety of interesting things?	1	2	3	4
b) Is your job too varied and split up?	1	2	3	4
c) Is your job boring?	1	2	3	4
d) Do you consider your job very important?	1	2	3	4
e) Do you feel your immediate superior considers your job very important?	1	2	3	4
f) Do your colleagues consider your job very important?	1	2	3	4
g) How often do you wish that you were doing a different job?	1	2	3	4
h) How often do you feel that you are doing your job only for the money?	1	2	3	4

40. When you are having difficulties in your work

[Please answer all questions]

	Often	Sometimes	Seldom	Never
a) How often do you get help and support from your colleagues?	1	2	3	4
b) How often are your colleagues willing to listen to your work related problems?	1	2	3	4
c) How often do you get help and support from your immediate superior?	1	2	3	4
d) How often is your immediate superior willing to listen to your problems?	1	2	3	4
e) How often can you delegate work effectively to your juniors?	1	2	3	4

41. About your job in general. How satisfied are you with your job as a whole, taking everything into consideration?

Very Satisfied	Satisfied	Dissatisfied	Very dissatisfied
1	2	3	4

42. a) Do you work with visual display units (VDU's) or desk top television screens?

Yes 1

No 2

If No, go to Question 43

If Yes,

b) When did you first start using VDU's regularly

19 ☐

Year

c) On average, how many hours per week do you use a VDU?

☐

hours

SOCIAL LIFE

43. This section concerns people in your life who you feel close to and from whom you can obtain support (either emotional or practical) including close relatives and good friends.

How many people do you feel very close to? (It does not matter where they live or whether you have seen them recently.)

PLEASE WRITE NUMBER IN THIS BOX [ ]

Who have you felt closest to in the last 12 months? Please describe in terms of their relationship to you: (e.g. WIFE, SON, AUNT, BOYFRIEND, MALE FRIEND, FEMALE FRIEND). Remember these are just examples and we would like you to write in whoever you feel closest to. If you feel close to more than one person, please list two below:

WRITE IN THE PEOPLE YOU ARE CLOSEST TO HERE:

Closest person _____

Second person _____

Only one person on each line, please.

On the opposite page please tell us how you would rate the practical and emotional support each of the people you have listed above provides for you.
(Each column refers to one of the people you listed above).

Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support from (a - o) **IN THE LAST 12 MONTHS.**

Not at all	A little	Quite a lot	A great deal
1	2	3	4

for example:-
If the person you are closest to is your wife and the second a male friend, the columns on the next page might look like this:-

Write in the people you are closest to here:-	Closest Person Wife	Second Person Male friend
a) How much in the last 12 months... did this person give you **information, suggestions, and guidance** that you found helpful?	4	2

e.g. "a great deal" from wife, "a little" from friend. Of course, these are only examples. Please complete each question (a) - (o) on the 1 - 4 scale for the person or two people you listed above.

Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support.
1 = not at all. 2 = a little. 3 = quite a lot. 4 = a great deal.

Write in the people you are closest to here:-	Closest Person	Second Person
a) How much in the last 12 months... did this person give you information, suggestions and guidance that you found helpful?		
b) How much in the last 12 months... could you rely on this person (was this person there when you needed him/her?)		
c) How much in the last 12 months... did this person make you feel good about yourself?		
d) How much in the last 12 months... did you share interests, hobbies and fun with this person?		
e) How much in the last 12 months... did this person give you worries, problems and stress?		

This section is about **confiding** in people, that is talking frankly or sharing feelings with them. Rate each person on the scale from 1 - 4 to show how well they have provided each stated type of support:
1 = not at all. 2 = a little. 3 = quite a lot. 4 = a great deal.

Write in the people you are closest to here:-	Closest Person	Second Person
f) How much in the last 12 months... did you want to confide in (talk frankly, share feelings with) this person?		
g) How much in the last 12 months... did you confide in this person?		
h) How much in the last 12 months... did you trust this person with your most personal worries and problems?		
i) How much in the last 12 months... would you have liked to confide more in this person?		
j) How much in the last 12 months... did talking to this person make things worse?		
k) How much in the last 12 months... did he/she talk to you about his/her personal worries with you?		

This section is about major and minor practical support. Rate each person on the scale from 1 - 4 to show how well they provided each type of support:
1 = not at all. 2 = a little. 3 = quite a lot. 4 = a great deal.

Write in the people you are closest to here:-	Closest Person	Second Person
l) How much in the last 12 months... did you **need** practical help from this person with **major** things (e.g. look after you when ill, help with finances, children)?		
m) How much in the last 12 months... did this person give you **practical** help with **major** things?		
n) How much in the last 12 months... would you have **liked more practical** help with major things from this person?		
o) How much in the last 12 months... did this person give you **practical** help with **small** things when you needed it? (e.g. chores, shopping, watering plants etc.)		

We would also like a few details on each of these people:-

Write in the people you are closest to here:-	Closest Person	Second Person
p) How old are they? (in years)		
q) What sex are they? (male/female)	M F	M F
r) How long have you known them? (in years)		
s) Do they work with you? (Yes/No)	Y N	Y N
t) About how many days did you see them in the last year (1 - 365)		
u) How close do they live to you? (with you, or number of miles away)		

v) All things considered, how satisfied or dissatisfied are you overall with your own personal relationships? Please circle one of the numbers on the 1 - 7 scale to show how satisfied or dissatisfied you feel:-

Very dis-satisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

w) All things considered, how satisfied are you with the way you spend your leisure time? Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:-

Very dis-satisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

44. a) Are there any relatives outside your household whom you regularly visit or who visit you? (Not necessarily the same person each time)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5
No relatives outside household	6

If No relatives outside household go to Question 45

b) How many relatives do you see once a month or more?

None	1
1 - 2	2
3 - 5	3
6 - 10	4
More than 10	5

45. How often do you see anyone from work, socially out of work hours? (Excludes casual lunchtime meeting)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

46. a) Do you have any friends or acquaintances you visit or who visit you? (not necessarily the same person each time)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

b) How many friends or acquaintances do you see once a month or more?

None	1
1 - 2	2
3 - 5	3
6 - 10	4
More than 10	5

47. How often do you attend religious services? (apart from weddings and funerals)

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

48. a) Do you belong to any clubs or organisations? (Social or recreational groups, trade unions, commercial groups, professional organisations, political parties,sports clubs, cultural groups, pressure groups etc.)

Yes	1
No	2

If No, go to Question 49

If Yes,

b) Taking all the above organisations together, how often do you attend?

Almost daily	1
About once/week	2
About once/month	3
Once every few months	4
Never/almost never	5

49. All things considered, how satisfied or dissatisfied are you with your standard of living?
Please circle one of the numbers on the 1 - 7 scale below to show how satisfied or dissatisfied you feel:-

Very dis-satisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
1	2	3	4	5	6	7

50. This Section is about the way you are feeling these days. Please answer each question by circling the number which most nearly applies to you.

During the past few weeks did you feel:

	Not at all	A little	Quite a lot	A great deal
a) Particularly excited or interested in something	1	2	3	4
b) So restless you could not sit long in a chair	1	2	3	4
c) Proud because someone complimented you on something you had done	1	2	3	4
d) Very lonely or remote from other people	1	2	3	4
e) Pleased about having accomplished something	1	2	3	4
f) Bored	1	2	3	4
g) On top of the world	1	2	3	4
h) Depressed or very unhappy	1	2	3	4
i) That things were going your way	1	2	3	4
j) Upset because someone criticised you	1	2	3	4

51. The following is a list of things that can happen to people. Try to think back over the past 12 months a remember if any of these things happened to you and, if so, how much you were upset or disturbed by

	Very much	Moderately	Not too much	Not at all
a) Personal serious illness, injury or operation				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
b) Death of close relative or friend				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
c) Serious illness, injury or operation of a close relative or friend				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
d) Major financial difficulty				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
e) Divorce, separation or break up of personal intimate relationship				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
f) Other marital or family problem				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
g) Any mugging, robbery, accident or similar event				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4
h) Change of job or residence				
Yes 1				
No 2				
If Yes, How much did it upset you?	1	2	3	4

52. a) How often do you have worries or problems with other relatives (e.g. parents or in-laws)?

Always	Often	Sometimes	Seldom	Never
1	2	3	4	5

b) How often does it happen that you do not have enough money to afford the kind of food or clothing you/your family should have?

Always	Often	Sometimes	Seldom	Never
1	2	3	4	5

c) How much difficulty do you have in meeting the payment of bills?

Very great	Great	Some	Slight	Very little
1	2	3	4	5

d) To what extent do you have problems with your housing? (e.g. too small, repairs, damp etc.)

Very great problems	Great	Some	Slight	Very little
1	2	3	4	5

e) To what extent do you have problems with the neighbourhood in which you live? (e.g. noise, unsafe street, few local facilities)

Very great problems	Great	Some	Slight	Very little
1	2	3	4	5

GENERAL HEALTH QUESTIONS

Please read this carefully

We should like to know if you have had any medical complaints, and how your health has been in general over the past few weeks. Please answer **ALL** questions on the following pages simply by circling the answer which you think most nearly applies to you. Remember that we want to know about your present and recent complaints, not those that you had in the past.

It is important that you try to answer **ALL** the questions.

HAVE YOU RECENTLY:-

53. - been able to concentrate on whatever you're doing?	Better than usual	Same as usual	Less than usual	Much less than usual
	1	2	3	4
54. - lost much sleep over worry?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
55. - been having restless, disturbed nights?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
56. - been managing to keep yourself busy and occupied?	More so than usual	Same as usual	Rather less than usual	Much less than usual
	1	2	3	4
57. - been getting out of the house as much as usual?	More so than usual	Same as usual	Less than usual	Much less than usual
	1	2	3	4
58. - been managing as well as most people would in your shoes?	Better than most	About the same	Rather less well	Much less well
	1	2	3	4
59. - felt on the whole you were doing things well?	Better than usual	About the same	Less well than usual	Much less well
	1	2	3	4
60. - been satisfied with the way you've carried out your task?	More satisfied	About same as usual	Less satisfied than usual	Much less satisfied
	1	2	3	4
61. - been able to feel warmth and affection for those near to you?	Better than usual	About same as usual	Less well than usual	Much less well
	1	2	3	4

HAVE YOU RECENTLY:-

62. - been finding it easy to get on with other people?	Better than usual	About same as usual	Less well than usual	Much less well
	1	2	3	4
63. - spent much time chatting with people?	More time than usual	About same as usual	Less time than usual	Much less than usual
	1	2	3	4
64. - felt that you are playing a useful part in things?	More so than usual	Same as usual	Less useful than usual	Much less useful
	1	2	3	4
65. - felt capable of making decisions about things?	More so than usual	Same as usual	Less so than usual	Much less capable
	1	2	3	4
66. - felt constantly under strain?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
67. - felt you couldn't overcome your difficulties?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
68. - been finding life a struggle all the time?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
69. - been able to enjoy your normal day-to-day activities?	More so than usual	Same as usual	Less so than usual	Much less than usual
	1	2	3	4
70. - been taking things hard?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
71. - been getting scared or panicky for no good reason?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
72. - been able to face up to your problems?	More so than usual	Same as usual	Less able than usual	Much less able
	1	2	3	4

HAVE YOU RECENTLY:-

73. - found everything getting on top of you?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
74. - been feeling unhappy and depressed?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
75. - been losing confidence in yourself?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
76. - been thinking of yourself as a worthless person?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
77. - felt that life is entirely hopeless?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
78. - been feeling hopeful about your own future?	More so than usual	About same as usual	Less so than usual	Much less hopeful
	1	2	3	4
79. - been feeling reasonably happy, all things considered?	More so than usual	About same as usual	Less so than usual	Much less than usual
	1	2	3	4
80. - been feeling nervous and strung-up all the time?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
81. - felt that life isn't worth living?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4
82. - found at times you couldn't do anything because your nerves were too bad?	Not at all	No more than usual	Rather more than usual	Much more than usual
	1	2	3	4

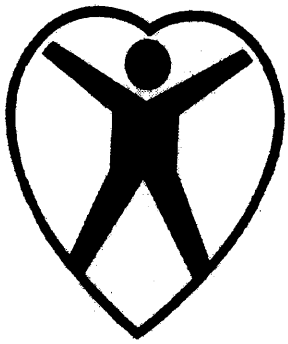
Date when form completed

Day	Month	Year

PLEASE ADD COMMENTS OPPOSITE IF YOU WISH:-
THANK YOU VERY MUCH FOR YOUR COOPERATION

CONFIDENTIAL

HEALTH SURVEY



Stress and Health Study
Department of Epidemiology and Public Health
University College London

Civil Service Occupational Health Service

S3/August 1991

We are interested in identifying the characteristics of work and personal environment which may affect people's health. We should, therefore, be grateful if you would complete this questionnaire which asks for some general background information as well as questions about your activities.

The answers to these questions will, of course, be kept strictly confidential. All information on individuals will go into statistics for all men and women in the study, and it will not be possible to identify your responses from any reports or publications.

Under no circumstances will any information from an individual record be made available to anyone, either connected with the Civil Service, or outside it.

PLEASE USE BLOCK LETTERS THROUGHOUT

Once returned, the personal identification section will be removed. This will ensure the preservation of confidentiality in subsequent handling of the questionnaires.

SURNAME
FORENAMES (in full)
HOME ADDRESS
MINISTRY/DEPARTMENT
ROOM NUMBER
BUILDING
WORK ADDRESS (in full)
WORK TELEPHONE NUMBER

This questionnaire asks about features of your way of life which may affect your health.
To study this we need to continue to monitor your health over the next few years.

In the last questionnaire we asked you to give us permission to monitor your health via your departmental sickness records. We would like to continue collecting this information and in cases of serious illness to obtain details from your general practitioner. We shall continue to treat all information with the strictest confidence.

If you agree, please complete the following.

Consent given: Yes No

(Please circle one)

If **Yes**, please sign your name here _____ Date _____

If you have given your consent, please could you provide your General Practitioner's name and address.

NAME

ADDRESS

General instructions

Please read these notes before filling in the rest of the Questionnaire

- Please answer all the questions.
- The answers to most questions can be indicated by blocking in the appropriate rectangle - you don't need to be too precise; a single bold stroke over the length of the rectangle will do
- Please use only an HB pencil
- Please DO NOT mark your answers like this:
- Where a question requires you to indicate a number, simply block in the rectangle next to the appropriate number. The example here shows "48":
- In some cases where a number is required, an opportunity is given for you also to WRITE in the number. This is provided to assist you but please note that the appropriate rectangles MUST be blocked in.
- Where the answer is likely to be a phrase or sentence please write in the space indicated

Example What is your sex? Male ■ Female □

✓ ✗ ⊖

Example What is her age? 10 20 30 40 50 60 70 80 90 100 / 1 2 3 4 5 6 7 8 9

Example What is your date of birth?

DAY		MONTH		YEAR		
2	1	1	2	19	3	1

10 1 10 1 10 1
20 2 20 2 20 2
30 3 30 3 30 3

Example: What was the main reason for being in hospital? PLEASE SPECIFY: Acute Bronchitis

THANK YOU

The Questionnaire

1. a) Please give your present or most recent grade title - IN FULL

GRADE TITLE

b) Is your grade title on the following list? If it is please indicate ONE.

NAME OF GRADE TITLE

- ▭ Senior Executive Officer
- ▭ Higher Executive Officer
- ▭ Executive Officer
- ▭ Senior Scientific Officer
- ▭ Higher Scientific Officer
- ▭ Scientific Officer
- ▭ Assistant Scientific Officer
- ▭ Principal Professional Technology Officer
- ▭ Higher Professional Technology Officer
- ▭ Professional Technology Officer
- ▭ Administrative Officer (formerly Clerical Officer)
- ▭ Administrative Assistant (formerly Clerical Assistant)
- ▭ Senior Personal Secretary
- ▭ Personal Secretary
- ▭ Typing Manager
- ▭ Typist (including specialist, audio shorthand typists)
- ▭ Support Manager 1 (includes Reprographics/Photoprinter Manager)
- ▭ Support Manager 2 (includes Chief Reprographics/Photoprinter Officer)
- ▭ Support Manager 3 (includes Chief Paperkeeper and Assistant Chief Reprographics Officer)
- ▭ Support Grade Band 1 (includes Senior Messenger, Senior Paperkeeper and Reprographics Operator 1)
- ▭ Support Grade Band 2 (includes Messenger, Paperkeeper and Reprographics Operator 2)
- ▭ Senior Information Officer
- ▭ Information Officer
- ▭ Assistant Information Officer
- ▭ Unified Grade 1
- ▭ Unified Grade 2
- ▭ Unified Grade 3 (including Undersecretary)
- ▭ Unified Grade 4
- ▭ Unified Grade 5 (including Assistant Secretary)
- ▭ Unified Grade 6 (formerly Senior Principal)
- ▭ Unified Grade 7 (formerly Principal level)
- ▭ Superintendent of Specialist Teleprinter Operators
- ▭ Specialist Teleprinter Operator
- ▭ Superintendent of Teleprinter Operators
- ▭ Teleprinter Operator
- ▭ Director of Audit (National Audit Office)
- ▭ Deputy Director of Audit (NAO)
- ▭ Chief Auditor (NAO)
- ▭ Senior Auditor (NAO)
- ▭ Auditor (NAO)
- ▭ Assistant Auditor (NAO)
- ▭ Superintendent Examiner (Patents Office)
- ▭ Principal Examiner (Patents Office)
- ▭ Senior Examiner (Patents Office)
- ▭ Examiner (Patents Office)
- ▭ Museum Warder Grade 1
- ▭ Museum Warder Grade 2
- ▭ Museum Warder Grade 3
- ▭ Museum Warder Grade 4
- ▭ Museum Warder Grade 5
- ▭ Museum Warder Grade 6
- ▭ Museum Warder Grade 7
- ▭ Curatorial Officer Grade D
- ▭ Curatorial Officer Grade E
- ▭ Curatorial Officer Grade F
- ▭ Curatorial Officer Grade G
- ▭ Conservation Officer D
- ▭ Conservation Officer E
- ▭ Conservation Officer F
- ▭ Conservation Officer G

c) If you DO NOT know your **official** grade title, give a brief description of your job, including level of seniority

JOB DESCRIPTION

d) **If you have left the civil service;** please give your last civil service grade title and your leaving date. Please also state if you are working elsewhere, your current occupation and industry.

