

Chapter 1
Job Stress & Health:
A Review of the Epidemiologic Evidence

A/Prof Anthony D. LaMontagne, Lead Investigator
Amber Louie, Research Assistant
Centre for Health & Society
School of Population Health, University of Melbourne 3010

A/Prof Aleck Ostry, Co-Investigator
Department of Healthcare & Epidemiology
University of British Columbia, Vancouver
CANADA

Job Stress & Health: Introduction

Job stress is a widespread concern in Australia and other OECD countries. Further, it is a concern across all employment sectors as well as occupational levels, and is a commonly reported cause of occupational illness and associated organisational outcomes (e.g., lost work days, turnover rates). In Europe, stress-related problems are the second most commonly-reported cause of occupational illness, following musculoskeletal complaints.¹ It is important to note that recent research has shown that the job stress is a major factor in the aetiology of musculoskeletal disease. Roughly one fourth of workers in the EU reported job stress as affecting their health in the 2000 European Foundation survey.¹ Smaller—but still significant—percentages reported having experienced other adverse psychosocial exposures in the previous year, including bullying (9%), unwanted sexual attention (2%), acts of violence from people at work (2%), and acts of violence from other people (4%). Comparable figures are not available for Australian workers; however, they are likely to be similar.

Further, there is evidence that job strain—the combination of high job demands with low job control and the most widely studied job stressor—has been increasing in prevalence in Europe as well as the US.^{2,3} Comparable population-based job stress surveillance data is not available in Australia, but trends are likely to be similar to other OECD countries. In summary, job stress and other psychosocial hazards are widely prevalent and represent a growing concern to working people, the business community, and society.

Job Stress Concepts & Measures

The various theories and models of job stress all propose that the stress process originates with exposure to *stressors*.^{4,5} *Stressors* arising in the work environments are classified as *psychosocial* (e.g., time pressure) and/or *physical* (e.g., noise).⁵ In the discussion that follows we describe the job stress process according to the widely used and accepted University of Michigan job stress model.⁵ In brief, exposure to *stressors* (either psychosocial or physical) can lead to *perceived stress*. *Perceived stress* can, in turn, lead to *short-term responses* to stress. These *short term responses* can be physiological (e.g., elevated blood pressure), psychological (e.g., tenseness), or behavioural (e.g., smoking as a form of coping). *Short-term responses* can then lead to *enduring health outcomes* of a physiological (e.g., coronary heart disease), psychological (e.g., anxiety disorder), or behavioural (e.g., nicotine addiction, alcoholism) nature.

Each of these steps in the stress process can be affected by a wide range of modifying variables (social, psychological, biophysical, behavioural and genetic factors). In addition, the process is not simply linear, as feedback loops may occur between different steps (e.g., enduring health outcomes may lead to increased vulnerability to continuing job stressors). In addition, physical and psychosocial stressors can interact to increase vulnerability to enduring health effects of job stress.⁶ Notable examples in this regard are noise⁷ and ergonomic exposures.⁴ Finally, recent evidence suggests that the effects of job stress on enduring health outcomes may be greater among lower socio-economic or occupational status groups.^{8,9}

There are three theoretical- frameworks, or models, for measuring psychosocial and physical stressors that have been most widely validated and utilized in epidemiological studies of job stress (Table 1). These models mainly focus on measuring stressors present at

the task or organisational level in the work environment.^{4 10} While they originate from diverse disciplines, including psychology, sociology, and occupational health, they are all currently widely used in public health research and practice.

Karasek & Theorell’s demand/control model (DCM) is the most widely studied (Table 1).¹¹ The DCM focuses on task-level job characteristics. It postulates that perceived stress among workers arises from the interaction of low control with high demands which, according to the model produces “job strain”. Further, the model postulates that low levels of support from co-workers and supervisors, in conjunction with low control and high demand (i.e., a work environment condition named ‘iso-strain’) is particularly hazardous.¹² Finally, this model also posits that work can be health-promoting for workers in jobs with both high demand and high job control (“active jobs”).

Table 1: Job Stress Models & Measures

Model	Measures
Demand/Control ¹³	<ul style="list-style-type: none"> • Core construct scales of psychological demand, decision latitude or “job control” (composed of the sum of two equally weighted scales of decision authority and skill discretion) • Demand and control scores analysed as ordinal measures, or grouped into high and low (usually at the median) and crossed to create four categories of: <ul style="list-style-type: none"> • Low strain (low demand, high control) • Active (high demand, high control) • Passive (low demand, low control) • High strain (high demand, low control)
Effort/Reward Imbalance ¹⁴	<ul style="list-style-type: none"> • Core construct scales of effort, reward, and overcommitment • Effort/reward ratio of equally weighted scales analysed either as ordinal measures, or categorically as ratio > 1, while controlling for: • Overcommitment (high/low)
Organisational Justice ¹⁵	<ul style="list-style-type: none"> • Core construct scales procedural justice and relational justice • Scores analysed either as ordinal measures, or grouped into high and low and analysed categorically

Siegrist’s effort/reward imbalance (ERI) model is the second most widely studied (Table 1).^{14 16} Siegrist conceptualizes and measures work characteristics more broadly than the demand/control model. The ERI model focuses on the reciprocity of exchange at work where high cost/low gain conditions (i.e., high effort and low reward, so called “effort/reward imbalance”) are considered particularly stressful. Rewards are financial, self-

esteem, and occupational status control (e.g., job stability, ability to advance in career). Further, the ERI model acknowledges a role for personality traits, and includes a measure of the individual's need for control and approval called "overcommitment."

