

Work related factors and ill health The Whitehall II Study

Prepared by
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Work related factors and ill-health

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Stephen Stansfeld
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1999

The influences of the psychosocial work environment on self-reported ill-health including alcohol dependence, health functioning, psychiatric morbidity, and sickness absence are reported from the longitudinal Whitehall II cohort study of British civil servants.

Effort reward imbalance is associated with increased risk of alcohol dependence, psychiatric disorder, long spells of sickness absence and poor health functioning. High job demands predict poor health functioning and psychiatric disorder. Low decision latitude is moderately associated with risk of alcohol dependence. Work social supports and control over work have a protective effect on mental health and health functioning and reduce risk of spells of sickness absence.

The work environment appears to be an important influence on health but the importance of different aspects of work varies according to the health outcome. Work factors are as important as non-work influences on health. Our results suggest that intervention at the level of work design, organisation and management may reduce morbidity in working populations.

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EXECUTIVE SUMMARY

This report examines the influence of work related factors on self reported ill-health, including alcohol dependence, psychiatric morbidity and health functioning in the Whitehall II study. It also examines the relationship between work related factors and short and long spells of sickness absence.

The objectives of the project were:

1. To establish the relative contribution of work related factors to the development of ill-health, including the percentage increased risk in ill-health attributable to work related factors and the significance of this risk relative to non-work related factors.
2. To establish which work related factors contribute most to ill-health. These analyses will establish which work related factors contribute to which disease outcomes.

These analyses have been carried out in the longitudinal Whitehall II study of 10308 male and female civil servants, aged 35-55 years on entry to the study in 1985. This cohort of civil servants has been followed up since then with repeated phases of data collection. The initial response rate to the study was 73% and there has been good follow up of participants since then. Measurement of work has been carried out by a self report questionnaire and external assessment of work characteristics by personnel officers.

The psychosocial work environment is measured by self report questions on decision latitude (degree of control over work and opportunity for use of skills and amount of variety present in work), psychological job demands (including pace of work and conflict between competing tasks), and work social support from supervisors and colleagues. Effort-reward imbalance is an additional measure of the psychosocial work environment, in which putting in high levels of effort at work and receiving low rewards (in terms of income, promotion and being valued) is thought to increase the risk of ill-health.

Alcohol dependence is measured by the four item CAGE questionnaire. Effort-reward imbalance was associated with alcohol dependence in men and low decision latitude was associated with alcohol dependence in women. Neither of these associations were altered by adjustment for other work characteristics or non-work related risk factors.

Psychiatric disorder was measured by the 30 item General Health Questionnaire, screening for anxiety and depression. High job demands were associated with increased risk of psychiatric disorder over the five year follow up period, even after adjustment for other work characteristics and non-work related risk factors. Work social supports, particularly support from supervisors, had a protective effect on future mental health over the follow up period, even after adjustment for the effects of other work characteristics. Effort-reward imbalance, characterised by high efforts and low rewards, was associated with a more than two-fold risk of psychiatric disorder over the five year follow up period.

Health functioning was measured by the SF-36 General Health Survey, with sub-scales of physical, general mental health, and social functioning. Low decision latitude and high psychological demands predicted poor physical functioning in men. Effort-reward imbalance was a risk factor for poor physical functioning in women.

A summary of the findings is presented in the box below:

Work characteristic:	Associated with:
Low decision latitude	<ul style="list-style-type: none"> - alcohol dependence - poor mental health - poor health functioning - increased sickness absence
High job demands	<ul style="list-style-type: none"> - poor mental health - poor health functioning
Low social support at work	<ul style="list-style-type: none"> - poor mental health - poor health functioning - increased sickness absence
Combination of high effort and low rewards	<ul style="list-style-type: none"> - alcohol dependence - poor mental health - poor health functioning - sickness absence (long spells)

Low decision latitude, low work social support, high work demands, and effort-reward imbalance were associated with poor general mental health in men and women. In men, low decision latitude, high job demands, low work social support, and effort-reward imbalance were related to increased risk of poor social functioning at follow up. The results, apart from decision latitude, were similar in women.

Externally assessed work characteristics, based on the assessments of posts by personnel managers, had few consistent relationships with either alcohol dependence, psychiatric disorder, or health functioning. This may be because these objective measures do not take into account the individual experience of being in the job and may have been relatively crude measures of control and demands at work.

Sickness absence was measured in terms of short spells (1-7 days) and long spells (8 days or more). Previous research on sickness absence in the Whitehall II Study found that high levels of control, job demands and support at work were associated with lower rates of both short and long spells of absence. These results were stronger for men than for women. For this report, sickness absence, measured by computerised records from the civil service, was examined across two periods, 1985-1989 – a job secure period, and 1991-1993 – a job insecure period. Rates of short spells of sickness absence declined from the job secure to the job insecure period. This was particularly the case for lower employment grades. Rates of long spells of sickness absence remained relatively constant across the two periods.

High decision authority and high skill discretion were associated with lower risk of taking short spells of sickness absence. High social supports at work had a similar protective effect, being associated with a reduced risk of short spells of sickness absence in both the job secure and job insecure period. High levels of decision authority were associated with decreased risk of long spells of sickness absence, particularly in the job insecure period. High levels of social support at work were also associated with a reduced risk of long spells of sickness absence for both men and women. Effort-reward imbalance was associated with increased risk of long spells of sickness absence in women.

In general, the different aspects of work appear to have an additive influence on health. For example, the influence of job demands on health does not seem to be more important in those with low decision latitude. This would suggest that workplace interventions need to tackle each aspect of work environment rather than only concentrating on those situations where a combination of poor work aspects predominate.

The work environment appears to have an important influence on health. The importance of different aspects of work varies according to the health outcome. Work related factors are as important as non-work related factors on health. Our results suggest that intervention at level of work design, organisation, and management may reduce morbidity in working populations.

1. INTRODUCTION

1.1 OBJECTIVES AND METHODS OF THE STUDY

It has been recognised that the workplace is an effective site for intervention to improve health and reduce health inequalities as described in the Healthy Workplace Initiative (Department of Health, 1999). Whereas in the past there has been an emphasis on physical working conditions in relation to risks to health, more recently there has been a focus on psychosocial work characteristics and how these might impact on the health of office workers (Health & Safety Executive, 1998). Current health and safety guidance to employers includes advice on the causes and consequences of work-related stress (Health & Safety Executive, 1995; Health & Safety Executive, 1998). There is still debate about whether or not stress at work should be regulated under the Health and Safety at Work Act 1974 (Health & Safety Commission, 1999). These different concerns have led to a need to understand what aspects of work might damage health, what aspects of work might be protective to health and their relative contribution to different health outcomes.

There have been many recent changes in the nature of work in western industrial societies. Increasing deregulation, down-sizing of companies, increasing job insecurity, the ever present spectre of long term unemployment, the impact of technology, have changed the character of work and of the workplace (OECD, 1994). Many of these changes are potentially threatening to workers and might be expected to have an impact on health, especially mental health. Thus the changing nature of work brings more stressors which are risk factors for ill-health. On the other hand, these changes in work organisation may not all be negative and some may be beneficial to health.

This report describes the impact of work on three self reported outcomes (alcohol dependence, common mental disorder, and health functioning) as well as the association between work and sickness absence in the Whitehall II Study of middle aged British civil servants.

Alcohol dependence is a major public health issue in Western culture. Alcohol dependence is associated with both psychiatric complications, such as depression, as well as physical illness subsequent to high levels of alcohol intake. Alcohol dependence also has effects on social relationships but, most importantly for this report, it may influence performance at work and sickness absence from work.

Psychiatric disorder, largely depression and anxiety, is both frequent and widespread in the general population (Meltzer et al, 1994). It is associated with high levels of distress and impairment of everyday functioning (Wells et al, 1989; Johnson et al, 1992). Psychiatric disorder is distributed throughout both working and non-working populations. Thus it has a cost not only to individuals and families but also to the workplace and to the economy as a whole. Reduction or prevention of psychiatric disorder at work would relieve individual distress and improve productivity at work.

Measures of health functioning add an extra dimension to diagnostic descriptions of illness by measuring how an illness influences a person's everyday life. Thus measures of functioning described below give a better idea of the impact of illness on the individual, their social network,

and their workplace. Functioning may be broadly classified according to domains of health, such as physical, psychological, and social, in keeping with the World Health Organisation definition of health. Thus measures of functioning provide a useful intervening measure between workplace exposures and the expression of frank illness. In this way, they may be sensitive to the early signs of the effects of environmental factors which may be damaging to health in the long run.

Sickness absence causes substantial costs both in industry and Government. In the United Kingdom, 187 million working days are lost as sickness absence annually with a cost to industry estimated to be £12 billion (Confederation of British Industry, 1997). There are many influences on sickness absence levels. These include societal influences, organisational influences, and influences at the level of psychosocial work characteristics and the interaction of individual personal characteristics and working conditions. Identification of factors that reduce sickness absence could have important policy implications both for business and health. Sickness absence is a useful, additional indirect measure of illness, which has direct relevance to the workplace and its productivity.

Ill-health at work is thus a major problem with costs both to the individual, to organisations and to the country as a whole. The cost to employers of work related ill-health is estimated to be £1.6 billion (in 1995/6 prices) (Health & Safety Executive, 1999). It has been estimated that the total costs to society as a whole of work related illness (in 1995/6) including the pain, grief and suffering of individuals and their families, may amount to as much as £6.2-7.2 billion. An understanding of how the psychosocial work environment influences ill-health at work can help to try to reduce these costs both to the individual and the wider economy.

The Whitehall II Study provided the opportunity to study the influence of the psychosocial environment on health in a longitudinal cohort study of white collar employees.

The objectives of this research project were:

1. *To establish the relative contribution of work-related factors to the development of ill-health. This will include estimates of:*
 - a) *the percentage increased risk in morbidity attributable to work-related factors.*
 - b) *the significance of this risk relative to other non-work factors.*
2. *To establish which work-related factors contribute most to ill-health. These analyses will establish which job-related factors contribute to which disease outcomes and their relative importance in contributing to psychological and physical morbidity and sickness absence.*

1.2 WHITEHALL II STUDY

Whitehall II is a longitudinal study of 10,308 male and female civil servants aged 35-55 years on entry to the study. This study was set up to investigate the degree and causes of the social gradient in morbidity and mortality. A cohort of civil servants was established between 1985 and 1988 (Phase 1). All male and female civil servants, aged between 35 and 55 years, in 20 London based civil service departments were sent an introductory letter and screening questionnaire and had a screening examination including measurement of blood pressure, an electrocardiogram and a blood sample. There have been five waves of data collection. This report deals with the first three phases of data collection (see box below).

Information collected in first three phases:

Phase 1 N = 10308 (1985-88)	Phase 2 N = 8129 (1989)	Phase 3 N = 8548 (1991-93)
Questionnaire Demographic Socio-economic data Work characteristics Social supports Health behaviours Health status Mental health Examination Weight, height Blood pressure ECG Blood sample	Postal questionnaire Demographic Socio-economic data Work characteristics Social supports Health behaviours Health status Mental health	Questionnaire Demographic Socio-economic data Work characteristics Social supports Health behaviours Alcohol dependence (CAGE) Health status SF-36 (functioning) Mental health Examination Weight, height, waist hip ratio Blood pressure ECG Blood sample Cognitive function
Sickness Absence data from the Civil Service (1985-)		

The overall response rate was 73% (74% for men, 71% for women). The true response rates are likely to be higher, however, because around 4% of those on the list of employees had moved before the study and were not eligible for inclusion. Altogether 10,308 civil servants were examined – 6,895 men (67%) and 3,413 women (33%). The participation rates at Phase 2 and Phase 3 were 79% and 83% respectively; 7,372 subjects (72%) were participants at all three Phases; 9,302 participants (90%) took part at either Phase 2 or Phase 3.

Self-report questionnaires have been administered at all phases and collected information relating to personal characteristics, family, work environment, health behaviours, social supports and self-reported health. The Civil Service identifies 12 non-industrial grades on the basis of salary. There was a steep increment in salaries from an annual salary in 1987 of between £3061 and £5841 in the clerical and office support grades to between £18020 and £62100 in the unified grades 1 to 6. Besides the steep increment in salaries there were also marked differences in other socio-economic indicators (education, housing tenure, car ownership, and fathers' occupation) by grade of employment (Marmot et al, 1991). Further details of non-work related risk factors for ill-health are reported elsewhere (Marmot et al, 1991; Stansfeld et al, 1998; Stansfeld, Fuhrer & Shipley, 1998). There have been three clinical examinations of the cohort (Phases 1, 3, and 5) which have included measurement of height, blood pressure, body mass index, ECG abnormalities and glucose tolerance.