LAST GRADE

CURRENT OCCUPATION

INDUSTRY

LEAVING DATE

Day	Month	Year
10 1	10 1	1
20 2	2	2
30 3	3	3
4	4	4
5	5 50	5
6	6 60	6
7	7 70	7
8	8 80	8
9	9 90	9

e) **If retired,** please give your last civil service grade title and your leaving date. Please also state your retirement date and reasons for stopping work.

LAST GRADE TITLE

REASON FOR STOPPING WORK

RETIREMENT DATE

Day	Month	Year
10 1	10 1	1
20 2	2	2
30 3	3	3
4	4	4
5	5 50	5
6	6 60	6
7	7 70	7
8	8 80	8
9	9 90	9

2. a) What is your date of birth?

DATE OF BIRTH

Day	Month	Year
10 1	10 1	1
20 2	2	2
30 3	3 30	3
4	4 40	4
5	5 50	5
6	6 60	6
7	7 70	7
8	8 80	8
9	9 90	9

b) Sex Male ☐ Female ☐

---

3. a) Are you married/cohabiting?

Yes ☐ No ☐

If No, go to part (c)
If Yes,

b) Is this your first marriage/cohabitation?

Yes ☐ No ☐

Now go to Question 4

c) If **not** now married/cohabiting, which are you?

Single ☐ Widowed ☐ Divorced or separated ☐

---

4. a) How many brothers do you have?

0 1 2 3 4 5 6 7 8 9 10

b) How many sisters do you have?

0 1 2 3 4 5 6 7 8 9 10

c) How many of your own children do you have?

0 1 2 3 4 5 6 7 8 9 10

---

5. Is the accommodation in which you live owned or rented?

Own outright or have mortgage ☐
Rent from local authority ☐
Rent privately: unfurnished ☐
Rent privately: furnished ☐

---

6. Is there a car or van normally available for use by you or other members of your household?

Yes ☐ No ☐

---

7. Is your natural father still alive?

Yes ☐ No ☐

If **Yes**, how old is he?

10 20 30 40 50 60 70 80 90 10(
1 2 3 4 5 6 7 8 9

If **No**, how old was your father when he died?

10 20 30 40 50 60 70 80 90 10(
1 2 3 4 5 6 7 8 9

---

8. Is your natural mother still alive?

Yes ☐ No ☐

If **Yes**, how old is she?

10 20 30 40 50 60 70 80 90 10(
1 2 3 4 5 6 7 8 9

If **No**, how old was your mother when she died?

10 20 30 40 50 60 70 80 90 10(
1 2 3 4 5 6 7 8 9

---

9. How many **near relatives** (i.e. brothers, sisters, parents or your own children) have ever received treatment for any of the following disorders?
Please answer each part.

a) Senile Dementia	0	1	2	3
b) Schizophrenia	0	1	2	3
c) Manic-depression	0	1	2	3
d) Depression	0	1	2	3
e) Alcoholism	0	1	2	3

THIS SECTION CONCERNS YOUR OWN HEALTH

10. Over the last 12 months would you say your health has been

Very good ☐ Good ☐ Average ☐
Poor ☐ Very Poor ☐

11. a) Do you have any longstanding illness, disability or infirmity? *(longstanding means anything that has troubled you over a period of time or that is likely to affect you over a period of time)*

Yes ☐ No ☐

If No, go to Question 12
If Yes,

b) What is the matter with you?

12. a) Have you ever had any pain or discomfort in your chest?

Yes ☐ No ☐

If No, go to Question 13
If Yes,

b) Do you get this pain or discomfort when you walk uphill or hurry?

Yes ☐ No ☐

c) Do you get it when you walk at an ordinary pace on the level?

Yes ☐ No ☐

d) When you get any pain or discomfort in your chest, what do you do?

Stop ☐ Slow down ☐ Continue at the same pace ☐

e) Does it go away when you stand still?

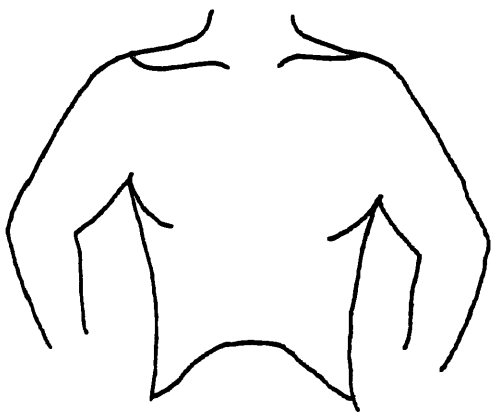
Yes ☐ No ☐

f) How soon?

In 10 mins or less ☐ More than 10 mins ☐

g) Where do you get this pain or discomfort?
Mark the place(s) with an X on the diagram.

RIGHT **LEFT**



FRONT VIEW

13. a) Have you ever had a severe pain across the front of your chest lasting half an hour or more?

Yes ☐ No ☐

If No, go to Question 14
If Yes,

b) Did you talk to a doctor about it?

Yes ☐ No ☐

If No, go to Question 14
If Yes,

c) What did he say it was?

d) How many of these attacks have you had? ☐ NUMBER

14. a) Have you ever had heart trouble suspected or confirmed by your GP or a hospital doctor?

Yes ☐ No ☐

If No, go to Question 15
If Yes,

b) When was the first time? *Give year.*

19 ☐10 ☐20 ☐30 ☐40 ☐50 ☐60 ☐70 ☐80 ☐90
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9

c) What was the diagnosis?

Heart attack ☐ Valve disease ☐
Angina ☐ Hole in heart ☐
High blood pressure ☐ Other (please specify) ☐

OTHER

d) Did you attend a hospital? Yes ☐ No ☐

e) Are you still attending a doctor for heart trouble? Yes ☐ No ☐

15. Have you had any of the following symptoms in the last 14 days? *Please answer all questions*

a) A cough, catarrh or phlegm Yes ☐ No ☐
b) Diarrhoea Yes ☐ No ☐
c) Heartburn, wind or indigestion Yes ☐ No ☐
d) Shortness of breath Yes ☐ No ☐
e) Dizziness or giddiness Yes ☐ No ☐
f) Earache or discomfort in the ears Yes ☐ No ☐
g) Swollen ankles Yes ☐ No ☐
h) Nervy, tense or depressed Yes ☐ No ☐
i) A cold or 'flu' Yes ☐ No ☐
j) A sore throat Yes ☐ No ☐
k) Difficulty in sleeping Yes ☐ No ☐
l) Pains in the chest Yes ☐ No ☐
m) A backache or pains in the back Yes ☐ No ☐
n) Nausea or vomiting Yes ☐ No ☐

o) Feeling tired for no apparent reason — Yes ☐ No ☐
p) Rashes, itches or other skin trouble — Yes ☐ No ☐
q) Blocked or runny nose — Yes ☐ No ☐
r) Dry throat — Yes ☐ No ☐
s) Headache — Yes ☐ No ☐
t) Dry, itchy or tired eyes — Yes ☐ No ☐
u) Wheeziness — Yes ☐ No ☐
v) Toothache or trouble with the gums — Yes ☐ No ☐
w) Any other complaints in the last 14 days? *Please specify* — Yes ☐ No ☐

OTHER COMPLAINTS

16. In the last 12 months how many days were you off work for health reasons?

100 200 300
0 10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7 8 9

17. Do you suffer from diabetes? Yes ☐ No ☐

18. a) Do you usually bring up any phlegm from your chest first thing in the morning in winter?

Yes ☐ No ☐

If No, go to Question 19
If Yes,
b) Do you usually bring up phlegm in the morning on most days for as much as 3 months in the winter?

Yes ☐ No ☐

19. In the past three years have you had a period of increased cough and phlegm lasting for three weeks or more?

None ☐ One period ☐ Two or more periods ☐

20. a) This question concerns any medicines that you may have taken during the last fourteen days.
Have you been taking any medicines, tablets, tonics or pills **prescribed by a doctor** (excluding contraceptive pills) within the last fourteen days?

Yes ☐ No ☐

If Yes,
b) Please list any medicines below:

i)
ii)
iii)
iv)

21. a) During the last 12 months, were you in hospital as an in-patient, overnight, or longer?

If No, go to Question 22 Yes ☐ No ☐
If Yes,

b) How many times did you go into hospital overnight or longer during the last 12 months? ☐ NUMBER

c) How many days altogether were you in hospital during the last 12 months? ☐ NUMBER

d) What were the main reasons for you being in hospital? *Please specify*

FOR WOMEN ONLY

If MALE, go to Question 30

22. a) Are you taking any contraceptive pills?

Yes ☐ No ☐

If No, go to Question 23
If Yes,
b) At what age did you first start?
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

c) For how many years altogether have you taken the pill?
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

d) Which pill are you currently taking?
Please specify brand

BRAND

Now go to Question 24

23. IF NOT NOW TAKING CONTRACEPTIVE PILLS:-
a) Did you ever take contraceptive pills?

Yes ☐ No ☐

If No, go to Question 24

If Yes,
b) At what age did you first start?
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

c) For how many years altogether did you take contraceptive pills?
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

24. a) Have you ceased having your periods?

Yes ☐ No ☐

If No, go to part d
If Yes,
b) At what age did you stop?
10 20 30 40 50 60 70 80 90
1 2 3 4 5 6 7 8 9

c) What was the cause of menopause?

Natural menopause ☐
Hysterectomy (removal of womb only) ☐
Hysterectomy plus removal of ovaries ☐
Other *Please specify* ☐

OTHER

d) Have you ever had hormone replacement therapy? Yes ☐ No ☐

If No, go to Question 25

If Yes,

e) For how long? Years 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

Months 1 2 3 4 5 6 7 8 9 10 11 12

f) Please specify the names of the medicine(s)

MEDICINE

g) Are you still taking hormone replacement therapy? Yes ☐ No ☐

If you have ceased having your periods go to Question 29

25. Which of the following descriptions apply to your periods during the last 12 months?

a) Normal for you in terms of regularity flow and duration? Yes ☐ No ☐

b) Less regular than usual? Yes ☐ No ☐

c) Shorter in duration over the year? Yes ☐ No ☐

d) One or more skipped periods? Yes ☐ No ☐

26. a) What was the date of the start of your last period?

DATE

b) What is the usual length of your cycle?

DAYS

27. Are your periods regular?

Always ☐ Usually ☐ Sometimes ☐ Never ☐

28. If you are still having periods, do you experience any premenstrual symptoms?

	Yes, a lot	Yes, somewhat	Yes, a little	No, not at
a) Irritability	☐	☐	☐	☐
b) Swelling or weight gain (bloated feeling)	☐	☐	☐	☐
c) Breast tenderness	☐	☐	☐	☐
d) Lower back pain	☐	☐	☐	☐
e) Headache	☐	☐	☐	☐
f) Other *Please specify*	☐	☐	☐	☐

29. a) Do you experience menopausal symptoms? Yes ☐ No ☐

If No, go to Question 30

If **Yes**, to what extent do you experience the following symptoms?

	Yes, a lot	Yes, somewhat	Yes, a little	No, not at
b) Hot flushes	☐	☐	☐	☐
c) Depression	☐	☐	☐	☐
d) Sleep disturbance	☐	☐	☐	☐
e) Bone pains	☐	☐	☐	☐
f) Night sweats	☐	☐	☐	☐
g) Other *Please specify*	☐	☐	☐	☐

SMOKING HABITS

30. a) Do you smoke cigarettes now? (i.e, not cigars/pipe) Yes ☐ No ☐

If No, go to Question 31

b) How many manufactured cigarettes do you smoke per day?

NUMBER

and/or

c) About how many ounces of tobacco do you use per week for hand-rolled cigarettes?

OUNCES

31. a) Do you smoke cigars? Yes ☐ No ☐

If Yes,

b) How many cigars per week?

NUMBER

c) Do you smoke a pipe? Yes ☐ No ☐

If Yes,

d) How many ounces of tobacco do you smoke per week?

OUNCES

32. a) If currently a non-smoker, to what extent are you exposed to cigarette smoke **at work?**

Not at all ☐ A little ☐

Quite a lot ☐ Very much ☐

b) If currently a non-smoker, to what extent are you exposed to cigarette smoke **at home?**

Not at all ☐ A little ☐

Quite a lot ☐ Very much ☐

DRINKING HABITS

33. a) In the past 12 months have you taken an alcoholic drink?
Indicate one only

- Twice a day or more ☐
- Daily or almost daily ☐
- Once or twice a week ☐
- Once or twice a month ☐
- Special occasions only ☐
- No ☐

b) If **No**, have you always been a non-drinker?

Yes ☐ No ☐

If always a non-drinker go to Question 36

c) Compared with 5 years ago do you now drink:

A lot more ☐ A bit more ☐ The same ☐
A bit less ☐ A lot less ☐

d) If you have **given up or reduced** drinking, what was the main reason?
Indicate one only

Illness/doctors orders ☐ Health precautions ☐
Finance ☐ Other *Please specify* ☐

OTHER

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34. a) Have you had an alcoholic drink in the last seven days?

Yes ☐ No ☐

If No, go to Question 35

If Yes,
In the last seven days, how many drinks have you had of each of the following?
Please remember that a drink poured at home could be equivalent to 2 or 3 pub measures.
If none, indicate 0.

b) Spirits (Whisky, gin, rum, brandy, vodka etc.) or liqueurs

☐
MEASURES

c) Wine (including sherry, port, vermouth)

☐
GLASSES

d) Beer (including lager and cider)

☐
PINTS

---

35. a) Have you ever felt that you ought to cut down on your drinking? Yes ☐ No ☐

b) Have people annoyed you by criticising your drinking? Yes ☐ No ☐

c) Have you ever felt bad or guilty about your drinking? Yes ☐ No ☐

d) Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover? Yes ☐ No ☐

COFFEE AND TEA CONSUMPTION

36. The following questions about your regular beverage apply to work as well as home.

If you do not drink tea or coffee go to Question 37

How many cups of tea or coffee on average do you drink every day?

a) Tea *If none indicate 0*

☐
CUPS

b) Coffee *If none indicate 0*

☐
CUPS

c) If you drink coffee, how is it **usually** prepared?
(Please mark one box only)

- Instant ☐
- Ground, freshly prepared ☐
- Boiled ground coffee, e.g. on filter machine with heated jug ☐

d) Which type of coffee do you **usually** drink? *(Please mark one box only)*

- Caffeinated ☐
- Decaffeinated ☐

Please answer the following questions about your food habits.

37. a) What type of bread do you eat most frequently? *Indicate one only*

White ☐ Wholemeal ☐ Granary or wheatmeal ☐ Other brown ☐ Both brown and white ☐

b) What type of milk do you usually use? *Indicate one only*

Do not use milk ☐ Channel Islands Whole milk (gold top) ☐ Whole Milk (silver/red top or sterilised) ☐

Skimmed milk ☐ Semi-skimmed milk ☐ Other *Please specify* ☐

OTHER

38. How often do you eat fresh fruit or vegetables?

Seldom or never ☐ Less than once a month ☐ 1-3 times a month ☐ 1-2 times a week ☐

3-4 times a week ☐ 5-6 times a week ☐ Daily ☐ 2 or more times daily ☐

HEALTH AND DAILY ACTIVITIES

39. In general, would you say your health is:–

Please indicate one

Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor ☐

40. **Compared to one year ago,** how would you rate your health in general now?

Please indicate one

Much better now than one year ago ☐ Somewhat worse now than one year ago ☐

Somewhat better now than one year ago ☐ Much worse now than one year ago ☐

About the same as one year ago ☐

41. The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, Not limited at all
a) **Vigorous activities,** such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
b) Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	☐	☐	☐
c) Lifting or carrying groceries	☐	☐	☐
d) Climbing **several** flights of stairs	☐	☐	☐
e) Climbing **one** flight of stairs	☐	☐	☐
f) Bending, kneeling or stooping	☐	☐	☐
g) Walking **more than one mile**	☐	☐	☐
h) Walking **half a mile**	☐	☐	☐
i) Walking **one hundred yards**	☐	☐	☐
j) Bathing and dressing yourself	☐	☐	☐

42. During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of your physical health?** *Please indicate one answer for each question.*

a) Cut down the **amount of time** you spent on work or other activities	Yes ☐	No ☐
b) **Accomplished less** than you would like	Yes ☐	No ☐
c) Were limited in the **kind** of work or other activities	Yes ☐	No ☐
d) Had **difficulty** performing the work or other activities (for example, it took extra effort)	Yes ☐	No ☐

43. During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?
Please indicate one answer for each question

a) Cut down the **amount of time** you spent on work or other activities	Yes ☐	No ☐
b) **Accomplished less** than you would like	Yes ☐	No ☐
c) Didn't do work or other activities as **carefully** as usual.	Yes ☐	No ☐

44. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups? *Please indicate one*

Not at all ☐ Slightly ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

45. How much **bodily** pain have you had during the **past 4 weeks?**
Please indicate one

None ☐ Very mild ☐ Mild ☐ Moderate ☐ Severe ☐ Very severe ☐

46. During the **past 4 weeks,** how much did **pain** interfere with your normal work (including both work outside the home and housework)? *Please indicate one*

Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

47. How much of the time during the **past 4 weeks,**
Please indicate one answer for each question

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
a) Did you feel full of life?	☐	☐	☐	☐	☐	☐
b) Have you been a very nervous person?	☐	☐	☐	☐	☐	☐
c) Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
d) Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
e) Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
f) Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
g) Did you feel worn out?	☐	☐	☐	☐	☐	☐
h) Have you been a happy person?	☐	☐	☐	☐	☐	☐
i) Did you feel tired?	☐	☐	☐	☐	☐	☐

48. During the **past 4 weeks,** how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)?
Please indicate one

All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time ☐

49. Please choose the answer that best describes how **true** or **false** each of the following statements is for you:
Please indicate one answer for each question

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a) I seem to get sick a little easier than other people	☐	☐	☐	☐	☐
b) I am as healthy as anybody I know	☐	☐	☐	☐	☐
c) I expect my health to get worse	☐	☐	☐	☐	☐
d) My health is excellent	☐	☐	☐	☐	☐

50. Please indicate the degree to which each of the following statements is TRUE OF YOU in general:
Please indicate one answer for each question

	Not at all	A little bit	Moderately	Quite a bit	Extremely
a) Sudden loud noises really bother me	☐	☐	☐	☐	☐
b) I hate to be too hot or too cold	☐	☐	☐	☐	☐
c) I am quick to sense the hunger contractions in my stomach	☐	☐	☐	☐	☐
d) I have a low tolerance for pain	☐	☐	☐	☐	☐

51. How often do you take part in sports or activities that are mildly energetic, moderately energetic or vigorous?
See details below

	3 times a week or more	Once or twice a week	About once to 3 times a month	Never/ hardly ever
a) **Mildly energetic** (e.g. walking, woodwork, weeding, hoeing, bicycle repair, playing darts, general housework)	☐	☐	☐	☐
b) **Moderately energetic** (e.g. scrubbing, polishing car, dancing, golf, cycling, decorating, lawn mowing, leisurely swimming)	☐	☐	☐	☐
c) **Vigorous** (e.g. running, hard swimming, tennis, squash, digging, cycle racing)	☐	☐	☐	☐

Please give the average number of hours per week you spend in such sports or activities.

d) Mildly energetic ☐ HOURS e) Moderately energetic ☐ HOURS f) Vigorous ☐ HOURS

52. Compared to someone of the same age and sex do you usually walk:

Slower ☐ Faster ☐ About the same pace ☐

53. How many times a week do you engage in vigorous physical activity long enough to work up a sweat?
If none, indicate 0

Times each week ☐ TIMES Hours each week ☐ HOURS

WORK CHARACTERISTICS

If you are no longer working please go to Question 69

54. How long do you spend daily travelling **to and from** work? (i.e. there and back). *If none, indicate 0*

Hours 0 1 2 3 4 5 6 7 8 9 10

Mins 10 20 30 40 50 / 0 1 2 3 4 5 6 7 8 9

55. Do you find commuting stressful (emotionally or physically)?

Yes, very much ☐ Yes, quite a lot ☐ Yes, a little ☐ No, not at all ☐

56. a) Do you work with visual display units (VDU's) or desk top television screens? Yes ☐ No ☐
If No, go to Question 57
If Yes,

b) When did you first start using VDU's regularly (Year)?