Most recently, measures of organisational justice or equity has been put forth as a complement to the DCM and ERI models (Table 1).¹⁵ Organisational justice includes procedural and relational components. Procedural justice refers generally to the perceived fairness or equity of decision-making within the organisation. Relational justice assesses the degree of perceived fairness and respect accorded to an individual by his or her supervisor. Prior research showed that perceived justice was associated with people's feelings and behaviours in social interactions. A Finnish research group led by Kivimaki then extended this finding, demonstrating in a series of cross-sectional and longitudinal studies that low perceived justice is also harmful to worker health.^{15 17-19}

The DCM, ERI, and organisational justice measures of job stress overlap to some extent, but also have complementary, independent relationships with adverse health outcomes.¹⁹⁻²¹ Taken as a whole, they can be seen as providing concrete measures of three relationships that have long been posited as important determinants of the mental and physical health of working people: the relationship between the worker and his or her job, between the worker and other people at work, and between the worker and the organisation.²² While most recent attention has focused on how deficiencies in these areas are harmful, these measures also specify how work can be satisfying and health promoting. Once again, these concepts have long been known, as summarised by Brook²² from this a 1959 source:²³ satisfying and health promoting work includes interesting and challenging duties, genuine responsibility, opportunity for achievement by the individual, recognition for such achievement, and scope for individual advancement and growth.

Job Stress & Physical Health

The link between occupational stress and adverse effects on physical and mental health has been well substantiated in a rapidly growing international literature of empirical studies.²⁴⁻²⁶ In terms of physical health outcomes, cardiovascular disease (CVD) has been studied to the greatest extent.²⁶ Numerous cross-sectional studies have linked occupational stress with physiological risk factors for CVD (e.g., hypertension, atherogenic lipids, elevated fibrinogen, overweight/body mass index) and with CVD outcomes (e.g., myocardial infarction, angina pectoris, doctor-diagnosed ischemia).^{3 24-26} In addition, job strain and effort-reward imbalance have been shown to predict subsequent CVD outcomes after controlling for established CVD risk factors (e.g., smoking, overweight, etc.) in more than a dozen prospective cohort studies, including the widely known Whitehall I & II studies.^{20 24 25 27-30} For example, a recent prospective cohort study²⁸ found a doubling of CVD risk among industrial employees in high stress jobs as measured by either Karasek's demand/control or Siegrist's effort/reward imbalance models. Using different measures, the recently published multi-country "InterHeart" case control study (N~25,000) found a doubling of risk for acute myocardial infarction from job stress as well as additional risk from non-work stress.³¹ This study included Australian subjects and found that risk patterns were consistent across regions, in different ethnic groups, and in men and women.

In the most comprehensive systematic review of job stress and CVD to date, effect sizes for job strain as a risk factor for CVD ranged from a 1.2—4.0 fold increase for men and a 1.2—1.6 fold increase for women (after adjustment for known confounders).²⁶ Belkic et al

note that these are likely underestimates of effect size, as biases to the null dominated in the contributing studies (page 107).²⁶ Odds Ratios for effort/reward imbalance in relation to coronary heart disease range from 1.5-6.1.²⁵ The evidence base for men is larger, and demonstrates strong and consistent evidence of association. The evidence base for women, on the other hand, is more sparse and less consistent. Adjusting for various personality traits (e.g., negative affectivity) and mental states (e.g., minor psychiatric disorder) has shown little effect on the relationship between job stress and CVD outcomes,³² with the possible exception of “overcommitment to work” (an ERI model measure) substantially increasing job strain-associated risk in women (e.g., Odds Ratio increasing from 1.2 to 2.2 in one study, reviewed by Belkic et al,²⁶ page 114).

Other physical health problems linked with job stress include musculoskeletal disorders, immune deficiency disorders, gastrointestinal disorders. These have been reviewed elsewhere and are beyond the scope of this brief review.¹⁰

Job Stress & Mental Health

Job stress has been linked to increased risk for wide range of mental health outcomes. These range from increased visits for psychiatric treatment, to various measures of general mental health and psychological distress, anxiety disorders, and three forms of depression.²⁶³³³⁴ Table 2 presents a summary of mental health outcomes linked to job stress. While the majority of studies are cross-sectional, there is a growing number of longitudinal or prospective studies in which measurement of job stressors preceded the development of mental health outcomes among study subjects, thus strengthening causal inference.³³³⁵⁻⁴⁸ A detailed narrative review of 20 years of empirical research on demand/control model measures (job demands, job control, and job strain) and mental health found considerable support for the negative effects of high demands and low control on psychological well-being.⁴⁹ A recent systematic literature review has linked psychological ill health (including anxiety, depression, and emotional exhaustion) and sickness absence to a range of job factors, including management style, work overload and pressure, lack of control over work, and unclear work role.⁵⁰ Although these reviews cite some conflicting studies, they find strong evidence overall for job stress as a risk factor for several adverse mental health outcomes.

One of the best-designed studies—a prospective study of 668 Dutch employees over 4 waves of data collection (1994 through 1997)³⁹—tested normal (job characteristics affect mental health) and reversed (mental health influences work characteristics) relationships between job stress and mental health. Primary work characteristics were assessed using demand-control model measures of psychologic demands, job control, job strain, and social support. While some evidence of reciprocal causal relationships between work characteristics and mental health was found, the effects of work characteristics *on* mental health were causally dominant. These investigators also assessed time lags between exposure and effect and found that a 1 year time lag yielded the best model fit (i.e., adverse effects on mental health can occur from 1 year of exposure).

