

# **Employment arrangements, work conditions and health inequalities**

Report on new evidence on health inequality reduction, produced by Task group 2 for the  
Strategic review of health inequalities post 2010

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## **Summary**

Employment and working conditions make a significant contribution to the development of social inequalities in health in England, as is the case in all wealthy countries. They are of critical importance to improve population health and redress health inequalities in several interrelated ways. First, labour market and economic policies determine employment rates and conditions (e.g. precarious, insecure or informal work). These have a major impact on a range of life chances associated with paid work as a main social role in adult life. Second, wages and salaries provide the main component of income. Low and insecure income affects health via material deprivation, unhealthy behaviours and stressful experience. Importantly, due to childhood antecedents of poor adult health, low income can have long-lasting negative effects across generations. Third, adverse working conditions in terms of physical and chemical hazards, risks of injuries, long or irregular work hours, shift work and physically demanding work affect workers' health, defining targets of occupational health and safety measures. Fourth, as the organisation of work and employment has changed significantly during the last century, psychological and socio-emotional job demands and threats evolving from insecure employment conditions and other forms of an adverse psychosocial work environment have become more common. As these demands and threats have been shown to directly affect the health of workers, new challenges have emerged to strengthen 'good' (health-promoting and -protective) work through primary and secondary preventative measures.

The distribution of unemployment and health-adverse employment and working conditions across the workforce is socially patterned, leaving those in lower socioeconomic positions at higher risk. The scientific evidence for the associations between adverse employment and working conditions and a range of indicators of poor health is summarised in this report, and available results from intervention studies are presented and discussed. The implications for policy- and workplace-related interventions are derived from this evidence.

Finally, recommendations are proposed that are intended to make a significant contribution towards healthier work and, ultimately, towards reducing social inequalities in health. These recommendations are based on general principles that focus on fair employment and improved quality and safety of work as a central goal of governmental policies. The reduction of harmful employment and working conditions (through legislation, income transfers, empowering workers, and integrating labour standards with labour market regulations) and the implementation of participatory activities and inter-sectoral, contextualised interventions

at national, regional and local levels should be pursued in accordance with the principles of a sustainable economy.

Specific recommendations concern measures to increase job security, to enforce protection in employment, to enhance participation at work, to promote control and reward at work, to reintegrate sick, disabled and unemployed people, and to strengthen the work-life balance.

These recommendations need to be further elaborated, harmonized with recommendations from other task groups, evaluated with respect to their feasibility, measurement and implementation, and prioritised in the context of short-term, medium-term, and long-term policies. The medium and long-term perspectives should embody the principles of sustainable development.

## **1. Introduction**

### **1.1. Employment, work and health: essential relations**

Work and employment make a significant contribution to the development of social inequalities in health in England, as is the case in all modern societies. They are of critical importance for population health and health inequalities in at least four interrelated ways:

*First*, participation in, or exclusion from the labour market determines a range of life chances that are mainly mediated through regular wages and salaries. Adverse effects on health produced by the exclusion from work and employment are most visible among those who experience long-term unemployment (Bethune 1997). In addition to material constraints and deprivations resulting from loss of employment, many psychosocial stressors contribute to poor health not only among the unemployed themselves, but also among their partners and children (Bartley et al 2006). These constraints and stressors are related to the loss of a core role in social life that is crucial for ones' sense of identity, thus prevention goal-orientated activities and associated experiences of control, reward, social participation and support (Siegrist & Theorell 2006). As the prevalence of unemployment is unequally distributed across society, leaving those in lower socioeconomic positions at higher risk, this fact contributes to the manifestation of a social gradient in health (*see 3.1.1*; Kasl & Jones 2000).

*Second*, wages and salaries provide the major component of the income of most people in employment. There are substantial income inequalities in England (Jones et al 2008), leading to material deprivation amongst the worst off. In addition, relative deprivation may be experienced by people who are economically better off. Health-adverse effects of inappropriately low income were demonstrated in several studies, thus adding further evidence to the links between work, health and social inequality (*see 3.1.4*; Kawachi 2000).

*Third*, exposure to physical, ergonomic, and chemical hazards at the work place, physically demanding or dangerous work, long or irregular work hours, shift work, health-adverse posture, repetitive injury and extended sedentary work can all adversely affect the health of working people. Again, these conditions are more prevalent among employed people with lower educational attainment and among those working in lower, less privileged occupational positions (*see 3.1.2*; *3.1.3*; Karasek & Theorell 1990).

*Fourth*, as the nature of employment and work has changed significantly over the last half century, psychological and socio-emotional demands and threats evolving from an adverse psychosocial work environment have become more wide spread in all advanced societies. Technological progress and economic growth in the context of globalised markets and trades result in new types of tasks (e.g. information processing, personal services and service

centres). This has led to an unprecedented flexibility of employment arrangements and contracts, often in combination with job instability and insecurity and with an increase in work intensification and long hours of work. Today's economy inducing trade and financial liberalisation carries a high risk of volatility and financial crisis, thus widening income inequality, job instability and related material and psychosocial adversity (Blouin et al 2009). This adversity includes conflicts within workplace hierarchies and power relations, restricted participation of employees in decision-making, and a spectrum of covert or overt discriminatory activities. 'Toxic' combinations of these dimensions of work are frequent in the current labour market, yet unequally distributed between occupations. Their highest prevalence is found among the most deprived workers, specifically those in 'precarious jobs' defined by a lack of safety at work, by exposure to multiple stressors including strenuous tasks with low control, low wage and high job instability (Benach et al 2000; Benach & Muntaner 2007). As documented below (*see 3.1.4*) there is ample evidence on adverse effects on health and well being produced by these conditions.

Overall, a social gradient of health-adverse employment and working conditions has been documented in advanced societies, including England, leaving those in lower socio-economic positions at higher risk (*see 2.1; 3.2*). Conversely, health-promoting and health protective 'good' working and employment conditions are more often experienced by people with higher socioeconomic status who also enjoy better health and well being. The common scientific approach towards studying associations of work with health and well being tends to focus on 'pathogenic' rather than 'salutogenic' or protective and health-promoting effects, thus to study adversity among lower socio-economic groups of employed people rather than opportunities of good health and positive development. This is due to the primacy of the consensual goal of reducing modifiable inequalities. In this report, too, emphasis is put mainly on pathogenic aspects of work and employment. However, as will be documented, respective scientific evidence provides a convincing basis of knowledge from which recommendations on how to develop and implement 'good' (i.e. health-promoting and health-protective) work can be derived. In particular, this will become evident in the context of theoretical models that identify specific components within the complexities of work and employment that are of critical importance for health (*see 3.4.1*).

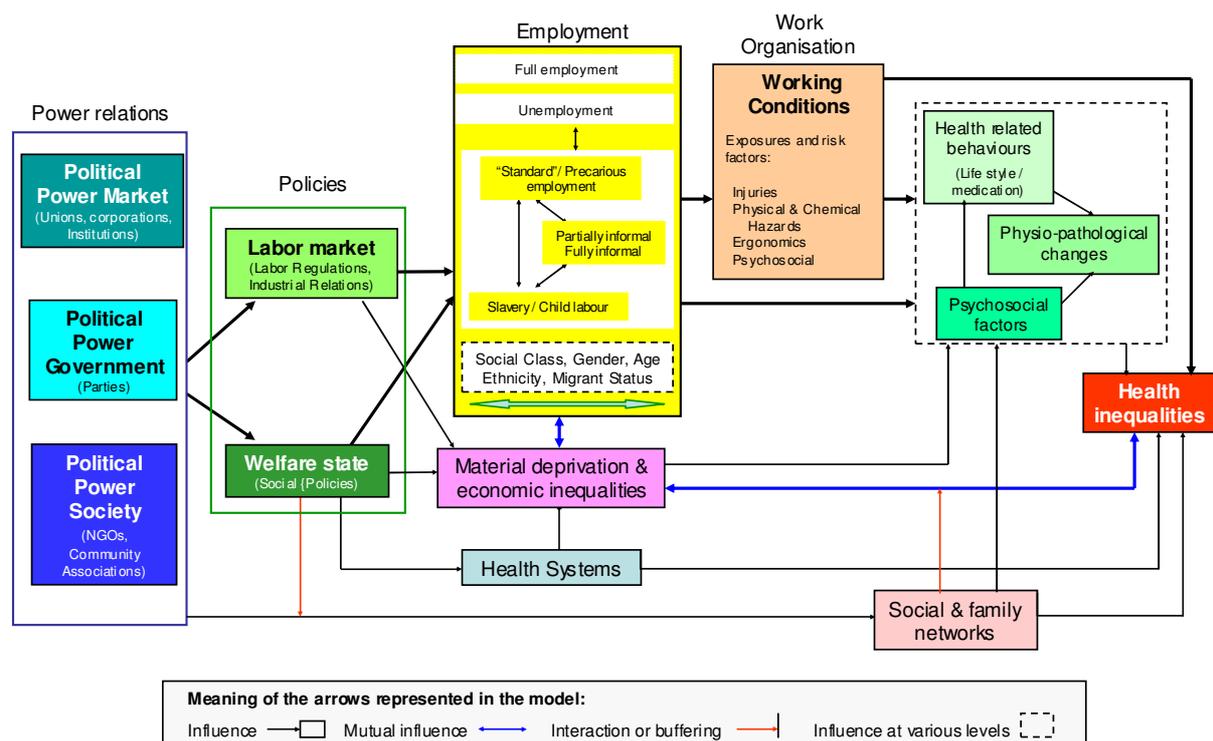
While work and employment make a significant contribution to social inequalities in health, it is equally true that obtaining employment and attained work-position are to a considerable extent determined by exogenous factors over the life course (parental influences, educational attainment, socio-economic position, peer groups and social networks, geographic location,

ethnicity and macro-economic environment). For this reason, the health impact of work and employment cannot be assessed in isolation from the individual's wider social environment (Kuh & Ben Shlomo 2004).

## 1.2. A conceptual approach towards disentangling links between employment relations and health inequalities

In spite of growing scientific evidence regarding the effects of employment conditions on health, few conceptual approaches have been proposed to disentangle the complex relationships and pathways connecting employment conditions with health inequalities. One such approach has been elaborated as part of the work of the WHO Commission on Social Determinants of Health (Benach et al 2009) (*Figure 1*).

*Figure 1.* Conceptual approach towards analysing employment and working conditions with respect to social inequalities in health



In this approach, macro-, meso- and micro-levels are linked, starting with governmental (e.g. welfare regimes, social policies) and labour market conditions as 'upstream' macro-socioeconomic determinants. National labour markets are stratified according to power and privilege (centre and periphery), socio-economic position, gender, race/ethnicity, migrant status and age. They include standard and non-standard work arrangements (e.g. informal,

unstable, temporary, seasonal work). Labour markets vary by stage of economic development, sector and geographical region. At the meso-level, employment conditions influence health both directly and indirectly, mediated by exposure to adverse working conditions. These influences are partly non-specific or general, increasing the susceptibility of workers to a range of different disorders, partly specific (e.g. occupational diseases). ‘Downstream’ pathways to the health of individual workers are mediated by noxious physical and chemical hazards, psychosocial adversity expressed by psycho-biological mechanisms, and health-related behaviours. These processes are not uni-directional but characterized by interaction (e.g. effect modification) and feedback. Importantly, working people suffering from ill health are faced with additional challenges of adaptation and integration into prevailing employment and working conditions that may further affect their health in positive or negative ways. Finally, the conceptual approach emphasizes the strong links that exist between work and non-work (social and family life) conditions.

In this review, main emphasis is put on the ways of how employment and working conditions affect health inequalities and how evidence of existing pathways can be used to help improve the health of working populations. However, the current state of research on work and health does not yet adequately address the complexities suggested in this conceptual approach (*Figure 1*).

### **1.3. The process of knowledge generation**

Any review of employment, working conditions and health faces various challenges. First, much of the research into the interactions between these factors does not focus on health inequalities and their causes. Second, knowledge on best practices and examples of policy successes in lessening health inequalities is limited. Third, some of the most adverse working conditions are often hidden or less well-known. Standard systematic reviews are limited by the fact that studies are selected on the basis of the quality of the methods rather than on theoretical considerations. The classical paradigm of randomised controlled trials is not applicable in this context. Thus, following the precedent set by the Global Commission on the Social Determinants of Health, we have taken a broader view of what constitutes *evidence* in this field of scientific inquiry (Kelly et al 2006, Marmot & Friel 2008). Employing a wide range of strategies of inquiry, a variety of methods, and multiple sources of data and evidence, we synthesised the inputs of several disciplines.

*First*, in searching scientific literature we used digital bibliographic databases included Medline, PsycInfo, Sociological Abstracts, Social Sciences Abstracts, EconLit, American

Business Inform, Business Abstracts, Public Administration Abstracts, Political Science, and Worldwide Political Science Abstracts. Search strategies and key words were identified after a series of tests and qualitative evaluations of each of the listings obtained. All searches were limited by year of publication, from 1990 to 2009.

The information presented in *Tables 1 and 2 (Appendix)* is based on search strategies using the following key words: Job insecurity, job instability, job loss, downsizing, temporary employment, flexible work, non-permanent work, longitudinal study, cross-sectional study, case control-study, psychological distress, psychosomatic symptoms, minor psychiatric morbidity, self-rated health and health related behaviours. The information presented in *Table 3 (Appendix)* is based on search strategies using the following key words: demand-control model, job strain model, decision latitude, job control, job demands, social support at work, effort-reward imbalance model, over commitment, esteem, promotion prospects, job security, coronary heart disease, cardiovascular disease, depression, physical and mental functioning, self-rated health, stress-related disorders, cohort study, observational study, prospective study and longitudinal study.

In evaluating study findings priority was given to results reported from prospective observational studies in occupational health epidemiology as this study design represents the gold standard in this field of research (*see Table 3(Appendix)*). This is due to the fact that exposure assessment precedes disease onset, that the risk of disease is estimated as a function of exposure and that effects can be adjusted for relevant confounding factors in a multivariate analysis.

*Second*, we aimed at identifying relevant materials such as books, reports, and unpublished documents. To identify and select on-line documents, we followed two main strategies: a) Using metasearchers (ixquick.com, metacrawler.com, search.com) and a search engine (google.com), searches were made for each employment dimension using key words. For each dimension, additional key words were considered to limit results of the search to the topic of interest. To reduce the number of documents we focused on publications after 1999-2000.

*Third*, we consulted several key websites of relevant organisations, including non-governmental organisations. Finally we had extensive personal communication with scientists and other experts engaged in work and health related activities, so as to include their most recent insights.

Despite our efforts in following these principles we cannot claim to represent all relevant aspects of this large and diversified field of research in this short report. Moreover, the

evidence corroborated through this process of knowledge generation may be biased to some extent in terms of the language of the literature reviewed (largely English) and in terms of publication bias (more positive than negative findings being published). A more elaborate synthesis of information, e.g. by conducting a meta-analysis, was not feasible, given the heterogeneity of sources, indicators, study designs and study populations available. Nonetheless, with the primary interest being on evidence-based recommendations, in considering those aspects of social inequalities in health that are attributable to work and employment and, our aim was to contribute to the development of the evidence base for ‘good’ and sustainable work.

#### **1.4. Defining a health-adverse psychosocial environment**

As the nature of employment and work has changed substantially during recent decades, psychosocial adversity at work has become a major concern of research and policy related to work and health. This highly debated topic requires further conceptual clarification before it can be integrated into evidence-based recommendations for policy.

An *adverse psychosocial environment* at work cannot be identified by direct physical or chemical measurement. Theoretical concepts are needed to delineate particular stressful job characteristics so that they can be identified at a level of generalization that allows for their use in a wide range of different occupations. These concepts can be translated into measures with the help of social science research methods (standardized questionnaires, observation techniques, etc.) that meet the criteria of adequate reliability and validity of data collection. A variety of concepts that encapsulate adverse psychosocial work environments have been developed in occupational health psychology and sociology, social epidemiology and organisational sciences (for reviews, see Antoniou & Cooper 2005, Cartwright & Cooper 2008). However, only a few have been tested with convincing study designs (e.g. longitudinal observational investigations of initially healthy employed populations) and have addressed the social gradient in work and health. Among these, two models have received special attention, the demand-control model and the effort-reward imbalance model.