19 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

c) On average, how many hours per week do you use a VDU?

Hours 10 20 30 40 50 60 70 80 90 / 1 2 3 4 5 6 7 8 9

57. Please answer the following questions *(if applicable)*

a) How close is your desk to a window? Very close ☐ Close ☐ Far ☐ Very far ☐

b) How many people work in your room/area? 1 ☐ 2-4 ☐ 5-9 ☐ 10-29 ☐ more than 30 ☐

c) Is there a carpet on the floor of your room/area? Yes ☐ No ☐

d) In your room/area, can you switch lights on and off? Yes ☐ No ☐

e) In you room/area, can you adjust the heating? Yes ☐ No ☐

f) In your room/area, can you open the windows? Yes ☐ No ☐

58. How long do you work in your building in a typical week? *(to the nearest hour)* ☐ HOURS

59. The following questions are about your work. For each please indicate the one answer that best describes your job or the way you deal with problems occurring at work. *Please answer all questions*

Concerning your particular work:	Often	Sometimes	Seldom	Never/ Almost Never
a) Do you have to work very fast?	☐	☐	☐	☐
b) Do you have to work very intensively?	☐	☐	☐	☐
c) Do you have enough time to do everything?	☐	☐	☐	☐
d) Are your tasks such that others can help you if you do not have enough time?	☐	☐	☐	☐
e) Do you have the possibility of learning new things through your work?	☐	☐	☐	☐
f) Does your work demand a high level of skill or expertise?	☐	☐	☐	☐
g) Does your job require you to take the initiative?	☐	☐	☐	☐
h) Do you have to do the same thing over and over again?	☐	☐	☐	☐
i) Do you have a choice in deciding HOW you do your work?	☐	☐	☐	☐
j) Do you have a choice in deciding WHAT you do at work?	☐	☐	☐	☐

60. About your position at work - how often do the following statements apply? *Please answer all questions*

	Often	Sometimes	Seldom	Never/ Almost Never
a) Others take decisions concerning my work	☐	☐	☐	☐
b) I have a good deal of say in decisions about work	☐	☐	☐	☐
c) I have a say in my own work speed	☐	☐	☐	☐
d) My working time can be flexible	☐	☐	☐	☐
e) I can decide when to take a break	☐	☐	☐	☐
f) I can take my holidays more or less when I wish	☐	☐	☐	☐
g) I have a say in choosing with whom I work	☐	☐	☐	☐
h) I have a great deal of say in planning my work environment	☐	☐	☐	☐

61. About consistency and clarity regarding your job. *Please answer all questions*

	Often	Sometimes	Seldom	Never
a) Do different groups at work demand things from you that you think are hard to combine?	☐	☐	☐	☐
b) Do you get sufficient information from line management (your superiors)?	☐	☐	☐	☐
c) Do you get consistent information from line management (your superiors)?	☐	☐	☐	☐

62. Regarding job involvement. *Please answer all questions*

	Often	Sometimes	Seldom	Never
a) Does your job provide you with a variety of interesting things?	☐	☐	☐	☐
b) Is your job too varied and split up?	☐	☐	☐	☐
c) Is your job boring?	☐	☐	☐	☐
d) Do you consider your job very important?	☐	☐	☐	☐
e) Do you feel your immediate superior considers your job important?	☐	☐	☐	☐
f) Do your colleagues consider your job very important?	☐	☐	☐	☐
g) How often do you wish you were doing a different job?	☐	☐	☐	☐
h) How often do you feel that you are doing your job only for the money?	☐	☐	☐	☐

63. How would you judge the contribution your job makes to the general welfare of society, compared with other jobs?

Harmful or no contribution ☐ Slight contribution ☐ Great contribution ☐ Very great contribution ☐

64. When you are having difficulties at work: *Please answer all questions*

	Often	Sometimes	Seldom	Never
a) How often do you get help and support from your colleagues?	☐	☐	☐	☐
b) How often are your colleagues willing to listen to your work related problems?	☐	☐	☐	☐
c) How often do you get help and support from your immediate superior?	☐	☐	☐	☐
d) How often is your immediate superior willing to listen to your problems?	☐	☐	☐	☐

65. Compared to people in a similar job, do you have more or less control over your work? *(Please mark one box)*

A lot more ☐ Somewhat more ☐ About the same ☐ Somewhat less ☐ A lot less ☐

66. How much supervision do you have at work? *(Please mark one)*

Far too much ☐ Rather too much ☐ About the right amount ☐ Rather too little ☐ Far too little ☐

67. Major changes in the organisation and location of civil service departments have been made and/or are planned. Which of these changes affect you?

	Has happened	Is planned	Not certain what will happen	Is not planned
a) Change of your department into an agency	☐	☐	☐	☐
b) Major changes in the organisation or management of your department	☐	☐	☐	☐
c) Your department is being relocated	☐	☐	☐	☐

If your department has been, or will be relocated, please answer the following questions:

i. I moved/will move with the department	Yes ☐	No ☐
ii. I transferred/will transfer to another department within the civil service	Yes ☐	No ☐
iii. I will leave the civil service	Yes ☐	No ☐

68. What is the effect of the actual or planned changes as far as your job is concerned?

	Often	Sometimes	Seldom	Never
a) I am uncertain about the future	☐	☐	☐	☐
b) I feel these changes are a good thing	☐	☐	☐	☐

Now go to Question 70

69. If you retired, was it because of the recent changes in the organisation or location of the civil service?

Yes ☐ No ☐

70. The following questions are about how you usually are as a person. Please indicate the extent to which each description applies to you in the appropriate column.

	Very much like me	Fairly like me	Not really like me	Very unlike me
a) I am over-perfectionistic	☐	☐	☐	☐
b) I am over-conscientious	☐	☐	☐	☐
c) I am always tense and apprehensive	☐	☐	☐	☐
d) I am always very shy	☐	☐	☐	☐
e) I need certainty and security	☐	☐	☐	☐
f) I let other people take over responsibility for major areas in my life	☐	☐	☐	☐

71. All things considered, rate how important each of the following areas are to your life at present.

	Extremely important	Very important	Fairly important	Slightly important	Not important
a) Your health	☐	☐	☐	☐	☐
b) Your marital or love relationship	☐	☐	☐	☐	☐
c) Your job	☐	☐	☐	☐	☐
d) Your sex life	☐	☐	☐	☐	☐
e) Your family life	☐	☐	☐	☐	☐
f) Your leisure time activities	☐	☐	☐	☐	☐

72. All things considered, how satisfied or dissatisfied are you with the following areas of your life? *If applicable*

	Very dissatisfied	Moderately dissatisfied	A little dissatisfied	No feelings either way	A little satisfied	Moderately satisfied	Very satisfied
a) Your marital or love relationship	☐	☐	☐	☐	☐	☐	☐
b) Your leisure time activities	☐	☐	☐	☐	☐	☐	☐
c) Your standard of living	☐	☐	☐	☐	☐	☐	☐
d) Your job	☐	☐	☐	☐	☐	☐	☐
e) Your health	☐	☐	☐	☐	☐	☐	☐
f) Your family life	☐	☐	☐	☐	☐	☐	☐
g) Your sex life	☐	☐	☐	☐	☐	☐	☐
h) The way you feel about yourself as a person	☐	☐	☐	☐	☐	☐	☐

73. On an average weekday, approximately how many hours do you spend on the following activities: *If applicable*

a) Work (daytime and work brought home)
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

b) Time with family
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

c) Sleep
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

74. How often do you feel **physically exhausted** at the end of the day?

Hardly ever/never ☐ Once in a while ☐ Often ☐ Very often/always ☐

75. How often do you feel **emotionally or mentally exhausted** at the end of the day?

Hardly ever/never ☐ Once in a while ☐ Often ☐ Very often/always ☐

76. In general, how much stress or pressure have you experienced in your daily living **in the past four weeks**?

(Please mark one box) None ☐ A little ☐ A fair amount ☐ Quite a lot ☐ A great deal ☐

77. To what extent do you feel that the stress or pressure you have experienced in your life has affected your health?

(Please mark one box) Not at all ☐ Slightly ☐ Moderately ☐ A lot ☐ Extremely ☐

78. a) Are you currently providing any personal care or help to an aged or disabled relative(s)?

Yes ☐ No ☐

If *Yes,*

b) How many hours in an average week do you spend looking after this person(s)?

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐
10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐
100 ☐

79. a) Are there any relatives outside your household whom you regularly visit or who visit you? (Not necessarily the same person each time)

Almost daily ☐ About once a week ☐ About once a month ☐
Once every few months ☐ Never/almost never ☐ No relatives outside household ☐

If you have no relatives outside household, go to Question 80.

b) How many relatives do you see once a month or more?

None ☐ 1 - 2 ☐ 3 - 5 ☐ 6 - 10 ☐ More than 10 ☐

80. a) Do you have any friends or acquaintances you visit or who visit you? (Not necessarily the same person each time)

Almost daily ☐ About once a week ☐ About once a month ☐
Once every few months ☐ Never/almost never ☐

b) How many friends or acquaintances do you see once a month or more?

None ☐ 1 - 2 ☐ 3 - 5 ☐ 6 - 10 ☐ More than 10 ☐

81. a) Are you an active member of: social or recreational groups, trade unions, commercial groups, professional organisations, political parties, sports clubs, cultural groups, pressure groups etc.?

Yes ☐ No ☐

If No, go to Question 82

If Yes,

b) Taking all the above organisations together, how many hours in an average month do you devote to activities of these organisations?

10 20 30 40 50 60 70 80 90 100 200

0 1 2 3 4 5 6 7 8 9

82. a) At what age do you think most people enter middle age?

10 20 30 40 50 60 70 80 90

1 2 3 4 5 6 7 8 9

b) At what age do you think most people leave middle age?

10 20 30 40 50 60 70 80 90

1 2 3 4 5 6 7 8 9

83. How much do you agree or disagree with the following statements?

Please indicate one for each of the following questions

	DISAGREE				AGREE	
	Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
a) **At Home**, I feel I have control over what happens in most situations	☐	☐	☐	☐	☐	☐
b) **At work**, I feel I have control over what happens in most situations	☐	☐	☐	☐	☐	☐
c) Keeping healthy depends on things that I can do	☐	☐	☐	☐	☐	☐
d) There are certain things I can do for myself to reduce the risk of a heart attack	☐	☐	☐	☐	☐	☐
e) There are certain things I can do for myself to reduce the risk of getting cancer	☐	☐	☐	☐	☐	☐
f) I feel that what happens in my life is often determined by factors beyond my control	☐	☐	☐	☐	☐	☐
g) I have a sense of direction and purpose in my life	☐	☐	☐	☐	☐	☐
h) Over the next 5 - 10 years I expect to have many more positive than negative experiences	☐	☐	☐	☐	☐	☐
i) I often have the feeling that I am being treated unfairly	☐	☐	☐	☐	☐	☐
j) In the past ten years my life has been full of changes without my knowing what will happen next	☐	☐	☐	☐	☐	☐
k) One can always find a solution to painful things in life	☐	☐	☐	☐	☐	☐
l) My life in the future will probably be full of changes without my knowing what will happen next	☐	☐	☐	☐	☐	☐
m) I very often have the feeling that there's little meaning in the things I do in my daily life	☐	☐	☐	☐	☐	☐
n) I am certain that there will always be people whom I will be able to count on in the future	☐	☐	☐	☐	☐	☐

84. Do your family life and family responsibilities **interfere with** your performance on your job in any of the following ways?

Would you say:-

	Not at all	To some extent	A great deal	Not applicable
a) Family matters reduce the time you can devote to your job	☐	☐	☐	☐
b) Family worries or problems distract you from your work	☐	☐	☐	☐
c) Family activities stop you getting the amount of sleep you need to do your job well	☐	☐	☐	☐
d) Family obligations reduce the time you need to relax or be by yourself	☐	☐	☐	☐

85. To what extent do your job responsibilities **interfere with** your family life? Would you say:-

	Not at all	To some extent	A great deal	Not applicable
a) Your job reduces the amount of time you can spend with the family	☐	☐	☐	☐
b) Problems at work make you irritable at home	☐	☐	☐	☐
c) Your job involves a lot of travel away from home	☐	☐	☐	☐
d) Your job takes so much energy you don't feel up to doing things that need attention at home	☐	☐	☐	☐

86. a) How often do you have worries or problems with other relatives (e.g. parents or in-laws)?

Always ☐ Often ☐ Sometimes ☐ Seldom ☐ Never ☐

b) How often does it happen that you do not have enough money to afford the kind of food or clothing you/ your family should have?

Always ☐ Often ☐ Sometimes ☐ Seldom ☐ Never ☐

c) How much difficulty do you have in meeting the payment of bills?

Very great ☐ Great ☐ Some ☐ Slight ☐ Very little ☐ None ☐

d) To what extent do you have problems with your housing (e.g. too small, repairs, damp etc.)?

Very great problems ☐ Great ☐ Some ☐ Slight ☐ Very little ☐ None ☐

e) To what extent do you have problems with the neighbourhood in which you live (e.g. noise, unsafe street, few local facilities)?

Very great problems ☐ Great ☐ Some ☐ Slight ☐ Very little ☐ None ☐

GENERAL HEALTH QUESTIONS

Please read this carefully

We should like to know if you have had any medical complaints, and how your health has been in general **over the past few weeks**. Please answer ALL questions on the following pages simply by indicating the answer which you think most nearly applies to you. Remember that we want to know about your present and recent complaints, **not** those you had in the past.

It is important that you try to answer **ALL** the questions

HAVE YOU RECENTLY:-

87. Been able to concentrate on whatever you're doing?

Better than usual ☐ Same as usual ☐ Less than usual ☐ Much less than usual ☐

88. Lost much sleep over worry?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

89. Been having restless, disturbed nights?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

HAVE YOU RECENTLY:-

90. Been managing to keep yourself busy and occupied?

More so than usual ☐ Same as usual ☐ Rather less than usual ☐ Much less than usual ☐

91. Been getting out of the house as much as usual?

More so than usual ☐ About same as usual ☐ Less than usual ☐ Much less than usual ☐

92. Been managing as well as most people would in your shoes?

Better than most ☐ About the same ☐ Rather less well ☐ Much less well ☐

93. Felt on the whole you were doing things well?

Better than usual ☐ About the same ☐ Less well than usual ☐ Much less well ☐

94. Been satisfied with the way you've carried out your task?

More satisfied ☐ About same as usual ☐ Less satisfied than usual ☐ Much less satisfied ☐

95. Been able to feel warmth and affection for those near to you?

Better than usual ☐ About same as usual ☐ Less well than usual ☐ Much less well ☐

96. Been finding it easy to get on with other people?

Better than usual ☐ About same as usual ☐ Less well than usual ☐ Much less well ☐

97. Spent much time chatting with people?

More time than usual ☐ About same as usual ☐ Less time than usual ☐ Much less than usual ☐

98. Felt that you are playing a useful part in things?

More so than usual ☐ Same as usual ☐ Less useful than usual ☐ Much less useful ☐

99. Felt capable of making decisions about things?

More so than usual ☐ Same as usual ☐ Less so than usual ☐ Much less capable ☐

100. Felt constantly under strain?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

101. Felt you couldn't overcome your difficulties?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

102. Been finding life a struggle all the time?

Not at all ☐ No more than usual ☐ rather more than usual ☐ Much more than usual ☐

HAVE YOU RECENTLY:-

103. Been able to enjoy your normal day-to-day activities?

More so than usual ☐ Same as usual ☐ Less so than usual ☐ Much less than usual ☐

104. Been taking things hard?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

105. Been getting scared or panicky for no good reason?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

106. Been able to face up to your problems?

More so than usual ☐ Same as usual ☐ Less able than usual ☐ Much less able ☐

107. Found everything getting on top of you?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

108. Been feeling unhappy and depressed?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

109. Been losing confidence in yourself?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

110. Been thinking of yourself as a worthless person?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

111. Felt that life is entirely hopeless?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

112. Been feeling hopeful about your own future?

More so than usual ☐ About same as usual ☐ Less so than usual ☐ Much less hopeful ☐

113. Been feeling reasonably happy, all things considered?

More so than usual ☐ About same as usual ☐ Less so than usual ☐ Much less than usual ☐

114. Been feeling nervous and strung-up all the time?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

115. Felt that life isn't worth living?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

116. Found at times you couldn't do anything because your nerves were too bad?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

PLEASE ADD ANY COMMENTS BELOW, IF YOU WISH

COMMENTS

THANK YOU VERY MUCH FOR YOUR CO-OPERATION

FOR OFFICE USE ONLY
STUDY NUMBER

0	0	0	0	0	0	A	N
1	1	1	1	1	1	B	O
2	2	2	2	2	2	C	P
3	3	3	3	3	3	D	Q
4	4	4	4	4	4	E	R
5	5	5	5	5	5	F	S
6	6	6	6	6	6	G	T
7	7	7	7	7	7	H	U
8	8	8	8	8	8	I	V
9	9	9	9	9	9	J	W
						K	X
						L	Y
						M	Z

CONFIDENTIAL

HEALTH SURVEY

Stress and Health Study
Department of Epidemiology and Public Health
University College London

Civil Service Occupational Health Service

S4/1995

Thank you for your continuing participation in our study of stress and health. We would be very grateful if you could complete this further questionnaire which will bring us up to date with any changes in your employment status, any new illnesses you may have had and your use of health services.