To date, we are not aware of any systematic reviews or meta-analyses of job stress in relation to mental health outcomes. Because depression represents a major and growing contributor to the global burden of disease, we have focused on this mental health outcome for illustrative purposes. Some cross-sectional studies have found large effect sizes for depression, such as a US study that presented high adjusted Odds Ratios for job strain and

major depressive episode (OR = 7.0), job strain and depressive episode (OR = 4.1), and job strain and dysphoria (OR = 2.9) among women.³⁴ That study found no significant associations among men. Longitudinal studies, by contrast, tend to find smaller effect sizes. In a four-year longitudinal study of depression outcomes in Swedish workers that also examined the role of non-occupational factors such as coping ability and stressful life events, job strain remained significantly associated with sub-clinical depression (RR = 2.8) in the final multivariate analysis for women.⁴⁶ In the French longitudinal GAZEL study, Neidhammer et al found that the demand/control model measures of high psychological demands (OR = 1.77 men, 1.37 women), low job control (OR = 1.38 men, 1.41 women), and low social support (OR = 1.58 men, 1.29 women) predicted subsequent depressive symptoms at 1-year follow-up.³⁶ All effects were statistically significant and were unchanged after adjustment for potential confounders. The same pattern of relationships (again with little difference between men and women) were confirmed on 3-year follow-up in the same study.⁵¹ These studies contrast with a recently published longitudinal Finnish study of 4815 hospital personnel. Although this study found significant associations between organisational justice and depression, it found no association between job strain and depression.⁵²

Turning to more general mental health outcomes, a Canadian longitudinal study of female nurses indicated significant effects of job strain on psychological distress (OR = 1.98) and emotional exhaustion (Maslach burnout scale) (OR = 5.0), after adjusting for “Type A behaviour” as a personality trait, domestic load, recent stressful life events, and social support outside work.⁵³ A UK study³⁵ looked into the relationship between personality and negative affectivity and the risk of poor mental health (defined as General Health Questionnaire score greater than or equal to 5) from workplace factors. Results showed that personality had little consequence on mental health in relation to job control (OR = 1.27 in men and OR = 1.19 in women for association between job control and mental health). Adjusting for negative affectivity increased the effects of job demands in women (OR = 1.9 from 1.48) but caused no change in men (OR = 1.36).³⁵

The international literature includes a limited number of Australian studies. Two notable recent studies examined cross-sectional associations between job strain (demand-control model), job insecurity, and mental health among 1,188 employed professionals in the ACT aged 40-44 years.^{54 55} After adjustment for a range of confounders and negative affectivity, they found statistically significant independent associations of job strain with depression (OR = 2.54) and anxiety (OR = 3.15). In the same models, job insecurity showed even greater statistically significant independent associations (i.e., in addition to job strain) of high job insecurity with poor self-rated health (OR = 3.72), depression (OR = 3.49), and anxiety (OR = 3.29). Based on the findings of this study, these investigators created a new measure called “job pressure” combining job strain with job insecurity; this measure classifies individuals across a 5-point gradient of low to extreme job pressure.⁵⁵ Job pressure showed a better fit with physical and mental health outcomes than job strain and job insecurity as distinct variables.⁵⁵ Further, this graded measure of job pressure demonstrated a dose-related increase in associated health outcome risks. Most notably, middle ranges of job pressure (in relation to low) showed associations with anxiety and depression comparable to job strain and job insecurity (adjusted OR in range of 2-3), but a substantial increase in risk estimates with extreme job pressure (adjusted OR = 13.9) for depression and for anxiety (adjusted OR = 12.9). These findings highlight the substantial health risks of the rising trends in combined exposures to job stress and job insecurity—even among mid-career professionals of middle to upper socio-economic status.

Table 2. Etiologic Studies of Job Stress and Mental Health

Mental Health Outcome	Job Stress Measures Used
Depression ¹ <ul style="list-style-type: none"> • Major depressive episode • Depressive syndrome • Dysphoria • Depressive symptoms 	<ul style="list-style-type: none"> • Demand-control model (job strain, decision authority, psychologic demands, social support)^{34 36 38-42 46 54 56-60} • Effort-reward imbalance^{59 61} • Job pressure⁵⁵ • Organisational justice⁵² • Work overload, organizational structure and climate, and role conflict (review)⁶² • Job satisfaction (review)⁶³
Anxiety	<ul style="list-style-type: none"> • Demand-control model^{54 57 59 64} • Effort-reward imbalance⁵⁹ • Job pressure⁵⁵ • Work overload, organizational structure and climate, and role conflict (review)⁶² • Demand-control, social support, role clarity (review)⁵⁰ • Job satisfaction (review)⁶³
General Mental Health <ul style="list-style-type: none"> • Short Form-12 (SF-12) • Short Form-36 (SF-36) • General Health Questionnaire (GHQ) • Psychiatric Symptom Index (PSI) 	<ul style="list-style-type: none"> • Demand-control model^{33 35 44 45 48 53 65} • Effort-reward imbalance^{29 33 35} • Organizational justice⁶⁶⁻⁶⁹ • Review (including demand-control, social support, role clarity)⁵⁰ • Job structure (job complexity, pressures, rewards)⁷⁰ • Job stress, mental load, and strain caused by schedule⁷¹
Burnout, Emotional Distress & Emotional Exhaustion	<ul style="list-style-type: none"> • Demand/control model^{37 39 53 56 72} • Organizational justice⁷³ • Review (including demand-control, social support, role clarity)⁵⁰ • Review of job satisfaction studies⁶³
Suicide	<ul style="list-style-type: none"> • Specific stressful workplace events, such as layoffs, downsizing, and demotions⁷⁴⁻⁷⁹

Several other Australian studies led by HR Winefield, AH Winefield, and MF Dollard have focused in particular on the health of community services sector workers (e.g., teachers, academic staff of universities, correctional officers).⁸⁰⁻⁸² In this sector, the most common job stress-related outcomes documented are negative emotional and psychological states and disorders (e.g., emotional exhaustion, psychological distress, anxiety, depression). Another study of a medium-sized public sector organisation in Australia found that job control and social support at work were related to job satisfaction and psychological health.⁸³

ⁱ Depression has been measured using a number of self-rated scales, such as the CES-D (Center for Epidemiologic Studies), Zung, and Diagnostic Interview Schedule.