1.3 VALIDATION OF WORK MEASURES

We have self-report measures of the psychosocial work environment based on the Karasek/Theorell Job Content Instrument from 3 phases (Phases 1, 2, and 3) (Karasek & Theorell, 1990). In their initial formulation of the job strain model, worst health outcomes were predicted by a combination of high demands and low decision latitude. We have assessed the consistency of the work characteristics across the first three waves of data collection and have assessed the validity of the sub-scales using confirmatory factor analysis. On the basis of this work, we have defined the following three dimensions:

- Decision latitude
- Job demands
- Work social support

Decision latitude can be further subdivided into: decision authority and skill discretion. Work social support has three components: support from colleagues, support from superiors and information from superiors.

We have also considered a different model of work environment, the effort-reward imbalance model, which conceptualises psychosocial stress at work in terms of an imbalance between efforts and rewards (Siegrist, 1996). We have derived a measure of effort-reward imbalance using items included in the questionnaire at Phase 1 (Bosma et al, 1998). High efforts were defined in terms of competitiveness, work related overcommitment or hostility. Low rewards were defined by poor promotion prospects or a blocked career. We have classified people into one of three groups:

- Neither high efforts or low rewards
- One of high efforts or low rewards
- Both high effort and low rewards

Our other measure of work is based on external assessments of job control and job demands carried out by Civil Service personnel officers during Phase 1 (North et al, 1996). In 18 out of 20 departments in our study, 140 personnel managers assessed each job, independently of the holder of the post, for the level of control and work demands. In all, 5766 different jobs were rated covering 8838 participants.

Appendix A gives details of the work measures.

1.4 ANALYSES OF SELF-REPORT HEALTH OUTCOMES

Each of the work measures was divided into tertiles and these were labelled 'low', 'medium', or 'high', so that, for example, those participants within the top third of all scores on the job demand scale were labelled as having 'high job demands'.

We examined the association between the work characteristics measures and each of the self report health outcomes, after taking account of age and employment grade. In order to see whether any observed associations might be a result of pre-existing poor health, we then repeated analyses adjusting for baseline health. As associations may be due to reporting bias, we further adjusted for possible reporting bias by including a measure of negative affectivity. Finally, we identified and adjusted for other non-work predictors of each health outcome. Potential non-work risk factors included health behaviours (smoking, alcohol consumption, physical activity), marital

status, social supports outside work, material difficulties and stressful life events. In this report, we only present results for those non-work factors which were found to be associated with each health outcome.

One interpretation of the Karasek job strain model postulates that high job demands will have the greatest adverse effect on health in those with low decision latitude. In order to test this hypothesis, further analyses were run to test whether there were interactions between any of the work measures in their influence on health.

In addition, these analyses were repeated within employment grade to test whether there is a differential effect of work related factors by social class. We also investigated the possibility that the effect of work related factors may differ according to age although, of course, the Whitehall II study does not cover all working ages.

Logistic regression analyses were used to examine the association between work characteristics and each self report health outcome. Results are presented as odds ratios with their 95% confidence intervals. In the text, for ease of reading, we have sometimes used the term risk to describe these odds ratios.

2. WORK CHARACTERISTICS AND ALCOHOL DEPENDENCE

Alcohol dependence was measured by the CAGE questionnaire which was first included in the Whitehall II study at Phase 3. This brief four item scale is a well used and validated screening instrument for alcohol dependence developed originally for general practice settings. The CAGE has been used in a variety of clinical settings (Ewing, 1984) and in population surveys (Smart et al, 1991; Whichelow, 1993; Hedges, 1996). This short scale appears to correlate well with a clinical diagnosis of alcoholism (Mayfield, McLeod & Hall, 1974) and may even be a better predictor than biochemical indicators of alcohol dependence (Bernadt et al, 1972). A cut off of two or more positive responses to the CAGE questions has been found to identify problems in a number of studies (Ewing, 1984) and has been used here.

We first examined the prevalence of alcohol dependence by sex and social class measured by occupational grade. Table 1 shows the prevalence of alcohol dependence by employment grade for men and women. In women, there was a clear grade gradient with those in the highest two grades having the highest proportion of problem drinkers. This was not the case in men for whom there was little grade gradient.

Table 1
Percentages of men and women classified as alcohol dependent at Phase 3 by employment grade at Phase 1

Grade level *	Men (n=5714)	Women (n=2566)
UG1-UG6	11%	14%
UG7	10%	12%
SEO	12%	10%
HEO	11%	10%
EO	12%	7%
Clerical	12%	4%

* Civil Service Unified Grades 1-6 and 7 consist of senior management and equivalent grades; SEO, HEO and EO consist of executive and equivalent professional grades; Clerical represents the clerical and office support staff.

In data for England and Wales, mortality for cirrhosis in men shows a clear social class gradient (Drever & Whitehead, 1997). Similarly, alcohol dependence also shows a social class gradient with greater rates of disorder in lower social class groups. However, patterns of reported alcohol intake do not match this social gradient in illness. In national data in men, the prevalence of alcohol dependence increases with lower socioeconomic status but there is no socioeconomic pattern for high consumption (Drever & Whitehead, 1997). In women, the national data suggests there is increasing high alcohol consumption with increasing socioeconomic status. This social pattern of high alcohol consumption in women matches the pattern of alcohol dependence in Whitehall II. As the pattern in Whitehall II matches the national data for alcohol intake by sex, it seems likely that the Whitehall II findings are representative of a general pattern. This seems to indicate that women in higher employment grades may be more at risk for alcohol problems than women in lower grades.

Table 2 shows the association between each of the work measures and alcohol dependence, after taking account of age and employment grade. In men, effort-reward imbalance was associated with alcohol dependence with those classified as making high efforts and receiving low rewards having the highest risk of being alcohol dependent. This association was also seen for women although was not as marked. In addition, low decision latitude in women was associated with increased risk of alcohol dependence.

Table 2
Odds ratios (95% confidence interval) for alcohol dependence at Phase 3
by work characteristics at phase 1, adjusted for age and employment grade (Model 1)
and additionally adjusted for other predictors (Model 2) and adjusted for other
self report work characteristics (Model 3)

	Men			Women		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Decision latitude						
		(n=4809)			(n=1998)	
High	1	1	1	1	1	1
Medium	1.19 (1.0,1.5)	1.12 (0.9,1.4)	1.13 (0.9,1.4)	1.14 (0.7,1.8)	1.13 (0.7,1.9)	1.14 (0.7,1.9)
Low	1.20 (0.9,1.6)	1.03 (0.8,1.4)	1.02 (0.8,1.4)	1.46 (0.9,2.4)	1.43 (0.8,2.5)	1.45 (0.8,2.6)
Job demands						
Low	1	1	1	1	1	1
Medium	0.92 (0.7,1.2)	0.92 (0.7,1.2)	0.88 (0.7,1.1)	1.18 (0.8,1.8)	0.94 (0.6,1.5)	0.95 (0.6,1.5)
High	0.97 (0.7,1.3)	0.82 (0.6,1.1)	0.73 (0.6,1.0)	1.22 (0.7,2.0)	1.00 (0.6,1.7)	1.00 (0.6,1.8)
Work supports						
High	1	1	1	1	1	1
Medium	0.90 (0.7,1.1)	0.83 (0.7,1.0)	0.80 (0.6,1.0)	1.09 (0.7,1.7)	1.01 (0.6,1.6)	0.99 (0.6,1.6)
Low	1.03 (0.8,1.3)	0.86 (0.7,1.1)	0.81 (0.6,1.0)	1.07 (0.7,1.6)	0.95 (0.6,1.5)	0.88 (0.5,1.4)
High effort-Low Reward						
Neither	1	1	1	1	1	1
Either	1.69 (1.2,2.3)	1.44 (1.1,2.0)	1.56 (1.1,2.2)	1.15 (0.6,2.1)	1.11 (0.6,2.1)	1.11 (0.6,2.1)
Both	2.26 (1.6,3.1)	1.69 (1.2,2.4)	1.93 (1.4,2.7)	1.63 (0.9,3.0)	1.25 (0.6,2.4)	1.25 (0.6,2.5)

Model 2 includes adjustment for age, employment grade, GHQ, longstanding illness, smoking and alcohol consumption (Phase 1), physical activity, height, negative affectivity, negative aspects of social supports and network size.

The next step after demonstrating associations between work characteristics and alcohol dependence was to examine how these associations might be affected by adjustment for non-work related risk factors. (The associations of these non-work related factors and alcohol dependence are reported separately in Table 4.) As we did not include the CAGE questionnaire as a measure of alcohol dependence at baseline, we have taken units of alcohol consumption as an indicator of problem drinking at baseline. Other factors found to be associated with alcohol dependence were baseline health, smoking habits, physical activity, height, negative aspects of close relationships, social networks, and negative affectivity. Adjusting for these non-work factors accounted for

some of the association between effort-reward imbalance and alcohol dependence (Model 2, Table 2), but for men there was still a significant association between effort-reward imbalance and alcohol dependence. The association seen for low decision latitude in women, and alcohol dependence was hardly altered by adjustment for non-work factors.

Following this, we additionally adjusted each work characteristic for the other work characteristics, testing whether the effects for individual work characteristics could be explained by the other work characteristics. The results for each work measure remained the same after adjustment for the other three work characteristics (Model 3, Table 2). There was no evidence of interaction between any of the work measures. For example, the association seen for effort-reward imbalance was similar in people reporting high decision latitude and people reporting low decision latitude.

The estimated odds ratios for effort-reward imbalance were comparable or stronger than those for smoking, social supports, social networks or baseline psychiatric morbidity. The risk of alcohol dependence among men classified as having effort-reward imbalance was increased by approximately 70% when compared to men in the 'low effort, high reward' group (after taking account of other non-work factors). For women, the strongest association was seen for decision latitude with those reporting low control having a 40% higher risk of alcohol dependence when compared with those reporting high job control. In comparison, the risk of alcohol dependence for men (women) classified as having no social network outside their household is 30% (70%) higher than for those with good social networks.

There was no evidence that any of these associations differed by social class or within our available age range.

Table 3
Odds ratios (95% confidence interval) for alcohol dependence at Phase 3
by external work characteristics at phase 1, adjusted for age and employment grade
(Model 1) and additionally adjusted for other predictors (Model 2) and adjusted
for other externally assessed work characteristics (Model 3)

	Men			Women		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Externally assessed job control	(n=4261)			(n=1808)		
High	1	1	1	1	1	1
Medium	0.83 (0.7,1.0)	0.89 (0.7,1.1)	0.88 (0.7,1.1)	1.28 (0.8,2.1)	1.26 (0.8,2.1)	1.24 (0.7,2.1)
Low	0.86 (0.6,1.1)	0.91 (0.7,1.2)	0.88 (0.6,1.2)	0.87 (0.5,1.5)	1.07 (0.6,1.9)	1.00 (0.5,1.9)
Externally assessed job demands						
Low	1	1	1	1	1	1
Medium	0.92 (0.7,1.2)	0.85 (0.7,1.1)	0.87 (0.7,1.1)	1.03 (0.6,1.7)	0.96 (0.6,1.6)	0.91 (0.5,1.5)
High	0.98 (0.8,1.2)	0.85 (0.7,1.1)	0.83 (0.6,1.1)	0.97 (0.6,1.5)	0.84 (0.5,1.4)	0.83 (0.5,1.4)

Model 2 includes adjustment for age, employment grade, GHQ, longstanding illness, smoking and alcohol consumption (Phase 1), physical activity, height, negative affectivity, negative aspects of close relationships and network size.

There was no clear association between externally assessed work characteristics and alcohol dependence. It is possible that this measure, although an external assessment of work, and thus potentially free from the bias inherently present in self-report measures, did not capture the individual experience of work which may be the risk factor for alcohol dependence.