The answers to these questions will, of course, be kept strictly confidential. All information on individuals will go into statistics for all men and women in the study, and it will not be possible to identify your responses from any reports or publications.

Under no circumstances will any information from an individual record be made available to anyone, either connected with the Civil Service, or outside it.

PLEASE USE BLOCK LETTERS.

Once returned, this personal identification section will be removed. This will ensure the preservation of confidentiality in subsequent handling of the questionnaires.

SURNAME

FORENAMES (in full)

DATE OF BIRTH

HOME ADDRESS

HOME TELEPHONE NUMBER

WORK ADDRESS (in full)

WORK TELEPHONE NUMBER

MINISTRY/DEPARTMENT (if applicable)

ROOM NUMBER (if applicable)

BUILDING (if applicable)

TODAY'S DATE

In the last questionnaire we asked you to give us permission to monitor your health via your departmental sickness records. We would like to continue collecting this information and in cases of serious illness to obtain details from your general practitioner. We shall continue to treat all information with the strictest confidence.

If you agree, please complete the following:

Consent given *Yes* *No* *(please circle one)*

If *yes*, please sign your name here _____ Date _____

Please could you provide your General Practitioner's name and address.

GP's NAME

ADDRESS (in full)

General Instructions

Please read these before filling in the rest of the questionnaire.

- Please answer all the questions.

- The answers to most questions can be indicated by blocking in the appropriate rectangle - you don't need to be too precise; a single bold stroke over the length of the rectangle will do.

  Example: What is your sex? Male ▬ Female ▭

- **Please use the HB pencil enclosed.** Do NOT use a ball-point pen.

- Please DO NOT mark answers with a tick, cross or circle.

- Where a question requires you to indicate a number, simply block in the rectangle next to the appropriate number. The example opposite shows '48'.

  Example: What is your age?

10	20	30	40	50	60	70	80	90	100
▭	▭	▭	▬	▭	▭	▭	▭	▭	▭

1	2	3	4	5	6	7	8	9
▭	▭	▭	▭	▭	▭	▭	▬	▭

- Where the answer is likely to be a phrase or sentence please write in the space indicated.

  Example:
  What was the main reason for being in hospital? *Acute Bronchitis*

This section is about your employment status

1. **Are you still working as a civil servant?** Yes ☐ No ☐ ▶ *If not still working as a civil servant, please go to question 7.*

2. **A. What is your exact civil service grade title?** *(Please write out in full)*

B. Please give a description of your job, including level of seniority.

3. **Major changes in the organisation and location of civil service departments have been made and/or are planned. How much do you anticipate these changes will affect your own working conditions/job tasks?**

A lot ☐ Somewhat ☐ A little ☐ Not at all ☐

4. **How secure do you feel in your present job?** *(Please indicate **one**)*

Very secure ☐ Secure ☐ Insecure ☐ Very insecure ☐

5. **Over the past three years has your job:** *(Please indicate **one**)*

Become more secure? ☐ Remained unchanged? ☐ Become less secure? ☐

6. **A. Over the next two years do you expect still to be working in the civil service?**

No ☐ Yes ☐ ▶ *If yes, please go to question 13.*

B. *If no*, which of the following is most likely to be the reason? *(Please indicate **one**)*

Retirement at 60 ☐
Voluntary Early Retirement ☐
Voluntary Compulsory Redundancy ☐
Redundancy ☐
Other *(Please specify)* ☐ ▶

Now please go to question 13

QUESTIONS 7 - 12 ARE FOR THOSE NO LONGER WORKING IN THE CIVIL SERVICE

7. **If you are NOT still working in the civil service, when did you leave?**

Month: J F M A M J J A S O N D
Year: 80 90
19.. 1 2 3 4 5 6 7 8 9

8. **What was your last grade in the civil service?** *(Please write out in full)*

9. **By which route did you leave the civil service?** *(Please mark **one** box only)*

- Retirement at 60 ☐
- Voluntary Early Retirement ☐
- Retirement on health grounds ☐
- Voluntary Compulsory Redundancy ☐
- Redundancy ☐
- Transfer to company through privatisation ☐
- Left to take a post outside the civil service ☐
- Left to become self-employed ☐
- Other *(please specify)* ☐ ▶ _____

10. **Are you currently in paid employment?** Yes ☐ ▶ *If yes, please go to question 12.* No ☐

11. **If you are not currently in paid employment, would you classify yourself as?** *(Please mark **one** box only)*

- Unemployed ☐
- Retired ☐
- Long term sick ☐
- Other *(please specify)* ☐ ▶ _____

Now please go to question 13

12. **A. What is the exact title of your main current job? What kind of work do you do in it?**

B. What qualifications or training, if any, are necessary for that job?

C. How many people work at your place of work? less than 25 employees ☐ 25 or more employees ☐

D. Are you in charge of other people? Yes ☐ ▶ *If yes,* **how many?**

100 ☐ 200+ ☐
10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

No ☐

E. Are you an: employee ☐ *or* self-employed ☐ ▶ *If self-employed, please go to question 13.*

F. If you are an employee, what does your employer make or do?

13. **A. Are you married or cohabiting?** Yes ☐ No ☐ ▶ *If no, go to part C.*

If yes:

B. Is this your first marriage/cohabitation? Yes ☐ No ☐

Now please go to question 14

C. If NOT now married/cohabiting, which are you?

Single (never married) ☐ Widowed ☐ Divorced ☐ Separated ☐

14. **A. Are you currently providing any personal care to an aged or disabled relative or friend?** Yes ☐ No ☐ ▶ *If no, please go to question 15*

If yes:

B. How many hours in an average week do you spend looking after this person(s)?

100 ☐
10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

This section concerns your health

15. In general would you say your health is:-

*(Please indicate **one**)* Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor ☐

16. COMPARED TO ONE YEAR AGO, how would you rate your health in general now? *(Please indicate **one**)*

Much better now than one year ago ☐ Somewhat worse now than one year ago ☐

Somewhat better now than one year ago ☐ Much worse now than one year ago ☐

About the same as one year ago ☐

17. The following items are about activities you might do during a typical day. Does YOUR HEALTH NOW LIMIT YOU in these activites? If so, how much?

*(Please indicate **one** answer for each question)*

	Yes, limited a lot	Yes, limited a little	No, not limited at all
A. Vigorous activites, such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
B. Moderate activites, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	☐	☐	☐
C. Lifting or carrying groceries	☐	☐	☐
D. Climbing **several** flights of stairs	☐	☐	☐
E. Climbing **one** flight of stairs	☐	☐	☐
F. Bending, kneeling or stooping	☐	☐	☐
G. Walking **more than one mile**	☐	☐	☐
H. Walking **half a mile**	☐	☐	☐
I. Walking **one hundred yards**	☐	☐	☐
J. Bathing and dressing yourself	☐	☐	☐

18. During the PAST FOUR WEEKS have you had any of the following problems with your work or other regular daily activites AS A RESULT OF YOUR PHYSICAL HEALTH? *(Please indicate **one** answer for each question)*

	Yes	No
A. Cut down the **amount of time** you spent on work or other activities	☐	☐
B. Accomplished less than you would like	☐	☐
C. Were limited in the **kind** of work or other activities	☐	☐
D. Had **difficulty** performing the work or other activities (for example, it took extra effort)	☐	☐

19. During the PAST FOUR WEEKS have you had any of the following problems with your work or other regular daily activites AS A RESULT OF ANY EMOTIONAL PROBLEMS (Such as feeling depressed or anxious)?

*(Please indicate **one** answer for each question)*

	Yes	No
A. Cut down the **amount of time** you spent on work or other activities	☐	☐
B. Accomplished less than you would like	☐	☐
C. Didn't do work or other activities as **carefully** as usual	☐	☐

20. During the PAST FOUR WEEKS, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups? *(Please indicate **one**)*

Not at all ☐ Slightly ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

21. How much BODILY pain have you had during the PAST FOUR WEEKS? *(Please indicate **one**)*

None ☐ Very mild ☐ Mild ☐ Moderate ☐ Severe ☐ Very severe ☐

22. During the PAST FOUR WEEKS, how much did PAIN interfere with your normal work (including both work outside the home and housework) *(Please indicate **one**)*

Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

23. How much of the time during the PAST FOUR WEEKS:
*(Please indicate **one** answer for each question)*

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
A. Did you feel full of life?	☐	☐	☐	☐	☐	☐
B. Have you been a very nervous person?	☐	☐	☐	☐	☐	☐
C. Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
D. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
E. Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
F. Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
G. Did you feel worn out?	☐	☐	☐	☐	☐	☐
H. Have you been a happy person?	☐	☐	☐	☐	☐	☐
I. Did you feel tired?	☐	☐	☐	☐	☐	☐

24. During the PAST FOUR WEEKS, how much of the time has your PHYSICAL HEALTH OR EMOTIONAL PROBLEMS interfered with your social activities (like visiting friends, relatives, etc.)? *(Please indicate **one**)*

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐	☐	☐	☐	☐

25. Please choose the answer that best describes how TRUE or FALSE each of the following statements is for you: *(Please indicate **one** answer for each question)*

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
A. I seem to get sick a little easier than other people	☐	☐	☐	☐	☐
B. I am as healthy as anybody I know	☐	☐	☐	☐	☐
C. I expect my health to get worse	☐	☐	☐	☐	☐
D. My health is excellent	☐	☐	☐	☐	☐

FOR WOMEN ONLY

IF MALE, go to Question 28

26. A. Do you experience menopausal symptoms Yes ☐ No ☐ ▶ *If no, go to question 27.*

If yes, to what extent do you experience the following symptoms?

	Yes, a lot	Yes, somewhat	Yes, a little	No, not at all
B. Hot flushes	☐	☐	☐	☐
C. Depression	☐	☐	☐	☐
D. Sleep disturbance	☐	☐	☐	☐
E. Bone pains	☐	☐	☐	☐
F. Night sweats	☐	☐	☐	☐
G. Other *(please specify)*	☐	☐	☐	☐ ▶

27. A. Have you ceased having your periods? Yes ☐ No ☐ ▶ *If no, go to part D.*

If yes:

B. At what age did you stop?

10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

C. What was the cause of menopause?

- Natural menopause ☐
- Hysterectomy (removal of womb only) ☐
- Hysterectomy plus removal of ovaries ☐
- Other *(please specify)* ☐ ▶

D. Have you ever had hormone replacement therapy? Yes ☐ No ☐ ▶ *If no, go to question 28.*

If yes:

E. For how long? Years 10 20 30 / 1 2 3 4 5 6 7 8 9

Months 1 2 3 4 5 6 7 8 9 10 11

F. Please specify name of the medicine(s) taken.

G. Are you still taking hormone replacement therapy? Yes ☐ No ☐

FOR BOTH MEN AND WOMEN

28. A. Do you have any longstanding illness, disability or infirmity? (Longstanding means anything that has troubled you over a period of time or that is likely to affect you over a period of time.) Yes ☐ No ☐ ▶ *If no, go to question 29.*

If yes:

B. What is the matter with you?

29. A. Have you ever had any pain or discomfort in your chest? Yes ☐ No ☐ ▶ *If no, go to question 30.*

If yes:

B. Do you get this pain or discomfort when you walk uphill or hurry? Yes ☐ No ☐

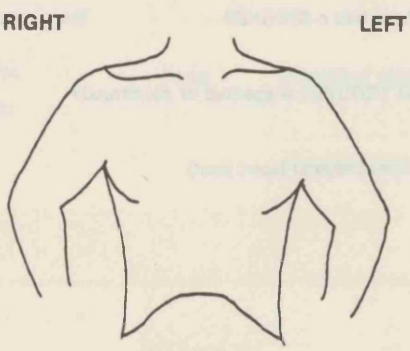
C. Do you get it when you walk at an ordinary pace on the level? Yes ☐ No ☐

D. When you get any pain or discomfort in your chest, what do you do? Stop ☐ Slow down ☐ Continue at the same pace ☐

E. Does it go away when you stand still? Yes ☐ No ☐

F. How soon? In 10 minutes or less ☐ More than 10 minutes ☐

G. Where do you get this pain or discomfort? *Mark the place(s) with an X on the diagram.*



30. A. Have you ever had a severe pain across the front of your chest lasting half an hour or more? Yes ☐ No ☐ ▶ *If no, go to question 31.*

If yes:

B. Did you talk to a doctor about it? Yes ☐ No ☐ ▶ *If no, go to question 31.*

If yes:

C. What did he/she say it was?

D. How many of these attacks have you had? 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+ ☐

31. These questions concern any **HEART PROBLEMS** you may have had. *(Please answer yes or no to each question)*

A. Has a doctor ever told you that you have had **ANGINA?** Yes ☐ No ☐ ▶ *If no, go to part B.*

If yes: When was the first time? 19.....

Are you still suffering from angina? Yes ☐ No ☐

When was the last time you had angina? 19.....

B. Has a doctor ever told you that you have had a **HEART ATTACK (MYOCARDIAL INFARCT/CORONARY THROMBOSIS)?** Yes ☐ No ☐ ▶ *If no, go to part C.*

If yes: How many heart attacks have you had? 1 ☐ 2 ☐ 3+ ☐

When were these attacks? 1st 19..... 2nd 19..... 3rd 19.....

C. Has a doctor ever told you that you have **HIGH BLOOD PRESSURE (HYPERTENSION)?** Yes ☐ No ☐ ▶ *If no, go to part D.*

If yes: When was the first time? 19.....

Have you ever had drug treatment for high blood pressure? Yes ☐ No ☐

Are you still receiving drug treatment now? Yes ☐ No ☐

D. Has a doctor ever told you that you have had a **STROKE?** Yes ☐ No ☐ ▶ *If no, go to part E.*

E. Have you ever had any **OTHER HEART TROUBLE** suspected or confirmed? Yes ☐ No ☐

If yes: Please specify (eg. heart failure, irregular heart beat)

32. These questions concern any TESTS or TREATMENT you may have had for CHEST PAIN or HEART DISEASE.

Have you ever had any of the following? *(Please answer yes or no to each question)*

If yes: Please give year, hospital, town and the name of the consultant for each occasion.
If you need more space please use the back page.

A. An exercise ECG (treadmill) test — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

B. Angiogram or X-ray of your coronary arteries (a dye test of the arteries) — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

C. Angioplasty of coronary arteries (balloon treatment for angina) — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

D. Coronary artery bypass graft (CABG) operation — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

E. An admission to hospital with chest pain, angina or heart attack — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

F. An admission to hospital with other heart trouble — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

If yes, please specify ▸

G. Other heart tests or operations — Yes ☐ No ☐ ▸ YEAR | HOSPITAL NAME/TOWN | CONSULTANT

If yes, please specify (eg 24 hour ECG, pacemaker or echocardiogram ▸

This section concerns your health in general

33. A. This question concerns any medicines that you may have taken during the last fourteen days. Have you been taking any medicines, tablets, tonics or pills PRESCRIBED BY A DOCTOR (excluding contraceptive pills) within the last fourteen days?

Yes ☐ No ☐ ▶ *If no, please go to question 34.*

If yes:

B. Please list any medicines below. **And the reasons for taking**

(i)

(ii)

(iii)

(iv)

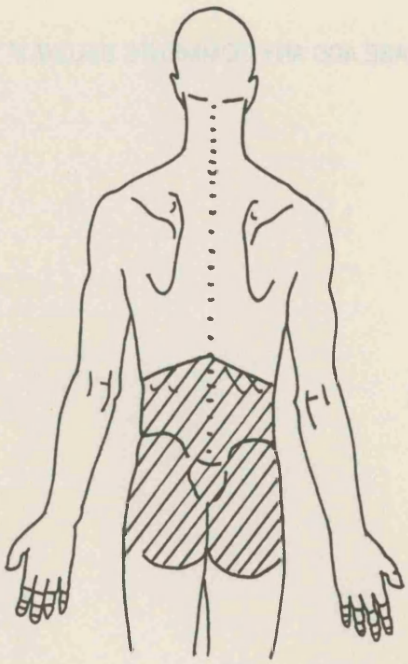
34. Have you ever been told by a doctor that you have, or have had, any of the following?

(Please answer *yes* or *no* for each question)

	No	Yes	▶ *If yes, what was the year that the doctor first told you?*
Hiatus hernia, heart burn or reflux disease	☐	☐	19
Gastric, peptic or duodenal ulcer	☐	☐	19
Gall bladder disease (gall stones)	☐	☐	19
Osteoarthritis ('wear and tear' arthritis)	☐	☐	19
Rheumatoid arthritis	☐	☐	19
Gout	☐	☐	19
Osteoporosis	☐	☐	19
Bronchitis	☐	☐	19
Asthma	☐	☐	19
Tuberculosis	☐	☐	19
Thyroid disease (including goitre)	☐	☐	19
Depression or depressive illness	☐	☐	19
Anxiety state or chronic anxiety	☐	☐	19
Agoraphobia (fear of open spaces)	☐	☐	19
Diabetes	☐	☐	19
Kidney stones	☐	☐	19
Bladder infection (cystitis or urinary tract infection)	☐	☐	19
Epilepsy (fits or convulsions)	☐	☐	19
Cancer (If yes, please specify)	☐	☐	19

▶

35. The following question concerns any back pain which you may have had during the last 12 months, excluding back pain due to feverish illness such as flu or (in women) due to the menstrual period. Back pain is any pain located on the shaded areas of the diagram.