Job Stress & Organisational Health

A range of organisational outcomes have been linked to job stress and stress-related illness (Table 3). For example, a recent systematic literature review has linked psychological ill health (including anxiety, depression, and emotional exhaustion) and sickness absence to the following key psychosocial work factors: long hours worked, work overload and pressure, and the effects of these on personal lives; lack of control over work; lack of participation in decision making; poor social support; and unclear management and work role.⁵⁰ These outcomes (Table 3) represent potential levers for convincing employers to adopt a systems approach to job stress—improvements in these areas tend to occur only when intervention is organisationally-focused, and not when intervention is solely focused at the individual level (as outlined in detail in chapter 3 below).

Absenteeism and sickness absence are the most widely studied organisational outcomes in intervention studies (Table 3). Job stress is a substantial contributor to absenteeism. Some estimate as much as 60% of absenteeism as attributable to stress-related disorders.⁸⁴ With the exception of one study, various job stress measures were related to higher absence. In a 3-year longitudinal study, Smulders & Nijhuis found high job control predictive of lower absence, but—unexpectedly—high demand was predictive of lower absence. High demand was suggested to operate in this instance as “pressure to attend.”⁸⁵

Table 3. Job Stress and Organizational Outcomes

Organizational Outcome	Job Stress Measures Used
Job satisfaction	<ul style="list-style-type: none"> • Demand-control model^{39 83 86} • Organizational justice^{73 87-89}
Absenteeism and sickness absence	<ul style="list-style-type: none"> • Demand-control model^{56 58 59 85 90 91} • Effort-reward imbalance⁵⁹ • Organizational justice^{66-68 92} • Review (including demand-control, social support, role clarity)⁵⁰
Turnover	<ul style="list-style-type: none"> • Organizational justice⁹³⁻⁹⁷
Job performance <ul style="list-style-type: none"> • Organizational Citizenship Behaviorsⁱⁱ • Counterproductive Work Behaviorsⁱⁱⁱ • Work effectiveness 	<ul style="list-style-type: none"> • Demand-control⁹⁸ • Organizational justice^{73 98-101}
Accident and Injury rates	<ul style="list-style-type: none"> • Demand-control¹⁰²⁻¹⁰⁵
Health Care Expenditures and Workers' Compensation Claims	<ul style="list-style-type: none"> • Worker reported stress^{106 107}

ⁱⁱ Organizational citizenship behaviours (OCB) are discretionary in nature, not recognized by the formal reward system, and in the aggregate contribute to the efficient and effective functioning of the organization.

ⁱⁱⁱ Counterproductive work behaviors (CWB) such as aggression, interpersonal conflict, sabotage, and theft are behaviors that are intended to have a detrimental effect on organizations and their members.

Job Stress and Health Behaviours

The indirect effects of work on health are less well characterized, but evidence is accumulating on the relationships between working conditions and health behaviours, or between ‘job risks’ and ‘life risks’.^{108 109} Numerous studies have documented relationships between working conditions (such as safety risks, hazardous substance exposures, and job stress) and health behaviours (such as smoking, sedentary behaviour, diet, and alcohol consumption).¹¹⁰⁻¹¹⁴ A current cross-sectional study of a representative sample of working Victorians (same study as described in Chapter 4) found significant relationships between job stress and smoking after adjustment for physical job demand, other occupational hazards, and demographics. For men (n = 526), being a smoker was related to job strain (OR = 2.16). For women (n = 575), ‘active’ jobs (high demand and high control) were protective (OR = 0.44), whereas physical demand (OR = 1.82) increased the likelihood of being a smoker. Since most smokers take up smoking by their late teens or early 20s, these results suggest that job stress operates as a barrier to cessation for working Victorians.¹¹⁵ In the same Victorian study, longer (36-50/week) or excessive hour (51+ hours/week) were associated with significant increases in body-mass index in men.¹¹⁶

In one of the few prospective studies in this area, decreasing job stress over time was associated with a decrease in cigarette smoking among bus drivers.¹¹³ More recently, a prospective study of UK civil servants has shown that effort-reward imbalance is a risk factor for alcohol dependence in men.¹¹⁷ In short, the traditional view of job risks and life risks as separate and independent requires revision. Rather, job risks and life risks are related to each other as well as being independent contributors to injury and disease. Thus, opportunities exist for integrating job stress and health promotion interventions in this area.¹⁰⁹

Challenges to Job Stress—Health Outcome Associations

Strictly speaking, observational (i.e., non-experimental studies) epidemiologic studies cannot formally prove that associations are causal. Two principal challenges have been raised in the epidemiologic literature with regard to job stress—health outcomes associations: that the associations could be artifactual due to confounding by negative personality traits (i.e., those people who report high stress levels do so because of negative personality traits, and those traits are what cause the adverse health outcomes) or by social class (i.e., job stress is more prevalent among lower social/occupational classes, but so is social disadvantage, and social disadvantage is the more important factor).

The issue of personality traits has been addressed by controlling for such traits in studies of the job stress-health outcome relationships. As described above, negative affectivity has been ruled out as a significant contributors to job stress-cardiovascular disease associations.³² The hostility component of type-A behaviour, however, has been associated with low levels of job control; thus adjustment for hostility lowers effect sizes somewhat for CHD in association with low job control (reviewed by Belkic et al 2004²⁶, page 114). With respect to mental health outcomes, negative personality traits have also been associated with high job strain and low job control⁵⁴ (also reviewed by Belkic et al 2004²⁶, page 114). Accordingly, most peer-reviewed job stress-health outcome studies include measure and adjust for negative personality traits (e.g., negative affectivity,³² hostility¹⁷). However, it should also be noted that there is evidence that long term exposure to job stress and other

work characteristics can lead to deterioration of personality,⁷⁰ as been shown empirically in a South Australian study of correctional officers.¹¹⁸ Thus, Karasek has consistently argued that controlling for personality traits results in an underestimation of effect size (to the extent that personality traits are part of the causal pathway). In short, personality traits are accounted for in most job stress—likely resulting in underestimates of effect sizes.^{iv} Adjustment for personality traits sometimes attenuates the effect size, but does not eliminate, job stress—health outcome relationships.