The *demand-control model* (Karasek 1979; Karasek & Theorell 1990) posits that stressful experience at work results from a distinct job task profile defined by two dimensions, the psychological demands put on the working person and the degree of control available to the person to perform the required tasks. This latter dimension is labelled ‘decision latitude’. Jobs defined by high demands in combination with low control are stressful because they limit the individual’s autonomy and sense of control while generating continued pressure (‘high job

strain'). Under these conditions, following the experience of control and mastery, it is expected that excessive arousal of the autonomic nervous system would occur without any compensatory relaxation response. Conversely, 'active jobs' are expected to be health-protective as they are defined by challenging demands that go along with a high degree of decision latitude and learning opportunities, enabling individuals to experience positive stimulation, success and self efficacy. A third dimension, social support at work, was added to the original formulation. In this formulation, the highest level of strain would be expected in jobs that are characterized by high demand, low control and low social support at work or social isolation ('iso-strain jobs') (Johnson & Hall 1988). Extensive tests of the demand-control- (support) model showed that the concept, in its fully developed form, does not always predict poor health but that this is more often the case if single components are analysed (*see 3.1.4 and Table 3 in Appendix*).

A complementary model, *effort-reward imbalance*, is concerned with stressful features of the work contract (Siegrist 1996). This model builds on the notion of social reciprocity, a fundamental principle of all types of transactions that are characterized by some form of utility. Social reciprocity lies at the core of the work contract which defines distinct obligations or tasks to be performed in exchange with adequate rewards. These rewards include money, esteem and career opportunities (promotion, job security). Contractual reciprocity operates through norms of return expectancy, where effort spent by employees is reciprocated by equitable rewards from employers. The effort-reward imbalance model claims that lack of reciprocity occurs frequently under specific conditions. Failed reciprocity, in terms of high cost and low gain, elicits strong negative emotions and associated stress reactions with adverse long-term health consequences (*see 3.1.4. and Table 3 in Appendix*). 'High cost-low gain' conditions at work occur frequently if employed people have no alternative choice in the labour market. This is often the case among those with low socio-economic position or low level of skills, among elderly workers and, more general, in a highly competitive labour market.

These two models complement each other by focusing on 'toxic' components of job task profiles and employment contracts respectively. Low control and low reward are assumed to be equally stressful experiences in the context of work that requires high levels of effort. They both elicit negative emotions and enhanced stress responses with adverse long-term health consequences. Thus, the co-occurrence of low control and low reward in demanding jobs has been shown to increase the probability of ill health above and beyond the risk associated with exposure to the separate components (Peter et al 2002).

As mentioned earlier, the focus we have placed on these two models is due to the fact that an accumulated body of empirical evidence on health-adverse effects is available from which specific recommendations can be made (*see 3.3.5 and 4*). In addition, they contribute to the role of work and employment in explaining social inequalities in health (*see 3.2*). Further conceptual approaches were proposed and tested, indicating a growing awareness of the importance of understanding health-damaging and health-promoting aspects of modern work and employment. One such approach is concerned with *organisational justice* (Greenberg & Cropanzo 2001), where inaccurate decision-making procedures and unfair treatment by supervisors contribute to poor health (Elovainio et al 2002). Despite some potential overlap with the above mentioned approach, the models of effort-reward imbalance and organisational justice have been shown to predict health outcomes independently (Kivimäki et al 2007).

An additional multidimensional construct, *employment precariousness*, has been proposed to capture more distal, labour market and related determinants of health (Benach & Muntaner 2007).

## **1.5. Structure of the report**

In this report it is argued that there is substantial evidence that some of the employment and working conditions in England are associated with adverse health outcomes (*see section 2.1*). Many of these conditions are socially patterned, leaving those in lower positions at higher risk. The extent to which inequalities in adverse work and employment contribute to health inequalities is still debated in current research. At least two concurrent explanations exist. One such explanation claims that social selection accounts for a large part of work-related social inequalities in health. This means that people with unfavourable socioeconomic, psychosocial or biological background are more likely to end up in stressful jobs in adult life (Macleod et al 2001, Nettle 2003). In the context of a life-course approach to chronic disease development this argument is important. However, several epidemiological studies have controlled for adverse childhood circumstances and found that work-related factors have a stronger explanatory power than social background-related factors (Brunner et al 2004, Marmot et al 2001, Melchior et al 2006, Kivimäki et al 2005). For this reason, it seems appropriate to explore the extent to which stressful work and employment follows a social gradient and contributes towards explaining social inequalities in health. As a consequence, targeting these work and employment conditions through prevention or intervention provides a plausible approach towards reducing these inequalities.

The recommendations of this report (*see section 4*) are derived from scientific knowledge that evolved mainly from tackling the following four key questions:

*First:* Is there sufficient evidence of a causal link between adverse work and employment conditions and reduced health? This question is addressed in *section 3.1*

*Second:* Is there sufficient evidence that adverse work and employment conditions mediate the association between socioeconomic position and health? This question is addressed in *section 3.2*.

*Third:* Is there sufficient evidence that work- and employment related interventions improve health and, thus, may contribute towards reducing social inequalities in health? This question is addressed in *section 3.3*.

*Fourth:* Is there sufficient evidence that favourable economic effects result from work-and employment-related interventions? This question is addressed in *section 3.4* where the role of broader socio-political and economic conditions is also discussed.

In *section 4*, recommendations for action, both general and specific, are derived from answers to these questions. Links between these recommendations and reported evidence are indicated by cross-references.

Given the central importance of work and employment in adult life and its close links with personal, family and civic life, it is not feasible to address all aspects relevant to health in detail in this report. In particular, the evidence on several topics has not been summarised - including the working conditions of self-employed people and their effects on health (Saarni et al 2008), the cumulative or protective effects of a work-life balance (or imbalance) and their effects on unequal health (Artazcoz et al 2004, Westman 2002). Gender-specific variations in the associations between work, social inequality and health are also important, but are not considered in detail in this report (Messing & Silverstein 2009, Weidner et al 2002).

As this report draws on the international state of the art in this field of research, a critical question concerns the relevance of available knowledge to the English context. While this question is dealt with throughout the report, the next section (*section 2*) is specifically focused on a discussion of employment, working conditions and related policies in England.

## **2. The context for recommending future policies and interventions**

### **2.1. Employment and working conditions in England**

As is the case for many countries, the labour market in England has been significantly affected by globalisation and related financial and economic issues. Economic, financial and

trade decisions of large corporations operating at a global scale affect working conditions of large parts of the workforce, labour standards, occupational health and safety regulations, wages and measures of social protection. Currently, the most visible developments concern rising unemployment, an increase in non-standard employment, work intensification and the growth in numbers in vulnerable groups.

According to the most recent National Statistics on the labour market (Office for National Statistics 2009) the employment rate at working ages was 74.1 per cent in the three months to January 2009, with an unemployment rate of 6.5 per cent. As a consequence of the current financial crisis, 266,000 people were laid off in that three-month period, raising unemployment above 2 million for the first time since 1997 and affecting all economic sectors. The increase in unemployment rates, compared to a year earlier, exceeded two percentage points in the North East, Yorkshire and the Humber, the West Midlands and Wales. An earlier analysis showed that unemployment rates in the previous three months were highest for those who had worked in elementary occupations (9.7 per cent) and sales and customer service occupations (7.5 per cent). Rates were lowest for professional and managerial occupations (1.6 and 2.2 per cent). A report by Oxford Economics estimates that more than a million British workers will lose their jobs over the next two years (Taylor 2009).

### *2.1.1 Recent changes in the workforce composition*

Large-scale enterprises account for the main share of total employment (46 per cent) in the UK economy. While the number of large, multinational companies has traditionally been high, economic restructuring during the 1980s reduced the average size of workplaces and encouraged the growth of small enterprises. Moreover, the proportion of own account self-employed workers has increased (Walters 2004).

The changes in the structure and organisation of work and labour markets are important influences on the practicability of workplace arrangements for representing workers' interests in improving occupational health. Outsourcing and downsizing by large firms has contributed to growing job insecurity, self-employment, and precarious employment. These practices have been driven by management strategies such as lean production, flexible work and engineered standards. The growing influence of neo-liberal policies in government has led to practices such as privatisation and competitive tendering, with these developments being experienced in both private and public sectors (Walters 2006).

The relationship between the labour market and health has also been influenced by changes introduced through legal frameworks addressing employment security, industrial relations and social welfare. Workers' representation in these activities seems less pronounced in the UK compared to many Western European countries where intermediary institutions between state and single enterprises are more strongly developed. For instance, a recent survey indicates that one third of employees only have access to some type of collective bargaining (Parent-Thirion et al 2007).

The last 25-30 years has witnessed some fairly radical changes in the British labour market. The continuing decline of the manufacturing sector has given rise to the dominance of the service sector leading to changes in both the industrial structure of employment and occupational composition. Until employment rates started to decline in the middle of 2008, they had increased fairly steadily over the previous 15 years. However, in 2008 the employment rate was roughly the same as it had been in 1971. A more detailed examination of the data shows a very different picture for men and women. Between 1971 and 2008 male and female (working age) employment rates show considerable convergence; increasing by 14 percentage points for women and falling by 13 percentage points for men. This meant that in April 2008, 79 per cent of working age men and 70 per cent of working age women were in employment (McKnight 2009). Women are much more likely than men to work part time (40 per cent compared with 10 per cent), mainly to fit employment around caring for their children. These jobs are generally of lower quality (in terms of pay, conditions and status) than full time jobs and this relates to the overall lower position of women in the labour market. Significant progress has been made in narrowing the pay gap between male and female employees but it remains high (particularly for women working part time).

The 1980s and 1990s recessions and the restructuring associated with the decline in manufacturing all took their toll on male employment. This was particularly the case for older male workers for whom employment rates among men aged 50-64 fell from around 90 per cent in the early 1970s to less than 65 per cent in the early 1990s (Pensions Commission, 2005). Not only did unemployment increase but inactivity rates among working age men increased too. This was coupled with increases in rates of disability among the working age population and lower rates of economic activity among this group. Union membership continued its steady long term downward trend through the 1990s and 2000s (from 32.5 per cent in 1995 to 28.4 per cent in 2006) (Grainger & Crowther 2007).

Additional relevant changes concern the age composition of the workforce, the increase of migrant workers and changes in educational level. The employment rate of people aged 50

and over has increased steadily since 1992. For those aged 50 to state pension age, the rate increased by 8.6 percentage points and for those individuals of state pension age and above, the increase was 3.6 percentage points. This resulted in an increasing number of older people in the workforce.

An increase in migrant workers has been observed in recent years, in part due to the enlargement of the European Union in 2004 (Ker & Kahn 2009). In the first quarter of 2009, about 13 per cent or 3.8 million employed people were born overseas (compared to 2.0 million in 1997 and 2.6 million immediately before EU enlargement in 2004). Of those born abroad, numbers born in the EU increased from 694 thousand at the time of enlargement to 1.2 million in 2009. The new EU states contributed 76 thousand and 518 thousand, respectively, in 2004 and 2009 (ONS 2009). A majority of those from new EU states (55 per cent) were employed either in elementary occupations or as process, plant and machine operatives, compared to 18 per cent of the UK born (Ker & Kahn 2009).

Partly in response to the shift from a manufacturing to a service led economy (where academic qualifications have greater value over vocational skills), the UK working age population has become more academically qualified. The proportion without any educational qualifications has been reduced by a third over the last ten years.

However, increases in higher education over the 1990s were disproportionately enjoyed by the most advantaged. Higher education participation rates increased from 35 per cent to 50 per cent for young people from non-manual backgrounds but from 11 to 19 per cent for young people from manual backgrounds. Some recent evidence suggests that this socio-economic gap narrowed between 2002 and 2006 (DIUS 2008). The higher qualified enjoy a much more advantaged position in the labour market with higher earnings and lower incidence of unemployment (Palmer et al 2008).

To monitor social inequalities in current work and employment conditions in a reliable and valid way, a new National Statistics Socio-economic Classification (NS-SEC) was introduced in 2001. This classification was the first to have relations and conditions of employment as its conceptual basis where it is assumed that social power arises from the division of labour. The allocation of detailed occupation groups to classes was based on theory and empirical investigation. A series of specially commissioned questions, designed to capture the theoretical dimensions of the conceptual basis, were included in the UK Labour Force Survey to assist with the allocation of occupation groups. The five key dimensions were the structure of pay, period of notice required, promotion prospects and flexibility in working time (autonomy). In terms of its theoretical basis, NS-SEC represents a structural model where

individuals occupy social class positions that shape their lives and determine a variety of outcomes, one of which is health (Rose & Pevalin 2003).

One of the biggest challenges in terms of tackling the social gradient in health is that some of the social gradients in the social determinants of health inequality have considerably widened over the recent past. Social change over the last few decades in the UK has meant that there has been considerable growth in managerial and professional occupations ('more room at the top') and a relative reduction in a range of occupations at the intermediate and lower end of the social scale. This has resulted in an increase in the share of employees working in jobs with better relations and conditions of employment – with health outcomes among employees expected to improve. However, residualisation has meant that those at the lower end of the social scale are increasingly more disadvantaged across a range of dimensions – with the social gradient in health outcomes expected to have increased as a result.

Even if there were no change in health outcomes, a simple redistribution of the population across the social scale, with the most advantaged become more heavily concentrated in the top social class and those at the lower end becoming a more homogenous group of very disadvantaged employees, would result in an increase in health inequality. Layered on top of this redistribution, some determinants such as earnings inequality and the experience of unemployment have become considerably more unequal between employees along the social gradient (Annan 2009, Dickens & McKnight 2008a). Inequality in hourly, weekly, monthly and annual earnings became considerably greater over the 1980s and to a lesser extent over the 1990s. In terms of annual earnings, recent research evidence has shown that the highest earning 10 per cent of employees in 1980 were earning approximately 10 times the lowest earning 10 per cent. This increased to around 17 times by 1990 and 20 times by 2000. Inequality in annual earnings, according to this measure, doubled over this 20 year period (McKnight 2009). While earnings form the largest component of household income for the majority of the working age population, the impact of benefits and taxation is also important. However, a recent study found little net redistributive effects of these over the last 30 years (Jones et al 2009).

Work to validate NS-SEC showed a clear relationship between the experience of unemployment and social class (both short term and long term) even after controlling for gender, age and household circumstance. Individuals occupying 'labour contract' class positions were found to be considerably more likely to experience unemployment than those occupying 'service relationship' classes (Elias & McKnight 2003).

In such an environment it is clear that, in assessing the likely impact of policies designed to reduce health inequalities, it is necessary to take into account changes in the social context and have a good understanding of the underlying changes in the labour market.

### *2.1.2 Critical employment conditions*

The majority of the English workforce is employed on full-time contracts. While the country is known for its long working hours culture average weekly hours of employment fell from 33.5 to 32 between 1995 and 2005, a similar decrease in percentage point was also recorded among full time employees. The share of employees working very long hours, 48 hours or more a week, also fell by 20 per cent. This trend was no doubt related to the Working Time Directive which partly came into force in 1998, although the limit on weekly hours of work remains voluntary. Despite the high prevalence of full-time work, part-time work, temporary work and other types of non-standard work are relevant to the topic of this report.

*Temporary working*, although heterogeneous, is generally considered to be of lower quality than permanent employment. Concern grew over the 1990s as the share of employees working in temporary jobs increased. Yet, in 2008, the rate fell to 5.5 per cent. Various policies are being designed to improve the conditions of employment of temporary workers (e.g. the Agency Workers Directive).

The percentage of individuals *working part time* increased from 23.6 per cent in 1992 to 25.5 per cent in 2008. While this results from free choice in many employees (women, older workers), male part-time employees often report that they could not find a full-time job (Kent 2009). A recent survey found that the UK had one of the lowest proportions of people holding indefinite contracts, and that there were a large number of workers without any contract (Parent-Thirion et al 2007). However, all UK employees are covered by a range of Statutory Rights. These include the statutory right to a written contract of employment and rights that cover unfair dismissal, paid holiday entitlement, redundancy pay and, for fixed term employees, having the same contractual rights as comparable permanent employees.