Table 4
Odds ratios (95% confidence interval) for alcohol dependence at Phase 3
by other risk factors at phase 1, adjusted for age and employment grade (Model 1)
and additionally adjusted for work characteristics and other risk factors (Model 2)

	Men (n=4809)		Women (n=1998)	
	Model 1	Model 2	Model 1	Model 2
GHQ caseness				
No	1	1	1	1
Yes	1.64 (1.3,2.0)	1.14 (0.9,1.4)	1.61 (1.1,2.3)	1.17 (0.8,1.8)
Longstanding illness				
No	1	1	1	1
Yes	1.84 (1.4,2.4)	1.43 (1.1,1.9)	1.51 (0.9,2.5)	1.23 (0.7,2.2)
Negative affectivity score	1.18 (1.13,1.22)	1.11 (1.06,1.17)	1.17 (1.10,1.24)	1.14 (1.05,1.23)
Smoking				
None	1	1	1	1
Ex smoker	2.13 (1.7,2.6)	1.62 (1.3,2.0)	2.43 (1.6,3.6)	1.80 (1.2,2.8)
1-10 a day	2.41 (1.6,3.6)	1.63 (1.1,2.5)	2.29 (1.4,4.6)	1.22 (0.6,2.6)
11-20 a day	1.65 (1.1,2.6)	0.97 (0.6,1.6)	2.19 (1.2,4.0)	1.69 (0.9,3.2)
21+ a day	3.05 (2.0,4.6)	1.38 (0.9,2.2)	3.26 (1.5,7.3)	1.42 (0.6,3.5)
Units of alcohol M(W)				
0	0.88 (0.6,1.4)	0.84 (0.5,1.3)	0.67 (0.3,1.4)	0.67 (0.3,1.4)
1-10 (1-7)	1	1	1	1
11-24 (8-14)	3.20 (2.5,4.2)	2.96 (2.3,3.9)	4.47 (2.7,7.3)	4.28 (2.6,7.1)
25-35 (15+)	6.98 (5.3,9.2)	6.73 (5.0,9.0)	9.44 (5.7,15.7)	8.77 (5.2,14.9)
36+	10.72 (8.0,14.4)	9.47 (6.9,12.9)	14.47 (5.0,42.0)	11.65 (3.7,36.6)
Physical activity				
Vigorous	1	1	1	1
Moderate	0.92 (0.7,1.2)	0.93 (0.7,1.2)	0.72 (0.4,1.2)	0.72 (0.4,1.3)
Mild/none	1.18 (0.9,1.5)	1.18 (0.9,1.5)	0.75 (0.4,1.3)	0.82 (0.5,1.4)
Negative aspects of close Relationships				
Low	1	1	1	1
Medium	1.30 (1.0,1.6)	1.17 (0.9,1.5)	1.02 (0.7,1.6)	0.86 (0.5,1.4)
High	1.76 (1.4,2.2)	1.32 (1.0,1.7)	1.26 (0.8,1.9)	0.87 (0.5,1.4)
Network size				
Low	1	1	1	1
Medium	0.77 (0.6,1.0)	0.71 (0.6,0.9)	0.80 (0.5,1.2)	0.69 (0.4,1.1)
High	0.85 (0.7,1.1)	0.75 (0.6,1.0)	0.68 (0.4,1.1)	0.59 (0.4,0.9)

The presence of baseline psychiatric disorder and baseline longstanding illness were both predictors of alcohol dependence at follow up after adjustment for age and employment grade (Table 4). Similarly, both smoking and alcohol intake at baseline were powerful predictors of alcohol dependence at follow up although lack of physical activity was not a predictor. Negative aspects of close relationships and network size, after adjustment for smoking, were also predictive of alcohol dependence at follow up. After adjustment for work characteristics and other risk factors the baseline risk associated with psychiatric disorder was no longer significant, although was maintained for longstanding illness in men but not in women. On the other hand, both smoking and baseline alcohol intake remain significant predictors after adjustment for work characteristics and other risk factors. Generally in men, but not in women, an effect of negative aspects of close relationships was still present for alcohol dependence at follow up after adjustment for work characteristics and other risk factors. Height, as a marker for early development, showed some association with alcohol dependence at follow up (results not shown).

3. WORK CHARACTERISTICS AND PSYCHIATRIC DISORDER

Psychiatric disorder was measured by the 30 item General Health Questionnaire (GHQ) which was completed by participants in the first three phases of the study. This well established instrument, measuring depression and anxiety was validated in this cohort against the Clinical Interview Schedule in a subsample (Stansfeld & Marmot, 1992). A threshold between 4 and 5 on the GHQ was chosen on the basis of receiver operating characteristic analysis. At this threshold the sensitivity of the GHQ was 72.7% and the specificity was 78% against the Clinical Interview Schedule. All those scoring 0-4 on the GHQ were considered not to be cases and those scoring 5+ were deemed to be cases.

Table 5 illustrates the percentage of GHQ cases by employment grade. Case rates are fairly typical of the general population being higher in women than men across 5 of the 6 employment grade groups. Psychiatric disorder is more common among lower employment grades in men and in fact the gradient may be steeper as previous analyses have suggested that lower grade employees tend to underreport psychiatric disorder on the GHQ (Stansfeld & Marmot, 1992). There is a strikingly different picture in women. If anything, there tends to be more psychiatric disorder in higher grades among women. In an initial analysis with Phase 1 data, adjustment for under-reporting identified in the validation study eliminated this gradient in women, and strengthened the social gradient in men. It is possible that these findings with a composite measure of psychiatric disorder obscure varying gradients for specific conditions. For instance, while depression shows a fairly clear gradient in men, anxiety if anything seems to be more prevalent in higher employment grades (Stansfeld et al, 1998). Overall, there seemed to be a social gradient in psychiatric disorder in men in this study with little gradient in women.

Table 5
Percentage GHQ caseness at Phase 3 by employment grade at Phase 1

Grade level	Men (n=5733)	Women (n=2576)
UG1-UG6	18%	39%
UG7	21%	33%
SEO	21%	28%
HEO	22%	28%
EO	20%	27%
Clerical	21%	21%

The odds ratios for GHQ caseness at Phase 3 by work characteristics at Phase 1 are shown in Table 6. High job demands were associated with a markedly increased risk of psychiatric disorder over the 5 year follow up period in both men and women. These risks were influenced very little by adjustment for other work characteristics and although there was a reduction in risk with further adjustment for baseline GHQ score, high job demands were significantly associated with between 30% and 50% increased risk of psychiatric disorder at follow up. Other studies also suggest that work demands may be important determinants of psychiatric disorder (Loscocco et al, 1991; Eshelinen et al, 1991; Fletcher & Jones, 1991) and this has also been found in a study of the National Health Service workforce where high work demands were associated with worse mental health (Wall et al, 1997). Conversely, work social supports had a protective effect on

future mental health and lack of, or low, work social support was associated with increased risk (Table 6). This risk was reduced by adjustment for other work characteristics, and further reduced by adjustment for baseline GHQ score, but low work social supports were still associated with a 30% to 40% increased risk of psychiatric disorder at follow up compared to high social supports.

Table 6
Odds ratios (95% confidence interval) for GHQ caseness at Phase 3 by
work characteristics at Phase 1

Work characteristics	Men			Women		
	Adjusted ^a (n=5646)	Adjusted ^b (n=5646)	Adjusted ^c (n=5646)	Adjusted ^a (n=2467)	Adjusted ^b (n=2467)	Adjusted ^c (n=2467)
Decision authority						
High	1	1	1	1	1	1
Medium	1.05 (0.9,1.2)	1.0 (0.8,1.2)	0.94 (0.8,1.1)	1.10 (0.8,1.4)	1.02 (0.7,1.3)	1.07 (0.8,1.4)
Low	1.25 (1.0,1.5)	1.06 (0.9,1.3)	0.95 (0.8,1.1)	1.37 (1.0,1.8)	1.14 (0.8,1.5)	1.10 (0.8,1.5)
Skill discretion						
High	1	1	1	1	1	1
Medium	1.16 (1.0,1.4)	1.19 (1.0,1.4)	1.12 (0.9,1.3)	1.19 (0.9,1.6)	1.24 (0.9,1.6)	1.17 (0.9,1.6)
Low	1.26 (1.0,1.5)	1.32 (1.1,1.6)	1.13 (0.9,1.4)	1.31 (1.0,1.7)	1.32 (0.9,1.8)	1.16 (0.8,1.6)
Job demands						
Low	1	1	1	1	1	1
Medium	1.25 (1.0,1.5)	1.26 (1.1,1.5)	1.17 (0.9,1.4)	1.21 (1.0,1.5)	1.18 (0.9,1.5)	1.13 (0.8,1.4)
High	1.75 (1.4,2.1)	1.77 (1.5,2.2)	1.38 (1.1,1.7)	2.02 (1.5,2.6)	1.97 (1.5,2.6)	1.52 (1.1,2.0)
Work social support						
High	1	1	1	1	1	1
Medium	1.20 (1.0,1.4)	1.15 (1.0,1.4)	1.05 (0.9,1.2)	1.38 (1.1,1.8)	1.32 (1.0,1.7)	1.25 (0.9,1.6)
Low	1.74 (1.5,2.0)	1.61 (1.4,1.9)	1.31 (1.1,1.6)	1.84 (1.5,2.3)	1.67 (1.3,2.1)	1.43 (1.1,1.8)

a Adjusted for age, employment grade.

b Adjusted for age, employment grade, and work characteristics.

c Adjusted for age, employment grade, work characteristics, and baseline GHQ score.

In the age and employment grade adjusted analysis, low decision authority was associated with increased risk of psychiatric disorder. However, this was no longer significant after adjustment for other work characteristics. Skill discretion, job demands and work social support each made an independent contribution to reducing the effect of decision authority. Analyses of work characteristics at Phase 1 predicting psychiatric disorder at Phase 2, and work characteristics at Phase 2 predicting psychiatric disorder at Phase 3 showed stronger effects of decision authority on psychiatric disorder even after adjusting for age, employment grade and baseline GHQ score (Stansfeld et al, 1999). It may be the case that decision authority has an effect on mental health only over a shorter period of time unlike the effects of job demands and social support which appear more robust over time. The effect of low skill discretion on risk of future psychiatric disorder was similar in magnitude to that of decision authority in the age and grade adjusted

analyses. However, unlike decision authority, the effect of low skill discretion remained after adjustment for other work characteristics, although it became much diminished after additional adjustment for baseline GHQ score.

The overall measure of work social support can be split into 3 sub-scales which distinguish support from different sources. These distinctions may be important for deciding on how preventive social support interventions should be designed. Lack of support from supervisors and lack of clarity and consistency of information from supervisors were associated with a higher risk of future psychiatric disorder than lack of support from colleagues, although low support in all these 3 groups was associated with increased risk of psychiatric disorder over the 5 year period (Table 7). High levels of social support at work have been found to be predictive of better mental health in employees in other studies (LaRocco et al, 1980; Karasek et al, 1982). There were similar findings in the results linking work characteristics at Phase 1 and psychiatric disorder at Phase 2, and work characteristics at Phase 2 and psychiatric disorder at Phase 3 (Stansfeld et al, 1999). These results suggest that support from supervisors is important for employees' mental health and should be highlighted in planning how work is organised and carried out. This will involve more than one approach. It is likely to include a need for management training as well as identification of structural elements in the organisation which may either form barriers or facilitate the transmission of support from supervisor to employee. This may be an issue especially at times of workplace reorganisation and change when traditional social networks may have broken down.

Table 7
Odds ratios (95% confidence interval) of GHQ caseness (Phase 3)
by each work social support component at Phase 1

	Men	Women
	Adjusted for age, employment grade (n=5620)	Adjusted for age, employment Grade (n=2454)
Support from colleagues		
High	1	1
Medium	1.14 (1.0,1.3)	1.29 (1.0,1.6)
Low	1.35 (1.1,1.6)	1.63 (1.3,2.1)
Support from supervisors		
High	1	1
Medium	1.25 (1.1,1.5)	1.32 (1.1,1.6)
Low	1.95 (1.6,2.3)	1.81 (1.4,2.3)
Information from supervisors		
High	1	1
Medium	1.35 (1.2,1.6)	1.45 (1.1,1.8)
Low	1.92 (1.6,2.3)	1.98 (1.5,2.6)

Effort-reward imbalance, characterised by high efforts and low rewards was associated with a more than two-fold risk of psychiatric disorder over the 5 year follow up period (Table 8). The risk was not greatly reduced by adjustment for the Karasek work characteristics (job demands, decision latitude, and work social support). This suggests that effort-reward imbalance is measuring a slightly different dimension of the psychosocial work environment which is a powerful risk factor for future psychiatric disorder.

Table 8
Odds ratios (95% confidence interval) for GHQ caseness (Phase 3)
by effort reward imbalance at Phase 1

	Men		Women	
	Adjusted ^a (n=5577)	Adjusted ^b	Adjusted ^a	Adjusted ^b (n=2392)
Effort-reward imbalance				
Neither	1	1	1	1
Either	1.86 (1.5,2.3)	1.70 (1.3,2.1)	1.50 (1.1,2.1)	1.34 (0.9,1.9)
Both	2.94 (2.3,3.7)	2.49 (1.9,3.2)	2.48 (1.7,3.6)	2.02 (1.4,2.9)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, and Karasek work characteristics.