During the last year have you had any back pain which lasted for more than one day?

Yes ☐
No ☐

36. During the two weeks ending yesterday, have you visited your GENERAL PRACTITIONER (family doctor)?

Yes ☐
No ☐ ▶ *If no, please go to question 37.*

If yes, what were the reasons.

37. In cases of serious illness which have involved attendance at hospital, we would like permission to obtain details from the hospital records. (Please note this is different from the consent requested on the first page). This information will be treated with the strictest confidence.

CONSENT GIVEN Yes ☐ No ☐ *(please mark **one**)*

If yes, please sign your name here

SIGNATURE

DATE

GP's NAME (unless given on the first page)

GP's ADDRESS (in full)

PLEASE ADD ANY COMMENTS BELOW, IF YOU WISH

DO NOT WRITE PAST HERE

FOR OFFICE USE ONLY

A ▭ B ▭ C ▭

STUDY NUMBER

0	0	0	0	0	0	A	N
1	1	1	1	1	1	B	O
2	2	2	2	2	2	C	P
3	3	3	3	3	3	D	Q
4	4	4	4	4	4	E	R
5	5	5	5	5	5	F	S
6	6	6	6	6	6	G	T
7	7	7	7	7	7	H	U
8	8	8	8	8	8	I	V
9	9	9	9	9	9	J	W
						K	X
						L	Y
						M	Z

DO NOT WRITE PAST HERE

CONFIDENTIAL

HEALTH SURVEY

STRESS AND HEALTH STUDY
DEPARTMENT OF EPIDEMIOLOGY AND PUBLIC HEALTH
UNIVERSITY COLLEGE LONDON

OCCUPATIONAL HEALTH AND SAFETY AGENCY

PHASE 5 - 1997

This Questionnaire contains questions covering many aspects of your life and as you will see below we have divided these areas into separate sections for you to complete. You may find it helpful to complete the Questionnaire a section at a time.

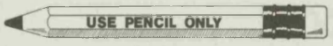
General Instructions

Please read these instructions before filling in the rest of the Questionnaire

- Please answer all the questions

- The answers to most questions can be indicated by blocking in the appropriate rectangle - you don't need to be too precise; a single bold stroke over the length of the rectangle will do.

Example: What is your sex? Male ☐ Female ■



Please use the HB pencil enclosed. DO NOT use a ball-point pen.

Where a question requires you to indicate a number, simply block in the rectangle next to the appropriate number. The examples opposite shows 1948 and 19.

Example 1: 1948

19

10	20	30	40	50	60	70	80	90	100
☐	☐	☐	■	☐	☐	☐	☐	☐	☐

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	■	☐

Example 2: 19

10	20	30	40	50	60	70	80	90	100
■	☐	☐	☐	☐	☐	☐	☐	☐	☐

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	■

- Where the answer is likely to be a phrase or sentence please write in the space indicated

Example: What was the main reason for being in hospital *Acute Bronchitis*

Once again thank you very much for your co-operation

Thank you very much for continuing to participate in our study of stress and health. The enclosed Questionnaire marks the beginning of the next phase of the study which will bring us up to date with any changes in your employment status, your state of health, and includes some new questions on various aspects of your lifestyle and social life which are relevant to health. The information you have provided so far is truly impressive and continues to give us important knowledge about the factors which can contribute to ill-health. Thank you again for your invaluable participation in this study.

The answers to these questions will, of course, be kept strictly confidential. All information on individuals will go into statistics for all men and women in the study, and it will not be possible to identify your responses from any reports or publications.

Under no circumstances will any information from an individual record be made available to anyone, either connected with the Civil Service, or outside it.

PLEASE USE BLOCK LETTERS.

Once returned, this personal identification section will be removed. This will ensure the preservation of confidentiality in subsequent handling of the questionnaires.

SURNAME

FORENAMES (in full)

DATE OF BIRTH

HOME ADDRESS (in full)

HOME TELEPHONE NUMBER

WORK ADDRESS (in full)

WORK TELEPHONE NUMBER

ROOM NUMBER (if applicable)

BUILDING (if applicable)

TODAY'S DATE

Consent

As before, a crucial aspect of this study is the accurate identification of illness through Questionnaire and Civil Service sickness absence records. We sometimes need to obtain additional details from your general practitioner and hospital records. In order to do this we need your permission again please.

We shall continue to treat all information in the strictest confidence.

If you agree, please complete the following:

Consent given **Yes** ☐ **No** ☐
(please mark one)

If **Yes**, please sign your name here _____ Date _____

GPs NAME

ADDRESS (in full)

SECTION 1 - WORK HISTORY & PERSONAL DETAILS

These questions are about your employment status

1.1 What was your grade title when you first joined the Civil Service?

Please give full title

1.2 Were you a fast stream entrant? Yes ☐ No ☐

1.3 a. Are you still working in the Civil Service? Yes ☐ No ☐ ***If No, please go to Question 1.4***

If you are directly employed by a non-departmental public body (NDPB) (except HSC, HSE or ACAS), or if you currently work in a section of the Civil Service which has been privatised, please go to Question 1.4.

If Yes,

b. In which Ministry/Department do you work?

c. Please give your present Civil Service grade/job title - IN FULL

Grade/Job Title

d. Please give a description of your job, including level of seniority

e. What formal qualifications or training, if any, are necessary for that job?

f. Are you in charge of other people? Yes ☐ No ☐

g. Have you been promoted in the last 5 years?

Yes ☐ No ☐

If Yes, in which year were you last promoted?

19 ☐90

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8

h. Do you currently work in a 'Next Steps' agency or other organisation operating on 'Next Steps' lines?

Yes ☐ No ☐

If Yes,

Please give the name of the 'Next Steps' agency/other organisation in full (and the acronym if you know it, eg. Security Facilities Executive (SAFE))

If No,

Is the section in which you work likely to become a 'Next Steps' agency or organisation operating on Next Steps' lines in the future?

Yes ☐ No ☐

i. Do you think the work you are doing is likely to be privatised? Yes ☐ No ☐ Don't know ☐

j. There have been many changes in the Civil Service over the past 8 years.
Overall, have these changes affected you? Beneficially ☐ Adversely ☐ Not at all ☐

Now please go to Question 1.6

Questions 1.4 - 1.5 are for those who have left the Civil Service

1.4 a. By which route did you leave the Civil Service? *(Please mark one box only)*

Transfer to company through privatisation	☐	Voluntary Compulsory Redundancy	☐
Transfer to an NDPB	☐	Redundancy	☐
Retirement at 60	☐	Left to take up a post outside the Civil Service	☐
Voluntary Early Retirement	☐	Left to become self-employed	☐
Retirement on health grounds	☐	Other *(please specify)* ➤	☐

b. When did you leave Civil Service employment?

Month ☐ J ☐ F ☐ M ☐ A ☐ M ☐ J ☐ J ☐ A ☐ S ☐ O ☐ N ☐ D

Year 19 ☐ 80 ☐ 90

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

c. What was your last grade in the Civil Service? *(Please write out in full)*

Civil Service grade

Description of job including level of seniority

d. If you left before retirement age, how much was your decision affected by changes in the Civil Service over the last 5-8 years? *(Please mark one box only)*

Exclusively ☐ Very much ☐ Quite ☐ A little ☐ Not at all ☐

e. Have you had any paid jobs since leaving the Civil Service?

Yes ☐ No ☐ ***If No, please go to part g.***

If Yes,

f. How many paid jobs have you had since leaving the Civil Service, including your present job if you have one? ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10+

g. Excluding your present situation, have you had any periods of unemployment since leaving the Civil Service?

Yes ☐ No ☐ ***If No, please go to part i.***

h. Do your previous periods of unemployment add up to

less than 3 months ☐ 3 - 6 months ☐ 6 - 12 months ☐ more than 12 months ☐

i. Are you in paid employment at present? Yes ☐ No ☐

If you are in paid employment please go to Question 1.5

If you are NOT in paid employment at present

j. How would you classify yourself? *(Please mark one box only)*

Unemployed	☐	Housewife/husband	☐
Retired	☐	Student	☐
Long-term sick	☐	Other *(please specify)* ☐ ➤	

k. How long is it since you were last in paid employment?

Years ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12

Months ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12

l. Would you like to find another job? Yes ☐ No ☐

m. Are you **currently** looking for paid employment? Yes ☐ No ☐

n. How would you rate your chances of finding another job? *(Please mark one box only)*

Very good ☐ Good ☐ Fair ☐ Poor ☐ No chance at all ☐

Now please go to Question 1.7

1.5 a. What is the exact title of your main current job, including those of you who are self-employed?
(Please give the full title by which the job is known and give the rank or grade if you have one)

b. What kind of work do you do in it? (List the main things you do in the job)

c. What qualifications or training, if any, are necessary for that job?

d. How many people are employed at your place of work?

less than 25 employees ☐ 25 or more employees ☐

e. Are you in charge of other people? Yes ☐ No ☐

f. Are you: an employee *or* self-employed?

Employee ☐ Self-employed ☐ ***If self-employed please go to Question 1.6***

g. If you are an employee, what does your employer make or do?

h. Is your present job? (please indicate one only)

a permanent post ☐ a temporary post ☐ a fixed term contract ☐ other ☐

These questions are for those who are currently in paid employment (Civil Service or other).

1.6 a. Is your present job full time ☐ part time (less than 30 hours per week) ☐

b. How secure do you feel your present job is? *(Please mark one box only)*

Very secure ☐ Secure ☐ Not very secure ☐ Very insecure ☐

c. Are you looking for another job? Yes ☐ No ☐

d. How many hours do you work per average week in your main job, including work brought home?

hours ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90 ☐ 100+

e. Do you have any other paid employment in addition to your main job?

Yes ☐ No ☐ ***If No, please go to Question 1.7***

f. How many hours do you work in an average week in your additional employment?

hours ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90

We would like to ask some brief questions about your spouse (partner).

1.7 Is your spouse (partner) currently doing any paid work? *Please indicate one only.* Not applicable ☐

Yes: full time (over 30 hours/week) ☐ Yes: part-time (less than 30 hours/week) ☐

No: unemployed - seeking work ☐ No: retired ☐

No: Looking after the house/family ☐ No: Not working - other reasons ☐

1.8 How old was your spouse (partner) when he/she finished full time education?

☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50+ Not applicable ☐

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

We would like to check that our records concerning your personal / home circumstances are accurate and that we have not missed any information. We would be grateful if you would answer the following questions.

1.9 Which of the following ethnic groups do you consider that you belong to?

Black-Caribbean ☐ Black-African ☐ Black-Other ☐
Indian ☐ Pakistani ☐ Bangladeshi ☐
Chinese ☐ White ☐ Other *(please specify)* ☐ ➤

1.10 a. Are you married or cohabiting? Yes ☐ No ☐ ***If No, please go to part c***

If Yes,

b. Is this your first marriage/cohabitation? Yes ☐ No ☐

c. If NOT married/cohabiting, which are you? Single (never married) ☐ Widowed ☐ Divorced ☐ Separated ☐

1.11 Does anyone live in your household besides you? Yes ☐ No ☐ ***If No, please go to Question 1.13***

1.12 Please specify who is living in your household:

a. Spouse or partner Yes ☐ No ☐
b. Any other adults Yes ☐ No ☐
c. Adult children (18+) Yes ☐ No ☐
d. Children Yes ☐ No ☐

If yes to d., please specify number of:

i. Children under 5 Male 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
Female 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
ii. Children aged 5-12 Male 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
Female 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
iii. Children aged 13-18 Male 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
Female 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐

e. During the last 12 months how many people have lived in your household on a permanent basis?
Number 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12+ ☐

Could you help us check that our records about your education are complete.

1.13 a. Have you, at any time, been in full-time or part-time education since leaving school? Yes ☐ No ☐

b. How many years of education have you had, including primary, secondary school, college, technical college, polytechnic and university? 0 ☐ 10 ☐ 20 ☐ 30 ☐
0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

c. What is the highest level of examination or qualification that you obtained when you **first** left full-time education? (Please exclude any short gaps, eg, between school and university)

i. No academic qualifications ☐
ii. School Certificate ☐
iii. Matriculation ☐
iv. 'O' Level ☐
v. 'A' Level, SCE Higher ☐
vi. 'S' Level ☐
vii. BA/BSc ☐
viii. University or CNAA Higher degree (e.g. MA/MSc, PhD) ☐
ix. City and Guilds ☐
x. National Diplomas and Certificates (e.g. ONC, HND, etc.) ☐
xi. Other: *(please specify)* ▼ ☐

1.14 Have you obtained any higher qualification **since** first leaving full-time education? Yes ☐ No ☐

If Yes,

1.15 What is the highest level of examination or qualification that you have attained?

i. School Certificate ☐
ii. Matriculation ☐
iii. 'O' Level ☐
iv. GCSE (and CSE) ☐
v. 'A' Level, SCE Higher ☐
vi. 'S' Level ☐
vii. BA/BSc ☐
viii. University or CNAA Higher degree (e.g. MA/MSc, PhD) ☐
ix. City and Guilds ☐
x. National Diplomas and Certificates (e.g. ONC, HND, etc.) ☐
xi. Professional Qualification (degree equivalent/higher etc.) ☐
xii. Other: *(please specify)* ▼ ☐

SECTION 2 - HEALTH & ILLNESS

This Section covers your general health, as well as specific diseases. We are interested in psychological, physical and social aspects of your health, as well as any diagnoses which your doctor(s) may have made.

2.1 a. Do you have any longstanding illnesses, diseases or medical conditions for which you have sought treatment in the last 12 months. (Longstanding illness means anything that has troubled you over a period of time or that is likely to affect you over a period of time.)

Yes ☐ No ☐

If Yes, please list below

b. **i.** _____ **iv.** _____

ii. _____ **v.** _____

iii. _____ **vi.** _____

We would be very grateful if you would give us details of all past episodes of health problems - even if you have told us about them before. This will help us to make sure that we do not miss any information.
*(Please answer **Yes** or **No** to each Question)*

2.2 a. Have you ever had any pain or discomfort in your chest?

Yes ☐ No ☐ ***if No, go to Question 2.3.***

If Yes,

b. Do you get this pain or discomfort when you walk uphill or hurry?

Yes ☐ No ☐

c. Do you get it when you walk at an ordinary pace on the level?

Yes ☐ No ☐

d. When you get any pain or discomfort in your chest, what do you do?

Stop ☐ Slow down ☐ Continue at the same pace ☐

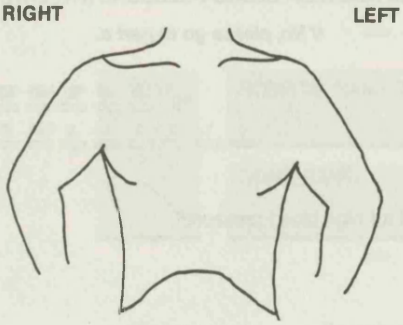
e. Does it go away when you stand still?

Yes ☐ No ☐

If Yes,

f. How soon? In 10 minutes or less ☐ More than 10 minutes ☐

g. Where do you get this pain or discomfort? *Mark the place(s) with an **X** on the diagram.*



2.3 a. Have you ever had a severe pain across the front of your chest lasting half an hour or more?

Yes ☐ No ☐ ***If No, go to Question 2.4***

If Yes,

b. Did you talk to a doctor about it?

Yes ☐ No ☐ ***If No, go to Question 2.4***

If Yes,

c. What did he/she say it was?

_____

d. How many of these attacks have you had?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+ ☐

2.4 a. Has a doctor ever told you that you have had ANGINA?

Yes ☐ No ☐ ***If No, please go to part b.***

If Yes,

When was the first time? 19 ☐30 ☐40 ☐50 ☐60 ☐70 ☐80 ☐90
(Please indicate year) ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9

Are you still suffering from angina? Yes ☐ No ☐

When was the last time you had angina? 19 ☐30 ☐40 ☐50 ☐60 ☐70 ☐80 ☐90
(Please indicate year) ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9

b. Have you ever taken any 'NITRATE' medicines (including tablets under the tongue, sprays, patches)?

Nitrate medicines include: Glyceryl Trinitrate *(contained in drugs such as Nitrolingual Spray, Suscard, Sustac, Percutol)*
Isosorbide Dinitrate *(contained in drugs such as Cedocard, Isordil, Sorbichew, Isoket)*
Isosorbide Mononitrate *(contained in drugs such as Ismo, Elantan, Monit, Imdur)*

Yes ☐ No ☐ ***If Yes, please give the name(s)*** ➤

If No, please go to part c.

When did you first take these nitrate medicines: 19 ☐40 ☐50 ☐60 ☐70 ☐80 ☐90
☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9

Are you still taking these nitrate medicines?

Yes ☐ No ☐

c. Has a doctor ever told you that you have had a HEART ATTACK (MYOCARDIAL INFARCT/CORONARY THROMBOSIS)?

Yes ☐ No ☐ ***If No, please go to part d.***

If Yes:

How many heart attacks have you had? 1 ☐ 2 ☐ 3+ ☐

When were these attacks?	1st	2nd	3rd
(Please indicate year)	*19___*	*19___*	*19___*

d. Has a doctor ever told you that you have HIGH BLOOD PRESSURE (HYPERTENSION)?

Yes ☐ No ☐ ***If No, please go to part e.***

If Yes,

When was the first time? 19 ☐30 ☐40 ☐50 ☐60 ☐70 ☐80 ☐90
(Please indicate year) ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9

Have you ever had drug treatment for high blood pressure?

Yes ☐ No ☐

Are you still receiving drug treatment now?

Yes ☐ No ☐

e. Has a doctor ever told you that you have an ENLARGED HEART, FLUID ON THE LUNGS or HEART FAILURE?

Enlarged heart	Yes ☐	No ☐
Fluid on the lungs	Yes ☐	No ☐
Heart failure	Yes ☐	No ☐

f. Have you ever had any OTHER HEART TROUBLE (e.g. valve disease, congenital heart disease or irregular heart beat) suspected or confirmed?

Yes ☐ No ☐

If Yes, please specify

2.5 These questions concern any TEST(S) or TREATMENT(S) you may have had for CHEST PAIN or HEART DISEASE.

Have you ever had any of the following? *(Please answer Yes or No to each Question)*

If Yes, please give year, hospital, town and the name of the consultant for each occasion.