Many forms of *non-standard work arrangements* and *precarious jobs* such as contingent, unregulated underground or home-based, are characterised by variable schedules, reduced job security, lower wages, hazards at the workplace and stressful psychosocial working conditions. Workers having a permanent contract have more skills and credentials, have more information of the workplace hazards, experience less hazardous work conditions, and have better health outcomes. Research has also shown that when workers have less skills and credentials, they also tend to experience hazardous working conditions, including physical

strain, low job control, greater noise and air pollution, shift work, a monotonous job, and a hectic work pace, as well as worse self-reported health and a large number of health outcomes (Vahtera et al 1999; Schrijvers et al 1998; Siegrist & Marmot 2006).

*Informal employment* is an important type of precarious employment varying according to type of production unit and type of job. Type of production unit is defined in terms of the legal organization and other enterprise-related characteristics, while type of job is defined in terms of employment status and other job-related characteristics. Production units are classified into three groups: formal sector enterprises, informal sector enterprises, and households. Jobs are distinguished according to status-in-employment categories and according to their formal or informal nature. For employment status, different types of groups can be described: own-account workers; employers; contributing family workers; employees; and members of producers' cooperatives.

Workers holding informal jobs are disadvantaged compared to formally hired workers in several aspects that separately or together affect their occupational health. The most important factor is poverty, since several studies show that firms in the informal economy usually have low profits, and informal workers have lower salaries than those in formal firms. In addition, individuals working in the informal sector are unlikely to be making National Insurance contributions. For this reason, it is less likely that they will be building up entitlement to protective, contribution-based benefits which they could draw on when they are unemployed, sick, pregnant and when they retire. This makes their position precarious both now and in the future. Informal employment is relatively prevalent among young people and, overall, is higher in the UK than in many other European countries (Stanculescu 2005). The scientific literature on occupational health and the informal economy is scarce and most studies are descriptive, a fact that limits the generalisation of results (da Silva et al 2006; Fongichigong 2005; Hernandez 1996; Nilvarangkul et al 2006; Lowenson 1998; Rongo et al 2004; Iriart et al 2006; Santana & Loomis 2004; Gutberlet & Baeder 2008).

*Child labour* is a type of work that is of special concern. Although quantitative estimates are not precise, studies conducted over the last two decades in the UK conclude that the extent of child labour is still an issue (Pettitt 1998; O'Donnell & White 1998; Somerset 2001). Although the Government introduced the Children's Bill in 2004, designed in part to extend the protection offered to children, child work continues to require careful monitoring as child-labour is often associated with problems related to the physical, physiological, mental and social development of children as well as accidents (Health and Safety executive 2003). Child labour may also directly compromise height, which can be regarded as a biological indicator

of social injustice, and recently seen as a relevant component of the so-called physiological capital (Eijekemans et al 2005; Gunnarsson; Dantas 2005; Duyar & Ozener 2005; Fassa 2003; Yamanka & Ashworth 2002; Fogel 2006; Hawamdeh & Spencer 2003). Several recent policy documents have addressed issues of special concern about the development of child labour (UNICEF 2003a, 2003b, 2004; TUC/NSPCC 2001).

*Migrant workers* are another group at potential risk. A report, undertaken in South Lincolnshire in 2005 on behalf of the East Midlands Development Agency (Zaronaite & Tirzite 2006) identified a range of problems faced by migrant workers due to exploitative practices of employment agencies and developed a set of key recommendations in relation to exploitation at work, exploitation in accommodation, and education, training and integration (Palmer et al 2008). Remittance payments put an additional strain on many migrants, leading them to work long hours, hold multiple jobs, live in overcrowded accommodation and eat a poor diet (Datta et al 2006). However, it is difficult to generalise as there is a considerable amount of variation in the chances of migrants being employed and their relative earnings by country of birth (Dickens & McKnight 2008b; Rutter & Latorre 2009).

A minority issue concerns *slavery*. A report on the UK position highlighted the circumstances of those working in highly exploitative conditions, with no rights and threatened with the fear or reality of violence (Craig et al 2007). Studies reveal abuse and exploitation of migrant domestic workers (Oxfam & Kalayaan 2008). While there are no reliable figures on the scale of forced labour in the country, there is a range of qualitative accounts on the subject, based both on first-hand and anecdotal accounts of foreign nationals trafficked into the UK.

Women from poorer countries who do not find formal or informal jobs in economic sectors such as agriculture/horticulture, contract cleaning and residential care (Anderson & Rogaly 2005) are particularly at risk of trafficking for sexual exploitation (Skrivankova 2006). No valid figures are available on numbers involved and whether (and to what extent) this trafficking has involved children. The working and living conditions of these vulnerable groups and the limited statutory protection afforded to them warrants particular attention (Anderson & O'Connell 2003, Matthews 2006). For example, the UK has yet to sign and ratify the Council of Europe's Convention on Action Against Trafficking in Human Beings, or to ratify the UN Palermo Protocol (Craig et al 2007).

## **2.2. Recent initiatives on improving health and work in England**

In this section we briefly describe some of the recent policy initiatives designed to tackle unemployment, inactivity and other aspects of poor relations and conditions of employment which are known to be associated with poorer health outcomes. A number of *labour market policies* introduced over the last ten years have potentially improved health among the work force. In terms of reducing unemployment, the New Deal programmes were designed to tackle high unemployment rates among specific groups (e.g. long term unemployed, young people, over 50s, lone parents). In the first few years after this programme was introduced evaluation evidence suggests they have had a modest but significant impact on helping unemployed people into work. Different groups faced differing degrees of compulsion to participate in the programmes which involved active assistance from personal advisors to prepare for and seek employment. Young people (18-25 years) who had not found work after a set period faced benefit sanctions if they did not take up subsidised employment or a restricted number of work related options (Blundell et al 2003).

For the first time lone parents were offered voluntary assistance to prepare for and find work. The New Deal programmes have evolved over time and elements have now been integrated into standard conditions for all job seekers. In addition to activating the unemployed into find work, there has been a second strand of policies designed to ‘make work pay’. In-work benefits have been extended to include a much wider group of low paid employees and these Tax Credits are more generous than those previously available. Tax credits increase the financial incentive for individuals with low earnings potential to find and remain in work. In 1999 for the first time a national minimum wage was introduced and various other changes to the tax and national insurance schedules led to increases in the net earnings of low paid workers.

More recent developments have shifted the focus onto those who have traditionally not received *work search assistance* and whose out of work benefit entitlement has not been conditional on taking active steps to find work. Disabled people and lone parents have traditionally experienced high rates of non-employment and high associated rates of poverty. A number of initiatives have been tried to reach disabled people but the most significant was introduced in October 2008 when the whole structure and conditions attached to claiming benefit on the basis of disability were changed. All applicants now have to undergo a Work Capability Assessment. If they meet various criteria individuals can qualify for the new Employment and Support Allowance (ESA), if they do not then they have to apply for Job Seeker’s Allowance.

A number of policies have been designed to make it easier for individuals (particularly women) to combine caring responsibilities with work. The *National Childcare Strategy*, announced in 1998, aimed to make available accessible, affordable, good quality childcare for all children aged 0-14 years (DfEE 1998). Some gains have been made in working towards this objective with free pre-school places available for 3 and 4 year olds and an expansion in child care places (Stewart 2009). However, deficiencies remain and coverage is not universal with particular problems with certain types of childcare (such as wrap around care). Since 2003 employees have had a statutory right to request a flexible working arrangement as long as they have been continuously employed with the same employer for a defined minimum time. This applies to parents and legal guardians and those who care for a spouse or relative. However, this does not confer the right to flexible working - only a statutory right to ask for it and for their application to be given serious consideration.

*Antidiscrimination legislation* on the basis of sex introduced in 1975 was extended to include age (2006), religion or belief and sexual orientation (2003). The Equality Bill before Parliament in 2009, if passed, would consolidate and extend previous legislative on age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex and sexual orientation. It would also impose a duty on some public authorities to have due regard to socioeconomic considerations in deciding their strategic priorities (UK Parliament 2009).

Importantly for health inequalities employees on fixed term contracts now have the same minimum rights as permanent employees in terms of pay and conditions, benefits packages, occupational pensions schemes (but usually have to have a contract for 2+ years) and protection against redundancy or dismissal. However, temporary workers (particularly agency workers) conditions remain inferior to those enjoyed by most permanent employees and further steps are being explored to improve their conditions of employment. The 1995 Disability Discrimination Act built on and extended earlier disability discrimination legislation and required employers to make reasonable adjustments to ensure that they do not discriminate against disabled customers or employees. It prohibits discrimination in relation to employment of disabled people, including recruitment, training, promotion, benefits, dismissal, etc.

In conclusion, recent initiatives on improving aspects of employment known to be related to health outcomes – such as, work participation and employment prospects, protection at work and improving income of low paid workers - in England have produced some favourable

results. Yet, in view of the challenges described additional efforts are needed, in particular those aiming at the reduction of social inequalities in health of the workforce.

### **3. Answering the key questions**

#### **3.1. Health effects of adverse work and employment conditions: a selective review**

##### *3.1.1. Unemployment, job instability and temporary employment*

The impact of unemployment on health is well established in England. Unemployment increases rates of depression, particularly in the young. Parasuicide rates in young men who are unemployed are substantially higher than for those in employment (Dorling 2009).

Several epidemiological studies from England and Wales (Morris et al 1994, Moser et al 1987, Bethune 1997, Mitchell et al 2000), from Scandinavian and other countries (Martikainen & Valkonen 1996, Iversen et al 1987, Pensola & Martikainen 2004, Voss et al 2004, Ahs & Westerling 2006, Kivimäki et al 2003, Gallo et al 2004) document elevated risks of fatal or non-fatal cardiovascular or cerebrovascular events or of all-cause mortality among *unemployed* as compared to permanently employed people. Risks are particularly high among the long-term unemployed.

The prospective study design, and the adjustment for baseline health observed in some of these studies reduce the probability of reverse causation. Effect sizes are usually in the range of 1.5 to 2.5. In the ONS Longitudinal Study, excess mortality from suicide was obvious among unemployed men (Moser et al 1984). In the British Household Panel Study unemployment among people in the most disadvantaged social group was related to elevated risk of incident limiting illness (Bartley et al 2004). Other studies point to impaired mental health, specifically depression, as a consequence of unemployment (Kasl & Jones 2000, Kaplan et al 1987), whereas becoming depressive in turn increases the probability of future unemployment and loss of income (Whooley et al 2002). Becoming re-employed is generally associated with a reduction in symptomatology (Kessler et al 1989, Kasl & Jones 2000), but not in the rate of mortality (Bethune 1997).

A substantial amount of evidence is now available on adverse health effects due to job insecurity and its most important determinants, downsizing, restructuring and outsourcing. In *Table 1 (Appendix)* the current state of art is summarised in a systematic way. It is of particular interest to see that exposure to *job instability* due to downsizing was shown to increase health adverse behaviour (Kivimäki et al 2007), musculoskeletal problems (Kivimäki et al 2001), work-related health symptoms (Dragano et al 2005), sickness absence (Vahtera et

al 2004, Westerlund et al 2004a), disability pension (Vahtera et al 2005) and mortality (Vahtera et al 2004) (for review Ferrie et al 2008). In this latter study from Finland all-cause mortality was increased by about 40 per cent among those experiencing (and surviving) heavy downsizing, and coronary heart disease mortality was increased by almost a hundred percent (Vahtera et al 2004). Conversely, turning from insecure to secure employment was associated with improved health (Virtanen et al 2003). In the British Whitehall II study, exposure to threat of a major organizational change was associated with adverse changes in longstanding illness, sleep patterns and minor psychiatric morbidity (Ferrie et al 1998). Other reports document effects of job instability, in combination with subjectively perceived job insecurity, on atherogenic risk (Siegrist et al 1988, Mattiassin et al 1990). Several studies indicate that *job insecurity*, defined as the discrepancy between the level of security experienced and the level they prefer, is related to poor mental health (Ferrie et al 2008). Job instability and insecurity can also occur in rapidly expanding companies in addition to the more obvious processes of downsizing. One Swedish study found elevated odds ratios of long-term sickness absence and hospitalization of employees in the years following a period of rapid organisational expansion (Westerlund et al 2004b). However, the current evidence on health adverse effects of perceived job insecurity is mixed (*see Table 1, Appendix* and Muntaner et al 1998).

*Temporary employment* or working on a fixed term contract, a condition that is common in about 15 per cent of the workforce in Europe, is associated with increased risks of a variety of adverse health outcomes. Again, the current state of the art is summarised in a systematic way in a separate Appendix (in *Table 2, Appendix*).

Along with labour market flexibility, deregulation of labour markets around the world is a potential source of deterioration in workers' health in some of the 'new' types of temporary employment. Although a majority of studies suggest adverse effects on health, temporary work is sometimes related to an improvement in health (Virtanen et al 2003), possibly reflecting effects of different labour market regulations in different countries (Rodriguez 2002) or the heterogeneity of circumstances in which people take on temporary work.

The risks associated with temporary work included increased occurrence of alcohol-related causes of death in both genders and an increase in smoking-related causes of death in men, with hazard ratios ranging from 1.2 to 1.6 (Kivimäki et al 2003). Mortality risks are substantially stronger if temporary work is continued on an involuntary basis or in combination with feelings of dissatisfaction (hazard ratios ranging from 2.1 to 2.6) (Nätti et al 2009). In a review of 27 studies on health effects of temporary work most consistent

associations were found with regard to reduced mental health (Virtanen et al 2005a). Additionally, increased risks of accident and musculoskeletal disorders were reported (Benavides & Benach 1999, Silverstein et al 1998).

Although temporary work arrangements have tended to create jobs during periods of high unemployment in most European countries, this can have a detrimental effect on health. Most recent research has indicated that under equal working conditions, such types of employment tend to be associated with several health problems (Benavides & Benach 1999; Benavides et al 1999; Benavides et al 2000) such as distress (Cannuscio et al 2004), fatigue, musculoskeletal disorders (Benavides et al 2000; Benach et al 2004), self-perceived health (Virtanen et al 2005b; Artazcoz et al 2005), liver disease, mental disorders (Kim et al 2008), absenteeism (Benavides et al 2000; Benach et al 2004, Virtanen et al 2006) and stress (Benavides et al 2000; Virtanen et al 2006). Against this background, Dutch and Danish governments have developed 'flexicurity' labour markets, intended to expedite flexibility to the benefit of employers, and at the same time, to give greater job security to employees.

### *3.1.2. Physical, ergonomic and chemical hazards at work*

The European-wide panel survey on working conditions indicates that every sixth worker in Europe is exposed to toxic substances at the workplace, and almost one third is exposed to noise at work, at least intermittently (Parent-Thirion et al 2007). A detailed account of occupational diseases cannot be given here (McDonald 2000), but it is evident that physical and chemical stressors at work make a significant contribution to the burden of work-related diseases and injuries (Verma et al 2002). Specifically, occupational groups with a high percentage of workers in lower socio-economic positions are at elevated risk of occupational injuries and accidents, such as construction workers, agricultural workers, transport workers, or miners (Arndt et al 2005). Moreover, unhealthy or restricted posture at work, repetitive movements and heavy lifting are more prevalent among lower status workers, and these conditions increase the risk of musculoskeletal disorders (Bernard 1997). Workers exposed to these physically stressful conditions are less likely to be able to work until retirement age (Parent-Thirion et al 2007), and their risk of disability pension is increased by 50 to 100 percent compared to unexposed workers (Blekesaune & Solem 2005, Krokstad et al 2002, Lund & Csonka 2003, Karpansalo et al 2002).

Physical, ergonomic and chemical hazards at work are often combined with an adverse psychosocial work environment, thus multiplying health risks among exposed people. Few

studies have documented the long-term health effects of such cumulative exposures in any detail (see Devereux et al 2002, Dragano 2007).

### 3.1.3. *Shift work and other work time factors*

The results of several epidemiological studies, suggest that the risk of cardiovascular disease in *shift workers* is increased by about 40 percent compared to daytime workers (Härmä 2006, Tüchsen et al 2006, Haupt et al 2008, Ellingsen & Bener 2007). Similarly, an increased risk of developing a metabolic syndrome was observed among shift workers, with a relative risk of about 1.7 (de Baquer et al 2009, Karlsson et al 2001). Additional investigations demonstrate an elevated risk of accidents, particularly among evening and night shift workers (Bambra et al 2008a). Reported health effects are contingent on duration of shift work, with marked increases after more than 10 years of continued exposure (Steenland 2000). However, there are some inconsistent results, and the processes mediating the reported associations (sleep disturbances and mismatch between circadian rhythms, disturbed work-life balance, changes in health lifestyle) are still debated (Härmä 2006). Night shifts are particularly relevant as a potential source of work accidents, cardiovascular and gastro-intestinal problems and eventually cancer (Swerdlow 2003). Potential links between shift work, chronodisruption and the pathogenesis of cancers are currently debated in international occupational health research (Erren et al 2009).