Table 9
Odds ratios (95% confidence intervals) for GHQ caseness at Phase 3
by externally assessed work characteristics at Phase 1

	Men (n=4519)		Women (n=1854)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Externally assessed job control				
High	1	1	1	1
Medium	1.03 (0.9,1.2)	1.01 (0.8,1.2)	1.14 (0.9,1.5)	1.16 (0.8,1.6)
Low	0.93 (0.7,1.2)	0.83 (0.6,1.1)	0.92 (0.7,1.2)	0.95 (0.7,1.4)
Externally assessed job demands				
Low	1	1	1	1
Medium	1.03 (0.9,1.2)	1.03 (0.8,1.3)	0.82 (0.6,1.1)	0.73 (0.5,1.0)
High	0.99 (0.8,1.2)	0.97 (0.8,1.2)	0.90 (0.7,1.1)	0.85 (0.6,1.1)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, other external work characteristics, baseline GHQ score, marital status, type of accommodation, confiding/emotional social supports, negative aspects of close relationships, life events, material problems, physical activity, and negative affectivity.

External assessments of both job control and job demands had no significant effect on risk of future psychiatric disorder (Table 9). This was unchanged by adjustment for non-work predictors of psychiatric disorder, negative affectivity and baseline GHQ score. It seems likely that external assessments of job characteristics in this white collar cohort are not sufficient on their own to predict future risk of psychiatric disorder. It is necessary to include subjective perceptions of the psychosocial work environment to predict risk of future psychiatric disorder.

Table 10
Odds ratios (95% confidence intervals) for GHQ caseness (Phase 3) by work characteristics before and after adjustment for other risk factors

	Men (n=5110)		Women (n=2068)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Decision authority				
High	1	1	1	1
Medium	0.98 (0.8,1.2)	0.95 (0.8,1.1)	0.98 (0.7,1.3)	1.03 (0.8,1.4)
Low	1.06 (0.9,1.3)	1.01 (0.8,1.2)	1.17 (0.9,1.6)	1.20 (0.9,1.6)
Skill discretion				
High	1	1	1	1
Medium	1.17 (1.0,1.4)	0.99 (0.8,1.2)	1.20 (0.9,1.6)	1.18 (0.9,1.6)
Low	1.28 (1.0,1.6)	0.94 (0.7,1.2)	1.22 (0.9,1.7)	1.11 (0.8,1.6)
Job demands				
Low	1	1	1	1
Medium	1.12 (0.9,1.4)	1.05 (0.9,1.3)	1.05 (0.8,1.3)	0.96 (0.7,1.2)
High	1.39 (1.1,1.7)	1.20 (1.0,1.5)	1.63 (1.2,2.2)	1.45 (1.1,2.0)
Work social support				
High	1	1	1	1
Medium	1.08 (0.9,1.3)	0.98 (0.8,1.2)	1.27 (1.0,1.6)	1.13 (0.9,1.5)
Low	1.44 (1.2,1.7)	1.20 (1.0,1.4)	1.46 (1.1,1.9)	1.26 (1.0,1.6)
Effort-reward imbalance				
Neither	1	1	1	1
Either	1.77 (1.4,2.3)	1.50 (1.2,1.9)	1.23 (0.8,1.8)	1.12 (0.8,1.7)
Both	2.58 (2.0,3.3)	1.90 (1.5,2.5)	2.02 (1.4,3.0)	1.54 (1.0,2.3)

a Adjusted for age, employment grade and other work characteristics.

b Additionally adjusted for marital status, type of accommodation, confiding/emotional social supports, negative aspects of social supports, life events, material problems, physical activity and negative affectivity.

When all four work characteristics were included in the same model, the associations between each of the work characteristics and psychiatric morbidity were all slightly attenuated but the pattern of relationship described still remained (Table 10). There were no significant interactions between the work measures in their association with psychiatric disorder. There was no support for an interaction between high demands and low decision latitude and psychiatric morbidity as would be expected from the original Karasek Job Strain model.

Adjusting for non-work factors diminished the association between work characteristics and psychiatric morbidity, in particular work social supports and job demands in men. For both of these, the results were somewhat attenuated if non-work factors were taken into account but still remained statistically significant (Table 10). Further adjustment by externally assessed demands and control had no effect on the association.

These associations between work and psychiatric morbidity were consistent across the employment grades. However, among men, the association between job demands and psychiatric morbidity was stronger in the younger age group (aged 35 to 44 at baseline).

Non-work predictors of psychiatric morbidity included social supports with both low confiding/emotional support in men and high negative aspects of close relationships in men and women being associated with increased risk of psychiatric disorder at follow up. Health-related behaviours including alcohol intake and lack of physical activity were also related to increased risk of psychiatric disorder as were life events and material problems including financial difficulties, housing and neighbourhood problems (Table 11). Type of accommodation did not show significant effects in this population.

The estimated odds ratios for the work measures were comparable or stronger than those for the non-work measures. For example, the risk of having psychiatric disorder (as measured by the GHQ) was increased by around 20-26% for both men and women classified as receiving low support at work when compared with the group receiving high support at work. The corresponding figures for confiding/emotional support at home were 30% in men (low tertile of confiding/emotional support compared to high tertile).

Table 11
Odds ratios (95% confidence interval) for GHQ caseness at Phase 3
by other risk factors at Phase 1

	Men (n=5110)		Women (n=2068)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Marital status				
Married/cohabiting	1	1	1	1
Single	1.23 (1.0,1.5)	1.14 (0.9,1.4)	1.14 (0.9,1.5)	1.17 (0.9,1.5)
Widowed	1.22 (0.9,1.7)	0.79 (0.5,1.1)	1.28 (1.0,1.7)	0.94 (0.7,1.3)
Divorced/separated	2.05 (0.7,5.9)	1.51 (0.4,5.1)	0.97 (0.5,1.9)	0.90 (0.4,1.9)
Type of accommodation				
Owner occupied	1	1	1	1
Council rented	0.83 (0.5,1.3)	0.72 (0.4,1.2)	0.91 (0.6,1.3)	0.76 (0.5,1.1)
Private rented	0.89 (0.5,1.6)	0.92 (0.5,1.7)	1.13 (0.7,1.9)	0.96 (0.5,1.7)
Other	1.40 (0.9,2.2)	0.98 (0.6,1.7)	1.48 (0.7,3.2)	1.03 (0.4,2.5)
Confiding/emotional support				
High	1	1	1	1
Medium	1.29 (1.1,1.5)	1.10 (0.9,1.3)	1.24 (1.0,1.6)	1.09 (0.8,1.4)
Low	1.62 (1.4,1.9)	1.31 (1.1,1.6)	1.09 (0.8,1.4)	0.86 (0.6,1.2)
Negative aspects of close relationships				
Low	1	1	1	1
Medium	1.53 (1.3,1.8)	1.17 (1.0,1.4)	1.64 (1.3,2.1)	1.34 (1.0,1.8)
High	2.18 (1.8,2.6)	1.17 (1.0,1.4)	2.05 (1.6,2.6)	1.26 (0.9,1.7)
Life events in preceding year				
0	1	1	1	1
1	1.13 (0.9,1.4)	0.95 (0.8,1.2)	1.37 (1.0,1.8)	1.19 (0.9,1.6)
2+	2.11 (1.8,2.5)	1.36 (1.1,1.6)	2.29 (1.7,3.0)	1.54 (1.1,2.1)
Material problems				
Low	1	1	1	1
Medium	1.49 (1.2,1.8)	1.32 (1.1,1.6)	1.30 (1.0,1.7)	1.17 (0.9,1.5)
High	2.06 (1.7,2.4)	1.41 (1.2,1.7)	2.14 (1.7,2.7)	1.59 (1.2,2.1)
Physical activity				
Vigorous	1	1	1	1
Moderate	1.15 (1.0,1.4)	1.17 (1.0,1.4)	0.84 (0.6,1.2)	0.88 (0.6,1.2)
Mild/none	1.32 (1.1,1.6)	1.22 (1.0,1.5)	0.89 (0.6,1.2)	0.90 (0.6,1.3)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, work characteristics, baseline GHQ score, negative affectivity and other risk factors.

4. WORK CHARACTERISTICS AND HEALTH FUNCTIONING

The SF-36 General Health Survey (Stewart et al, 1998; Ware & Sherbourne, 1992) was included at Phase 3 and provides analysis of physical, psychological and social functioning which indicate how illness influences a person's everyday life. This scale was scored using the Medical Outcome's Study scoring system. Of the eight SF-36 scales, we concentrated on the three overall functioning domains that are conceptually distinct. In this working population, we omitted analysis of the two role limitation scales, both for clarity and also because the distribution of these scales was highly skewed with only a small proportion showing severe limitations. Three dimensions were used, which all had good internal consistencies: Physical functioning (10 items) Cronbach's Alpha = 0.86; General mental health (5 items) Cronbach's Alpha = 0.79; Social functioning (2 items) Cronbach's Alpha = 0.81. The scores on these three measures have been divided into sex-specific quartiles and the lowest quartile taken to indicate poor functioning. Our definition of functioning varied by sex because many of our health outcomes varied by sex. We thought it would be misleading to combine the functioning of the men and women, especially because the predominance of men in the sample means that the results would be weighted towards men at the expense of the women.

Table 12
Percent of poor physical, psychological, and social functioning at Phase 3 by sex and employment grade level at Phase 1; sex specific definition of poor functioning

Grade level	Number	Poor physical functioning	Poor general mental health	Poor social functioning
Men				
UG1-UG6	871	19.7	20.6	23.5
UG7	1404	16.8	24.9	25.7
SEO	1050	18.0	25.4	28.9
HEO	1257	19.5	28.4	30.7
EO	712	25.2	28.2	32.5
Clerical	444	30.5	34.5	40.5
Women				
UG1-UG6	97	14.3	28.9	35.1
UG7	223	12.5	27.8	25.9
SEO	172	16.3	26.2	25.6
HEO	386	18.9	28.0	29.8
EO	522	26.0	30.1	30.4
Clerical	1177	34.1	27.0	31.4

The distribution of poor physical, psychological and social functioning by employment grade is shown in Table 12. Poor physical functioning showed a clear social gradient in both men and women. There was a social gradient for poor general mental health in men but not in women. Similarly, for social functioning there was a social gradient for men but not women.

4.1 PHYSICAL FUNCTIONING

Physical functioning does not directly measure physical illness but does indicate impairment and accompanying physical illness. In that way, it may be directly relevant to impairment of performance at work. In age and grade adjusted analyses, low decision latitude, low work social support, high job demands, and effort-reward imbalance were related to increased risk of poor physical functioning at follow-up (Table 13). Low decision latitude was a predictor of poor physical functioning in men but not in women. On the other hand, the effect of job demands were stronger in women than in men. Further adjustments were then made for the other work characteristics as well as social supports, social network size, smoking, physical activity, and negative affectivity. The effect of low decision latitude in men was reduced after adjustment, but job demands still showed between 30-50% increased risk for future poor physical functioning after adjustment. The effects of work social supports were also reduced as were effort-reward imbalance in men. In general, the most powerful effects remaining were for demands in men and women and for effort-reward imbalance in women.

Table 13
Odds ratios (95% confidence intervals) of poor physical functioning at Phase 3
by work characteristics at Phase 1

	Men (n=5159)		Women (n=2167)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Decision latitude				
High	1	1	1	1
Medium	1.18 (1.0,1.4)	1.11 (0.9,1.3)	0.90 (0.7,1.2)	0.92 (0.7,1.3)
Low	1.35 (1.1,1.7)	1.19 (1.0,1.5)	0.97 (0.7,1.3)	0.92 (0.7,1.3)
Job demands				
Low	1	1	1	1
Medium	1.09 (0.9,1.3)	1.05 (0.9,1.3)	1.20 (1.0,1.5)	1.06 (0.8,1.4)
High	1.46 (1.2,1.8)	1.31 (1.1,1.6)	1.88 (1.4,2.5)	1.51 (1.1,2.1)
Work social supports				
High	1	1	1	1
Medium	1.17 (1.0,1.4)	1.04 (0.9,1.2)	1.01 (0.8,1.3)	0.97 (0.7,1.3)
Low	1.40 (1.2,1.7)	1.14 (0.9,1.4)	1.26 (1.0,1.6)	1.11 (0.9,1.4)
Effort-reward imbalance				
None	1	1	1	1
Either	1.19 (1.0,1.5)	1.03 (0.8,1.3)	1.31 (0.9,1.9)	1.17 (0.8,1.8)
Both	1.44 (1.2,1.8)	1.07 (0.8,1.4)	1.98 (1.3,2.9)	1.46 (1.0,2.2)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

4.2 GENERAL MENTAL HEALTH

The relationship between the work measures and poor general mental health functioning is reported in Table 14. Low decision latitude, low work social support, high work demands, and effort-reward imbalance were associated with poor mental health in men. The effects were generally stronger than for physical functioning.