Some measures of job stress are known to increase with decreasing socio-economic status. For example, low job control and high physical demands are more common among lower status occupations, whereas higher psychologic demands combined with greater job control (so-called “active” or health-promoting jobs) are more common among well-educated white collar workers. This pattern is observed generally in the international literature (reviewed by Belkic,²⁶ page 111) and is also apparent in our current survey of working Victorian adults (see Chapter 4 on Victorian job strain profiles). Given the strong social gradients in chronic (e.g., coronary heart disease) as well as other health outcomes, some researchers have raised concerns about whether lower social disadvantage confounds the relationships observed between high job stress and adverse health outcomes.^{119 120}

This can be addressed in two ways. First, by controlling or adjusting for socio-economic position in analyses of job stress—health outcome relationships. For example, most positive studies of job stress and heart disease have controlled for social class (reviewed by Belkic,²⁶ pages 111-112). Alternatively, one can assess whether job stress is associated with health outcomes within a socio-economically homogeneous group. This was done elegantly by Strazdins et al in a recent Australian study.⁵⁵ They restricted their sample to a relatively well-off and high social status group—professionals and managers aged 40-44, and still found strong associations between job stress and adverse physical and mental health outcomes. Thus job stress—health outcome associations are not due to confounding by social class or material disadvantage.

Estimating the Job-Stress Related Disease and Injury Burden

General population-based estimates of the proportion of CVD attributable to job stress are on the order of 7-16% among men for job strain assessed at a single point, and up to 35% for long-term exposure to low job control.¹²¹ A generally accepted conservative estimate is 10%, which would increase if restricted to people under age 70. Inclusion of other psycho-social hazards which have been linked to CVD would expand these estimates (e.g., shift work,^{122 123} and long working hours^{124 125}).

Comprehensive estimates of the job stress related health burden would need to include the full range of associated health outcomes, such as depression, anxiety, and other mental health outcomes; work-related suicide; the contribution of job stress to injuries; contributions of job stress to behavioural disorders (e.g., alcoholism, nicotine addiction); and more. No such comprehensive estimates are available. However, the same job strain exposures that predict a doubling or more of CVD risk, predict similar excess risks of depression and anxiety. Thus, the proportions of burdens for those widely prevalent and increasing health concerns in Australia¹²⁶ and internationally¹²⁷ would be similar to those

^{iv} Note that controlling for health behaviours such as smoking and alcohol consumption—which to some extent are job stress related—also results in underestimation of effect sizes in health outcome studies.

above for CVD. Compensated 'psychological injury' and other stress-related claims, despite their rise in Australia in recent years,¹²⁸ represent only a small fraction of job stress-related adverse health outcomes.^{129 130} In summary, the epidemiologic evidence indicates that job stress is rapidly emerging as the single greatest cause of work-related disease and injury, and as a significant contributor to the overall burden of disease in society.

Conclusions

In summary, various measures of work-related stress predict serious adverse effects on physical and mental health outcomes, even after accounting for other established causes of the same outcomes. Effect sizes for leading chronic diseases such as CVD, depression, and anxiety disorders are approximately doubled by exposure to job stress. . Given the widespread prevalence of job stress among working people, this translates to large preventable burdens of common chronic physical and mental health disease outcomes. Organisations are also adversely affected through effects on absenteeism, turnover, productivity, and other human and financial costs. Job stress is a large and growing public health problem, warranting a commensurate public health response.

LITERATURE CITED

1. Paoli P, Merllie D. Third European Survey on Working Conditions 2000. Dublin: European Foundation for the Improvement of Living and Working Conditions, 2001:86.
2. European Foundation. Time Constraints and Autonomy at Work in the European Union. Dublin: European Foundation for the Improvement of Living and Working Conditions, 1997.
3. Landsbergis P. Work organization and CVD. *New Solutions* 2003;13(2):149-152.
4. Huang GD, Feuerstein M, Sauter SL. Occupational stress and work-related upper extremity disorders: concepts and models. *American Journal of Industrial Medicine* 2002;41:298-314.
5. Israel BA, Baker EA, Goldenhar LM, Heaney CA, Schurman SJ. Occupational stress, safety, and health: conceptual framework and principles for effective prevention interventions. *Journal of Occupational Health Psychology* 1996;1(3):261-286.
6. Lindstrom K, Mantysalo S. Physical and chemical factors that increase vulnerability to stress or act as stressors at work. In: Kalimo R, El-Batawi M, Cooper C, editors. *Psychosocial factors at work*. Geneva: World Health Organization, 1987:112-123.
7. Blomkvist V, Eriksen W, Theorell T, Ulrich R, Rasmanis G. Acoustics and psychosocial environment in intensive coronary care. *Occup Environ Med* 2005;62:e1.
8. Landsbergis PA, Schnall PL, Warren K, Pickering TG, Schwartz JE. The effect of job strain on ambulatory blood pressure in men: does it vary by socioeconomic status? *Annals of the New York Academy of Sciences* 1999;896:414-6.
9. Landsbergis PA, Schnall PL, Pickering TG, Warren K, Schwartz JE. Lower socioeconomic status among men in relation to the association between job strain and blood pressure. *Scandinavian Journal of Work, Environment & Health* 2003;29(3):206-215.
10. Grosch J, Sauter S. Psychologic stressors and work organization. In: Rosenstock L, Cullen M, Brodtkin C, Redlich C, editors. *Textbook of Clinical Occupational & Environmental Medicine*. Second ed. Philadelphia: Elsevier, 2005:931-942.
11. Karasek R, Theorell T. *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life*. New York: Basic Books, Inc., Publishers, 1990.
12. Johnson JV, Hall EM. Job strain, workplace social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health* 1988;78(10):1336-42.
13. Karasek RA. Job demands, decision latitude, and mental strain: implications for job redesign. *Admin Sci Q* 1979;24:285-308.
14. Siegrist J. Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology* 1996;1(1):27-41.
15. Elovainio M, Kivimaki M, Vahtera J. Organizational justice: evidence of a new psychosocial predictor of health. *Am J Public Health* 2002;92(1):105-108.
16. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, et al. The measurement of effort-reward imbalance at work: European comparisons. *Soc Sci Med* 2004;58(8):1483-1499.
17. Kivimaki M, Elovainio M, Vahtera J, Ferrie JE. Organisational justice and health of employees: prospective cohort study. *Occup Environ Medicine* 2003;60(1):27-34.
18. Kivimaki M, Elovainio M, Vahtera J, Virtanen M, Stansfeld SA. Association between organizational inequity and incidence of psychiatric disorders in female employees. *Psychological Medicine* 2003;33(2):319-326.