In recent years, with increasing flexibility of work time patterns, studies documented adverse effects on health produced by *extended or irregular work hours*. For instance, working more than 11 hours a day is associated with a threefold risk of myocardial infarction (Sokeyima & Kagamimori 1998, van der Hulst 2003), and a fourfold increased risk of type 2 diabetes (Kawakami et al 1999). Moreover, in jobs with an overtime schedule the risk of injury is increased by 61 percent among American workers (Dembe et al 2006). In an 11-year longitudinal study among Finnish workers atherosclerotic plaque growth in the carotis was proportional to number of days worked per week and to annual work hours (Krause et al 2009).

A further temporal factor concerns *work time control*. Low work time control is associated with reduced health (Ala-Mursala et al 2004), whereas increased work time control moderates adverse health effects of stressful work (Ala-Mursala et al 2005).

#### 3.1.4. An adverse psychosocial work environment

High demand in combination with low control ('job strain') and effort-reward imbalance at work are associated with elevated risks of several highly prevalent chronic diseases in midlife, as evident from longitudinal observational studies carried out over the past twenty years (*see Table 3, Appendix*). To a lesser extent, this holds true for a third concept, organisational justice. The strongest available evidence of associations of the two work stress models, 'job strain' and 'effort-reward imbalance' with adverse health is summarised in *Table 3 (Appendix)*. Concerning *cardiovascular disease*, a majority of at least 20 reports derived from prospective studies document elevated odds ratios of fatal or non-fatal cardiovascular (mostly coronary) events among those reporting job strain or effort-reward imbalance (Belkic et al 2004, Eller et al 2009, Kivimäki et al 2006, Marmot et al 2006). Overall, risks are twice as high among those with job strain or effort-reward imbalance compared to those who are free from stress at work. Effects are stronger in men than in women and more pronounced in middle-aged than older working populations. Similar effects are observed in case of re-infarction after survived first coronary heart disease (Aboa-Éboulé et al 2007). Two reports based on the concept of organisational justice demonstrate an elevated cardiovascular risk (Kivimäki et al 2005, Elovainio et al 2006).

In addition several cardiovascular risk factors are associated with an adverse psychosocial work environment in terms of job strain and effort-reward imbalance, in particular metabolic syndrome (Chandola et al 2006), type 2 diabetes (Kumari 2004), hypertension (Schnall et al 2000), elevated fibrinogen (Brunner et al 2004, Vrijkotte et al 1999), atherogenic lipids (Siegrist et al 1988), obesity (Kivimäki et al 2002), health-adverse behaviours (Head et al 2004, Siegrist & Rödel 2006) and markers of dysregulated autonomic nervous and endocrine system activity (Chandola et al 2008, Hintsanen et al 2005, Vrijkotte et al 2000, Steptoe et al 2004).

A second, widely prevalent chronic disorder, *depression*, is associated with stressful work.

The large majority of results from 12 prospective investigations confirm elevated risks of depression among employees with job strain or effort-reward imbalance or a co-manifestation of both, and odds ratios vary between 1.5 and 3.6, depending on type of measure, gender and occupational group under study (Bonde 2008, Siegrist 2008). Again, psychobiological pathways that may trigger affective disorder were analysed with regard to job strain and effort-reward imbalance, especially so dysregulated patterns of cortisol secretion (Chandola et al 2008, Bellingrath & Kudielka 2008) and endogenous inflammation (Hamer et al 2006).

*Other health outcomes* significantly related to job strain or effort-reward imbalance concern reduced physical and mental functioning (Stansfeld et al 1998), musculo-skeletal disorders (Bongers et al 2002, Gillen et al 2007, Rugulies & Krause 2008), sickness absence (Marmot et al 2006, Head et al 2007) and disability pension (Blekesaune & Solem 2005, Dragano 2007, Stattin & Järholm 2005).

It should be pointed out that many of these new findings were obtained from the Whitehall II study in England where the concepts of demand, control and support at work, effort-reward imbalance at work and organisational justice have been tested extensively, with a variety of health outcomes and intermediary markers (*Table 3, Appendix*).

*In conclusion*, despite the fact that several studies have reported negative results, there is a substantial body of scientific evidence on the health effects of an adverse psychosocial work environment. This provides a solid basis for developing a range of work and employment-related interventions (*see Section 3.3*).

### **3.2. The role of work and employment in explaining social inequalities in health**

As indicated above, the distribution of adverse job conditions across working populations ('unemployment, job instability and temporary employment', 'physical, ergonomic and chemical hazards', 'shift work and other work time factors') is strongly related to the social gradient. Those in more disadvantaged groups are more often exposed than those in more privileged positions. Does the same hold true for an adverse psychosocial work environment? While this question has not yet been thoroughly researched, the components 'low control at work' (job strain model) and 'low reward' (effort-reward imbalance model) were repeatedly found to follow a social gradient in the expected direction (Bosma et al 1998, Brunner et al 2004, Marmot et al 2006, Niedhammer et al 2000). However, the prevalence of 'demand', 'effort' and 'over commitment' is often higher in higher occupational status groups (Karasek et al 1998, Siegrist et al 2004), resulting in a mixed pattern of evidence. Nonetheless, in a recent comparative study of adverse working conditions among 50 to 65 year old employees in 11 European countries, a consistent social gradient of effort-reward imbalance and low control at work was observed (Siegrist et al 2009).

Using multivariate regression analysis to test the *mediation hypothesis*, some evidence to support this hypothesis has been found. In the Whitehall II study, low control at work was independently associated with incident coronary disease and with low socioeconomic status (Marmot et al 1997). In a multivariate analysis, low control in the workplace accounted for about half the social gradient of coronary heart disease, as adjustment for this factor reduced

the odds ratio of coronary disease in the low employment group from about 1.4 to about 1.2. Importantly, the relation between low control and coronary disease was not removed by adjusting for socioeconomic position (Marmot et al 1997, Bobak et al 1998).

Mediation is important, but it is not the only way in which a variable that predicts disease incidence in populations can contribute to explaining the social gradient in morbidity and mortality. The *effect modification hypothesis* posits that susceptibility to an exposure (such health-adverse work and employment) is higher among employees in lower socioeconomic positions compared to higher status people and, therefore, that the effect size produced by the exposure is higher. The effect modification hypothesis has been tested in several studies where the effect on health of either high demand and low control at work or of high effort and low reward at work was found to be greater in lower than in higher socioeconomic groups (Johnson & Hall 1988, Hallqvist et al 1998, Kuper et al 2002, Wege et al 2008). For instance, in a German study, depressive symptoms were almost seven times as frequent in the lowest occupational group scoring high on effort-reward imbalance compared to the highest occupational group scoring low on effort-reward imbalance (Wege et al 2008).

Effect modification can be observed at different levels of analysis. In a recent comparative study on welfare regimes, working conditions and health inequalities in different European countries it was discovered that the effect size of an adverse psychosocial work environment on health varied according to type of welfare regime. In universalistic welfare states with a high degree of social protection (Esping-Andersen 1990), effects were smaller compared to effects in conservative and liberal welfare regimes with less extended social security measures (Siegrist et al 2009).

In *conclusion*, evidence in favour of the two hypotheses, mediation and effect modification, has direct policy implications. Based on the first of these, reducing the adversity of working conditions and employment could be expected to result in a tangible reduction of the social gradient across the whole population. The second hypothesis suggests that targeting interventions towards lower socioeconomic groups, where vulnerability is greatest, would be expected to reduce the steepness of the social gradient. We conclude that both approaches are needed.

### **3.3. Health-promoting effects of work-related interventions**

#### *3.3.1. A taxonomy of interventions*

Interventions aimed at improving health and well being at work can operate at different levels. At the national or supranational level, occupational health and safety legislation and

distinct policies (e.g. labour market, taxes, education, family and welfare programmes) define the broader contexts within which more specific actions can be implemented. These specific interventions can be led by a variety of intermediate organisations, such as employer associations, trade unions, health services, professional groups concerned with occupational health and safety, and associations or NGOs dealing with organisational and personnel development and their business impact. Finally, the intervention needs to be delivered within either a single organisation or company, a network of interrelated firms or a group of individuals.

It is common to distinguish primary, secondary and tertiary intervention measures where the first ones are directed towards general or specific groups of working people who are free from symptoms of disease or impairment. While secondary interventions address special risk groups in terms of occupational exposures, behavioural problems or reduced health and functioning, tertiary interventions deal with rehabilitation and reintegration of (formerly) sick or chronically ill people or people with longstanding absences from work for other reasons. At each level of intervention (primary, secondary, tertiary) two distinct, but often combined, approaches can be taken - work environment change and behavioural change. The latter applies to groups of people or to individuals.

Interventions that aim to reduce social inequalities in health are commonly located at the level of primary prevention, and their focus is on the work environment rather than behavioural change. This is due to the fact that large groups are targeted and that beneficial and cost-effective interventions might be expected to produce favourable outcomes in a relatively short time interval. For this reason, the following review gives priority to these types of intervention. However, special employee assistance or rehabilitation programmes as well as health-promoting activities at work represent complementary activities with potential impact on the social gradient of disease (Black 2008).

According to Semmer (2008) *work environment change interventions* can be classified as environment-directed (ergonomic, noise, temperature, work time, broader technological and organisational context), task-directed (workload, division of work, job autonomy, team work), and social relationship-directed (communication, conflict, leadership, esteem, social support). They usually include measures of organisational and personnel development (Noblet & LaMontagne 2008). In view of the significant contribution of health-adverse behaviours (in particular cigarette smoking, unhealthy diet and lack of physical activity), in explaining the social gradient for major chronic diseases (Kivimäki et al 2008, Gruer et al 2009), it seems appropriate to consider the potential for combining health-promoting behavioural change

programmes and stress management training with approaches that change the work environment.

In an attempt to systematize the available information on work and employment-related interventions, where possible we have followed the above structure in putting forward proposals. That is to say, we start with interventions dealing with employment conditions, followed by interventions directed towards physical and chemical hazards (including safety measures). We then address interventions concerned with shift work and other work time factors, followed by interventions that focus on quality of work in terms of a health promoting psychosocial work environment.

### *3.3.2 Employment*

Active labour market policies and remuneration and tax policies that aim to reduce income inequalities are of primary importance in improving the health of the working population. At the level of national welfare systems, job stability and quality of work were shown to be greater in universalistic welfare states, such as the Scandinavian welfare system (Dahl et al 2006). Relevant social security arrangements in Scandinavia include setting unemployment benefits above the poverty threshold. They also include some protection from severe market forces, an extended pension insurance system based on duration and status of employment, and relatively generous sickness pay schemes and rehabilitation measures and granting employees the opportunity to withdraw from work (for short or long periods) because of ill-health. Workers in routine and manual jobs and employees with lower salaries tend to have a greater need for such benefits, given their higher workload and poorer general health status (Dahl et al 2006). Implementing these measures into the English welfare system that is more strongly characterized by liberal principles (e.g. promotion of private welfare provision, targeted assistance measures, limited social security) has considerable potential for reducing health inequalities. The specific areas of intervention are as follows: (a) attempting to reduce long-term unemployment, (b) incentives to increase entry and re-entry into the labour market, including special programmes for vulnerable groups and (c) investment in the workability and health of older workers.

For example, a longitudinal study from Sweden found that the health consequences of unemployment were much smaller among those who were covered by the unemployment insurance system compared to those without comparable protection (Alm 2001). As full employment is unrealistic, investment in an informal labour market can be considered as a complementary strategy for coping with long-term unemployment. Another Swedish study

documented the beneficial effects on the health of long-term unemployed people of recruitment into informal work compared with remaining excluded from work (Levi 2001). In England, there are currently a number of initiatives being developed to reduce the rate of the long-term unemployed (DWP/DH 2008), in response to Dame Carol Black's recent report (Black 2008).

Many incentives to increase entry and re-entry into the labour market are primarily directed towards women, specifically by supporting child care facilities and by providing part-time employment. In the Nordic countries, social policies encourage mothers to engage in paid work. This includes lone mothers, who are disproportionately represented in lower socioeconomic groups. Although the health status of lone mothers is generally poorer than that of married women, irrespective of the type of welfare system, lone mothers in Nordic countries were shown to be less often materially deprived than lone mothers in Britain (Roos et al 2005). A further study found that employed women with children had better health, both in England and Finland (Lahelma et al 2002a).

Long-term sickness absence can also be modified by targeted policy programmes. Several such programmes directed towards vulnerable groups have recently been established in England, but their contribution towards reducing health inequalities has not yet been evaluated sufficiently.

The Nordic countries are among the leaders in developing and implementing programmes that aim to maintain a large proportion of older people in paid work. Extensive measures to retrain and re-skill and to promote health and workability are implemented in these countries (Ilmarinen & Tempel 2002). A recent comparative study of 12 European countries showed that quality of work, as measured by the balance between effort and reward, was better the higher the percentage of investments directed towards training on the job. A similar association was found between quality of work and mean age of retirement. Interestingly, the steepest gradient in this association was found with regard to the reward component of 'esteem experienced at work'. In all these respects, the Nordic countries did better than England (Siegrist et al 2009). Flexible retirement, enhanced part-time options and regulations to protect highly stressed occupational groups at older age are complementary measures that improve the health and workability of older employees in the Nordic countries. However, to our knowledge, no prospective evidence is yet available on the effects of such measures on reducing health inequalities among older workers.

Welfare regimes may also differ with regard to their ability to provide a buffer against the adverse health effects of economic crises and substantial job instability. There is preliminary

evidence that social inequalities in health have tended to remain stable in Nordic states during periods of economic crisis whereas they are widening in European states with both more liberal and conservative regimes (Lahelma et al 2002b). Indirect support for this view is given in a report on the adverse health effects produced by economic insecurity, in the context of trade and financial liberalisation. The absence of social protection policies magnifies morbidity and mortality risks (Blouin et al 2009).

While welfare state provision operates at the national level, additional employment- and health-related measures can operate through *negotiations between employer associations and trade unions* or through interventions organised by *stakeholders*. Rights of worker participation and the options for cooperation between stakeholders vary across countries, with a relatively high level of engagement in Nordic countries and in Germany and weaker impact in some Southern European countries. In England, several interventions organised by stakeholders, with or without participation of the state, are currently under way, e.g. the Employers Forum on Age, an independent network of leading employers funded in 1996 whose mission is to recognize the value of an age diverse workforce.

An interesting project is currently implemented in France where a large investigation in occupational epidemiology offers health screenings to representative membership groups of the national social security system. This has a particular focus on high risk groups, such as long-term unemployed, temporary workers, migrant workers and other groups on the periphery of the labour market ([www.constances.fr](http://www.constances.fr)). It is important because investment in health-promoting employment and work conditions usually clusters around more privileged segments of the labour market where the health burden is less than among those on the periphery. Similarly, large enterprises operating at an international scale have developed more comprehensive programs of worksite health promotion than smaller, economically weaker enterprises. Extending such programs to the latter business organisations is considered a high priority.

At the level of *individual companies*, participatory action research offers options for identifying and modifying health-adverse employment conditions, and several such projects have been successful in this regard (Aust & Ducki 2004, Schnall et al 2009).

In conclusion, improving employment conditions through interventions at these different levels (national welfare regimes, policies that impact on work contracts, wages and work time and through intermediary organisations and individual companies) could have a long term effect in reducing social inequalities in health, but the current evidence base is still quite limited (see below). More evidence is available on the other aspects of health-adverse work

conditions, namely physical or chemical hazards and accidents, shift work and other work time factors and a stressful psychosocial work environment.

### *3.3.3 Physical and chemical hazards, injuries at work*

The first challenge in occupational health is the appropriate identification, treatment and rehabilitation of workers affected by occupational diseases. For instance, even after banning asbestos production, exposure to existing products continued particularly among lower skilled construction workers. Exposure to heavy noise provides another example of higher prevalence among lower skilled workers, where legal requirements are not always followed or where available protective devices are often not used.