The effects of decision latitude as a predictor of poor general mental health remained after further adjustment for other work characteristics, social supports, social network size, smoking, physical activity, and negative affectivity. General mental health is more an index of well-being than distress. This difference in emphasis may account for why the results in relation to decision latitude are stronger for general mental health than for psychiatric disorder measured by the GHQ. The effects of high job demands and low social supports were reduced after further adjustment for the other work characteristics, social supports, social network size, smoking, physical activity, and negative affectivity. This was especially the case in men. The effects of effort-reward imbalance were also reduced after adjustment but continued to be associated with 55-60% increased risk for poor general mental health at follow up.

Table 14
Odds ratios (95% confidence intervals) of poor general mental health at Phase 3
by work characteristics at Phase 1

	Men (n=4997)		Women (n=2079)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Decision latitude				
High	1	1	1	1
Medium	1.69 (1.4,2.0)	1.44 (1.2,1.7)	1.40 (1.0,1.9)	1.34 (1.0,1.8)
Low	2.19 (1.8,2.7)	1.53 (1.2,1.9)	1.72 (1.3,2.3)	1.39 (1.0,1.9)
Job demands				
Low	1	1	1	1
Medium	1.23 (1.0,1.5)	1.07 (0.9,1.3)	1.12 (0.9,1.4)	0.95 (0.7,1.2)
High	1.39 (1.2,1.7)	1.12 (0.9,1.3)	1.68 (1.3,2.2)	1.22 (0.9,1.7)
Work social supports				
High	1	1	1	1
Medium	1.23 (1.0,1.4)	0.95 (0.8,1.1)	1.31 (1.0,1.7)	1.14 (0.9,1.5)
Low	1.71 (1.5,2.0)	1.08 (0.9,1.3)	1.76 (1.4,2.2)	1.22 (0.9,1.6)
Effort-reward imbalance				
None	1	1	1	1
Either	1.62 (1.3,2.0)	1.32 (1.1,1.6)	1.21 (0.8,1.7)	1.08 (0.7,1.6)
Both	2.39 (1.9,3.0)	1.56 (1.2,2.0)	2.26 (1.6,3.3)	1.59 (1.1,2.4)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

4.3 SOCIAL FUNCTIONING

Table 15 shows the relationship between the work measures and poor social functioning.

In men, low decision latitude, high job demands, low work social support and effort-reward imbalance were related to increased risk of poor social functioning at follow up. The results were the same for women although decision latitude did not show a significant effect. After further adjustment for other work characteristics, social supports, social network size, smoking, physical activity, and negative affectivity, the risks of poor social functioning at follow up were remarkably reduced. However, high job demands in women were still associated with 75% increased risk, effort-reward imbalance with 45% increased risk in men, 39% increased risk in women, and low work social support with 14% increased risk in men (Table 15).

Table 15
Odds ratios (95% confidence intervals) of poor social functioning at Phase 3
by work characteristics at Phase 1

	Men (n=5000)		Women (n=2080)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Decision latitude				
High	1	1	1	1
Medium	1.23 (1.1,1.4)	1.07 (0.9,1.3)	0.98 (0.7,1.3)	0.92 (0.7,1.2)
Low	1.38 (1.1,1.7)	1.05 (0.9,1.3)	1.25 (0.9,1.7)	1.13 (0.9,1.5)
Job demands				
Low	1	1	1	1
Medium	1.06 (0.9,1.2)	0.92 (0.8,1.1)	1.34 (1.1,1.7)	1.20 (0.9,1.5)
High	1.30 (1.1,1.5)	0.93 (0.8,1.1)	2.18 (1.7,2.9)	1.75 (1.3,2.4)
Work social support				
High	1	1	1	1
Medium	1.28 (1.1,1.5)	1.09 (0.9,1.3)	1.03 (0.8,1.3)	0.91 (0.7,1.2)
Low	1.58 (1.4,1.8)	1.14 (1.0,1.3)	1.39 (1.1,1.7)	1.04 (0.8,1.3)
Effort-reward imbalance				
None	1	1	1	1
Either	1.64 (1.3,2.0)	1.33 (1.1,1.6)	1.22 (0.9,1.7)	1.04 (0.7,1.5)
Both	2.22 (1.8,2.7)	1.45 (1.2,1.8)	2.00 (1.4,2.9)	1.39 (0.9,2.0)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

4.4 WORK CHARACTERISTICS AND FUNCTIONING – FURTHER ADJUSTMENTS

The results for each work measure were slightly attenuated after adjustment for the other work measures. There were no significant interactions between the work measures in their relationship with health functioning.

Other non-work factors found to be significant predictors of functioning included social supports, social networks, type A behaviour, smoking, physical activity, and body mass index. After adjusting for these variables, effort reward imbalance remained associated with all three measures of functioning in both men and women as did job demands in women.

The risk of poor physical functioning in men classified as having high demands was 1.3 times higher than for men with low demands. In comparison, the risk of poor physical functioning in men smoking more than 20 cigarettes a day was twice as high as in non-smokers. For women, the risk of poor physical functioning was doubled in the 'high effort, low reward' group; in comparison, for women smoking more than 20 a day, the risk was increased by 10%.

The associations between each work measure and health functioning did not differ according to social class. In women, there was some evidence that relationships differed according to age group. The association between decision latitude and poor physical functioning was stronger in younger women (aged 35-44 at baseline) than in older women (aged 45-55 at baseline). This was also true for work social supports. However, the reverse pattern was observed for job demands.

4.5 EXTERNALLY ASSESSED WORK CHARACTERISTICS AND FUNCTIONING

Externally assessed work characteristics at Phase 1 were generally not associated with poor physical functioning at follow up. However, low job control in women was associated with 37% increased risk of poor physical functioning, although this became insignificant after adjustment for other work characteristics, social supports, social network size, smoking, and physical activity (Table 16). High externally assessed job demands were associated, unexpectedly, with decreased risk of poor general mental health at follow up. This was only in men, but remained after further adjustment for other work characteristics, social supports, social network size, smoking, and physical activity (Table 17). There was a similar finding for high externally assessed job demands in relation to prediction of poor social functioning which again remained after adjustment for other work characteristics, social supports, social network size, smoking, and physical activity (Table 18). Low externally assessed job control in women was associated with 35% increased risk of poor social functioning at follow up and this was maintained after further adjustment (Table 18).

Table 16
Odds ratios (95% confidence intervals) of poor physical functioning at Phase 3
By externally assessed work characteristics at Phase 1

	Men (n=4556)		Women (n=1959)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Externally assessed job control				
High	1	1	1	1
Medium	0.88 (0.7,1.0)	0.93 (0.8,1.1)	1.09 (0.8,1.5)	1.00 (0.7,1.4)
Low	1.01 (0.8,1.3)	0.99 (0.8,1.3)	1.37 (1.0,1.9)	1.30 (0.9,1.8)
Externally assessed job demands				
Low	1	1	1	1
Medium	0.82 (0.7,1.0)	0.81 (0.7,1.0)	1.04 (0.8,1.3)	1.10 (0.8,1.4)
High	0.95 (0.8,1.1)	0.91 (0.8,1.1)	0.87 (0.7,1.1)	0.99 (0.7,1.3)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking and physical activity.

Table 17
Odds ratios (95% confidence intervals) of poor general mental health at Phase 3
By externally assessed work characteristics at Phase 1

	Men (n=4414)		Women (n=1881)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Externally assessed job control				
High	1	1	1	1
Medium	0.92 (0.8,1.1)	0.86 (0.7,1.0)	1.11 (0.8,1.5)	1.10 (0.8,1.5)
Low	0.93 (0.8,1.1)	0.81 (0.7,1.0)	1.03 (0.8,1.4)	1.02 (0.7,1.4)
Externally assessed job demands				
Low	1	1	1	1
Medium	0.97 (0.8,1.1)	0.98 (0.8,1.2)	0.83 (0.6,1.1)	0.82 (0.6,1.1)
High	0.80 (0.7,0.9)	0.75 (0.6,0.9)	0.89 (0.7,1.1)	0.88 (0.7,1.2)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking and physical activity.

Table 18
Odds ratios (95% confidence intervals) of poor social functioning at Phase 3
By externally assessed work characteristics at Phase 1

	Men (n=4417)		Women (n=1882)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Externally assessed job control				
High	1	1	1	1
Medium	0.98 (0.8,1.1)	0.94 (0.8,1.1)	1.22 (0.9,1.6)	1.20 (0.9,1.6)
Low	0.88 (0.7,1.1)	0.77 (0.6,1.0)	1.35 (1.0,1.8)	1.37 (1.0,1.9)
Externally assessed job demands				
Low	1	1	1	1
Medium	0.87 (0.7,1.0)	0.86 (0.7,1.0)	0.87 (0.7,1.1)	0.89 (0.7,1.2)
High	0.78 (0.7,0.9)	0.73 (0.6,0.9)	0.88 (0.7,1.1)	0.95 (0.7,1.2)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, other work characteristics, social supports, social network size, smoking and physical activity.

4.6 NON-WORK RELATED RISK FACTORS AND PHYSICAL FUNCTIONING

Confiding/emotional support from the closest person in men was predictive of poor physical functioning at follow up. In men in this cohort, this usually meant support from their spouse. An effect of confiding/emotional support from the closest person was not found for women. This effect was reduced after further adjustment for work characteristics, social network size, smoking, physical activity, and negative affectivity, but still remained significantly associated with increased risk (Table 19). Conversely in women, low practical support was associated with decreased risk of poor physical health at follow up which remained after further adjustment. As this is a measure of perceived support received over the previous 12 months, it seems likely that requiring low practical support may be an indirect indicator of good health. Negative aspects of close relationships in both men and women were associated with increased risk of poor physical health at follow up which also remained after further adjustment (Table 19). Two health-related behaviours, smoking and lack of physical activity, were both associated with increased risk which again remained statistically significant after further adjustment for work characteristics, social supports, social network size, and negative affectivity.

Table 19
Odds ratios (95% confidence intervals) of poor physical functioning at Phase 3
By non-work risk factors at Phase 1

	Men (n=5159)		Women (n=2167)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Confiding/emotional support				
High	1	1	1	1
Medium	1.15 (1.0,1.4)	1.05 (0.9,1.3)	1.03 (0.8,1.3)	1.02 (0.8,1.3)
Low	1.34 (1.1,1.6)	1.18 (1.0,1.5)	1.01 (0.8,1.3)	1.01 (0.8,1.4)
Practical support				
High	1	1	1	1
Medium	1.00 (0.8,1.2)	0.97 (0.8,1.2)	0.63 (0.5,0.8)	0.62 (0.5,0.8)
Low	1.10 (0.9,1.3)	0.98 (0.8,1.2)	0.62 (0.5,0.8)	0.63 (0.5,0.8)
Negative aspects of close relationships				
Low	1	1	1	1
Medium	1.21 (1.0,1.4)	1.10 (0.9,1.3)	1.56 (1.2,2.0)	1.56 (1.2,2.0)
High	1.52 (1.3,1.8)	1.20 (1.0,1.4)	1.93 (1.5,2.5)	1.67 (1.3,2.2)
Network size				
Low	1	1	1	1
Medium	0.94 (0.8,1.1)	1.01 (0.9,1.2)	0.93 (0.7,1.2)	0.98 (0.8,1.3)
High	0.80 (0.7,1.0)	0.94 (0.8,1.1)	0.98 (0.8,1.3)	1.17 (0.9,1.5)
Smoking habits				
Non smoker	1	1	1	1
Ex smoker	1.36 (1.2,1.6)	1.36 (1.2,1.6)	0.98 (0.8,1.2)	0.96 (0.7,1.2)
1-10 a day	1.68 (1.2,2.3)	1.60 (1.2,2.2)	0.91 (0.6,1.4)	0.80 (0.5,1.2)
11-20 a day	1.92 (1.4,2.6)	1.74 (1.3,2.4)	0.97 (0.7,1.4)	0.96 (0.7,1.4)
21+ a day	2.68 (1.9,3.7)	1.95 (1.4,2.8)	1.34 (0.8,2.2)	1.05 (0.6,1.8)
Physical activity				
Vigorous	1	1	1	1
Moderate	1.59 (1.3,1.9)	1.54 (1.3,1.9)	1.61 (1.1,2.4)	1.63 (1.1,2.5)
Mild/none	1.99 (1.6,2.5)	1.85 (1.5,2.3)	2.32 (1.6,3.5)	2.37 (1.6,3.6)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

4.7 NON-WORK RELATED RISK FACTORS, GENERAL MENTAL HEALTH AND SOCIAL FUNCTIONING

Low confiding/emotional support in men from the nominated closest person was associated with increased risk of poor general mental health at follow up. To a lesser extent, this was also present in women, although it became non-significant after adjustment for other risk factors. The association between low levels of practical support and general mental health in women was similar to that for physical functioning. As for poor physical functioning, negative aspects of close relationships were related to poor general mental health at follow up and the risk remained significant after further adjustment. Both smoking and lack of physical activity were related to poor general mental health, although these effects generally became non-significant after further adjustment for work characteristics, social supports, social network size, physical activity, and negative affectivity (Table 20).