19. Kivimaki M, Ferrie JE, Head J, Shipley MJ, Vahtera J, Marmot MG. Organisational justice and change in justice as predictors of employee health: the Whitehall II study.[see comment]. *Journal of Epidemiology & Community Health* 2004;58(11):931-7.
20. Bosma H, Peter R, Siegrist J, Marmot M. Two alternative job stress models and the risk of coronary heart disease. *American Journal of Public Health* 1998;88(1):68-74.
21. Ostry A, Kelly S, Demers P, Mustard C, Hertzman C. A comparison between the Effort-Reward Imbalance and Demand/Control Models of psychosocial job strain. *Biomedical Central, Public Health* 2003;3(10).
22. Brook A. Mental health of people at work. In: Schilling RSF, editor. *Occupational Health Practice*. London: Butterworths, 1973:379-393.
23. Herzberg F, Mausner B, Synderman B. *The Motivation to Work*. New York: Wiley, 1959.
24. Schnall PL, Belkic K, Landsbergis P, Baker D, Editors) G. The workplace and cardiovascular disease. *State of the Art Reviews: Occupational Medicine* 2000;15(1):1-334.
25. Peter R, Siegrist J. Psychosocial work environment and the risk of coronary heart disease. *International Archives of Occupational & Environmental Health* 2000;73 Suppl:S41-5.
26. Belkic K, Landsbergis P, Schnall P, Baker D. Is job strain a major source of cardiovascular disease risk? *Scand J Work Environ Health* 2004;30(2):85-128.
27. Siegrist J, Peter R, Junge A, Cremer P, Seidel D. Low status control, high effort at work and ischemic heart disease: prospective evidence from blue-collar men. *Social Science and Medicine* 1990;31(10):1127-1134.
28. Kivimaki M, Leino-Arjas P, Luukkonen R, Riihimaki H, Vahtera J, Kirjonen J. Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees. *BMJ* 2002;325:857-861.
29. Kuper H, Singh-Manoux A, Siegrist J, Marmot M. When reciprocity fails: effort-reward imbalance in relation to coronary heart disease and health functioning within the Whitehall II study. *Occupational & Environmental Medicine* 2002;59(11):777-84.
30. Kuper H, Marmot M. Job strain, job demands, decision latitude, and risk of coronary heart disease within the Whitehall II study. *Journal of Epidemiology & Community Health* 2003;57(2):147-53.
31. Rosengren A, Hawken S, Ounpuu S, Sliwa K, Zubaid M, Almahmeed W, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11,119 cases and 13,648 controls from 52 countries (the InterHeart study): case-control study. *Lancet* 2004;364:953-962.
32. Bosma H, Stansfeld S, Marmot M. Job control, personal characteristics, and heart disease. *Journal of Occupational Health Psychology* 1998;3(4):402-409.
33. Stansfeld S, Bosma H, Hemmingway H, Marmot M. Psychosocial work characteristics and social support as predictors of SF-36 functioning: The Whitehall II study. *Psychosomatic Medicine* 1998;60:247-255.
34. Mausner-Dorsch H, Eaton WW. Psychosocial work environment and depression: epidemiologic assessment of the demand-control model. *American Journal of Public Health* 2000;90(11):1765-1770.
35. Stansfeld SA, Fuhrer R, Shipley MJ, Marmot MG. Work characteristics predict psychiatric disorder: prospective results from the Whitehall II Study. *Occup Environ Med* 1999;56:302-307.