Employers have a responsibility to comply with these legal requirements and to provide qualified personnel to monitor and control conditions of work. Successful implementation requires the laws to be sufficiently robust, the enforcement agencies to be adequately resourced and the legal framework to be sufficiently clear to enable prosecutions to succeed (e.g. the limited successful use of recent corporate manslaughter legislation in England). As an essential prerequisite, an unambiguous and comprehensive risk assessment has to be established. In the UK, HSE has developed the necessary tools and procedures and has responsibility for implementation (Health and Safety Commission 2004). A recent extension includes the assessment of a stressful psychosocial work environment (see below).

A further challenge concerns the prevention of injuries and accidents at work. The legal and organisational measures undertaken by occupational cooperatives in Germany over the last century have been particularly successful. For instance, over a period of 40 years, from 1960 to 2000, the number of work-related accidents was reduced from 140 per 1000 employees to 40 per 1000 employees. Major measures included improved monitoring and documentation of accidents, systematic implementation of safety measures performed by a well-trained new professional group (safety experts), such as instruction or technological innovations, and comprehensive legal regulations protecting vulnerable groups. As several low status occupations were at increased risk (e.g. construction workers, wood and sawmill workers, farmers and agricultural workers) they had the largest health gain.

More recently, a nation-wide campaign against falls at work was launched, where public personalities from sport and films served as role models to reinforce appropriate behaviour. This approach had previously been shown to be effective among less educated occupational groups. Among occupations involving frequent physical mobility (e.g. using stairs frequently or involving heavy lifting or dragging), falls were reduced by 15 per cent during the 2-year

campaign (Seifert & Ekkernkamp 2008). Another trial with relevance to injury prevention, conducted in the USA, concerned increased autonomy at work. Particularly relevant for manual workers, this study found that increased control over the pace of work had a protective effect on the risk of occupational injury (Harrell 1990). Importantly, organisational commitment (mainly from managers) and self-managing work teams (where feasible) reinforced this effect (Clarke 2008).

A recent European wide project on the impact of safety representatives on reducing occupational health hazards concluded that having trade union representation in the assessment and control process leads to better compliance with the rules, lower accident rates and fewer work-related health problems (Menéndez et al 2009).

#### *3.3.4 Shift work and other work time factors*

Two recent reviews of interventions on reorganizing shift work (Bambra et al 2008a) and on compressing the working week (Bambra et al 2008b) reached the following conclusions:

*First*, most changes in patterns of time organisation of shift work had little effect on health, except for a change from slow to fast rotation (e.g. from 7 consecutive identical shifts to 3 consecutive identical shifts) or from biological backward to forward rotation, where beneficial effects on sleep quality, fatigue and work-life balance were observed.

*Second*, self-scheduling of shifts, i.e. improving control at work reduces fatigue and sickness absence. In an intervention study on bus drivers, this reduced the risk of accidents by 20 percent.

*Third*, compressed working weeks as an alternative work schedule (e.g. the ‘Ottawa system’) were shown to improve work-life balance, but had only a small effect on (self-reported) health. Although methodologically improved studies are needed, these results do not suggest that restructuring the work schedules of manual shift workers will achieve large reductions in social inequalities in health. However, it does indicate considerable room for improvements of work-time organisation in daytime work, as follows:

- given the health adverse effects of long working hours, overtime and excessive work hours need to be controlled more systematically particularly in jobs where legislation is often not strictly applied.
- the implementation of rest breaks is desirable, particularly in jobs with a fast pace, work pressure, multiple interruptions and monotony. Rest breaks have been found to reduce the risk of injury (Taylor 2005, Tucker et al 2003).

- individual work time control (e.g. with regard to flexitime or time banking) was shown to reduce sickness absence, specifically among employed women and to moderate adverse effects of psychosocial stress at work on sickness absence (Ala-Mursala et al 2005).

### 3.3.5 Psychosocial work environment

Several recent systematic reviews have summarized current evidence on health effects following improvements of the psychosocial environment at work (Bambra et al 2007, Baxter et al 2009, Biron et al 2009, Egan et al 2007, Graveling et al 2008, Martin et al 2009, Richardson & Rothstein 2008, Semmer 2008). A majority of intervention studies have addressed behavioural changes, especially stress management programmes, while fewer have tested the effects of changes in the work environment. Only a minority of these studies are explicitly based on the theoretical models mentioned above, and many are not methodologically rigorous.

Nevertheless, several conclusions can be drawn from these reviews.

*First*, in relation to the demand-control-support model, relatively consistent results were obtained on the positive effects on mental health and, where available, sickness absence from interventions that increased participants' job control and degree of autonomy at work (Bond & Bunce 2001). There is less evidence for the positive effects of reducing demands or augmenting social support (Egan et al 2007).

*Second*, interventions that worked well were characterized by a participatory approach involving employee representatives and management personnel, e.g. in the form of 'problem-solving committees' or 'health circles'. In this context, some studies applied participatory action research, a strategy where the roles of investigators and members of the organisation under study were not clearly separated (Aust & Ducki 2004).

*Third*, increasing task variety as part of the job and strengthening team working resulted in inconsistent and at best modest improvements in health. Similarly, introducing more autonomous production groups in factory based mass production did not show the desired effects on health (Bambra et al 2007).

*Fourth*, in relation to the effort-reward imbalance model, work-related burnout and psychobiological stress reactions was significantly reduced by reward-enhancing measures based on organisational and personnel development, including leadership training (Bourbonnais et al 2006, Theorell et al 2001).

*Fifth*, there is emerging evidence that the combined effects of making changes to the setting-focused work environment and employee-focused mechanisms for coping with adverse work are stronger and more sustainable than their separate effects (Biron et al 2009, Bond et al 2008a, Semmer 2008). Thus, tailoring organisational interventions to specific subgroups or contexts provides an effective approach to achieving intervention goals.

*Sixth*, several studies indicate that combining work environment change with healthy lifestyle interventions in employees increases the probability of them adopting health-promoting behaviour. Interestingly, this is the case not only in white-collar employees, but also in skilled blue-collar workers (Maes et al 1998, Kawakami et al 1997, Orth-Gomer et al 1994). The latter results are relevant in view of the well-documented steep social gradients in health-adverse behaviours and of the potential for preventive gain by reducing them.

*Seventh*, as health-promoting psychosocial work environments have been shown to improve return to work in the chronically ill and particularly in people with mental health problems, preventative and rehabilitative efforts need to be strengthened (Black 2008, OECD 2008). In addition, there is a strong business case in term of sickness absence reduction and productivity gain for introducing such measures, in particular the Individual Placement and Support Models (Bond et al 2008b, Dewe & Kompier 2008).

Risk assessment is a necessary preliminary to action. The assessment tool developed by HSE, in the Management Standards on Work Related Stress framework, deserves special attention. It is intended that this will be further developed and more widely applied (HSE 2007). Recognizing that work stress is a significant contributor to sickness absence, the government has recently introduced a strategy for the health and well being of people of working age ('Health, work and well-being: Caring for our future', HM Government 2005) which includes a recommendation to apply HSE management standards across the public sector. In addition, several organizations including HSE and representatives of trade unions have drawn up an European Social Partner Agreement on work-related stress (ETUC et al 2004).

In *conclusion*, despite the paucity of intervention studies directed at the work environment and the methodological limitations of many of them, there are some promising first results that illustrate the potential health gain that could be achieved by improving the psychosocial quality of work environments. As one review concluded: "Given this state of affairs, it seems 'natural' that the promotion of health and the prevention of health problems should predominantly focus on creating a work environment that does not induce an undue amount of stress and that compensates for unavoidable stresses by characteristics such as high control and high rewards" (Semmer 2008). Lack of control and lack of reward at work have been

shown to be critical determinants of a variety of stress-related disorders and to be more prevalent among lower occupational status groups. Focusing interventions around these dimensions and targeting less privileged groups within the workforce would seem to be a high priority.

### **3.4. Socio-political and economic conditions and consequences of interventions**

The fourth key question mentioned above (*see Section 1.5*) concerns evidence on favourable economic effects resulting from work-and employment-related interventions. So far, few studies only explored this question in a systematic way. Where reports on cost-effectiveness are available, estimates point to savings due to a reduction in sickness absence spells (Bond & Bunce 2001, Robertson & Flint-Taylor 2008). This paucity of data and the apparent lack of interest in long-term benefits of investment in ‘good’ work is difficult to understand, in view of the rising cost of inactivity due to adversity in the work environment (Levi 2001). A study by Pfeffer (1998) has demonstrated that return-on -investment can act as a powerful incentive for improving work and employment conditions, including fair employment contracts. The study explored common organisational features of those US companies that were most successful in terms of shareholder value in the 1980s and 1990s. He came up with a set of common characteristics that are similar to those identified in scientific studies based on the work-stress models discussed above. They included employment security, selective hiring of personnel, self-managed teams and appropriate compensation contingent on organisational performance.

#### *3.4.1. ‘Good’ work: new challenges*

What conclusions can be drawn from evidence reported in *sections 3.1 to 3.3* on how to define ‘good’ (i.e. health-promoting and health-protective) work?

*First*, good work is assumed to be free of the core features of precariousness, such as lack of stability and high risk of job loss, lack of safety measures (exposure to toxic substances, elevated risks of accidents) and the absence of minimal standards of employment protection.

*Second*, good work enables the working person to exert some control and participatory decision making on matters such as the place and the timing of work and the tasks to be accomplished.

*Third*, the demands of good work are appropriately high, both in terms of quantity and quality, without overtaxing the working persons' resources and capabilities and without doing harm to their physical and mental health.

*Fourth*, good work provides fair employment in terms of earnings reflecting productivity in an adequate way and in terms of employers' commitment towards guaranteeing job security.

*Fifth*, good work offers opportunities for skill training, learning and promotion prospects within a life course perspective, sustaining health and work ability and stimulating the growth of an individual's capabilities.

*Sixth*, good work provides opportunities of experiencing esteem, support and respect, preventing social isolation and any form of discrimination and violence.

*Seventh*, good work enables workers to share relevant information within the organisation, to participate in organisational decision-making and collective bargaining and to guarantee procedural justice in case of conflicts.

*Eighth*, good work aims at reconciling work and extra-work/family demands in ways that reduce the cumulative burden of multiple social roles.

*Ninth*, good work attempts to reintegrate sick and disabled people into full employment wherever possible by mobilising available means.

*Tenth*, good work contributes to the workers' well being by meeting the basic psychological needs of experiencing self- efficacy, self-esteem, sense of belonging and meaningfulness.

Obviously, there are many obstacles to promoting and expanding good work. For instance, labour market constraints may prevent any rapid decrease in low skill jobs. The current economic crisis may undermine efforts towards establishing regulatory control on downsizing, subcontracting and outsourcing. Job opportunities for elderly workers may be compromised by rising labour market competition following reduced economic growth. There are also structural conflicts between policies strengthening economic growth and full employment on one hand and policies that aim at developing an environment-friendly sustainable economy on the other.

However, a large 'unused' potential for developing and expanding 'good' working conditions exists in all advanced and rapidly developing economies where the benefits of implementing 'good' work include medium- term and long-term increases in return on investment, enhanced productivity, health and commitment of workers, and reduced costs related to sickness absence and work compensation claims.

### *3.4.2 Gaps in knowledge and constraints on action*

A key question is whether a *lack of evidence* on the social and economic effects of changing the work environment is a major *barrier to implementation*? Clearly there are still significant *gaps of knowledge* in this area of research. This is most obvious in relation to the following:

- Evidence is needed from methodologically sound, theory based intervention studies that changing stressful work environments is effective. These studies should make use of the emerging conclusion that the combined effects of changing the work environment and of improving employees' coping capabilities produces sustainable effects;
- There is a need for evidence derived from intervention studies that combine changes in the work environment with healthy lifestyle interventions among employees. These studies should make appropriate use of the synergies of structural and personal empowerment;
- In both types of intervention study, priority should be given to vulnerable groups, specifically those in low occupational positions, in unstable, precarious non-standard work arrangements, in workers confined to unfair work contracts and those with exposures to multiple physical and psychosocial stressors at work. In addition, priority should be given to working people who suffer from limiting illness, chronic disorder or restricted work ability;
- In both types of intervention study the social and economic effects need to be assessed not only with regard to short-term gains to companies, but also longer-term productivity and the well being of employees and companies;
- Evidence is needed from investigations that analyse the modifying effect that macro-social and economic contexts have on the health impact of interventions at work (for example, particular labour market or wage policies or welfare and social protection measures). These studies need to use cross-cultural comparative designs and apply multi-level models to identify the different pathways and effect sizes.

In addition to these and other gaps of knowledge there are other *constraints on action* that are not due to insufficient evidence. Among these, the following seem particularly important:

- Economic crises and downturns that derive from globalisation.
- Liberalisation of capital, trade and labour market may reduce the power of the state to enforce regulations;
- Trans-national forces operating across major sectors of economic development can reduce the impact of national labour market, welfare and redistributive policies;
- Coordination of work- and health-related policies at the European level may lag behind rapid technological and economic developments at a global level.;
- Resistance from employer organisations to investment in work- and employment-related health promotion is often due to short-term decision making, high turn-over of

responsible management, lack of commitment to the long term well being of employees, poor motivational and financial incentives for such activities, or ignorance of models of good practice and their significance for improving productivity and well being.

Reducing the gap between the available science and policy at different levels is a key issue in efforts to reducing social inequalities in health associated with work and employment.

#### **4. Recommendations and priorities**

This report has summarized three lines of evidence. First, specific employment and working conditions are associated with elevated risks of reduced physical and mental health, elevated sickness absence and disability pension risk. These conditions are found in the English workforce. Importantly, these associations are not confined to traditional occupational hazards and related occupational diseases and injuries, but include increased health risks attributable to insecure employment and an adverse psychosocial work environment. Second, as the distribution of many of these health problems follows a social gradient, it was shown that work contributes to the explanation of this social gradient in two complementary ways, by mediating part of this association and by magnifying the effects of socio-economic position on health. Third, available evidence suggests that structural (mainly organisational and workplace-related) and personal (mainly behavioural) interventions may improve health and well being of exposed groups within the workforce. based on this evidence, the following recommendations are intended to make a significant contribution towards healthier work and, ultimately, towards reducing social inequalities in health. Supportive evidence is indicated by referring to respective sections within this report.

##### *General principles for developing recommendations*

- Make the provision of fair employment and the improvement of ‘good’ work a central goal of government policies.
- Give priority to policies on employment and working conditions that emphasise action on social policies and good labour market and workplace standards in line with principles of a sustainable economy.
- Reduce harmful employment and working conditions through empowering workers, integrating labour standards with labour market regulations and, where necessary, additional legislation or regulation.

- Implement inter-sectoral interventions, where policymakers, government, employers, workers, and community organisations are actively engaged.
- Specify and implement actions that are contextualised for different types of regions, firms, and workers.