Negative aspects of close relationships were also predictors of poor social functioning at follow up (Table 21). Otherwise, after adjustment for work characteristics, social supports, social network size, smoking, physical activity, and negative affectivity, few of the other factors were significant predictors of poor social functioning.

Table 20
Odds ratios (95% confidence intervals) of poor general mental health at Phase 3
By non-work risk factors at Phase 1

	Men (n=4997)		Women (n=2079)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Confiding/emotional support				
High	1	1	1	1
Medium	1.40 (1.2,1.7)	1.16 (1.0,1.4)	1.25 (1.0,1.6)	1.10 (0.9,1.4)
Low	2.06 (1.7,2.4)	1.56 (1.3,1.9)	1.27 (1.0,1.6)	1.12 (0.8,1.5)
Practical support				
High	1	1	1	1
Medium	1.14 (1.0,1.3)	0.98 (0.8,1.2)	0.80 (0.6,1.0)	0.73 (0.6,0.9)
Low	1.38 (1.2,1.6)	0.98 (0.8,1.2)	0.85 (0.7,1.1)	0.76 (0.6,1.0)
Negative aspects of close relationships				
Low	1	1	1	1
Medium	1.48 (1.3,1.7)	1.19 (1.0,1.4)	2.03 (1.6,2.6)	1.76 (1.4,2.3)
High	2.16 (1.8,2.5)	1.16 (1.0,1.4)	2.39 (1.9,3.0)	1.54 (1.2,2.0)
Network size				
Low	1	1	1	1
Medium	0.83 (0.7,0.9)	0.95 (0.8,1.1)	0.85 (0.7,1.1)	1.00 (0.8,1.3)
High	0.63 (0.5,0.7)	0.79 (0.7,0.9)	0.66 (0.5,0.9)	0.84 (0.6,1.1)
Smoking habits				
Non smoker	1	1	1	1
Ex smoker	1.11 (1.0,1.3)	1.08 (0.9,1.3)	1.15 (0.9,1.5)	1.12 (0.9,1.4)
1-10 a day	1.36 (1.0,1.8)	1.27 (0.9,1.8)	1.64 (1.1,2.4)	1.49 (1.0,2.3)
11-20 a day	1.32 (1.0,1.8)	1.23 (0.9,1.7)	1.02 (0.7,1.5)	1.11 (0.8,1.6)
21+ a day	1.87 (1.3,2.6)	1.36 (0.9,2.0)	0.96 (0.6,1.7)	0.80 (0.4,1.5)
Physical activity				
Vigorous	1	1	1	1
Moderate	1.35 (1.2,1.6)	1.30 (1.1,1.5)	1.15 (0.8,1.6)	1.14 (0.8,1.6)
Mild/none	1.57 (1.3,1.9)	1.36 (1.1,1.7)	1.36 (1.0,1.9)	1.30 (0.9,1.9)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

Table 21
Odds ratios (95% confidence intervals) of poor social functioning at Phase 3
By non-work risk factors at Phase 1

	Men (n=5000)		Women (n=2080)	
	Adjusted ^a	Adjusted ^b	Adjusted ^a	Adjusted ^b
Confiding/emotional support				
High	1	1	1	1
Medium	1.21 (1.0,1.4)	0.98 (0.8,1.2)	1.10 (0.9,1.4)	1.01 (0.8,1.3)
Low	1.31 (1.1,1.5)	1.00 (0.8,1.2)	1.27 (1.0,1.6)	1.24 (0.9,1.6)
Practical support				
High	1	1	1	1
Medium	1.04 (0.9,1.2)	0.97 (0.8,1.1)	0.95 (0.7,1.2)	0.93 (0.7,1.2)
Low	1.05 (0.9,1.2)	0.97 (0.8,1.2)	0.86 (0.7,1.1)	0.79 (0.6,1.0)
Negative aspects of close relationships				
Low	1	1	1	1
Medium	1.76 (1.5,2.1)	1.50 (1.3,1.8)	1.47 (1.2,1.9)	1.34 (1.0,1.7)
High	2.68 (2.3,3.1)	1.81 (1.5,2.1)	1.81 (1.4,2.3)	1.32 (1.0,1.7)
Network size				
Low	1	1	1	1
Medium	1.01 (0.9,1.2)	1.10 (0.9,1.3)	1.04 (0.8,1.3)	1.19 (0.9,1.5)
High	0.99 (0.8,1.2)	1.18 (1.0,1.4)	1.00 (0.8,1.3)	1.25 (1.0,1.6)
Smoking habits				
Non smoker	1	1	1	1
Ex smoker	1.17 (1.0,1.3)	1.14 (1.0,1.3)	1.23 (1.0,1.5)	1.22 (1.0,1.5)
1-10 a day	1.08 (0.8,1.5)	1.03 (0.7,1.4)	1.20 (0.8,1.8)	1.10 (0.7,1.6)
11-20 a day	1.04 (0.8,1.4)	0.91 (0.7,1.3)	0.98 (0.7,1.4)	0.99 (0.7,1.4)
21+ a day	1.69 (1.2,2.3)	1.27 (0.9,1.8)	1.29 (0.8,2.2)	1.11 (0.6,1.9)
Physical activity				
Vigorous	1	1	1	1
Moderate	1.14 (1.0,1.3)	1.15 (1.0,1.3)	0.98 (0.7,1.4)	1.00 (0.7,1.4)
Mild/none	1.19 (1.0,1.4)	1.12 (0.9,1.4)	1.14 (0.8,1.6)	1.13 (0.8,1.6)

a Adjusted for age and employment grade.

b Adjusted for age, employment grade, physical illness, GHQ, work characteristics, social supports, social network size, smoking, physical activity and negative affectivity.

5. SICKNESS ABSENCE

Sickness absence is a complex phenomenon, an indicator of disability that involves illness behaviour as well as illness. It has been argued in the management literature that sickness absence has more to do with absence than with sickness and can be best explained by concepts such as the absence culture, influenced by shared attitudes to work, employee satisfaction with jobs or non-work responsibilities and interests. Medical literature, on the other hand, rather than seeing absence as a problem in its own right, tends to see absence as a marker for ill-health. In the Whitehall II Study, we have studied sickness absence since its inception. We have studied short and long spells of absence, where short spells are seven calendar days or less, for which civil servants were able to complete their own certificate and explain the absence, and long spells (absences longer than seven calendar days) for which a medical certificate was required. It may be the case that short spells of absence, one to two days, are less likely to reflect underlying ill health than longer spells. In fact, we have found that there was a strong association between ill health and sickness absence, particularly for longer spells, but also to a lesser extent for short spells, and have proposed that sickness absence be used as an integrated measure of physical, psychological and social functioning in studies of working populations (Marmot et al, 1995).

5.1 SICKNESS ABSENCE RECORDS

Ninety three percent (9,564) of participants gave consent to monitor their sickness absence and, of these, 96% (9,179) were linked with their records. Computerised sickness absence records to the end of December 1993 were obtained annually from the civil service pay centres. Rates of sickness absence are expressed per 100 person-years. Age adjusted rates were calculated by direct standardisation using the total sample as the standard. Adjusted rate ratios and their 95% confidence intervals were calculated using Poisson regression (North et al 1993).

5.2 PREVIOUS RESEARCH ON SICKNESS ABSENCE IN WHITEHALL II

We found striking relationships between baseline work characteristics and sickness absence measured prospectively over the subsequent five year period between 1985 and 1990. Civil servants with high levels of control, job demands and support at work had lower age adjusted rates of both short and long spells of sickness absence (North et al, 1996). These results were stronger for men than for women. Additional confirmation of these results was provided by external assessments of control and demands in these posts, where high levels of demand and control were also associated with lower rates of short spells and long spells of absence (North et al, 1996).

The associations between job demands and sickness absence are complex. High levels of job demands would not be expected to be related to lower levels of sickness absence according to the Karasek model. However, in this sample, high levels of demands were associated with high employment grade and, after adjustment for employment grade, high levels of demands were no longer associated with lower levels of sickness absence. After adjustment for employment grade, high levels of demands, in women, but not in men, then became associated with increased risk of long spells of sickness absence.

Analyses within employment grades demonstrate that, in the higher employment grades, high demands were associated with lower rates of absence. By contrast, in the lower employment grades, high demands were associated with higher rates of absence (North et al, 1996). This may be because job demands have different meanings at different levels in the civil service. In the higher employment grades, high job demands may be an integral part of a job that is challenging but also fulfilling. In the lower employment grades, however, jobs which have high demands may not have the latitude, or provide the opportunities to deal with the demands, and may also not have the compensating positive qualities that allow people to put up with the demands. More simply, the type of demands experienced by lower grade employees may be worse for health than those experienced by higher grade employees.

The work climate has been in a state of flux during the 13 year period of the Whitehall II Study. There have been considerable changes in the size of the workforce and the organisation of work in the public and private sector. These changes may also have changed the psychosocial work environment and this may be expected to alter rates of sickness absence. In these analyses, we have compared rates of sickness absence and the relationship between work characteristics and sickness absence between a job secure period, 1985-1989, and a job insecure period, 1991-1993.

5.3 SICKNESS ABSENCE BY EMPLOYMENT GRADE

Among the most striking of the early results from the Whitehall II Study was the demonstration of large gradients in sickness absence by employment grade (North et al, 1993). The age adjusted rates of short spells of sickness absence per 100 person years by the six employment grades for the job secure and job insecure periods are shown in Table 22. In men, rates of short spells of sickness absence increased in the top two employment grades, but decreased in the lower grades between the two periods. This was also largely the same for women. A similar pattern was also found among those civil servants who did not change employment grade between Phase 1 and Phase 3. Except for those in the highest employment grade, those who had not been promoted between Phase 1 and Phase 3 tended to have higher rates of short spells of absence in each grade than those who had been promoted. The employment grade gradient in sickness absence in men and women expressed in terms of the ratio of short spells of absence in each grade in relation to the highest grade declined between the job secure and the job insecure periods (Table 22). This was also the case with civil servants whose employment grade did not change between Phase 1 and Phase 3.

In contrast to short spells, rates of long spells of absence remained fairly stable in men across the two periods, increasing slightly in grades 2 to 4 (Table 23). The rate ratio of spells of absence in each of the grades relative to the highest grade also remained largely unchanged across the two periods. On both occasions, those in the lowest employment grade had nearly five times the rates of long spells of absence of those in the highest employment grade. The pattern of rates of long spells in women is a little less consistent across the two time periods, but the rate ratios are very much the same and women in the lowest grades had between four and five times the risk of taking long spells of sickness absence than those in the highest grades.