If you need more space please use the back page.

a. An exercise/stress ECG (heart tracing whilst walking or running on a treadmill) — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

b. Angiogram or X-ray of your coronary arteries (a dye test of the arteries) — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

c. Angioplasty of coronary arteries (balloon treatment for angina) — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

d. Coronary artery bypass graft (CABG) operation — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

e. An admission to hospital with chest pain, angina or heart attack — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

f. Other heart tests or operations, or admissions to hospital for other heart trouble — Yes ☐ ➤ / No ☐ — YEAR — HOSPITAL NAME/TOWN — CONSULTANT

If Yes to f. above, please specify
(e.g. 24 hours ECG, pacemaker, thallium scan, echocardiogram, or resting ECG *not* done as part of the Stress & Health study).

2.6 Do you have a FAMILY HISTORY of heart disease or high blood pressure in a parent, brother or sister?

Yes ☐ No ☐ *If Yes, please give details*

	Relation	Age of onset	Type of disease	Is this relative alive? *Please indicate Yes or No*
i				Yes ☐ No ☐
ii				Yes ☐ No ☐
iii				Yes ☐ No ☐
iv				Yes ☐ No ☐

We would like to know about your birth and birthweight.

2.7 Where were you born?

In hospital ☐ *(please specify)* ➤ HOSPITAL/NAME/TOWN

At home ☐

Elsewhere ☐

If you do not know your birthweight, please ask a member of your family. If no-one knows your birthweight, please indicate in the box.

2.8 a. How much did you weigh at birth? lbs 2 3 4 5 6 7 8 9 10 11 12 13 14 15

No-one knows ☐ ozs 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

b. Where, or from whom, did you obtain the information about your birthweight?

Family ☐ Memory ☐ Written record ☐ Other ☐

2.9 a. Has a doctor ever told you that you have diabetes?

Yes ☐ No ☐ *If No, please go to Question 2.10*

If Yes,

b. What treatments or diets are you currently using for your diabetes?

Please answer Yes or No to each Question.

Special or Diabetic diet	Yes ☐	No ☐
Tablets	Yes ☐	No ☐
Insulin	Yes ☐	No ☐

2.10 Have you ever been diagnosed as having cancer? Yes ☐ No ☐

If Yes, please specify

YEAR

HOSPITAL NAME/TOWN

CONSULTANT

2.11 a. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?

Yes ☐ No ☐

b. Are you short of breath when walking with other people of your own age on level ground?

Yes ☐ No ☐

c. Do you have to stop for breath when walking at your own pace on level ground?

Yes ☐ No ☐

d. Are you short of breath when washing or dressing?

Yes ☐ No ☐

e. Are you troubled by breathlessness when lying down at night?

Yes ☐ No ☐

f. Do you suffer from swollen ankles?

Yes ☐ No ☐

2.12 a. Do you usually bring up any phlegm from your chest first thing in the morning in winter?

Yes ☐ No ☐ ***If No, please go to Question 2.13***

If Yes,

b. Do you usually bring up phlegm in the morning on most days for as much as three months in the winter?

Yes ☐ No ☐

c. In the past three years have you had a period of increased cough and phlegm lasting for three weeks or more?

None ☐ One period ☐ Two or more periods ☐

2.13 a. Have you ever had a sudden attack of weakness or numbness on one side of the body?

Yes ☐ No ☐

b. Have you ever had a sudden attack of slurred speech or difficulty in finding words?

Yes ☐ No ☐

c. Have you ever had a sudden attack of vision loss or blurred vision in one or both eyes?

Yes ☐ No ☐

d. Have you seen a doctor about these attacks?

Yes ☐ No ☐ ***If No, please go to Question 2.14***

If Yes,

e. What did the doctor say these attacks were?

Stroke ☐ Transient Ischaemic Attack ('TIA' or mini stroke) ☐ Other ☐

If you indicated any of the above, please give details here:

YEAR	HOSPITAL NAME/TOWN
	CONSULTANT

2.14 a. Do you get any pains in either leg on walking?

Yes ☐ No ☐ ***If No, please go to Question 2.15.***

If Yes,

b. Does this pain ever begin when you are standing still or sitting? Yes ☐ No ☐

c. Do you get this pain in your calf or calves? Yes ☐ No ☐

d. Do you get it when you walk uphill or hurry? Yes ☐ No ☐

e. Do you get it when you walk at an ordinary pace on the level? Yes ☐ No ☐

f. Does this pain ever disappear while you are still walking? Yes ☐ No ☐

g. What do you do if you get it when you are walking?

Stop ☐ Slow down ☐ Continue at same pace ☐

h. What happens to it if you stand still?

Usually continues more than 10 minutes ☐ Usually disappears in 10 minutes or less ☐

2.15 a. Has a doctor ever told you that you have bad circulation in the arteries of your legs ('INTERMITTENT CLAUDICATION')?

Yes ☐ ➤ No ☐

YEAR	HOSPITAL NAME/TOWN
	CONSULTANT

b. Has a doctor ever told you that you have had a blood clot in the veins of your leg (DEEP VEIN THROMBOSIS)? Yes ☐ ➤ YEAR | HOSPITAL NAME/TOWN | CONSULTANT
No ☐

c. Has a doctor ever told you that you have had a blood clot on your lungs (PULMONARY EMBOLUS)? Yes ☐ ➤ YEAR | HOSPITAL NAME/TOWN | CONSULTANT
No ☐

Health and Daily Activities

2.16 In general, would you say your health is:-
*Please indicate **one** only.*

Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor ☐

2.17 Compared to one year ago, how would you rate your health in general now?
*Please indicate **one** only.*

Much better now than one year ago ☐
Somewhat better now than one year ago ☐
About the same as one year ago ☐
Somewhat worse now than one year ago ☐
Much worse now than one year ago ☐

2.18 The following items are about activities you might do during a typical day.
Does **your health now limit you** in these activities? If so, please indicate how much?

	Yes limited a lot	Yes limited a little	No, not limited at all
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	☐	☐	☐
c. Lifting or carrying groceries	☐	☐	☐
d. Climbing **several** flights of stairs	☐	☐	☐
e. Climbing **one** flight of stairs	☐	☐	☐
f. Bending, kneeling or stooping	☐	☐	☐
g. Walking **more than one mile**	☐	☐	☐
h. Walking **half a mile**	☐	☐	☐
i. Walking **one hundred yards**	☐	☐	☐
j. Bathing or dressing yourself	☐	☐	☐

2.19 During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**? *Please indicate one answer for each question.*

a. Cut down the **amount of time** you spent on work or other activities	Yes ☐	No ☐
b. **Accomplished less** than you would like	Yes ☐	No ☐
c. Were limited in the **kind** of work or other activities	Yes ☐	No ☐
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	Yes ☐	No ☐

2.20 During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)? *Please indicate one answer for each question.*

a. Cut down the **amount of time** you spent on work or other activities	Yes ☐	No ☐
b. **Accomplished less** than you would like	Yes ☐	No ☐
c. Didn't do work or other activities as **carefully** as usual	Yes ☐	No ☐

2.21 During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups? *Please indicate **one** only.*

Not at all ☐ Slightly ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

2.22 How much bodily pain have you had during the **past 4 weeks**? *Please indicate **one** only.*

None ☐ Very mild ☐ Mild ☐ Moderate ☐ Severe ☐ Very severe ☐

2.23 During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)? *Please indicate **one** only.*

Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely ☐

2.24 How much of the time, during the **past 4 weeks**? *Please indicate one answer for each question.*

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
a. Did you feel full of life?	☐	☐	☐	☐	☐	☐
b. Have you been a very nervous person?	☐	☐	☐	☐	☐	☐
c. Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
d. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
e. Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
f. Have you felt downhearted and low?	☐	☐	☐	☐	☐	☐
g. Did you feel worn out?	☐	☐	☐	☐	☐	☐
h. Have you been a happy person?	☐	☐	☐	☐	☐	☐
i. Did you feel tired?	☐	☐	☐	☐	☐	☐

2.25 During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)? *Please indicate **one** only.*

All of the time ☐ Most of the time ☐ Some of the time ☐ A little of the time ☐ None of the time ☐

2.26 Please choose the answer that best describes how **TRUE** or **FALSE** each of the following statements is for you:

Please indicate one answer for each question.	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a. I seem to get sick a little easier than other people	☐	☐	☐	☐	☐
b. I am as healthy as anybody I know	☐	☐	☐	☐	☐
c. I expect my health to get worse	☐	☐	☐	☐	☐
d. My health is excellent	☐	☐	☐	☐	☐

2.27 a. Are you, or have you ever been, registered disabled with a Job Centre under the Disabled Persons Employment Act (the green card scheme)?

Yes ☐ No ☐ ***If No, please go to Question 2.28***

If Yes,

b. What is the disability for which you are registered?

2.28 Do you wear a hearing aid at all? Yes ☐ No ☐

2.29 Do you have difficulty hearing someone talking to you in a quiet room (with hearing aid if normally worn)? Yes ☐ No ☐

2.30 Do you have great difficulty following a conversation if there is background noise, for example, a TV, radio or children playing (with hearing aid if normally worn)? Yes ☐ No ☐

2.31 Do you have difficulty recognising a friend across the road, even if glasses or contact lenses are worn? Yes ☐ No ☐

2.32 a. This question concerns any medicines that you may have taken during the last fourteen days. Have you been taking any medicines, tablets, tonics or pills **prescribed by a doctor** within the last fourteen days?

Yes ☐ No ☐ *If No, please go to Question 2.33*

If Yes,

b. Please list any medicines below — And the reasons for taking them

(i)

(ii)

(iii)

(iv)

(v)

(vi)

General Health Questions

*Please read this carefully. We should like to know if you have had any medical complaints, and how your health has been in general **over the past few weeks**. Please answer **ALL** questions on the following pages simply by indicating the answer which you think most nearly applies to you. Remember that we want to know about your present and recent complaints, **not** those you had in the past. It is important that you try to answer **ALL** the questions.*

HAVE YOU RECENTLY:-

2.33 Been able to concentrate on whatever you're doing?

Better than usual ☐ Same as usual ☐ Less than usual ☐ Much less than usual ☐

2.34 Lost much sleep over worry?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

2.35 Been having restless, disturbed nights?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

2.36 Been managing to keep yourself busy and occupied?

More so than usual ☐ Same as usual ☐ Rather less than usual ☐ Much less than usual ☐

2.37 Been getting out of the house as much as usual?

More so than usual ☐ About same as usual ☐ Less than usual ☐ Much less than usual ☐

2.38 Been managing as well as most people would in your shoes?

Better than most ☐ About the same ☐ Rather less well ☐ Much less well ☐

2.39 Felt on the whole you were doing things well?

Better than usual ☐ About the same ☐ Less well than usual ☐ Much less well ☐

2.40 Been satisfied with the way you've carried out your task?

More satisfied ☐ About same as usual ☐ Less satisfied than usual ☐ Much less satisfied ☐

2.41 Been able to feel warmth and affection for those near to you?

Better than usual ☐ About same as usual ☐ Less well than usual ☐ Much less well ☐

HAVE YOU RECENTLY:-

2.42 Been finding it easy to get on with other people?

Better than usual ▭ About same as usual ▭ Less well than usual ▭ Much less well ▭

2.43 Spent much time chatting with people?

More time than usual ▭ About same as usual ▭ Less time than usual ▭ Much less than usual ▭

2.44 Felt that you are playing a useful part in things?

More so than usual ▭ Same as usual ▭ Less useful than usual ▭ Much less useful ▭

2.45 Felt capable of making decisions about things?

More so than usual ▭ Same as usual ▭ Less so than usual ▭ Much less capable ▭

2.46 Felt constantly under strain?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.47 Felt you couldn't overcome your difficulties?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.48 Been finding life a struggle all the time?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.49 Been able to enjoy your normal day-to-day activities?

More so than usual ▭ Same as usual ▭ Less so than usual ▭ Much less than usual ▭

2.50 Been taking things hard?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.51 Been getting scared or panicky for no good reason?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.52 Been able to face up to your problems?

More so than usual ▭ Same as usual ▭ Less able than usual ▭ Much less able ▭

2.53 Found everything getting on top of you?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.54 Been feeling unhappy and depressed?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.55 Been losing confidence in yourself?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.56 Been thinking of yourself as a worthless person?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.57 Felt that life is entirely hopeless?

Not at all ▭ No more than usual ▭ Rather more than usual ▭ Much more than usual ▭

2.58 Been feeling hopeful about your own future?

More so than usual ▭ About same as usual ▭ Less so than usual ▭ Much less hopeful ▭

2.59 Been feeling reasonably happy, all things considered?

More so than usual ▭ About same as usual ▭ Less so than usual ▭ Much less than usual ▭

HAVE YOU RECENTLY:-

2.60 Been feeling nervous and strung-up all the time?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

2.61 Felt that life isn't worth living?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

2.62 Found at times you couldn't do anything because your nerves were too bad?

Not at all ☐ No more than usual ☐ Rather more than usual ☐ Much more than usual ☐

2.63 How many hours of sleep do you have on an average week night?

5 hours or less ☐ 6 hours ☐ 7 hours ☐ 8 hours ☐ 9 hours or more ☐

2.64 How often in the past month did you:	Not at all	1-3 days	4-7 days	8-14 days	15-21 days	22-31 days
a. Have trouble falling asleep?	☐	☐	☐	☐	☐	☐
b. Wake up several times per night?	☐	☐	☐	☐	☐	☐
c. Have trouble staying asleep (including waking far too early)?	☐	☐	☐	☐	☐	☐
d. Wake up after your usual amount of sleep feeling tired and worn out?	☐	☐	☐	☐	☐	☐

SECTION 3 - WOMEN'S HEALTH *Men, please go to Section 4*

3.1 Have you **ever** had any of the following operations? *Please answer Yes or No to each question*

If Yes, please give your age at the time of the operation

a. Removal of uterus (womb) and both ovaries (hysterectomy and bilateral oophorectomy)	Yes ☐ ➤ age	0 10 20 30 40 50 60	0 1 2 3 4 5 6 7 8 9
	No ☐		
b. Removal of uterus (womb) only (hysterectomy)	Yes ☐ ➤ age	0 10 20 30 40 50 60	0 1 2 3 4 5 6 7 8 9
	No ☐		
c. Removal of uterus (womb) and one ovary (hysterectomy and oophorectomy)	Yes ☐ ➤ age	0 10 20 30 40 50 60	0 1 2 3 4 5 6 7 8 9
	No ☐		
d. Removal of both ovaries only (bilateral oophorectomy)	Yes ☐ ➤ age	0 10 20 30 40 50 60	0 1 2 3 4 5 6 7 8 9
	No ☐		
e. Removal of one ovary only (oophorectomy)	Yes ☐ ➤ age	0 10 20 30 40 50 60	0 1 2 3 4 5 6 7 8 9
	No ☐		

3.2 **a.** Are you still having periods or menstrual bleeding? Yes ☐ No ☐ ***If Yes, please go to Question 3.3***

If No,

b. How old were you when your periods, or menstrual bleeding stopped? Age 0 10 20 30 40 50 60 / 0 1 2 3 4 5 6 7 8 9

c. Were your periods or menstrual bleeding stopped by

- Natural menopause ☐
- Surgery *(as described in Question 3.1)* ☐
- Chemotherapy/radiation therapy ☐
- Other *(Please specify, e.g. endometrial ablation, TRCE?)* ☐ ➤

3.3 **a.** Have you ever had hormone replacement therapy (HRT) ?

Yes ☐ No ☐ ***If No, please go to Question 3.4***

If Yes,

b. Are you still taking HRT? Yes ☐ No ☐ ***If No, please go to Question 3.4***

If Yes,

c. What medicine(s) are you taking? *If yes, please give the name(s).*

Patch/ Implant No ☐ Yes ☐ Name

Tablet No ☐ Yes ☐ Name

d. **Before** you first started HRT, had your periods or menstrual bleeding stopped?

Yes ☐ No ☐ ***If No, please go to Question 3.4***

If Yes,

e. How old were you when your periods stopped? Age 0 10 20 30 40 50 60 / 0 1 2 3 4 5 6 7 8 9

f. Were your periods stopped by

- Natural menopause ☐
- Surgery *(as described in Question 3. 1)* ☐
- Chemotherapy/radiation therapy ☐
- Other *(Please specify, e.g. endometrial ablation, TCRE)* ➤ ☐

If you are no longer having periods or menstrual bleeding, please go to Question 3.8

3.4 a. Are you taking any contraceptive pills? Yes ☐ No ☐ ***If No, please go to Question 3.5***

If Yes,

b. Which pill are you currently taking? *Please give the name*

Name

3.5 Which of the following descriptions apply to your periods during the last 12 months? *Please answer Yes or No to each question.*

a. Normal for you in terms of regularity, flow and duration	Yes ☐	No ☐
b. Less regular than usual	Yes ☐	No ☐
c. Shorter in duration over the year	Yes ☐	No ☐
d. One or more skipped periods	Yes ☐	No ☐

3.6 a. When was the first day of your last period or menstrual bleed?

Date 10 20 30 / 1 2 3 4 5 6 7 8 9 / J F M A M J J A S O N D

b. What is the usual length of your cycle (the number of days between the first day of one period and the first day of the next period)?

Days 10 20 30 40 40+ / 1 2 3 4 5 6 7 8 9

3.7 Are your periods or menstrual bleeding regular?

Always ☐ Usually ☐ Sometimes ☐ Never ☐

3.8 a. Do you experience menopausal symptoms? Yes ☐ No ☐ ***If No, please go to Question 3.9***

If Yes, to what extent do you experience the following symptoms? *Please answer all questions*

	Yes a lot	Yes somewhat	Yes a little	No, Not at all
b. Hot flushes	☐	☐	☐	☐
c. Depression	☐	☐	☐	☐
d. Sleep disturbance	☐	☐	☐	☐
e. Bone pains	☐	☐	☐	☐
f. Night sweats	☐	☐	☐	☐
g. Other, *please specify*	☐	☐	☐	☐

3.9 a. Have you ever had any children? Yes ☐ No ☐ ***If No, please go to Section 4***

If Yes,

b. How many children have you had? 0 10 / 0 1 2 3 4 5 6 7 8 9

c. How old were you when your first child was born? 0 10 20 30 40 50 / 0 1 2 3 4 5 6 7 8 9

SECTION 4 - LIFESTYLE

Exercise

We would like to know about your activities at work and in your free time that involve physical activity.