### *Specific recommendations*

#### 1. Increasing job security

- implement measures and incentives to extend employment opportunities in accordance with principles of a sustainable economy at the national, regional and company level (3.1.1. and Tables 1 and 2, Appendix);
- establish regulations to prevent the adverse effects of downsizing, subcontracting and outsourcing of companies and organisations (including supply chain regulations) (3.3.2);
- promote investment in training and re-skilling of less qualified segments of the workforce, with emphasis on developing a sustainable economy (2.1.1; 3.1.4);
- take measures to increase the job stability and appropriate career advancement of long-term employees (3.1.1 and Tables 1 and 2, Appendix; 3.3.2);
- reduce involuntary early retirement and promote policies that maintain the ability of older employees to work (3.3.5);
- promote policies to maintain employment during economic downturns, while ensuring efforts towards safeguarding the environment (3.3.2);

#### 2. Enforcing protection in employment

- ensure adequate surveillance information and monitoring of health-endangering employment and working conditions (including professional screening, expert rating systems, employee surveys) (3.1.2; 3.1.3; 3.3.3; 3.3.4);
- enforce existing legislation to protect workers at risk, specifically those in precarious, insecure or informal jobs, immigrant workers, disabled people and employed children (2.1.2; 3.3.2);
- ensure that legislation and regulations adequately cover the need for protection at work, including legal sanctions, discrimination and exposure to occupational hazards that affect work places and work environments (2.2; 3.3.2; 3.3.3)

- enforce existing regulations concerning work time, shift work and exposure levels and duration in hazardous jobs (3.1.3; 3.3.4);
- extend health assessments of workers in ‘unhealthy’ working conditions (3.1.4; 3.3.5);

### 3. Enhancing participation at work

- expand workplace participation to give workers a greater say in working conditions and in the sustainable operation of organisations for which they work (3.1.4 and Table 3, Appendix);
- develop and enhance partnership between employers, expert groups (occupational health and safety professionals) and employee representatives to improve healthy work organisation and practices (3.3.2);
- provide necessary means (training, staff, information and communication) to implement effective participation at work (3.1.4 and Table 3, Appendix; 3.3.5); include less privileged and marginal employment groups in participatory processes (3.2; 3.3.2);

### 4. Promoting control and reward at work

- increase employees’ control of their health by expanding coverage of occupational health services to those in precarious, irregular or informal jobs, including self employed and homeworkers (2.1.2; 2.2; 3.3.2);
- increase employees’ control of their health by providing adequate screening and monitoring of occupational health hazards and stressors and by providing appropriate worksite health-promoting programmes (3.3.1-3.3.5);
- improve employees’ control and autonomy at work by enabling decision making in task design, work time control and related measures of work organisation (3.1.4 and Table 3, Appendix; 3.3.5);
- improve employees’ rewards by providing fair wages and salaries, qualification-based promotion prospects and by establishing a culture of esteem, trust and good leadership (3.1.4 and Table 3, Appendix; 3.3.5);
- implement best practice models and intervention trials and create incentives for managers to invest into healthy work. These should include healthy work environments – social spaces, food and recreational facilities (3.3.1; 3.3.5; 3.4);

## 5. Reintegrating sick, disabled and unemployed people

- expand existing regulations of social protection and compensation to vulnerable groups of workers (2.2; 3.3.2);
- promote early intervention and treatment of employees with health problems, with particular emphasis on mental health (2.2; 3.3.2);
- enforce the implementation of regulations on rehabilitation measures in sick and disabled employees and provide appropriate services (staff, resources), with special attention to established models (e.g. Individual Placement and Support Models (3.3.5);
- endorse initiatives for re-integrating newly and longer-term unemployed into work (3.1.1; 3.3.2);

## 6. Strengthening Work-Life Balance

- promote opportunities of part-time and flexible work for those with caring responsibilities (working mothers, employees caring for disabled and chronically ill people) (2.1.2; 2.2; 3.3.2);
- expand social benefits and ensure minimal household income among those whose participation in the labour market is limited e.g. by family or similar personal obligations (2.1.2; 2.2; 3.3.2);
- promote incentives to develop family-friendly work arrangements and to provide adequate services (e.g. child care) (2.2; 3.3.4).

These recommendations to the Review need to be harmonized with recommendations coming from other task groups, evaluated with respect to their feasibility, measurement and implementation, and prioritised in terms of their capacity to reduce the social gradient in health in the short, medium and long term. The medium and long term perspectives should embody the principles of sustainable development.

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**Appendix to Task Group 2 Report**  
**Employment arrangements, work conditions and health inequalities**

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**Table 1. Overview of epidemiological studies: Job insecurity, downsizing and health (1990-2008) (I)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Roskies, et al. (1990)	Canada	26 Shipyard workers (1990)	Longitudinal study	1,291 (1990)	Job Insecurity	Psychological distress (GHQ)	The anticipatory phase was found to be a very burdening phase of unemployment due to the prolonged uncertainty. Despite good economic compensation, depressive and psychological reactions were noticed. The single, older unemployed men were found to be a risk group.
Roskies, et al. (1990)	Canada	Manager in Traditional industry (1990)	Cross-sectional study	1,291 (1990)	Job Insecurity	Psychological distress (GHQ)	Concern about any aspect of job insecurity was associated with decreased personal well-being and deterioration of work behaviour and attitudes. However, only a small minority of managers were seriously worried about imminent job loss, with substantially more anxious about deterioration in working conditions and long-term security.
Heaney, et al. (1994)	EEUU	Automotive industry. (1986-1987)	Longitudinal study	207 employees	Job Insecurity	Physical symptoms (17 somatic symptoms) Job satisfaction	Chronic job insecurity is predictive of changes over time in both job satisfaction and physical symptoms. Extended periods of job insecurity decrease job satisfaction and increase physical symptomatology.
Orpen. (1994)	Australia	Industry	Cross-sectional study	129 employees	Job Insecurity	Psychological well-being	The relation between job insecurity and psychological well-being is moderated by the self-esteem and the confidence in the personal control.
Kinnunen, et al. (1994)	Finland	Representative population (1990)	Cross-sectional study	3,503 salary earners	Job Insecurity	Psychosomatic symptoms Aches and pains	Job insecurity is a psychological stressor with adverse effects for employees. Social Support has a light moderating effect in alleviating the negative health effects of job insecurity.
Dekker & Schaufeli. (1995)	Australia	Australia's large public transport organisation	Longitudinal study	95 employees	Job insecurity	Psychological distress Burnout	Job insecurity is associated with a deterioration of psychological health (leading to psychological distress and burnout), as well as job and organisational withdrawal. Support from colleagues, management, or unions do not have a stress buffering effects.
Ferrie, et al (1995)	England	20 Civil service departments (Whitehall II)	Longitudinal cohort study	5,533 employees	Job insecurity	Self-rated health Health behaviours	There were no significant differences in the changes in health behaviours between cohort members moving into a period of job insecurity and the remainder of the cohort. Self-reported health status tended to deteriorate among employees anticipating privatisation when compared with that of the rest of the cohort.
Ferrie, et al. (1998a, 1998b)	England	Administrative workers (Whitehall II)	Longitudinal cohort study	7,419 white-collar civil servants	Downsizing	Self-rated health Longstanding illness Psychiatric morbidity (GHQ) Health related behaviours	Job uncertainty is likely to be related with poor self-rated morbidity, prolonged diseases, sleep disturbance, and minor psychiatric morbidity in both genders. Increases were significant for body mass index (BMI), ischemia, and cholesterol concentration in both genders. Among women only, job insecurity is significantly related to increase in blood pressure.
Ferrie, et al. (1999)	England	Office staffs working in civil service	Longitudinal study	8,354 office staffs	Job Insecurity Downsizing	Self-rated health Minor psychiatric morbidity health-related behaviours	Transfer to an executive agency involves a period of uncertainty in the United Kingdom. Men both already working in and anticipating transfer to an executive agency experienced significant increases in health self-rated as "average or worse", longstanding illness, adverse sleep patterns, mean number of symptoms in the fortnight before questionnaire completion, and minor psychiatric morbidity.

**Table 1. Overview of epidemiological studies: Job insecurity, downsizing and health (1990-2008) (II)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome Measure	Principals Results
McDonough. (2000)	Canada	1994 Canadian national sample aged 20-64 years old	Cross-sectional study	8,748 (1994)	Job Insecurity	Self-rated health Distress Medications Heavy drinking	High level of job insecurity lowered self-rated health and increased distress and the use of medications, but no impact on heavy drinking.
Domenighetti, et al (2000)	Swiss	General population (1997)	Cross-sectional study	2,024 employees	Job Insecurity	Psychosocial stress Self-rated health Health behaviours	Employees in high insecurity group, compared to those in low one, have significantly higher odds for seven indicators related to self-rated health and self-esteem, subjective stress, and low-back pain and poor health behaviours (regular smoking, avoiding medical consultation). The positive 'dose-response' gradient was found between rise in job insecurity level's and health indicators, suggesting a linear deterioration of health.
Kivimäki, et al (2000)	Finland	Municipal employees (1990-1995)	Longitudinal cohort study	764 employees	Downsizing	Sickness absence	Massive downsizing is attributable to disadvantageous changes in work including skill discretion, physical demands, and participation of decision-making resulting in adverse morbidity. Sickness absence rate from all causes was 2.17 (95% confidence interval 1.54 to 3.07) times higher after major downsizing than after minor downsizing.
Kivimäki, et al (2001a)	Finland	Municipal employees (1990-1995)	Longitudinal cohort study	764 employees	Downsizing	Musculoskeletal problems	Downsizing is a risk factor for severe musculoskeletal pain among those who remain in employment.
Kivimäki, et al (2001b)	Finland	Municipal employees 1991 and 1993.	Longitudinal cohort study	764: 189 men, 575 women employees	Downsizing	Musculoskeletal sickness absence	The odds ratio (OR) for musculoskeletal disorder and the corresponding sickness absence from major downsizing were 2.59 (95%, CI, 1.5 to 4.5) and 5.50 (95%, CI, 3.6 to 7.6), respectively.
Cole, et al (2001)	Canada	National Working Population 1994	Cross-sectional survey	4,230 men 4,043 women	Job Insecurity	Musculoskeletal pain Musculoskeletal activity restrictions	For both men and women, low social support at work and high job insecurity were independent predictors of restricted activity due to musculoskeletal disorders (men, OR 1.50, 95% CI 1.03-2.19; women OR 1.58, 95% CI 1.08-2.30).
Armstrong-Stassen. (2001)	Canada	Civil servants employed 1995-1997	Longitudinal study	187 of the 389 respondents, aged 45 and older	Downsizing Job Insecurity	Individual wellbeing (health-related symptoms, burnout)	After 20 months from a large scale of downsizing, older layoff survivors reported a significant reduction in commitment to the organization, employee's decisions power and organizational trust and morale. There is no significant relationship between organizational commitment and health symptoms or burnout.
Virtanen, et al. (2002)	Finland	Municipal sector employees in 8 Finnish towns in 1997-1998	Cross-sectional study	8,767 employees	Job insecurity Employment status	Self-rated health Chronic disease Psychological distress(GHQ)	Compared with permanent employees, fixed term men and women had better self-rated health and less chronic disease, but women had more psychological distress (OR 1.26). Low perceived employment security was associated with poor health across self-rated health, psychological distress, and mental health. The association of low perceived security with psychological distress was significantly stronger in permanent employees than among fixed term and subsidized employees.

**Table 1. Overview of epidemiological studies: Job insecurity, downsizing and health (1990-2008) (III)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Ferrie, et al. (2002)	England	White collar office workers in the British Civil Service	Longitudinal study (1985-88)	10,308 6,895 men 3,413 women	Chronic job insecurity Changes in job security	Self reported health Minor psychiatric morbidity, health behaviors	Loss of job security has adverse effects on self-reported health and minor psychiatric morbidity, which are not completely reversed by removal of the threat and which tend to increase with chronic exposure to the stressor.
Kivimäki, et al. (2003)	Finland	Municipal employees (1990-1993)	Longitudinal study	886 employees	Downsizing	Self-rated health Mental distress Musculoskeletal symptoms and pain Sickness absence	The greater the downsizing, the poorer was self-rated health, higher prevalence of musculoskeletal symptoms and pains (2-3 times high) in both genders, and mental distress among men. Employees who did not find employment after the staff reductions were older employees with high preexisting morbidity. Employees who get a new job elsewhere were younger and had better health already before the downsizing than the stayers. After the downsizing, deterioration of health was most likely in the stayers working in groups of major staff reductions and among the non employed leavers.
D'Souza, et al. (2003)	Australia	Self-employed managers and professionals	Cross-sectional study	1,188 workers	Job Insecurity	Depression, Anxiety, Physical health; self-rated health	High job insecurity was independently associated with poor self rated health 3.72(95% CI, 1.97-7.04), depression: 3.49 (95% CI, 1.90-6.41), anxiety: 3.29 (95% CI, 1.71-6.33), and a twofold increase for physical health 2.19 (95% CI, 1.21-3.95).
Ferrie, et al. (2003)	England	White collar office workers in the British Civil Service	Longitudinal study	10,308: 6,895 men 3,413 women	Job Insecurity Financial insecurity	Self-reported health longstanding illness: Mental health BMI	Job insecurity was strongly related to depression, but not morbidity and cardiovascular risk factors. Job insecurity seems to explain about 5% of health status which is self-rated health in both genders, longstanding illness in men, BMI in women Financial insecurity was a significant cause of deteriorating self-rated health, depression, longstanding illness, and BMI.
Mohren, et al. (2003)	Netherlands	45 different companies and organizations	Cross-sectional & Longitudinal study	12,140 employees	Job Insecurity	Common infections Health complaints	A cross-sectional relationship between job insecurity and common infections or health complaints was found. For the longitudinal relationship, the largest effect were found for flu-like illness (OR 1.39; 95% CI, 1.22-1.57) and health complaints (OR 1.51; 95% CI, 1.39-1.64).
Borrell, (2004)	Spain	National population	Cross-sectional study	2,345 men 1,874 women	Job Insecurity	Poor self-rated health	Higher levels of job insecurity than lower levels of job insecurity are associated with poor reported health (adjusted OR 2.33; 95% CI 1.51-3.61).
Lee<, et al. (2004)	U.S.A.	Women from the Nurses' Health Study, 1992-96	Prospective cohort	36,910 nurses	Job Insecurity	Coronary heart diseases	Job insecurity was associated with increased risk of non-fatal myocardial infarction (MI) in the short term (2-year follow-up: RR 1.89; 95% CI 1.03–3.50).
Swaan. (2004)	Netherlands	Working population 1998-2000	Longitudinal study	574 government employees	Downsizing	Psychological distress	The relative risk for becoming a psychological distress case was 1.61 (95% CI, 1.27-2.05), during 13 months after the closure threat of governmental agency. Within the closure group, a difference in relative risk for psychological distress was observed between employees who self reported an increase in job insecurity (RR, 1.85; 95%CI, 1.41-2.42).

**Table 1. Overview of epidemiological studies: Job insecurity, downsizing and health (1990-2008) (IV)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Vahtera, et al. (2004)	Finland	Municipal employees	Prospective cohort	5,909 male and 16 521 female	Downsizing	Sickness absence Mortality	Cardiovascular mortality was 2.0 (95% CI, 1.0-3.9) times higher after major downsizing than after no downsizing. Excess cardiovascular mortality was very pronounced in the first half of the follow up period after downsizing (adjusted HR 5.1; 95% CI 1.4 to 19.3). Major downsizing was associated with an increase in sickness absence in permanent employees, but not in temporary employees.
Ferrie, et al. (2005)	England	White-collar civil servants	Longitudinal study	10,308: 6,895 men 3,413 women (73%)	Job Insecurity	Self-reported health, Longstanding illness Minor psychiatric morbidity	Self-reported job insecurity has significantly adverse effects on both poor self-rated health and minor psychiatric morbidity. In general, about 60 percent of these associations were explained by job satisfaction, pessimism, financial insecurity, social support at work, and vigilance.
Cheng, et al (2005)	Taiwan	National Population, 2001	Cross-sectional study	17,272 (82%)	Job Insecurity	Self-rated health Mental health Job satisfaction	Job insecurity was strongly associated with lower levels of mental health, vitality, and general health, increased risks of various health complaints, as well as lower level of job satisfaction. The deleterious effects of job insecurity appeared to be stronger in men than in women. Job insecurity was more common among low-educated workers, in blue collar and construction workers, those who employed in smaller companies, and in older female workers.
Cole, et al. (2005)	Canada	Paid employees aged 18-64, 1994-1995, 2000-2001.	Longitudinal study	2,806 working adults	Job Insecurity	Work-related repetitive strain injuries	Job insecurity (OR 1.76; 95% CI, 1.07-2.91) were positively associated with work related repetitive strain injuries, whereas working less than 30 hours per week exhibited a negative association with such injuries (OR, 0.2; 95% CI, 0.1-0.7).
FRED STØRSETH. (2006)	Norway	Norwegian employees	Cross-sectional design	729 employees	Job Insecurity	Physical/Mental health complaints Risk taking behavior	A parsimonious model of job insecurity explained that mental health complains and employee' risk taking behavior were significantly predicted, but not physical health complaints.(sadness/depression/anxiety/dizziness/tiredness/sleep problem/heart flushes/extra heartbeats)
Kopp, et al. (2006)	Hungary	People residing in the 150 sub regions of Hungary	Cross sectional, ecological analyses	12,643 people	Job insecurity Income, Education Control in wok Social support	Cardiovascular mortality rate	Job insecurity, high weekend workload, and low control at work contribute most noticeably to variation in premature CV mortality rates among women, whereas high weekend workload, low social support at work, and low control at work account for a large part of variation in male premature CV mortality rates.
Broom, et al. (2006)	Australia	Community survey of people aged 40-44.	Cross sectional survey	2,497 people	Perceived job insecurity Perceived ability to get another job Job strain	Self-rated health Self-reported mental health(Depression) Physical health; Health service utilization	Poor quality of jobs (job insecurity, job strain, and low marketability) was associated with worse health when compared to jobs with fewer or no stressors. People in jobs with three or more of the job insecurity and strain report health that is no better than the unemployment.