36. Neidhammer I, Goldberg M, Leclerc A, Bugel I, David S. Psychosocial factors at work and subsequent depressive symptoms in the Gazel cohort. *Scand J Work Environ Health* 1998;24(3):197-205.
37. Bourbonnais R, Comeau M, Vezina M, Dion G. Job strain, psychological distress, and burnout in nurses. 1998;34(1):20-28.
38. de Lange AH, Taris TW, Kompier MA, Houtman IL, Bongers PM. Effects of stable and changing demand-control histories on worker health. 2002;28(2):94-108.
39. de Lange AH, Taris TW, Kompier MAJ, Houtman IL, Bongers PM. The relationships between work characteristics and mental health: examining normal, reversed and reciprocal relationships in a 4-wave study. *Work & Stress* 2004;18(2):149-166.
40. de Lange AH, Taris TW, Kompier MA, Houtman IL, Bongers PM. Different mechanisms to explain the reversed effects of mental health on work characteristics. 2005;31(1):3-14.
41. Kawakami N, Haratani T, Araki S. Effects of perceived job stress on depressive symptoms in blue-collar workers of an electrical factory in Japan. *Scand J Work Environ Health* 1992;18(3):195-200.
42. Kawakami N, Araki S, Kawashima M, Masumoto T, Hayashi T. Effects of work-related stress reduction on depressive symptoms among Japanese blue-collar workers. *Scand J Work Environ Health* 1997;23(1):54-59.
43. Parkes KR, Mendham CA, Vonrabenau C. Social Support and the Demand-Discretion Model of Job Stress - Tests of Additive and Interactive Effects in 2 Samples. *Journal of Vocational Behavior* 1994;44(1):91-113.
44. Stansfeld SA, Fuhrer R, Head J, Ferrie J, Shipley M. Work and psychiatric disorder in the Whitehall II Study. 1997;43(1):73-81.
45. Mino Y, Shigemi J, Tsuda T, Yasuda N, Bebbington P. Perceived job stress and mental health in precision machine workers of Japan: a 2 year cohort study. 1999;56(1):41-45.
46. Bildt C, Michelsen H. Gender differences in the effects from working conditions on mental health: a 4-year follow-up. 2002;75(4):252-258.
47. O'Campo P, Eaton WW, Muntaner C. Labor market experience, work organization, gender inequalities and health status: results from a prospective analysis of US employed women. 2004;58(3):585-594.
48. Cheng Y, Kawachi I, Coakley EH, Schwartz J, Colditz G. Association between psychosocial work characteristics and health functioning in American women: prospective study. *BMJ* 2000;320:1432-1436.
49. Van Der Doef M, Maes S. The job demand-control (-support) model and psychological well-being: a review of 20 years of empirical research. *Work and Stress* 1999;13(2):87-114.
50. Michie S, Williams S. Reducing work related psychological ill health and sickness absence: a systematic literature review. *Occup Environ Medicine* 2003;60:3-9.
51. Paterniti S, Niedhammer I, Lang T, Consoli SM. Psychosocial factors at work, personality traits and depressive symptoms. Longitudinal results from the GAZEL Study. *British Journal of Psychiatry* 2002;181:111-7.
52. Ylipaavalniemi J, Kivimaki M, Elovainio M, Virtanen M, Keltikangas-Jarvinen L, Vahtera J. Psychosocial work characteristics and incidence of newly diagnosed depression: a prospective cohort study of three different models. *Social Science & Medicine* 2005;61(1):111-22.
53. Bourbonnais R, Comeau M, Vezina M. Job strain and evolution of mental health among nurses. *Journal of Occupational Health Psychology* 1999;4(2):95-107.

54. D'Souza RM, Strazdins L, Lim LL-Y, Broom DH, Rodgers B. Work and health in a contemporary society: demands, control, and insecurity. *Journal of Epidemiology and Community Health* 2003;57:849-854.
55. Strazdins L, D'Souza RM, Lim LL, Broom DH, Rodgers B. Job strain, job insecurity, and health: rethinking the relationship. *Journal of Occupational Health Psychology* 2004;9(4):296-305.
56. de Jonge J, Reuvers MM, Houtman IL, Bongers PM, Kompier MA. Linear and nonlinear relations between psychosocial job characteristics, subjective outcomes, and sickness absence: baseline results from SMASH. Study on Musculoskeletal disorders, absenteeism, stress, and health. *J Occup Health Psychol* 2000;5(2):256-68.
57. Williams RB, Barefoot JC, Blumenthal JA, Helms MJ, Luecken L, Pieper CF, et al. Psychosocial correlates of job strain in a sample of working women. *Archives of General Psychiatry* 1997;54 (6)(June):543-8.
58. Karasek RA. Lower health risk with increased job control among white collar workers. *Journal of Organizational Behavior* 1990;11:171-185.
59. Godin I, Kittel F. Differential economic stability and psychosocial stress at work: associations with psychosomatic complaints and absenteeism. *social science & medicine* 2004;58(8):1543-1553.
60. Paterniti S, Niedhammer I, Lang T, Consoli SM. Psychosocial factors at work, personality traits and depressive symptoms. Longitudinal results from the GAZEL Study. 2002;181:111-117.
61. Pikhart H, Bobak M, Pajak A, Maljutina S, Kubinova R, Topor R, et al. Psychosocial factors at work and depression in three countries of Central and Eastern Europe. *social science & medicine* 2004;58(8):1475-1482.
62. Cooper CL, Marshall J. Occupational Sources of Stress - Review of Literature Relating to Coronary Heart-Disease and Mental Ill Health. *Journal of Occupational Psychology* 1976;49(1):11-28.
63. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occup Environ Med* 2005;62(2):105-112.
64. Wall TD, Jackson PR, Mullarkey S, Parker SK. The demands-control model of job strain: A more specific test. *Journal of Occupational and Organizational Psychology* 1996;69:153-166.
65. Bromet EJ, Dew MA, Parkinson DK, Cohen S, Schwartz JE. Effects of occupational stress on the physical and psychological health of women in a microelectronics plant. *Soc Sci Med* 1992;34(12):1377-1383.
66. Elovainio M, Kivimaki M, Vahtera J. Organizational justice: evidence of a new psychosocial predictor of health. *American Journal of Public Health* 2002;92(1):105-108.
67. Kivimaki M, Elovainio M, Vahtera J, Ferrie JE. Organisational justice and health of employees: prospective cohort study. *Occup Environ Med* 2003;60(1):27-33.
68. Kivimaki M, Elovainio M, Vahtera J, Virtanen M, Stansfeld SA. Association between organizational inequity and incidence of psychiatric disorders in female employees. 2003;33(2):319-326.
69. Sutinen R, Kivimaki M, Elovainio M, Virtanen M. Organizational fairness and psychological distress in hospital physicians. 2002;30(3):209-215.
70. Kohn ML, Schooler C. Job Conditions and Personality - A Longitudinal Assessment of Their Reciprocal Effects. *American Journal of Sociology* 1982;87(6):1257-1286.
71. Estryng-Behar M, Kaminski M, Peigne E, Bonnet N, Vaichere E, Gozlan C, et al. Stress at work and mental health status among female hospital workers. *British Journal of Industrial Medicine* 1990;47:20-28.