4.1 Getting about in the **PAST WEEK**.

a. On average, for how many minutes did you **walk** outside your home/workplace?

on each weekday ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90+ on each weekend day ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90+

b. On average, for how many minutes did you **pedal cycle**?

on each weekday ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90+ on each weekend day ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40 ☐ 50 ☐ 60 ☐ 70 ☐ 80 ☐ 90+

c. On average, how many **flights of stairs** did you climb?

on each weekday ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40+ ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 on each weekend day ☐ 0 ☐ 10 ☐ 20 ☐ 30 ☐ 40+ ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

4.2 Other physical activities in the **PAST FOUR WEEKS**. *Please indicate the number of **occasions** and **total** time spent on each of the activities listed. Write in other types of activity not listed, as applicable.*

a. SPORTS AND GAMES

	Occasions in the past 4 weeks							Total hours in past 4 weeks						
	None	1-2	3-4	5-10	11-15	16-20	21+	None	1/2	1-1 1/2	2-3	4-5	6-10	11+
Football (including coaching etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Golf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Swimming	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other activities e.g. aerobics, ballroom dancing, keep fit, jogging, tennis *(please specify)*														
▼	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

b. GARDENING

	Occasions in the past 4 weeks							Total hours in past 4 weeks						
	None	1-2	3-4	5-10	11-15	16-20	21+	None	1/2	1-1 1/2	2-3	4-5	6-10	11+
Weeding, hoeing, pruning etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Manual lawn mowing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other gardening e.g. digging, planting, clearing ground etc. *(please specify)*														
▼	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

c. HOUSEWORK

	Occasions in the past 4 weeks							Total hours in past 4 weeks						
	None	1-2	3-4	5-10	11-15	16-20	21+	None	1/2	1-1 1/2	2-3	4-5	6-10	11+
Carrying heavy shopping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cooking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hanging out washing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other housework e.g. dusting, ironing, hoovering *(please specify)*														
▼	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

d. DO-IT-YOURSELF

	Occasions in the past 4 weeks							Total hours in past 4 weeks						
	None	1-2	3-4	5-10	11-15	16-20	21+	None	1/2	1-1 1/2	2-3	4-5	6-10	11+
Manual car washing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Painting/decorating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other DIY e.g. household repairs, woodwork, bricklaying *(please specify)*														
▼	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

e. ADDITIONAL/OTHER *(please specify)*

	Occasions in the past 4 weeks							Total hours in past 4 weeks						
	None	1-2	3-4	5-10	11-15	16-20	21+	None	1/2	1-1 1/2	2-3	4-5	6-10	11+
▼														

4.3 How many times a week do you engage in vigorous physical activity enough to make you out of breath, and for how long in total?
Please specify the activity.

	Occasions per week							Total hours per week						
	None	1	2	3	4	5	6+	None	1/2	1	1 1/2	2	2 1/2	3+
▼														

4.4 On average, how many HOURS A WEEK do you spend:

	Total hours per week							
	None	1	2-5	6-10	11-20	21-30	31-40	40+
Standing or walking around at work/home								
Sitting at work, driving, commuting or other								
Sitting at home e.g. watching TV, sewing, at desk *(please specify)*								
▼								

Smoking Habits

4.5 a. Do you smoke cigarettes now (that is, not cigars/pipe)?

Yes ☐ No ☐ ***If No, please go to Question 4.9***

If Yes,

b. What kind of cigarettes do you smoke?

Manufactured Yes ☐ No ☐

Hand rolled Yes ☐ No ☐

c. How many manufactured cigarettes do you smoke per day? *and/or*

cigarettes 0 10 20 30 40 50 60 70 80 90+
0 1 2 3 4 5 6 7 8 9

d. About how many ounces of tobacco do you use per week for handrolled cigarettes?

ounces 0 10 20 30 40 50 60 70 80 90+
0 1 2 3 4 5 6 7 8 9

4.6 How soon after waking do you smoke your first cigarette of the day?

Less than 5 minutes ☐ Between 30 minutes and 1 hour ☐
Between 5 and 15 minutes ☐ Between 1 and 2 hours ☐
Between 15 and 30 minutes ☐ More than 2 hours ☐

4.7 How easy or difficult would you find it to go without smoking for a whole day?

Very easy ☐ Fairly easy ☐ Fairly difficult ☐ Very difficult ☐

4.8 How much do you want to give up smoking altogether?

Not at all ☐ Slightly ☐ Moderately ☐ Quite strongly ☐ Very strongly ☐

If a current smoker, please go to Question 4.11

4.9 a. If not a current cigarette smoker did you smoke in the past ? Yes ☐ No ☐ ***If No, please go to Question 4.11***

If Yes,

b. How many manufactured cigarettes did you smoke per day? *and/or*

cigarettes 0 10 20 30 40 50 60 70 80 90+
0 1 2 3 4 5 6 7 8 9

c. How many ounces of tobacco did you use per week for handrolled cigarettes?

ounces 0 10 20 30 40 50 60 70 80 90+
0 1 2 3 4 5 6 7 8 9

d. How old were you when you stopped smoking?

age 0 10 20 30 40 50 60
0 1 2 3 4 5 6 7 8 9

4.10 How old were you when you started smoking?

age 0 10 20 30 40 50 60
0 1 2 3 4 5 6 7 8 9

4.11 a. Do you smoke cigars? Yes ☐ No ☐ *If No, please go part c.*

If Yes,

b. How many cigars per week?

cigars 0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

c. Do you smoke a pipe? Yes ☐ No ☐ *If No, please go to Question 4.12*

If Yes,

d. How many ounces of tobacco do you smoke per week?

ounces 0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

4.12 Does your husband/wife/partner smoke?

Yes ☐ No ☐ Not applicable ☐

4.13 How many people smoke in the household where you live? (please include yourself and your husband/wife/partner)

number 0 1 2 3 4 5 6 7 8 9 10 11 12+

4.14 If at work, are you exposed to other people's smoke?

Not at all ☐ A little ☐ Quite a bit ☐ A lot ☐ Not at work ☐

Drinking Habits

4.15 a. In the past 12 months have you taken an alcoholic drink? *Indicate one only*

Twice a day or more ☐ Daily or almost daily ☐ Once or twice a week ☐

Once or twice a month ☐ Special occasions only ☐ No ☐

b. If No, have you always been a non-drinker? Yes ☐ No ☐

If always a Non-drinker, please go to Question 4.18

4.16 a. Have you had an alcoholic drink in the last seven days? Yes ☐ No ☐ *If No, please go to Question 4.17*

If Yes,

In the last seven days, how many drinks have you had of each of the following? *Please remember that a drink poured at home could be equivalent to 2 or 3 pub measures. If none, please indicate 0.*

b. Spirits (Whisky, gin, rum, brandy, vodka etc.) or liqueurs

measures 0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

c. Wine (including sherry, port, vermouth)

glasses 0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

d. Beer (including lager and cider)

pints 0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

4.17 a. Have you ever felt that you ought to cut down on your drinking? Yes ☐ No ☐

b. Have people annoyed you by criticising your drinking? Yes ☐ No ☐

c. Have you ever felt bad or guilty about your drinking? Yes ☐ No ☐

d. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover? Yes ☐ No ☐

Food Habits

4.18 a. What type of bread do you eat most frequently? *Indicate one only*

White ☐ Wholemeal ☐ Granary or wheatmeal ☐ Other brown ☐ Both brown and white ☐

b. What type of milk do you usually use? *Indicate one only*

Do not use milk ☐ Channel Islands Whole milk (gold top) ☐ Whole milk (silver/red top or sterilised) ☐

Semi-skimmed milk ☐ Skimmed milk ☐ Other *(please specify)* ☐

4.19 How often do you eat fresh fruit or vegetables? *Indicate one only*

Seldom or never ☐ Less than once a month ☐ 1-3 times a month ☐ 1-2 times a week ☐

3-4 times a week ☐ 5-6 times a week ☐ Daily ☐ 2 or more times daily ☐

SECTION 5 - SOCIAL LIFE

Activities and Hobbies

5.1 In your spare time are you involved in any of the following activities? *Please indicate which responses apply to you.*

How often have you taken part in these activities in the last 12 months?

				Weekly	Monthly	Less often
a. Religious activities/observance	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
b. Positions of office, school governor, councillor etc	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
c. Involvement in clubs and organisations, voluntary or official	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
d. Courses and education/evening classes	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
e. Cultural visits to stately homes, galleries, theatres, cinema or live music events	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
f. Social indoor games, cards, bingo, chess etc.	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
g. Visiting friends and relatives	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
h. Going to pubs and social clubs	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
i. Individual occupations, e.g. reading, listening to music	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
j. Household tasks e.g, DIY, maintenance, decorating.	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
k. Practical activities, making things with your hands e.g. pottery, drawing etc.	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
l. Gardening	No ☐	Yes ☐	if Yes ➤	☐	☐	☐
m. Using a home computer for leisure	No ☐	Yes ☐	if Yes ➤	hours per week		

0 10 20 30 40 50 60 70 80 90+

0 1 2 3 4 5 6 7 8 9

5.2 Here is a list of some things a person (a household) might be able to have or do.

a. Could you indicate which ones you believe are necessities for modern daily life?
Answers in column A please.

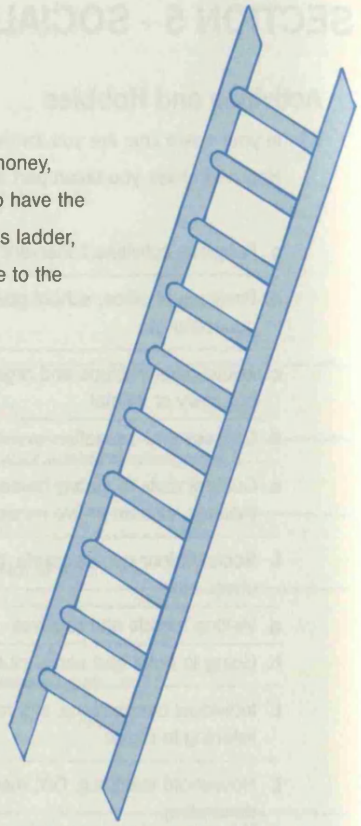
b. Looking again at the list, could you indicate which things you do not have or do not have regular access to?
Answers in column B please.

c. Of the things you don't have, which ones would you like to have but must do without because of lack of money?
Answers in column C please.

	A *necessity*	**B** *don't have*	**C** *would like/lack of money*
i. Freezer	☐	☐	☐
ii. Tumble Dryer	☐	☐	☐
iii. Dishwasher	☐	☐	☐
iv. CD Player	☐	☐	☐
v. Spare room for guests	☐	☐	☐
vi. Garden	☐	☐	☐
vii. Home Computer	☐	☐	☐
viii. Going out to a restaurant, cinema, theatre etc. once a week	☐	☐	☐
ix. Two annual holidays away from home	☐	☐	☐
x. Enough money to save	☐	☐	☐

5.3 Think of this ladder as representing where people stand in our society.

At the **top** of the ladder are the people who are the best off - those who have the most money, most education and best jobs. At the **bottom** are the people who are the worst off - who have the least money, least education, and the worst jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top and the lower you are, the closer you are to the people at the very bottom.



Where would you place yourself on this ladder?
Please place a large "X" on the rung where you think you stand.

5.4 Please read each of the following statements below and indicate the extent to which you agree with each statement. Try to be as accurate and honest as you can as you answer the questions. Try not to let your answer to one question influence your answers to other questions. There are no correct or incorrect answers.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. It's important to me to take time to plan out where I'm going in life	☐	☐	☐	☐	☐
b. I let my emotions cool before I act	☐	☐	☐	☐	☐
c. I don't think much about my long-term goals	☐	☐	☐	☐	☐
d. I often respond quickly and emotionally when something happens	☐	☐	☐	☐	☐
e. I have many long-term goals that I will work to achieve	☐	☐	☐	☐	☐
f. I'm always on guard for things that might come at me	☐	☐	☐	☐	☐
g. I keep a cool head when I am angry or frightened	☐	☐	☐	☐	☐
h. I'm not someone who worries about who's coming up behind me	☐	☐	☐	☐	☐
i. I'm on my guard in most situations	☐	☐	☐	☐	☐

This Section concerns people in your life who you feel close to and from whom you can obtain support (either emotional or practical) including close relatives and good friends.

5.5 How many people do you feel very close to? (It does not matter where they live or whether you have seen them recently).

number ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 20+

5.6 Who have you felt **closest** to in the last 12 months? Please describe in terms of their relationship to you: (e.g. WIFE, SON, AUNT, BOYFRIEND, MALE FRIEND, FEMALE FRIEND). Remember these are just examples and we would like you to write in whoever you feel closest to.

WRITE IN THE PERSON YOU ARE CLOSEST TO HERE:- Closest

Thinking about the person you are closest to, please tell us how you would rate the practical and emotional support they have provided for you **IN THE LAST 12 MONTHS**.

	Not at all	A little	Quite a lot	A great deal
a. How much in the last 12 months did this person give you **information, suggestions and guidance** that you found helpful?	☐	☐	☐	☐
b. How much in the last 12 months could you **rely** on this person (was this person there when you needed him/her)?	☐	☐	☐	☐
c. How much in the last 12 months did this person make you **feel good** about yourself?	☐	☐	☐	☐
d. How much in the last 12 months did you **share** interests, hobbies and fun with this person?	☐	☐	☐	☐
e. How much in the last 12 months did this person give you **worries, problems** and **stress**?	☐	☐	☐	☐
f. How much in the last 12 months did you **want** to **confide in** (talk frankly, share feelings with) this person?	☐	☐	☐	☐
g. How much in the last 12 months **did you confide** in this person?	☐	☐	☐	☐
h. How much in the last 12 months did you trust this person with your most personal worries and problems?	☐	☐	☐	☐
i. How much in the last 12 months would you have **liked to have confided more** in this person?	☐	☐	☐	☐
j. How much in the last 12 months did talking to this person make things worse?	☐	☐	☐	☐
k. How much in the last 12 months did he/she talk about his/her personal worries with you?	☐	☐	☐	☐
l. How much in the last 12 months did you **need** practical help from this person with **major** things (e.g. look after you when ill, help with finances, children)?	☐	☐	☐	☐
m. How much in the last 12 months did this person give you **practical help** with **major things**?	☐	☐	☐	☐
n. How much in the last 12 months would you have **liked more practical** help with major things from this person?	☐	☐	☐	☐
o. How much in the last 12 months did this person give you **practical** help with **small** things when you needed it? (e.g. chores, shopping, watering plants etc.)	☐	☐	☐	☐

5.7 **a.** Are there any relatives outside your household with whom you have regular contact (either by visit, telephone or letters)? (Not necessarily the same person each time)

If you have no relatives outside your household, please go to Question 5.8

Almost daily ☐ About once a week ☐ About once a month ☐

Once every few months ☐ Never/almost never ☐ No relatives outside household ☐

b. How often do you regularly **visit** or are **visited** by these relatives?

Almost daily ☐ About once a week ☐ About once a month ☐

Once every few months ☐ Never/almost never ☐ No relatives outside household ☐

c. How many relatives do you see once a month or more?

None ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ More than 10 ☐

5.8 a. Are there any friends or acquaintances with whom you have regular contact (either by visit, telephone or letters)? (Not necessarily the same person each time)

Almost daily ☐ About once a week ☐ About once a month ☐
Once every few months ☐ Never/almost never ☐

b. How often do you regularly **visit** or are **visited** by these friends or acquaintances?

Almost daily ☐ About once a week ☐ About once a month ☐
Once every few months ☐ Never/almost never ☐

c. How many friends and acquaintances do you see once a month or more?

None ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ More than 10 ☐

5.9 How much do you agree or disagree with the following statements? *Please indicate one for each of the following questions.*

	DISAGREE			AGREE		
	Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
a. At Home, I feel I have control over what happens in most situations	☐	☐	☐	☐	☐	☐
b. At Work, I feel I have control over what happens in most situations	☐	☐	☐	☐	☐	☐
c. I feel that what happens in my life is often determined by factors beyond my control	☐	☐	☐	☐	☐	☐
d. Over the next 5-10 years I expect to have many more positive than negative experiences	☐	☐	☐	☐	☐	☐

5.10 All things considered how satisfied or dissatisfied are you with your standard of living?

Please indicate on the scale below how satisfied or dissatisfied you feel:-

Very dissatisfied ☐ Moderately dissatisfied ☐ A little dissatisfied ☐ No feelings either way ☐ A little satisfied ☐ Moderately satisfied ☐ Very satisfied ☐

5.11 a. How often do you have any worries or problems with other relatives (e.g. parents or in-laws)?

Always ☐ Often ☐ Sometimes ☐ Seldom ☐ Never ☐ Not applicable ☐

b. How often does it happen that you do not have enough money to afford the kind of food or clothing you/your family should have?

Always ☐ Often ☐ Sometimes ☐ Seldom ☐ Never ☐

c. How much difficulty do you have in meeting the payment of bills?

Very great ☐ Great ☐ Some ☐ Slight ☐ Very little ☐

d. To what extent do you have problems with your housing (e.g. too small, repairs, damp, etc.)?

Very great problems ☐ Great ☐ Some ☐ Slight ☐ Very little ☐

e. To what extent do you have problems with the neighbourhood in which you live (e.g. noise, unsafe street, few local facilities)?

Very great problems ☐ Great ☐ Some ☐ Slight ☐ Very little ☐

5.12 All things considered how satisfied or dissatisfied are you with your life as a whole?

Please indicate on the scale below how satisfied or dissatisfied you feel:-

Very dissatisfied ☐ Moderately dissatisfied ☐ A little dissatisfied ☐ No feelings either way ☐ A little satisfied ☐ Moderately satisfied ☐ Very satisfied ☐

5.13 Here is a list of some of the things households need to do. In your household, who would you say took the main responsibility for these tasks under normal circumstances? *Please answer all questions.*

	Self	Male partner, relative or friend	Female partner, relative or friend	Shared equally	Outside help	Not applicable
a. Washing and ironing	☐	☐	☐	☐	☐	☐
b. Preparing main daily meal	☐	☐	☐	☐	☐	☐
c. Household cleaning	☐	☐	☐	☐	☐	☐
d. Household shopping	☐	☐	☐	☐	☐	☐
e. Paying regular bills	☐	☐	☐	☐	☐	☐
f. Repairing household equipment	☐	☐	☐	☐	☐	☐
g. Repairing car	☐	☐	☐	☐	☐	☐

Income

As you know the Civil Service is going through major changes. Also many of you are approaching retirement age, or have retired. Previously we relied on your Civil Service grade to indicate your income. However, Civil Service grade is not as clear an indicator of income as before and there are many of you to whom it no longer applies. We would therefore very much appreciate your help in completing the following questions.