**Table 1. Overview of epidemiological studies: Job insecurity, downsizing and health (1990-2008) (V)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Di Donato, et al. (2007)	Italy	77 men working in a university	Cross-sectional study	84 (response rate 82.4%)	Job Insecurity	Job strain Blood cytotoxic activity	Young employees and sanitary staff with temporary employment showed higher level of job insecurity than control subjects with stable position. Blood cytotoxic activity was significantly lower in the old employees with job strain or in the young employees with job insecurity (but not in the sanitary staff) than in the controls.
Boya, et al. (2008)	Turkey	Nurses working in 16 Private hospitals in Izmir	Cross-sectional study	462 nurses	Qualitative Job insecurity Quantitative Job insecurity	Perceived anxiety Depression	Perceived anxiety (OR, 2.2; 95% CI, 1.2-3.9) and depression (OR, 2.5; 95% CI, 1.6-4.1) were significantly associated with qualitative job insecurity. Similarly quantitative job insecurity was associated with perceived anxiety (OR, 3.4; 95% CI, 1.9-6.2) and depression (OR, 2.2; 95% CI, 1.4-5.6)
Lau & Knardahl. (2008)	Norway	Population-based Oslo Health Study: all men and women born in 1955-1970	Prospective design	5,163 persons at the first and second periods	Job Insecurity	Mental Distress Self-rated Health Upper Back Pain Lower Back Pain	Job insecurity is associated with back pain in the prospective results ( $\beta$ -0.09). Among the personality variables, "Type-A" was able to predict an increase in upper back pain; ( $\beta$ 0.07), while "Optimism" predicted a change in low back pain ( $\beta$ -0.07).
Bethge, et al. (2008)	German	German workers in the Socio-economic Panel survey in 2003-2006	A Cohort study	9,272 in 2003 8709 in 2004 7773 in 2006	Job Insecurity Financial insecurity	Self-reported health longstanding illness: Mental health BMI	Person with high job insecurity had—after adjustment for age, gender, education and occupational status- a higher risk of adverse self-rated health both after one year (OR, 1.18; 95 % CI, 1.06-1.31) and three years (OR, 1.18; 95 % CI, 1.05-1.32). The analysis could also identify an interaction between occupational status and job insecurity. High job insecurity proved to be a health risk, particularly for persons with lower occupational status (2004: OR=1.37; 95% CI: 1.15-1.62; 2006: OR=1.31; 95% CI: 1.09-1.57).
Martikainen, et al. (2008)	Finland	Population registration data on Finnish employees aged 35-64 years old (1993-2002)	Prospective Cohort study	85,833 Finish employees.	Downsizing	Mortality Cause-specific mortality	The results provide evidence that downsizing is not a significant determinant of excess mortality among those remaining in the downsized workplaces.
Rugulies, et al. (2008)	Denmark	Representative sample of the employees	Prospective cohort study	1,918 men 1,809 women in 1995, 2000	Job insecurity Labour market chances	Self-rated Health	Women with job insecurity had an increased risk of a decline in health at follow-up, after adjustment for all covariates (OR, 1.78, 95%CI: 1.24-2.54). Effect estimates were strongest among women 50 years of age or younger with poor labour market chances. Among men, there were no main effects for job insecurity. However, men aged 50 years or younger with poor labour market chances showed an OR of 1.64 (95% CI: 0.95-2.84) for a decline in health.

**Table 2. Overview of epidemiological studies: Temporary employment and health (1990-2008) (I)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Silverstein, et al. (1998)	U.S.A.	Washington State Fund claims' sample, 1987-1995	Case study	21,142 Cases of MSD	Industrial Classifications Temporary work help agencies	Work-related disorders of the upper extremities (MSDs)	Temporary assembly and machine operator has been in the top 10 industries for shoulder disorders. Industries characterized by manual handling and repetitive work have high rate ratio of upper extremities.
Martens, et al. (1999)	Belgium	Employees who received sickness benefits.	Case-Control study	480 patients	Non-flexible work Flexible work (Temporary, On-call, Continuous hours, Irregular, Compressed weeks)	Subjective physical Psychological well-being Quality of sleep	Patients working rotating shifts, compressed weeks, and irregularly changing hours showed significantly more health complaints, more problems related to their psychological performance, and more sleeping problems than a control group of workers with non-flexible work schedules. Patients working on temporary employment contracts reported significantly more problems with their psychological performance.
Morris. (1999)	U.S.A.	Manufacturing setting	Qualitative study in Three focus group interviews	20 individuals	Permanent Temporary	Injuries	An apparent two to three times higher injury frequency rate for temporary employees was identified in one manufacturing setting, compared to permanent workers.
Aronsson. (1999)	Sweden	Statistics Sweden's labour market survey	Cross-sectional study	1,564 workers	Permanent Non-Permanent (Substitutes Probationary Vacation, Seasonal, Employed on projects, emergency workers)	General health risks	More contingent workers than permanent employees report a lack of work environment knowledge. Probationary, seasonal, and emergency requirement employees have a negative impact on their risk behavior, which the ratio of those 'caring less' to those 'caring more' is very high.
Aronsson. (1999)	Sweden	Statistics Sweden's labour market survey	Cross-sectional study	1,564 workers	Permanent Non-Permanent (Substitutes Probationary Vacation, Seasonal, Employed on projects, emergency workers)	Psychological Symptoms (Headaches Fatigue and slightly Depressed Upper-back pain)	28 percent of permanent employees who were not in their preferred occupation reported significantly more headaches and greater fatigue and slight depression than did those in comparison groups. Temporary employment generally showed the same symptom level, regardless of whether they were in their preferred occupation. On the other hand, there was such an excess risk of upper-back pain for temporary employees not working in their preferred occupation.
Failde, et al. (2000)	Spain	Hospital employees	Cross-sectional study	890 employees	Permanent Temporary	Low back pain.	The objective of this study is to identify the occupational and non-occupational factors that will predict low back pain in the employees of a university hospital in southern Spain. Temporary employment situation are protective factors of suffering back pain. (OR, 0.4; 95%CI: 0.23-0.40).
Benavides, et al. (2000)	15 European countries	Employed persons	Cross-sectional survey	15,146 employees	Permanent Precarious	Stress Overall fatigue Muscular pains Backache Job satisfaction Absenteeism	Precarious employment from 15 European countries was positively associated with job dissatisfaction, but negatively associated with absenteeism and stress. Precarious employment, particularly full time precarious employment is likely to be associated with fatigue, backache, and musculoskeletal pains. Sole traders generally reported high percentage of all outcomes, except for absenteeism.

**Table 2. Overview of epidemiological studies: Temporary employment and health (1990-2008) (II)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Virtanen, et al. (2000)	Finland	10 Finnish hospitals	Cross-sectional study	5,650 workers (674 men, 4,976 women)	Permanent Contingent	Self-rated health Chronic disease Minor psychiatric morbidity Sickness absence	After adjustment for demographic and work-related characteristics, contingent employees had better self-rated health status (OR 0.76; 95%CI 0.62-0.94) and lower sickness absence rates between the groups (OR 0.90; 95%CI 0.85-0.95). There were no differences in the prevalence of diagnosed chronic diseases and minor psychiatric morbidity between the groups.
Nola, et al. (2001)	Italy	Workers affiliated Sixteen temporary work agencies	Cross-sectional study	470,000 workers	Temporary workforce	Occupational accidents	Temporary workers have high occupational accidents: overall frequency index (FI) was 92.1. The mean age accident was 27.8 years, mean duration of sick leave 13.7 days, and the main causes were work tools (51.5%), 76% of the accidents concerned unskilled manual workers. Temporary work is related to an increased risk of occupational accidents.
Aronsson, et al. (2002)	Sweden	Statistics Sweden's labour market survey employed persons, 1997	Cross-sectional study	2,767 workers	Permanent Probationary Seasonal On-call Project work Other temporary	Heartburn, Stomach ache Discomfort Sleep difficulties Back or neck pain Depression	Regarding health, as reflected in symptoms of a psychosomatic nature, the data do not support our hypothesis as consistent as is the case for work conditions. However, persons in on-call, substitutes show strikingly more health complaints than persons in other forms of employment (back/neck complaints, fatigue, stomach complaints). The differentiation of properties between centre and periphery has been described in terms of uncertainty.
Amuedo-Dorantes. (2002)	Spain	Representative sample, 1997	Retrospective study	3,804 workers	Permanent Temporary	Work-related injury	Although temporary workers exhibit higher work injury and illness rates than permanent workers, they exhibit a lower likelihood of work injury and illness than permanent workers once the analysis controls for a given set of working conditions. The single most important determinant of the likelihood of work-related injury is working conditions, not education, or tenure. Workers' occupations and working conditions prove to be more important in predicting work accidents and illnesses.
Virtanen, et al. (2002)	Finland	Representative population	Cross-sectional study	5,981 employees	Permanent Non-permanent Fixed term Government subsidized	Self-rated health	Compared with permanent employees, fixed-term men and women had better self-rated health (men OR 0.70; 95%CI 0.50-0.89, women 0.89; 95%CI 0.79-1.02), but women had more psychological distress (OR 1.26; 95%CI, 1.09-1.45).
Rodriguez. (2002)	German England	Representative sample, 1991-1993	Cross-sectional survey.	10,104 (Germany) 7,988 (Britain)	Full-time permanent Temporary Part-time	Perceived health	Controlling for background characteristics, the health status of part-time workers with permanent contracts is not significantly different from those who are employed full-time. In contrast, fulltime employed people with fixed-term contracts in Germany are about 42 percent more likely to report poor health than those who have permanent work contracts. In Britain, only part-time work with no contract is associated with poor health

**Table 2. Overview of epidemiological studies: Temporary employment and health (1990-2008) (1990- 2008) (III)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Silverstein, et al. (2002)	U.S.A.	Washington State Fund claims' sample, 1990-1998	Case study	688,795 Cases of MSD	Industrial classifications Temporary work help agencies	Work-related disorders of neck, shoulder, upper extremities (MSDs)	Temporary help agencies are high risk industries of MSD. Using Washington Industrial Classes, temporary workers in assembly and administrative service were high on the prevention index which ranks industries by averaging the ranks of their number of claims and their claims incidence rate of MSDs
Virtanen, et al. (2003)	Finland	Finish representative working age population, 1988-1993	Longitudinal cohort study	15,468 Employees	Permanent Fixed-term Atypical workers Unemployed	Self-rated health Chronic diseases Depression (BDI)	High odds of chronic disease and self-rated health were found among the employed with atypical contracts, but not among fixed-term employers. Female atypical workers also suffered from depression more often. Unemployed had elevated odds for chronic disease and depression and female unemployed elevated odds for poor self-rated health and depression.
Kivimaki, et al. (2003)	Finland	Representative sample, 1990- 2000.	Longitudinal cohort study	26,592 men 65,759 women	Permanent From temporary to permanent Temporary Unemployed	All-cause mortality Cause-specific mortality.	Cox proportional hazards models adjusted for age, occupational status, salary, and change in occupational title showed that overall mortality was 1.2-1.6 times higher among male and female temporary employees compared with permanent employees. Temporary employment was associated with increased deaths from alcohol-related with permanent employees (HR, 2.0; 95%CI: 1.3-6.0).
Bohle, et al. (2004)	Australia	Two five-star hotels' employees	Qualitative study In-depth, non-directive interviews	26 full-time and 13 casual employees	Full-time Casual(temporary)	Sleep disturbance Fatigue Disrupted exercise Dietary regimes.	In the same hotels, and doing largely the same jobs, casual employees had less desirable and predictable work schedules. Casual employees had greater work-life conflict and more associated health complaints than "permanent" workers.
Liukkonen, et al. (2004)	Finland	Eight Finnish towns involved in Public sector employees	Prospective cohort	6,028 employees	Permanent Fixed-term Subsidized Social support	Self rated health Psychological distress (GHQ)	Fixed-term employment predicted better self-rated health and less psychological distress, compared to permanent employment. Co-worker support was most common in permanent and least common in subsidized employees and it was associated with better self-rated health in women.
Bardasi & Francescani (2004)	England	British Household Panel Survey, 1991-2000	Longitudinal sample	3,184 male 3,570 female Workers	Permanent Seasonal/Casual Full-time (>30hr) Part-time (16-29hr) Mini-jobs (<15hr)	Mental health (GHQ) General Health Life satisfaction Job satisfaction	Both temporary and part-time employment did not have long lasting detrimental health effects regarding mental health, self-rated health, and life satisfaction. Job satisfaction is significantly reduced for workers in seasonal and casual jobs and is higher for part-timers. Seasonal/casual workers turn out to be characterized by relatively worse wellbeing conditions.
Benach, et al. (2004)	European Union	ES1995, ES2000 all employed and self-employed people in 15 EU countries	Two cross-sectional surveys	15,146 (1995) 19,405 (2000)	Permanent Sole traders Fixed-term Temporary Small employers	Stress Fatigue Backache Job dissatisfaction	Precarious work was associated with back-pain in 1995, but this association decreased in 2000. In comparison with permanent employment, non-permanent employment reported high percentages of job dissatisfaction but low levels of stress. Full-time employment almost reported worse levels of health indicators than part-time employment.

**Table 2. Overview of epidemiological studies: Temporary employment and health (1990-2008) (IV)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
Muhammed Jamel. (2004)	Canada	Large Canadian metropolitan city	Cross-sectional survey	376 employees	Standard Nonstandard Weekend work	Burnout, Stress Psychosomatic health problem	Employees involved with weekend work and nonstandard work shifts reported significantly higher emotional exhaustion, job stress, and psychosomatic health problems than employees not involved with weekend work and standard workers.
Zeytinogla, et al. (2005)	Canada	Occupational Health Survey from three mid sized cities in Southern Ontario	Qualitative Design	8 union representatives, 59 workers, (11 focus group and 18 interviews)	Part-time Jobs Casual Jobs	Work-related stress Physical Health Emotional health	Stress is a major occupational health problem for female part-time and casual workers in retail and consumer services. Stress from part-time and casual jobs results in repetitive strain injuries, migraine headaches, and feelings of low self-esteem, low motivation, and job dissatisfaction for women
Artazcoz, et al. (2005)	Spain	National Representative sample, 2002	Cross-sectional study	1,474 men 998 Women	Permanent Temporary(Fixed-term, Non-fixed-term, No contract)	Poor mental health Job dissatisfaction Limitation in family formation	Fixed term temporary contracts were not associated with poor mental health status. Working with non-fixed term temporary contract is associated with poor mental health status among non-manual female workers and manual male workers. (OR, 3.87; 95%CI 1.52-9.85 and OR, 4.30; 95%CI 1.89-9.4, respectively). Manual workers working with no contractors were positively associated with poor mental health and job dissatisfaction in both men and women.
Friedland, et al. (2005)	U.S.A.	National working population, Wave 1; 1986 Wave 2: 1989 Wave 3: 1994	Longitudinal study	1,429 aged 25 years and older	Full-time Underemployment (part-time, low income, and with few opportunities to gain skills)	Physical health Psychological well-being	Underemployed workers do report lower of health and well-being than adequately employed workers. Income-underemployed workers report higher levels of depression symptoms and lower positive self-concept. Hours-underemployed workers report lower level of positive self-concept but high levels of job satisfaction. Skill underemployment is not significantly related to any of indicators of health and well-being.
Bernhard-Oettel, et al. (2005)	Sweden	Two Swedish hospital employees	Cross-sectional survey	954 health care workers	Job insecurity Permanent full-time Permanent part-time Fixed-term On-call work	Mental distress (GHQ)	Perceptions of the job (job insecurity, job control, and demands), but not in type of employment contract, predicted health complaints. Type of employment interacted with perceptions of job insecurity, in that insecurity was associated with impaired well-being among permanent full-time workers. In comparison with full-time workers, there was a difference in the relationship between job insecurity and mental distress only for on-call employments, not part-time or fixed term workers.
Benavides, et al. (2006)	Spain	Representative sample of salaried workers in 2000 and 2001	Cross-sectional design	1,808,032 (1500 fatal, 1,806,532 non fatal injuries) 898,955(2000) 909,077(2001)	Permanent Temporary	Non-fatal injuries Fatal injuries	Temporary workers showed a rate ratio of 2.94 for non-fatal occupational injuries (95% CI 2.40-3.61) and 2.54 for fatal occupational injuries (95%CI 1.88-3.42). When these associations were adjusted by gender, age, occupation, and especially length of employment, they lose statistic significant: for non-fatal (OR 1.05; 95% CI 0.97-1.12) and for fatal injuries (OR1.07; 95% CI 0.91-1.26). Lower job experience and knowledge of workplace hazards, measured by length of employment, is a possible mechanism to explain the consistent association between temporary workers and occupational injury.