Table 22
Rates of short spells per 100 person years and rate ratios by employment grade
(age-adjusted)

Men				
Phase 1 grade (n =3772)	1985-1989		1991-1993	
	Rate	Rate ratios	Rate	Rate ratios
UG1-UG6	38.5	1	43.5	1
UG7	74.6	1.9	77.4	1.8
SEO	88.7	2.3	81.4	1.9
HEO	120.5	3.1	111.2	2.6
EO	203.7	5.3	177.4	4.1
Clerical	269.3	7.0	232.3	5.3
As above but for those with stable grade (n =2666)				
UG1-UG6	38.4	1	43.3	1
UG7	86.7	2.3	91.0	2.1
SEO	97.4	2.5	89.6	2.1
HEO	129.2	3.4	121.8	2.8
EO	211.3	5.5	187.1	4.3
Clerical	277.3	7.2	242.1	5.6
Women				
Phase 1 Grade (n = 1497)	1985-1989		1991-1993	
	Rate	Rate ratios	Rate	Rate ratios
UG1-UG6	68.9	1	75.4	1
UG7	84.3	1.2	90.3	1.2
SEO	152.3	2.2	115.2	1.5
HEO	164.8	2.4	165.6	2.2
EO	189.3	2.7	181.1	2.4
Clerical	220.4	3.2	212.5	2.8
As above but for those with stable grade (n =1146)				
UG1-UG6	53.4	1	57.3	1
UG7	99.8	1.9	108.6	1.9
SEO	172.3	3.2	132.6	2.3
HEO	185.8	3.5	180.0	3.1
EO	190.8	3.6	186.5	3.3
Clerical	229.0	4.3	216.6	3.8

Table 23
Rates of long spells per 100 person years and rate ratios by employment grade
(age-adjusted)

Men				
Phase 1 grade (n = 3772)	1985-1989		1991-1993	
	Rate	Rate ratios	Rate	Rate ratios
UG1-UG6	5.6	1	5.3	1
UG7	7.0	1.2	7.9	1.5
SEO	7.4	1.3	8.7	1.6
HEO	11.8	2.1	12.4	2.3
EO	15.6	2.8	15.5	2.9
Clerical	26.1	4.7	25.0	4.7
As above, but for those with stable grade (n =2666)				
UG1-UG6	5.5	1	5.4	1
UG7	8.0	1.4	9.0	1.7
SEO	8.0	1.4	8.9	1.6
HEO	13.0	2.4	13.5	2.5
EO	16.2	2.9	15.7	2.9
Clerical	26.9	4.9	26.2	4.9
Women				
Phase 1 Grade (n =1497)	1985-1989		1991-1993	
	Rate	Rate ratios	Rate	Rate ratios
UG1-UG6	7.6	1	7.6	1
UG7	9.6	1.3	9.8	1.3
SEO	10.4	1.4	12.1	1.6
HEO	17.9	2.4	17.5	2.3
EO	24.9	3.3	23.9	3.1
Clerical	31.7	4.2	33.2	4.4
As above, but for those with stable grade (n = 1146)				
UG1-UG6	7.5	1	6.9	1
UG7	9.8	1.3	11.4	1.7
SEO	11.6	1.5	14.3	2.1
HEO	17.2	2.3	19.7	2.9
EO	25.6	3.4	25.7	3.7
Clerical	34.0	4.5	35.6	5.2

5.4 WORK CHARACTERISTICS AND SICKNESS ABSENCE

The association of decision authority, skill discretion, job demands, and social support at work with short spells of sickness absence expressed as rate ratios, dividing work characteristics into tertiles is shown in Table 24. High decision authority is associated with a lower risk of taking short spells of sickness absence, both during the job secure and job insecure phases of the study. If anything, the effect of decision authority was slightly stronger during the latter job insecure period. High skill discretion was also associated with a lower risk of taking short spells of sickness absence, which again, as for decision authority, seem to have a stronger effect during the latter job insecure period. Job demands seem to have little effect on risk of sickness absence in this sample, although in the job insecure period high job demands were associated with significantly increased risk of short spells of absence in women (Table 24). High social supports at work had a protective effect, being associated with reduced risk of short spells of sickness absence in both the job secure and job insecure period. There was a significant interaction between decision authority and job demands in men. There was little association between job demands and short spells of absence among those reporting low decision authority (Rate ratio = 1.07). However, among those men reporting high decision authority, high job demands were associated with a lower risk of short spells of sickness absence (Rate ratio = 0.80). Effort-reward imbalance, measured at baseline, was not significantly related to increased risk of short spells of absence in either men or women, adjusting for age and employment grade.

Table 24
Rate ratios* (95% confidence intervals) of short spells (£ 7 days) of sickness absence
for tertiles of work characteristics

	Men (n =3770)		Women (n = 1497)	
	1985-89	1991-93	1985-89	1991-93
Decision authority				
Low	1	1	1	1
Medium	0.98 (0.9,1.1)	0.82 (0.8, 0.9)	0.89 (0.8, 1.0)	0.94 (0.8, 1.0)
High	0.87 (0.8,1.0)	0.80 (0.7, 0.9)	0.92 (0.8, 1.1)	0.87 (0.8, 1.0)
Skill discretion				
Low	1	1	1	1
Medium	0.93 (0.9, 1.0)	0.82 (0.7, 0.9)	0.85 (0.8, 1.0)	0.80 (0.7, 0.9)
High	0.86 (0.8, 0.9)	0.73 (0.7, 0.8)	0.80 (0.7, 0.9)	0.80 (0.7, 0.9)
Job demands				
Low	1	1	1	1
Medium	0.99 (0.9, 1.1)	0.96 (0.9, 1.0)	0.93 (0.8, 1.0)	1.07 (0.9, 1.2)
High	1.00 (0.9, 1.1)	0.93 (0.8, 1.0)	0.95 (0.8, 1.1)	1.19 (1.0, 1.4)
Social supports at work				
Low	1	1	1	1
Medium	0.94 (0.9, 1.0)	0.92 (0.8, 1.0)	1.01 (0.9, 1.1)	0.93 (0.8, 1.0)
High	0.91 (0.8, 1.0)	0.88 (0.8, 1.0)	0.94 (0.8, 1.0)	0.81 (0.7, 0.9)

* Adjusted for age and employment grade

The association between work characteristics and long spells of sickness absence, analysed in the same manner as for short spells is shown in Table 25. High decision authority was associated with decreased risk of long spells of sickness absence, particularly in the job insecure period for both men and women. There were no significant effects for skill discretion on long spells of sickness absence. There was also no significant effect of high job demands on long spells of sickness absence. High levels of social support as work, however, were associated with reduced risk of long spells of sickness absence for both men and women. There were no significant interactions between the work measures in their association with long spells of absence. Unlike for short spells, effort-reward imbalance was associated with increased risk of long spells of absence in women. Women with both high efforts and low rewards had a significantly increased risk of taking long spells of sickness absence (RR = 1.39 (95% CI 1.1,1.8)) compared to women with neither high efforts nor low rewards. The association between effort-reward imbalance and risk of long spells of sickness absence was not significant in men.

There is evidence from other studies that work characteristics influence sickness absence rates. Walters & Roach (1971) found that rates of absence were related to job autonomy and task identity. Kristensen (1991) found that increasing tailoring of work (i.e. fragmenting jobs into simpler, more repetitive tasks) was related to higher rates of sickness absence.

Table 25
Rate ratios* (95% confidence intervals) of long spells (> 7 days) of sickness absence for tertiles of work characteristics

	Men (n = 3770)		Women (n = 1497)	
	1985-89	1991-93	1985-89	1991-93
Decision authority				
Low	1	1	1	1
Medium	0.92 (0.8, 1.1)	0.91 (0.8, 1.1)	0.98 (0.9, 1.1)	0.90 (0.8, 1.0)
High	0.98 (0.8, 1.2)	0.88 (0.8, 1.0)	0.96 (0.8, 1.2)	0.87 (0.7, 1.0)
Skill discretion				
Low	1	1	1	1
Medium	0.95 (0.8, 1.1)	0.89 (0.8, 1.0)	0.97 (0.8, 1.1)	0.99 (0.9, 1.2)
High	1.04 (0.9, 1.2)	0.92 (0.8, 1.1)	1.07 (0.9, 1.3)	1.04 (0.8, 1.3)
Job demands				
Low	1	1	1	1
Medium	1.00 (0.9, 1.2)	0.99 (0.8, 1.2)	1.03 (0.9, 1.2)	1.04 (0.9, 1.2)
High	1.00 (0.8, 1.2)	1.08 (0.9, 1.3)	1.08 (0.9, 1.3)	1.07 (0.9, 1.3)
Social supports at work				
Low	1	1	1	1
Medium	1.06 (0.9, 1.2)	0.93 (0.8, 1.1)	0.93 (0.8, 1.1)	0.86 (0.7, 1.0)
High	0.85 (0.7, 1.0)	0.87 (0.8, 1.0)	0.88 (0.8, 1.0)	0.92 (0.8, 1.1)

* Adjusted for age and employment grade

The results of our analyses relating work characteristics and sickness absence were not as strong as those originally reported by North et al (1996). This may have been because the associations were weaker in the reduced sample available at follow up in the job insecure period. This was tested by comparing associations between work characteristics and sickness absence in the job secure period between those in the current sample with:

- (a) those who left the Civil Service between 1991 and 1993; and
- (b) those who were non-respondents at Phase 3.

The results, not reported here, were very consistent across the sample for both short and long spells in men and women, suggesting that the nature of the sample was not the explanation for the differences in the strength of associations.

Non-work predictors of sickness absence included social supports, network size, smoking, alcohol consumption, life events and baseline GHQ score. Adjusting for these other risk factors hardly changed the results for the association between self-report work characteristics and sickness absence, suggesting that work and non-work factors are independent predictors of sickness absence.

In men, the associations between work characteristics and short spells of sickness absence were comparable or stronger than effects seen for non-work risk factors. The risk of short spells was approximately 1.3 times higher in those reporting low skill discretion than in those with high skill discretion after taking account of other risk factors. In comparison, those smoking more than 20 cigarettes a day were around 1.2 times more likely to take short spells of sickness absence than non-smokers. For women, low skill discretion was associated with an approximate 25% increase in short spells of absence as compared to a 35% increase for heavy smokers.

For long spells of sickness absence, adverse levels of job control and work social support were associated with an approximate 10-15% increase in rates of long spells. Effects for smoking were stronger with male heavy smokers having an approximately 70% increased risk of long spells and female heavy smokers having an approximately 20% increased risk.

5.5 EXTERNALLY ASSESSED WORK CHARACTERISTICS AND SICKNESS ABSENCE

The association of externally assessed work demands and control at work with long spells of sickness absence is presented in Table 26. Unexpectedly, high levels of work demands were associated with reduced risk of long spells of sickness absence in both men and women after adjustment for potential confounding factors including age, socioeconomic status, ethnicity, health related behaviours, and social circumstances outside work. High levels of control at work were associated with decreased risk of taking long spells of sickness absence (Table 26). This showed a significant association in men but not in women, although a similar pattern was shown. It does seem from these results that high levels of control are having a protective effect against long spells of sickness absence. This is in keeping with findings that low control at work is a risk factor for coronary heart disease (Bosma et al, 1997). It is more surprising that high levels of work demands are associated with lower risk of long spells of sickness absence, but again this may reflect the fact that high levels of demands are more frequent in higher grade employees, where they may be a feature of challenging but satisfying jobs.

Table 26
Long spells of sickness absence (>7 days), by externally assessed work demands and control at work, adjusted for confounding factors^a

	Men			Women		
	No.	Adjusted RR ^a	95% CI	No.	Adjusted RR ^a	95% CI
Work demands	4186			1800		
Low		1.0			1.0	
Medium		0.83	0.70, 1.00		0.76	0.64, 0.92
High		0.67	0.55, 0.80		0.74	0.61, 0.86
Control at work	4185			1797		
Low		1.0			1.0	
Medium		0.80	0.67, 0.95		0.92	0.78, 1.09
High		0.61	0.50, 0.76		0.86	0.70, 1.10

Note. RR = rate ratio; CI = confidence interval

^a Confounding factors: age, socioeconomic status (years of education, housing tenure, access to a car), ethnicity, health related behaviours (smoking status, frequency of alcohol consumption, physical activity), and social circumstances outside work (difficulty paying bills, negative aspects of close relationships).

6. CONCLUSIONS

6.1 ALCOHOL DEPENDENCE

In men, the most striking relationship was between effort-reward imbalance and alcohol dependence. Thus male civil servants who were putting in high levels of effort but receiving low rewards were at between 70 and 90% greater risk of alcohol dependence than their colleagues who were putting in neither high efforts nor receiving low rewards. The effect of effort-reward imbalance in men was not explained by other work characteristics, namely decision authority, skill discretion, job demands and job social supports. It was also not explained by the association between non-work related factors and alcohol dependence. The effect of effort-reward imbalance on alcohol dependence in women was diminished after adjustment for non-work related risk factors. In women, low decision latitude seemed to be the most important risk factor for alcohol dependence. This was associated with just over 40% increased risk for women with low decision latitude compared to women with high decision latitude. This risk did not change in magnitude with adjustment for either other work characteristics or non-work related risk factors. For alcohol dependence the work related risk factors seem fairly specific relating to control over work and the balance of effort and reward.

6.2 PSYCHIATRIC DISORDER

In both men and women, high job demands, comprised of measures of work pace and conflicting demands, were associated with increased risk of psychiatric disorder at follow up. This increased risk associated with high job demands could not be explained by other work characteristics. After adjustment for other work characteristics, high job demands were associated with 38% increased risk of psychiatric disorder in men and 52% increased risk of psychiatric disorder in women. The risk of high job demands was also maintained after adjustment for other non-work risk factors. Psychological demands at work and work overload seem to be consistent risk factors of future psychiatric disorder.

Low social supports at work were also associated with increased risk of psychiatric disorder at follow up in both men and women. This risk could not be explained by other work characteristics and was maintained, although reduced, after adjustment for other non-work risk factors. Social support at work seems to be protective for future mental health. Support from supervisors seems to have a stronger effect on future mental health than support from colleagues.

Low decision authority was associated with a higher risk of psychiatric disorder at follow up, but this risk seemed to be explained by job demands and work social support. Low skill discretion was associated with increased risk of psychiatric disorder and this was not explained by other work characteristics. Nevertheless, this association became non-significant after adjustment for other non-work risk factors.