As with all other questions, the information you provide will be kept strictly confidential and used for study purposes only.

5.14 What is the total current yearly amount you receive from your wage, pension, benefit allowance or annual salary (before tax is deducted)? *Please indicate one category.*

Less than £9,999 ☐	£10,000 - £14,999 ☐	£15,000 - £19,999 ☐
£20,000 - £24,999 ☐	£25,000 - £34,999 ☐	£35,000 - £49,999 ☐
£50,000 - £69,999 ☐	More than £70,000 ☐	

5.15 a. How many people (including yourself) contributed to your household finances with income from any source (any source includes wages or salary from work, money from a second job or odd jobs, income from savings or investments, rent or property, pension, benefits and/or maintenance etc.) over the last 12 months?

Number of people ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

b. What total income (including your own) has your household received in the last 12 months from the sources in Question 5.15 a.?

Less than £999 ☐	£1,000 - £2,999 ☐	£3,000 - £4,999 ☐	£5,000 - £7,999 ☐
£8,000 - £9,999 ☐	£10,000 - £19,999 ☐	£20,000 - £39,999 ☐	£40,000 - £59,999 ☐
£60,000 - £99,999 ☐	£100,000 - £199,999 ☐	More than £200,000 ☐	

5.16 a. If you sold all the assets you own in your household, for example, your house, car, caravan, boat, and jewellery, cashed in your savings and investments, and paid off any debts you have (including your mortgage), how much money do you think you would have? *Please indicate one category.*

Less than £4,999 ☐	£5,000 - £9,999 ☐	£10,000 - £39,999 ☐
£40,000 - £99,999 ☐	£100,000 - £499,999 ☐	More than £500,000 ☐

b. Thinking of the next 10 years, how financially secure do you feel?

Secure ☐ Fairly secure ☐ Fairly insecure ☐ Insecure ☐

This section is about influences in your early life and the whole of your childhood up to when your were aged 16.

5.17 a. Were you ever separated from your mother for a year or more as a child (that is, up until you were 16)?

Yes ☐ No ☐ ***If No, please go to part d.***

If Yes,

b. What age were you when you were first separated from your mother for at least a year?

years old ☐ 10 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

c. Why did the separation happen?

Parents separated/ divorced ☐ Mother died ☐ Mother ill ☐ Adoption ☐ Evacuation ☐ Other reason ☐

d. Did any of the following things happen during your childhood (that is, up until you were 16)?

You spent 4 or more weeks in hospital	Yes ☐	No ☐
Your parents were divorced	Yes ☐	No ☐
Your father/mother were unemployed when they wanted to be working	Yes ☐	No ☐
Your parent(s) were mentally ill or drank so often that it caused family problems	Yes ☐	No ☐
You were physically abused by someone close to you	Yes ☐	No ☐
Your parents very often argued or fought	Yes ☐	No ☐
You were in an orphanage/childrens' home	Yes ☐	No ☐

e. Did you experience any of the following circumstances during your childhood (that is, up until you were 16)?

Your family had continuing financial problems	Yes ☐	No ☐
Your family/household did not have an inside toilet	Yes ☐	No ☐
Your family/household owned a car	Yes ☐	No ☐

The next few questions are about your mother, or the woman who cared for you most of your life whilst you were growing up (that is up until you were 16).

If you were cared for by your father, or in a home with a male care giver, but without a female care giver, please go to Question 5.19.
If you grew up without care givers please go to Question 5.20.

5.18 Please show **how you remember your mother** (or the woman who cared for you) during the years you were growing up.

(Please mark one answer on each line)

	A great deal	Quite a lot	A little	Not at all
a. How much did she understand your problems and worries?	☐	☐	☐	☐
b. How much could you confide in her about things that were bothering you?	☐	☐	☐	☐
c. How much love and affection did she give you?	☐	☐	☐	☐
d. How much time and attention did she give you when you needed it?	☐	☐	☐	☐
e. How strict was she with her rules for you?	☐	☐	☐	☐
f. How harsh was she when she punished you?	☐	☐	☐	☐
g. How much did she expect you to do your best in everything you did?	☐	☐	☐	☐

5.19 Please show **how you remember your father** (or the man who cared for you), during the years you were growing up,

If you were brought up in a home without a male parent please go to Question 5.20.

(Please mark one answer on each line.)

	A great deal	Quite a lot	A little	Not at all
a. How much did he understand your problems and worries?	☐	☐	☐	☐
b. How much could you confide in him about things that were bothering you?	☐	☐	☐	☐
c. How much love and affection did he give you?	☐	☐	☐	☐
d. How much time and attention did he give you when you needed it?	☐	☐	☐	☐
e. How strict was he with his rules for you?	☐	☐	☐	☐
f. How harsh was he when he punished you?	☐	☐	☐	☐
g. How much did he expect you to do your best in everything you did?	☐	☐	☐	☐

This section is about your relationships with your partner and other adults.

5.20 Please read the following statements. If a statement describes you exactly, give it a score of 100. If a statement describes a complete opposite to you, give it a score of 0. You can give any number between 0 and 100 but please do not give the same number twice.

	Rating
a. It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me.	☐
b. I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.	☐
c. I want to be completely emotionally intimate with others, but I often find others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.	☐
d. I am comfortable without close emotional relationships. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.	☐

Below are some statements which describe people's beliefs and attitudes and the way they might react to some situations. If the statement applies to you or describes you in general, indicate **True**. If the statement does not describe you indicate **False**.

		TRUE	FALSE
5.21	I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others	☐	☐
5.22	I think most people would lie to get ahead	☐	☐
5.23	When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing	☐	☐
5.24	Most people are honest chiefly through fear of being caught	☐	☐
5.25	Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it	☐	☐
5.26	It takes a lot of argument to convince most people of the truth	☐	☐
5.27	I feel that I have often been punished without cause	☐	☐
5.28	My way of doing things is apt to be misunderstood by others	☐	☐
5.29	I don't blame anyone for trying to grab everything he/she can get in this world	☐	☐
5.30	No one cares much what happens to you	☐	☐
5.31	It is safer to trust nobody	☐	☐
5.32	Most people make friends because friends are likely to be useful to them	☐	☐
5.33	I am sure I am being talked about	☐	☐
5.34	Most people inwardly dislike putting themselves out to help other people	☐	☐
5.35	People often disappoint me	☐	☐
5.36	I commonly wonder what hidden reason another person may have for doing something nice for me	☐	☐
5.37	There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done	☐	☐
5.38	Some of my family have habits that bother and annoy me very much	☐	☐
5.39	I am often inclined to go out of my way to win a point with someone who has opposed me	☐	☐
5.40	I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes on to those under them	☐	☐
5.41	I do not blame a person for taking advantage of someone who lays himself open to it	☐	☐
5.42	People generally demand more respect for their own rights than they are willing to allow for others	☐	☐
5.43	I have often found people jealous of my good ideas just because they had not thought of them first	☐	☐

5.44 Please read each of the following statements below and indicate the extent to which you agree with each statement. Try to be as accurate and honest as you can as you answer the questions. Try not to let your answer to one question influence your answers to other questions. There are no correct or incorrect answers.

	Absolutely agree	Somewhat agree	Absolutely disagree	Somewhat disagree	Cannot say
a. I feel that it is impossible to reach the goals I would like to strive for	☐	☐	☐	☐	☐
b. The future to me seems to be hopeless, and I can't believe that things are changing for the better	☐	☐	☐	☐	☐
c. I look forward to the future with hope and enthusiasm	☐	☐	☐	☐	☐
d. I might as well give up because I can't make things better for myself	☐	☐	☐	☐	☐
e. All I can see ahead of me is unpleasantness rather than pleasantness	☐	☐	☐	☐	☐
f. Things just won't work out the way I want them to	☐	☐	☐	☐	☐

If under 50, please go to Section 7

SECTION 6 - PRE-RETIREMENT & RETIREMENT

We would like this Section to be completed by people aged 50 years and above.

As many of you are now approaching retirement age and some of you have already retired, the study has been extended to cover your experiences of retirement. We would be very grateful if you could complete the following questions.

If you are retired please go to Question 6.4

6.1 **a.** Have you given any consideration to, and/or made preparations for your future retirement? Yes ☐ No ☐

If Yes,

b. Please indicate which areas you have given consideration to and/or made preparations for.

	Not considered	Considered	Made preparations
Income	☐	☐	☐
Activities/ Interests	☐	☐	☐
Accommodation	☐	☐	☐
Holidays	☐	☐	☐
Others *(please specify)* ▼	☐	☐	☐

6.2 Do you think you are given enough choice about the age at which you can retire?

Yes ☐ No ☐

6.3 Below are statements about attitudes or feelings towards retirement. Please indicate **any** statement(s) which apply to you.

I am looking forward to retirement ☐	I have no feelings either way ☐	I look forward to the freedom to organise my own time ☐
I feel apprehensive/unsure about retirement ☐	I have mixed feelings about retirement ☐	I have a fear of loneliness ☐
I have a fear of the unknown ☐	I dislike change in daily routines ☐	I shall be relieved to leave my job ☐

Now please go to Section 7

To be completed by people who have already retired.

6.4 a. Do you feel your transition from work into retirement could have been improved?

Yes ☐ No ☐ ***If No, please go to Question 6.5***

If Yes,

b. Would any of the following have been helpful? Please indicate **any** statement(s) which apply to you.

A lead-in period of part-time working ☐
Being given more information about retirement ☐
More planning for retirement ☐
Having more interests outside work ☐
Other *(please specify)* ☐ ➤

6.5 Below are five statements about attitudes and feelings towards your health in retirement.
Which statements apply to you? *Please answer Yes or No for each.*

a. I worry about getting a physical disability	Yes ☐	No ☐
b. I look after myself more as I have more time	Yes ☐	No ☐
c. I feel more relaxed and less stressed	Yes ☐	No ☐
d. I worry about not being able to get the health care I might need	Yes ☐	No ☐
e. I worry about my health	Yes ☐	No ☐

6.6 Do any of the following statements describe your feelings about retirement?
Please answer Yes or No for each.

a. I enjoy the freedom to organise my own time	Yes ☐	No ☐
b. I feel guilty about not working	Yes ☐	No ☐
c. I was relieved to have left my last job	Yes ☐	No ☐
d. I feel less pressured for time	Yes ☐	No ☐
e. I can do things spontaneously	Yes ☐	No ☐

6.7 a. With retirement, do you feel your life has gone through a major change? Yes ☐ No ☐

If Yes,

b. What has affected you most? *Please indicate one statement.*

Not working ☐
A change in financial position ☐
A change in daily routines ☐
A change in roles/relationships at home ☐
Adjusting to a new identity as a retired person ☐
Other *(please specify)* ☐ ➤

SECTION 7 - WORK

The following questions are about your work. For each please indicate the one answer that best describes your job or the way you deal with problems occurring at work. *Please answer all questions.*

7.1 Concerning your particular work:	Often	Sometimes	Seldom	Never/Almost Never
a. Do you have to work very fast?	☐	☐	☐	☐
b. Do you have to work very intensively?	☐	☐	☐	☐
c. Do you have enough time to do everything?	☐	☐	☐	☐
d. Do you have the possibility of learning new things through your work?	☐	☐	☐	☐
e. Does your work demand a high level of skill or expertise?	☐	☐	☐	☐
f. Does your job require you to take the initiative?	☐	☐	☐	☐
g. Do you have to do the same thing over and over again?	☐	☐	☐	☐
h. Do you have a choice in deciding HOW you do your work?	☐	☐	☐	☐
i. Do you have a choice in deciding WHAT you do at work?	☐	☐	☐	☐

7.2 About your position at work - how often do the following statements apply? *Please answer all questions.*	Often	Sometimes	Seldom	Never/Almost Never
a. Others take decisions concerning my work	☐	☐	☐	☐
b. I have a good deal of say in decisions about work	☐	☐	☐	☐
c. I have a say in my own work speed	☐	☐	☐	☐
d. My working time can be flexible	☐	☐	☐	☐
e. I can decide when to take a break	☐	☐	☐	☐
f. I have a say in choosing with whom I work	☐	☐	☐	☐
g. I have a great deal of say in planning my work environment	☐	☐	☐	☐

7.3 About consistency and clarity regarding your job. *Please answer all questions.*	Often	Sometimes	Seldom	Never
a. Do different groups at work demand things from you that you think are hard to combine?	☐	☐	☐	☐
b. Do you get sufficient information from line management (your superiors)?	☐	☐	☐	☐
c. Do you get consistent information from line management (your superiors)?	☐	☐	☐	☐

7.4 Regarding your job involvement. *Please answer all questions.*	Often	Sometimes	Seldom	Never
a. Does your job provide you with a variety of interesting things?	☐	☐	☐	☐
b. Is your job boring?	☐	☐	☐	☐

7.5 When you are having difficulties at work: *Please answer all questions.*	Often	Sometimes	Seldom	Never
a. How often do you get help and support from your colleagues?	☐	☐	☐	☐
b. How often are your colleagues willing to listen to your work related problems?	☐	☐	☐	☐
c. How often do you get help and support from your immediate superior?	☐	☐	☐	☐
d. How often is your immediate superior willing to listen to your problems?	☐	☐	☐	☐

7.6 About your job in general. How satisfied have you been with the following? *Please answer all questions.*	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
a. Your usual take home pay	☐	☐	☐	☐
b. Your work prospects	☐	☐	☐	☐
c. The people you work with	☐	☐	☐	☐
d. Physical working conditions	☐	☐	☐	☐
e. The way your section is run	☐	☐	☐	☐
f. The way your abilities are used	☐	☐	☐	☐
g. The interest and skill involved in your job	☐	☐	☐	☐
h. Your job as a whole taking everything into consideration	☐	☐	☐	☐

7.7 Do you agree with the following statements?

			If you agree, to what extent are you distressed by it?			
			Not at all	Somewhat	Rather	Very distressed
a. I have constant time pressure due to a heavy work load	No ☐	Yes ☐ ➤	☐	☐	☐	☐
b. I have many interruptions and disturbances in my job	No ☐	Yes ☐ ➤	☐	☐	☐	☐
c. I have a lot of responsibility in my job	No ☐	Yes ☐ ➤	☐	☐	☐	☐
d. I am often pressured to work overtime	No ☐	Yes ☐ ➤	☐	☐	☐	☐
e. I have experienced or expect to experience an undesirable change in my work situation	No ☐	Yes ☐ ➤	☐	☐	☐	☐
f. My job promotion prospects are poor	No ☐	Yes ☐ ➤	☐	☐	☐	☐
g. My job security is poor	No ☐	Yes ☐ ➤	☐	☐	☐	☐
h. I am treated unfairly at work	No ☐	Yes ☐ ➤	☐	☐	☐	☐

7.8 Do you agree or disagree with the following statements?

	Agree	Somewhat agree	Somewhat disagree	Disagree
a. If a task has to be done well I'd better take care of it myself	☐	☐	☐	☐
b. I can get very upset when someone hinders me in my duties	☐	☐	☐	☐
c. As soon as I get up in the morning, I start thinking about work problems	☐	☐	☐	☐
d. When I come home, I can easily relax and 'switch off' work	☐	☐	☐	☐
e. People close to me say I sacrifice myself too much for my job	☐	☐	☐	☐
f. For me, family or private life comes first, then work	☐	☐	☐	☐
g. Work rarely lets me go, it is still on my mind when I go to bed	☐	☐	☐	☐
h. Every once in a while I like it when others hold me back from working	☐	☐	☐	☐
i. If I postpone something that I was supposed to do today, I will have trouble sleeping at night	☐	☐	☐	☐

7.9 Do you agree with the following statements?
(please note the order of 'Yes', 'No' is changed)

			If you disagree, to what extent are you distressed by it?			
			Not at all	Somewhat	Rather	Very distressed
a. Considering all my efforts and achievements, my work prospects are adequate	Yes ☐	No ☐ ➤	☐	☐	☐	☐
b. I receive the respect I deserve from my superiors and colleagues	Yes ☐	No ☐ ➤	☐	☐	☐	☐
c. I experience adequate support in difficult situations	Yes ☐	No ☐ ➤	☐	☐	☐	☐
d. Considering all my efforts and achievements, I receive the respect and prestige I deserve at work	Yes ☐	No ☐ ➤	☐	☐	☐	☐

7.10 To what extent does your family life and family responsibilities interfere with your performance on your job in any of the following ways?
Would you say:-

	Not at all	To some extent	A great deal	Not Applicable
a. Family matters reduce the time you can devote to your job	☐	☐	☐	☐
b. Family worries or problems distract you from your work	☐	☐	☐	☐
c. Family activities stop you getting the amount of sleep you need to do your job well	☐	☐	☐	☐
d. Family obligations reduce the time you need to relax or be by yourself	☐	☐	☐	☐

7.11 To what extent do your job responsibilities interfere with your family life?
Would you say:-

	Not at all	To some extent	A great deal	Not Applicable
a. Your job reduces the amount of time you can spend with the family	☐	☐	☐	☐
b. Problems at work make you irritable at home	☐	☐	☐	☐
c. Your job involves a lot of travel away from home	☐	☐	☐	☐
d. Your job takes so much energy you don't feel up to doing things that need attention at home	☐	☐	☐	☐

PLEASE ADD ANY COMMENTS BELOW

DO NOT WRITE PAST HERE

FOR OFFICE USE ONLY

A ☐ B ☐ C ☐

STUDY NUMBER

DO NOT WRITE PAST HERE

0	0	0	0	0	0	A	N
1	1	1	1	1	1	B	O
2	2	2	2	2	2	C	P
3	3	3	3	3	3	D	Q
4	4	4	4	4	4	E	R
5	5	5	5	5	5	F	S
6	6	6	6	6	6	G	T
7	7	7	7	7	7	H	U
8	8	8	8	8	8	I	V
9	9	9	9	9	9	J	W
						K	X
						L	Y
						M	Z

Thank you very much for completing the 1997 Health Survey