**Table 2. Overview of epidemiological studies: Temporary employment and health (1990-2008) (V)**

Author and year (ref.)	Country	Population	Design	Sample	Independent Variable	Outcome measure	Principals Results
IH Kim, et al. (2006)	South Korea	Representative sample of salaried workers aged 20-64	Cross-sectional study	2,086 men 1,194 women	Standard Nonstandard (Part-time, Temporary, Daily)	Depression Suicide ideation	Nonstandard work status was associated with poor mental health after adjusting for age and socioeconomic position (education, occupational class, and income) The pattern of the relationship between nonstandard work and mental health differ by gender. For women, nonstandard work was significantly associated with poor mental health. For men, the effect of unstable employment status on depression disappeared after adjusting for potential confounders. Although males tended to report more suicidal ideation, this difference was not statistically significant.
Aydogan UIKer (2006)	Australia	The Household Income and Labour Dynamics in Australia Survey	Cross-sectional study design	2,876 males 2,430 females	Full Time Part time Unemployed (Regular day, regular evening, regular night, shift, on call)	Self-rated health General Health (SF-36) Mental Health Physical functioning	Among female, most of coefficients in all models are statistically insignificant, which implies very small magnitudes in terms of the correlation between nonstandard working hours and health. Among males, on the other hand, the negative relationship is more noticeable for self-rated health, general health and physical functioning than for mental health.
Seifert, et al. (2007)	Canada	Female general education teachers in two schools in Quebec	Qualitative and Quantitative studies	19,914 aged 25-62.	Permanent Temporary with registered the Union "call-back" list. Atypical teachers	Distress	Precarious work contracts can affect mental health not only through employment insecurity but also through negative effects on the ability to do one's job and take pride in one's work, as well as weakening the interpersonal relationships on which successful, productive work depends.
I-H Kim, et al. (2008)	South Korea	A representative sample of salaried workers aged 20-64 in 2001	Cross-sectional design	1,563 men 1,045 women	Standard Nonstandard (part-time, Temporary, Daily)	Self-rated health Specific Chronic diseases (Musculoskeletal Respiratory Circulatory Digestive Mental disease)	Nonstandard employment was significantly associated with higher risk of self-rated health and chronic condition after adjusting for socioeconomic position and health behaviors. The pattern in the relation between nonstandard work and specific chronic diseases greatly differed by gender: 1) Among men, nonstandard work arrangements were significantly associated with musculoskeletal disorders (OR 1.97, 95% CI 1.24-3.19) and Liver disease (OR 2.83, 95% CI 1.27-6.32). 2) Among women, nonstandard employment was related to mental disorders (OR 3.25, 95% CI 1.40-7.56).
M-H Kim, et al. (2008)	South Korea	Representative sample, 1997	Longitudinal study	1,991 male 1,378 female	Regular/full-time Temporary/Daily Part-time Contingent	Self-rated health	Precarious employment was associated with worse health in both men and women. By further controlling for socio-demographic covariates, the odds ratios were attenuated but remained significant. Job satisfaction, especially as related to job insecurity, and monthly wage further attenuated the effects.

**Table 3: Overview of longitudinal observational studies: Associations of an adverse psychosocial work environment ('job strain', 'effort-reward imbalance') with physical or mental disorder (in chronological order)**

First author and year (ref.)	Country	Population	Design	Sample	Independent variable	Outcome measure	Principals results (RR, OR, HR or other)*
Theorell (1977)	Sweden	Building construction workers	Longitudinal study	5187	Workload index	Fatal CHD and NF MI	1.98
La Croix (1984)	USA	Framingham population	Longitudinal study	876	Job control and demands (individual and ecological)	Fatal CHD, NF, MI, coronary insufficiency and angina (not stated)	Women: 2.9 Men: no association Ecological exposure was associated with risk in men and women
Alfredsson (1985)	Sweden	All working men and women in Stockholm	Longitudinal study	958,096	Hectic work, few chances to learn new things, and monotonous work (ecological)	NF MI hospitalisations	Men: Hectic work + non-learning: SMR = 128 (109-148) Hectic monotonous work: SMR = 118 (102-135) Women: Hectic monotonous work: SMR = (112-233)
Haan (1988)	Finland	Metal workers	Longitudinal study	902	Job strain – physical strain, variety, and control (individual)	Fatal CHD and NF MI	Strain (low control, low variety, high physical strain) 4.95 (p = 0.03)
Reed (1989)	USA	Hawaiians of Japanese decent, 45-65 years, population-based	Longitudinal study	4737	Strain – decision latitude and psychological demands (ecological)	Fatal CHD and NF MI	Job strain inversely associated with CHD incidence (p = 0.07)
Johnson (1989)	USA	The Honolulu heart program	Longitudinal study	7219	Iso-strain (imputed)	CVD death	1.92 (1.15-3.21)
Siegrist (1990)	Germany	Male blue collar workers	Longitudinal study	416	Effort-reward imbalance	Incident fatal or NF CHD	4.5 (1.43-14.30)
Netterström (1993)	Denmark	Urban bus drivers	Longitudinal study	2045	Job variety and satisfaction (individual)	Fatal CHD (59)	Choose same job: 2.2 (1.2-4.0) Not looking for new job: 6.5 (1.6-27.0) Cannot use skills 1.5 (0.9-2.5) High work pace: 0.9 (0.5-1.6) Job very varied: 2.5 (1.4-4.5)
Suadicani (1993)	Denmark	Survivors from a 15-year worker-based cohort study	Longitudinal study	1638	Job influence, monotony, pace, satisfaction, ability to relax	Fatal CHD and NF MI	Only inability to relax after work associated with CHD: 2.9 (1.3-6.1)
Alterman (1994)	USA	Chicago Western Electric employees (74% blue collar)	Longitudinal study	1683	Job strain – decision latitude and psychological demands	Fatal CHD and NF CHD	Per tertile increase in exposure <i>Fatal CHD</i> Job control: 0.76 (0.59-1.00) Job demands: 0.78 (0.48-1.26) Job strain: 1.40 (0.92-2.14)

					(ecological)		<b>NF CHD</b>
Hlatky (1995)	USA	Employed patients undergoing coronary angiography	Longitudinal study	1489	Job strain, decision latitude and psychological demands	Fatal CHD and NF MI	Job control: 0.87 (0.57-1.31) Job demands: 1.07 (0.54-2.12) Job strain: 1.54 (0.85-2.80) Job strain Fatal CHD: 1.01 (0.51-2.01) Total CHD : 0.96 (0.62-1.46)
Hoffmann (1995)	Switzerland	Patients 7 weeks after first MI	Longitudinal study	222	Job work load	Poor medical outcome (death, reinfarction, NYHA $\geq$ III)	High workload was positively associated with outcome (p = 0.01)
Bosma (1997)	UK	Whitehall II, male and female civil servants	Longitudinal study	10308	Job control, job demands, social support at work	Diagnosed CHD, angina	Low job control CHD: 1.26 (0.67-2.39) Angina: 2.02 (1.22-3.34) Job demands and social support at work not related. Ecological and individual measures similar
Lynch (1997)	Finland	Finnish men, 42-60 years, population-based	Longitudinal study	2297	Job demands, income	Fatal CHD and NF MI	High demands, low rewards 2.3 (1.35, 3.92)
Steenland (1997)	USA	US citizens 25-74 years, population-based, 58% blue collar	Longitudinal study	3575	Job strain – job control and job demand (ecological)	Fatal CHD and NF MI	High control: 0.71 (0.54-0.93) High demands: 0.81 (0.61-1.09) Job strain: 1.08 (0.81-1.49)
Bosma (1998)	UK	Whitehall II, male and female civil servants	Longitudinal study	10308	Job control, job demands, social support at work, effort-reward imbalance (individual)	Angina pectoris and doctor-diagnosed ischaemia	Effort reward imbalance: 2.15 (1.15-4.01) Low control (individual): 2.38 (1.32-4.29) Low job control (ecological): 1.56 (1.08-2.27) Job demands and social support at work unrelated
Stansfeld (1998)	UK	Whitehall II, male and female civil servants	Longitudinal study	10308	Effort-reward imbalance	Poor self-rated functioning (SF 36)	Physical: Men: 1.44 (1.07-1.94); women: 2.01 (1.15-3.52) Mental: Men: 1.78 (1.34-2.37); women 2.33 (1.36-3.98)
					Decision latitude		Physical: Men: 1.55 (1.24-1.93); women: 1.17 (0.82-1.66) Mental: Men: 1.06 (0.86-1.30); women: 1.02 (0.73-1.43)
					Job demands		Physical: Men: 1.12 (0.91-1.39); women: 1.57 (1.14-2.17) Mental: Men: 1.02 (0.83-1.23); women: 1.91 (1.39-2.61)
Niedhammer (1998)	France	Male and female employees in the French Gas and Electricity	Longitudinal study	11552	Job strain	Depressive symptoms	Men: 1.4 (1.2-1.6) Women: 1.4 (1.2-1.7)

Stansfeld (1999)	UK	Company Whitehall II, male and female civil servants	Longitudinal study	10308	Effort-reward imbalance Decision authority Skill discretion	Mild to moderate psychiatric disorder (mostly depression)	Men: 2.57 (1.8-3.6); women: 1.67 (1.0-2.9) Men: 1.29 (1.1-1.5); women: 1.37 (1.1-1.8) Men: 1.11 (0.9-1.3); women: 1.09 (0.8-1.4)
Orth-Gomér (2000)	Sweden	Women post acute coronary event	Longitudinal study	292	Job demands Job strain (job demands, job control)	Fatal CHD, NF MI, revascularisation	Men: 1.33 (1.1-1.6); women: 1.24 (1.0-1.6) Severe work stress: 1.67 (0.64-4.32) Age adjusted only: Low control: 1.62 (0.84-3.01) High demands: 1.21 (0.63-2.32) High-strain jobs: 0.71 (0.42-1.19) Passive jobs: 1.08 (0.69-1.69) Active jobs: 0.91 (0.54-1.53) 1.3 (1.12-1.65)
Lee (2002)	USA	Representative sample of US nurses	Longitudinal study	35038	Job strain	Fatal CHD, NF MI	High-strain jobs: 0.71 (0.42-1.19) Passive jobs: 1.08 (0.69-1.69) Active jobs: 0.91 (0.54-1.53) 1.3 (1.12-1.65)
Kuper (2002)	UK	Whitehall II, male and female civil servants	Longitudinal study	9870	Effort-reward imbalance	Incident CHD	1.3 (1.12-1.65)
Kuper (2002)	UK	Whitehall II, male and female civil servants	Longitudinal study	6918	Effort-reward imbalance	Poor self-rated functioning (SF 36)	Physical: 1.4 (1.18-1.67) Mental: 2.3 (1.94-2.77)
Kivimäki (2002)	Finland	Male and female industrial employees	Longitudinal study	812	Job strain, effort-reward imbalance	Fatal CHD	High job strain: 2.22 (1.04-4.73) High effort-reward imbalance: 2.42 (1.02-5.73)
Kuper (2003)	UK	Whitehall II, male and female civil servants	Longitudinal study	10308	Job strain, job demands, decision latitude	Fatal CHD, NF MI	All CHD: High demand and low control: 1.38 (1.1-1.75)
Eaker (2004)	USA	Framingham offspring study population	Longitudinal study	3039	Job strain	Fatal CHD, NF CHD	Fatal CHD <b>Men</b> Job strain: 1.1 (0.66-2.00) Low strain: 0.85 (0.48-1.5) Passive: 0.99 (0.59-1.68) <b>Women</b> Job strain: 1.00 (0.37-2.75) Low strain: 0.76 (0.24-2.42) Passive: 1.37 (0.63-2.97) Men: 1.8; women: 2.2
Niedhammer (2004)	France	Male and female employees in the French gas and electricity company	Longitudinal study	6286	Effort-reward imbalance	Poor self-related health	Men: 1.8; women: 2.2
Head (2004)	UK	Whitehall II civil servants	Longitudinal study	8280	Effort-reward imbalance	Alcohol dependence	Men: 1.59 (1.1-2.3); women: 1.15 (0.6-2.3)
Kumari (2004b)	UK	Whitehall II civil servants	Longitudinal study	8067	Effort-reward imbalance	Incident type II diabetes	Men: 1.65 (1.0-2.8); women: 0.93 (0.4-2.0)
Wang (2004)	Canada	Canadian employees	Longitudinal study	7371	Job strain	Diagnosed depression	1.3 (1.1-1.6) 1.2 (1.0-1.5)

Marchand (2005)	Canada	Male and female employees	Longitudinal study	7311	Job demand, job control	Diagnosed depression	1.0 (0.9-1.1)
Godin (2005)	Belgium	Male and female workers of four Belgian enterprises	Longitudinal study	1986	Effort-reward imbalance	Depression Anxiety Somatisation	Men: 2.8 (1.3-5.7); women: 4.6 (2.3-9.0) Men: 2.3 (1.1-4.8); women: 4.5 (2.1-9.8) Men: 2.0 (0.9-4.4); women: 3.6 (1.6-8.2)
Ylipaavalniemi (2005)	Finland	Public sector employees	Longitudinal study	48115		Diagnosed depression	1.2 (0.9-1.6)
de Bacquer (2005)	Belgium	Belgian job stress project	Longitudinal study	14337	Job strain, iso-strain	Incident CHD	1.35 (0.73-2.49)
Uchiyama (2005)	Japan	Hypertension follow-up group study	Longitudinal study	1615	Job strain	Incident CVD	6.66 (0.93-47.70)
Netterström (2006)	Denmark	Men from the MONICA II study	Longitudinal study	659	Job strain	Incident IHD	2.40 (1.01-5.68)
Kuper (2006)	Sweden	Swedish women aged 30-50	Longitudinal study	48066	Job strain	Fatal CHD, NF CHD	1.3 (0.7-2.5)
Chandola (2006)	UK	Whitehall II civil servants	Longitudinal study	7357	Job strain (and social isolation)	Metabolic syndrome	2.39 (1.36-4.21)
Rugulies (2006)	Denmark	Danish population	Longitudinal study	4133	Job strain	Depressive symptoms	Demand Men: 0.5 (0.2-1.2) Women: 1.0 (0.5-1.7) Control Men: 0.6 (0.3-1.2) Women: 1.9 (1.1-3.4) 3.4 (2.0-5.7)
Ahola (2007)	Finland	Dentists	Longitudinal study	2555	Job strain	Depressive symptoms	3.4 (2.0-5.7)
Aboa-Eboulé (2007)	Canada	Men and women with first MI	Longitudinal study	972	Job strain	Recurrent CHD	2.20 (1.37-3.66)
Kivimäki (2007)	Finland	Public sector employees	Longitudinal study	47351	Effort-reward imbalance	Physicians' diagnosis	1.5 (1.2-1.8)
Kivimäki (2007)	Finland	Hospital personnel	Longitudinal study	21938	Effort-reward imbalance	Physicians' diagnosis	1.6 (0.9-2.7)

\*Abbreviations: CHD: coronary heart disease; CVD: cardiovascular disease; HR: hazard ratio; OR: odds ratio; MI myocardial infarction; NYHA: New York Health Association Classification; NF: non fatal; RR: Relative risk; SF 36: short form 36 health survey; SMR: standardised mortality rate

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