Effort-reward imbalance showed a strong relationship with risk of future psychiatric disorder in both men and women. The risk of future psychiatric disorder associated with effort-reward imbalance was diminished slightly by adjustment for other work characteristics, but remained substantial in both men and women. An effect of effort-reward imbalance on future psychiatric disorder remained after adjustment for other non-work risk factors.

6.3 HEALTH FUNCTIONING

6.3.1 Physical Functioning

High job demands were associated with increased risk of poor physical functioning at follow up in both men and women. This risk was not explained by either other work characteristics or non-work related risk factors. After adjustment, high job demands were related to 30% increased risk in men and 50% increased risk in women for poor physical functioning in relation to low job demands. Low decision latitude in men, but not in women, was associated with increased risk of poor physical functioning at follow up. This risk was partially explained by adjustment for other work characteristics and non-work risk factors.

Low levels of social supports at work were related to increased risk of poor physical functioning in both men and women, but this risk became non-significant after adjustment for work characteristics and other non-work risk factors.

Effort-reward imbalance was associated with increased risk of poor physical functioning at follow up in both men and women. This relationship was maintained in women after adjustment for other work characteristics and non-work related risk factors, but remained no longer significant in men.

6.3.2 General Mental Health

High levels of job demands were associated with increased risk of poor general mental health at follow up in both men and women, however, this effect was much diminished after adjustment for other work characteristics and other non-work related risk factors.

Low decision latitude was associated with markedly increased risk of poor general mental health at follow up. This risk was maintained after adjustment for other work characteristics and other non-work related risk factors.

Low levels of social support at work were related to increased risk of poor general mental health at follow up, although this was largely explained by the effect of other work characteristics and non-work related risk factors.

Effort-reward imbalance was associated with poor general mental health at follow up in both men and women. Again, the risk remained substantial even after adjustment for other work characteristics and non-work related risk factors.

6.3.3 Social Functioning

High levels of job demands at work were associated with increased risk of poor social functioning at follow up in both men and women. The effect remained strong in women, but became non-significant for men after adjustment for other work characteristics and non-work related risk factors.

Low levels of social supports at work were also associated with risk of poor social functioning at follow up. This risk was markedly reduced in both men and women after adjustment for other work characteristics and non-work related risk factors.

Effort-reward imbalance was associated with increased risk of poor social functioning at follow up. This risk remained in men after adjustment for other work characteristics and non-work related risk factors, but became non-significant in women.

6.4 SICKNESS ABSENCE

6.4.1 Sickness Absence and Employment Grade: Differences Across Job Secure and Job Insecure Periods

Short spells of sickness absence decreased between the job secure and the job insecure periods (Stansfeld et al, 1999). This was evident in the lower rather than higher employment grades. Rates of long spells increased only marginally in the job insecure period and the social gradient declined rather than increased with differential effects on rates of short spells by employment grade. The fall in short spells of sickness absence observed in the more recent period of 1991-1993 might be explained both because of increased monitoring of sickness by management and because civil servants were reluctant to take absence and risk putting their jobs in jeopardy. This is in keeping with the findings by grade of employment that rates of short spells increased among higher grade employees and fell among lower grade employees. Increased monitoring generally increases rates of absence and this trend was observed among higher grade employees. However, short spells of absence decreased among lower grade employees who had less control over their continued employment.

Can this decline in short spells of absence be further understood? It may be that more attention paid to absence by management means that employees are less likely to take absence unrelated to sickness and attributed to sickness absence. Alternatively, it may be that employees are attending work, even though they are sick, for fear of losing their jobs, a situation that is unlikely to improve their health and is likely to be associated with a drop in work performance, reduction in morale and higher labour turnover.

6.4.2 Short Spells of Sickness Absence

High job demands had no significant effect on short spells of sickness absence in the period 1985-1989, a period of high job security. However, in the job insecure period, between 1991-1993, high job demands were related to a small decline in risk of short spells of absence in men and a small increase in risk of short spells of absence in women. Both high decision authority and high skill discretion were related to decreased risk of taking short spells of sickness absence in both men and women relative to those with low decision authority and low skill discretion respectively. This effect was stronger in the job insecure period between 1991-1993 than in the job secure period between 1985-1989. High levels of social support at work were associated with a small decreased risk of taking short spells of absence in both men and women. This decreased risk was larger in the job insecure period between 1991-1993 than in the job secure period between 1985-1989.

6.4.3 Long Spells of Sickness Absence

Job demands had no significant effect on long spells of sickness absence during either of the two periods studied. However, decision authority in the second job insecure period between 1991-1993 did have an effect in reducing the risk of long spells of sickness absence. This effect was not seen for skill discretion. High levels of social support at work did appear to have a protective effect on the risk of taking long spells of sickness absence in men in both the periods studied. In women, a similar magnitude of effect was observed, although this was not significant in the latter job insecure period of 1991-1993.

6.5 KARASEK JOB STRAIN MODEL

Karasek originally hypothesised (Karasek, 1979) that high demands would only be associated with ill-health in those with low decision latitude. In general, our results do not support this but instead suggest that high job demands and low decision latitude have independent effects on health.

6.6 SOCIAL GRADIENTS AND THE THREE SELF-REPORT HEALTH MEASURES

Alcohol dependence shows a small social gradient in men but a reversed gradient in women, in keeping with national figures on levels of high alcohol consumption. It is not clear from this data whether this means that women in higher employment grades are more at risk or whether these findings are biased by differential reporting by employment grade.

The distribution of psychiatric disorder at Phase 3 by employment grade is not dissimilar to that for alcohol dependence. There is a small social gradient in men for overall GHQ caseness and a larger gradient for depressive symptoms. In women, the percentage of GHQ caseness at Phase 3 tends to be higher in higher employment grades.

Poor physical functioning shows a clear social gradient by employment grade. Poor general mental health, similar to the results for the General Health Questionnaire shows a social gradient in men but very little gradient in women. Poor social functioning matches the gradient for poor general mental health. Thus, the results across the self-report measures are largely consistent. The results in men are representative of findings in the general population for white collar workers. The lack of gradient, or tendency towards an inverse gradient in women, is not in keeping with general population findings and it is not entirely clear why this should be the case. Further research is needed to explore this.

6.7 GENERALISABILITY OF OUR RESULTS

The British Civil Service has traditionally been seen as a unique workforce with very high levels of job security and excellent working conditions. The degree to which findings from this workforce can be generalised to other occupational groups has been questioned. In fact, the Civil Service is not very different from other large white collar workforces and the changes in the Civil Service in the last 10 years have made it more similar to other white collar workforces in both the public and private sectors.

There are few national datasets which examine the psychosocial work environment and health. In the 1994 Health Survey for England (Taylor, 1994) higher levels of work pace, variety and control were reported in social classes I and II compared to other social classes, similar to the findings in the Whitehall II Study. No analyses linking work characteristics and health were reported. The influence of high work demands on increased risk of psychiatric disorder are in keeping with a study of the NHS workforce (Wall et al, 1997) and our findings on the effects of low work social support and health accord with other studies of social support and wellbeing (La Rocco et al, 1980; Loscocco & Spitze, 1991).

6.8 COMPARISON OF THE EFFECTS OF WORK CHARACTERISTICS ACROSS HEALTH OUTCOMES

There are some associations which are common across several of the health outcomes. For instance, effort-reward imbalance on the negative side seems to be a risk factor for alcohol dependence, psychiatric disorder, and health functioning. On the more positive side, work social support, particularly from supervisors rather than colleagues, seems to have a protective effect on the development of future psychiatric disorder and also has an effect, to a certain extent, on health functioning and on short and long spells of sickness absence.

High job demands are related to increased risk of future psychiatric disorder and also physical and general mental health functioning. They do not seem to be especially related to either alcohol dependence or sickness absence. Decision latitude also has effects across the health outcomes: low decision latitude is related to increased risk of alcohol dependence in women; to poor physical functioning and general mental health; poor social functioning; and decreased risk for short spells of sickness absence in women, and long spells in men and women during the latter job insecure period. Thus, although there is some commonality of risk across different health outcomes, the different work characteristics are by no means interchangeable and an overall policy to improve health in the workplace cannot only focus on one or two work characteristics. Nevertheless, there are some recommendations that can be made for improving workplace health.

First, the results from the Whitehall II Study suggest that, in order to improve health in the workplace and prevent the development of ill health, it is necessary to intervene at the level of work organisation and management as our results apply to the group rather than the individual level.

Second, in general, it seems that the disparity in putting in high effort and getting low reward is fairly universally bad for people's health. While it may not be easy, or even desirable, to reduce the effort people put in at work, it may be possible to increase people's reward. In similar way, it will not be easy for organisations to reduce high job demands, although the evidence from our studies suggests that these are related strongly to future mental ill-health. On the other hand, increasing rewards which may be psychological as well as concrete, financial and promotional rewards may well improve people's health.

Third, linked to increase in rewards is the issue of work social support. Here, there seems clear evidence for a protective effect of work social support, particularly from managers to their employees. Clarity and consistency of information and emotional support can have a powerful positive effect on employee health and well-being. This is an area in which interventions could be achieved at very little cost, which might well have a beneficial effect on people's health.

It does seem feasible to intervene in the workplace to improve mental health. Our findings are in keeping with the results from the partnership on the health of the NHS workforce, which has made recommendations for improving the health of the NHS workforce based on a systematic review of the work and health literature. They state unequivocally that 'management style clearly affects health'. Their Action Now Plan recommends 'a major initiative to improve two-way communications to increase staff involvement and enhance team-working and control over work'. In more detail, this means to 'enhance a sense of control by staff over the work environment and to develop a culture in which staff are valued'. This in particular takes into consideration our findings in relation to effort-reward imbalance. They suggest that social support, both formal and informal, should be promoted and work demands and staffing should be reviewed (Williams et al, 1998). All in all, this does suggest that our findings are in keeping with the recommendations taken from other major workforce studies.

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APPENDIX A

WORK AND HEALTH MEASURES

KARASEK MODEL

Decision Authority

- Do you have a choice in deciding how you do your work?
- Do you have a choice in deciding what you do at work?
- Others take decisions concerning my work
- I have a good deal of say in decisions about work
- I have a say in my own work speed
- My working time can be flexible
- I can decide when to take a break
- I have a say in choosing with whom I work
- I have a great deal of say in planning my own work environment

Skill Discretion

- Do you have to do the same thing over and over again?
- Does your job provide you with a variety of interesting things?
- Is your job boring?
- Do you have the possibility of learning new things through your work?
- Does your work demand a high level of skill or expertise?
- Does your job require you to take the initiative?

Job Demands

- Do you have to work very fast?
- Do you have to work very intensively?
- Do you have enough time to do everything?
- Do different groups at work demand things from you that you think are hard to combine?

Social Support at Work

Support from colleagues

- How often do you get help and support from colleagues?
- How often are your colleagues willing to listen to your work related problems?

Support from superiors

- How often do you get help and support from your immediate superior?
- How often is your immediate superior willing to listen to your problems?

Information from superiors

- Do you get sufficient information from line management (your superiors)?
- Do you get consistent information from line management (your superiors)?

EFFORT-REWARD IMBALANCE

High Effort

Competitiveness

- Being bossy or dominating
- Having a strong need to excel
- Being hard driving and competitive

Work-related overcommitment

- Usually being pressed for time
- Have you often felt very pressed for time?
- Has your work often stayed with you so that you were thinking about it after working hours?
- Has your work often stretched you to the very limits of energy and capacity?

Hostility

- When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing
- It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important
- I am not easily angered

If in high tertile for any of above three then classified as 'high effort'

Low Rewards

Poor promotion prospects

- How satisfied have you been with your work prospects?

Blocked career

- Current employment grade lower than what on average could be expected given grade level on entry to civil service (adjusted for number of years in civil service)

If either poor promotion prospects or blocked career, classified as 'low reward'

EXTERNALLY ASSESSED WORK CHARACTERISTICS

Response categories: (1) often - (12) never

Decision latitude

How often does the job permit complete discretion and independence in determining how, and when, the work is to be done?

Job demands

- How often does the job involve working very fast?
- How often is it extremely important to do the work without mistakes?
- How often do different groups at work demand things which are difficult to combine?

HEALTH MEASURES

Alcohol dependence (CAGE)

Have you ever felt that you ought to cut down on your drinking?

Have people annoyed you by criticising your drinking?

Have you ever felt bad or guilty about your drinking?

Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?

If answer Yes to two or more of the above questions, then classified as problem drinker

APPENDIX B

PUBLISHED WHITEHALL II PAPERS

1. Marmot, M.G., Davey Smith, G., Stansfeld, S.A., Patel, C., North, F., Head, J., White, I., Brunner, E.J., and Feeney, A. Health inequalities among British Civil Servants: the Whitehall II study. *Lancet* 337:1387-1393, 1991.
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