72. De Jonge J, Dormann C, Janssen PPM, Dollard MF, Landeweerd JA, Nijhuis FJN. Testing reciprocal relationships between job characteristics and psychological well-being: A cross-lagged structural equation model. *Journal of occupational and organizational psychology* 2001;74:29-46.
73. Spence-Laschinger HK. Hospital nurses' perceptions of respect and organizational justice. *J Nurs Adm* 2004;34(7-8):354-364.
74. Kasl SV, Rodriguez E, Lasch KE. The impact of unemployment on health and well-being. In: Dohrenwend B, editor. *Adversity, stress, and psychopathology*. New York: Oxford University Press, 1998:111-31.
75. Platt S, Pavis S, Akram G. Changing labour market conditions and health: a systematic literature review (1993-1998). Dublin, Ireland: European Foundation for the Improvement of Living and Working Conditions, 1999.
76. Morton MJ. Prediction of repetition of parasuicide: with special reference to unemployment. 1993;39(2):87-99.
77. Lewis G, Sloggett A. Suicide, deprivation, and unemployment: record linkage study. *BMJ* 1998;317(7168):1283-1286.
78. Fergusson DM, Horwood LJ, Lynskey MT. The effects of unemployment on psychiatric illness during young adulthood. *Psychological Medicine* 1997;27(2):371-81.
79. Platt S. Unemployment and suicidal behaviour: a review of the literature. *Social Science and Medicine* 1984;19:93-115.
80. Winefield HR. Work stress and its effects in general practitioners. In: M.F Dollard AHW, & H.R. Winefield, editor. *Occupational Stress in the Service Professions*. London: Taylor & Francis, 2003:191-213.
81. Dollard MF, Winefield AH. A test of the demand-control /support model of work stress in correctional officers. *Journal of Occupational Health Psychology* 1998;3(3):243-264.
82. Dollard MF, Winefield HR, Winefield AH. *Occupational Strain and Efficacy in Human Service Workers: When the Rescuer Becomes the Victim*. Dordrecht: Kluwer Academic Publishers, 2001.
83. Noblet A. Building health promoting work settings: identifying the relationship between work characteristics and occupational stress in Australia. *Health Promotion International* 2003;18(4):351-9.
84. Fletcher B. The epidemiology of occupational stress. In: Cooper C, Payne R, editors. *Causes, Coping and Consequences of Stress at Work*. Chichester: John Wiley & Sons, 1988:3-50.
85. Smulders P, Nijhuis F. The job demands - job control model and absence behaviour: results of a 3-year longitudinal study. *Work & Stress* 1999;13(2):115-131.
86. Amick BC, III, Celentano DD. Structural determinants of the psychosocial work environment: introducing technology in the work stress framework. 1991;34(5):625-646.
87. Parker CP, Baltes BB, Christiansen ND. Support for affirmative action, justice perceptions, and work attitudes: A study of gender and racial-ethnic group differences. *Journal of Applied Psychology* 1997;83:376-389.
88. Sweeney PD, McFarlin DB. Workers evaluations of the "Ends" and "Means": An examination of the four models of distributive and procedural justice. *Organizational Behavior and Human Decision Processes* 1993;55:22-40.
89. Witt AL, Broach D. Exchange ideology as a moderator of the procedural justice-satisfaction relationship. *Journal of Social Psychology* 1993;133:97-103.

90. Gimeno D, Benavides FG, Amick BC, 3rd, Benach J, Martinez JM. Psychosocial factors and work related sickness absence among permanent and non-permanent employees. *Journal of Epidemiology & Community Health* 2004;58(10):870-6.
91. Nielsen M. The intervention project on absence and well-being (IPAW)--Denmark. In: EASHW, editor. *How to Tackle Psychosocial Issues and Reduce Work-Related Stress*. Luxembourg: European Agency for Safety and Health at Work (EASHW), 2002:52-58.
92. Elovainio M, Kivimaki M, Steen N, Vahtera J. Job decision latitude, organizational justice and health: multilevel covariance structure analysis. *social science & medicine* 2004;58(9):1659-1669.
93. Cropanzano R, Folger R. Procedural justice and worker motivation. In: Steers RM, Porter LW, editors. *Motivation and Work Behavior*. New York: McGraw Hill, 1991:131-143.
94. Masterson SS, Lewis K, Goldman BM, Taylor MS. Integrating justice and social exchange: the differing effects of fair procedures and treatment on work relationships. *Academy of Management Journal* 2000;43(4):738-748.
95. Barling J, Phillips M. Interactional, formal and distributive justice in the workplace: An exploratory study. *Journal of Psychology* 1993;127:649-656.
96. VanYperen NW, Hagedoorn M, Geurts SAE. Intent to leave and absenteeism as reactions to perceived inequity: The role of psychological and social constraints. *Journal of occupational and organizational psychology* 1996;69:367-372.
97. VanYperen N, Hagedoorn M, Zweers M, Potsma S. Injustice and employees' destructive responses: the mediating role of state negative affects. *Soc Jus Res* 2000;13(3):291-312.
98. Fox S, Spector PE, Miles D. Counterproductive work behaviour (CWB) in response to job stressors and organizational justice: Some mediator and moderator tests for autonomy and emotions. *Journal of Vocational Behavior* 2001;59(3):291-309.
99. Skarlicki DP, Latham GP. Increasing citizenship behavior within a labor union: A test of organizational justice theory. *Journal of Applied Psychology* 1996;2:161-169.
100. Skarlicki DP, Folger R. Retaliation in the workplace: The roles of distributive, procedural, and interactional justice. *Journal of Applied Psychology* 1997;82(3):434-443.
101. Moorman RH. Relationship between organizational justice and organizational citizenship behaviors: do fairness perceptions influence employee citizenship? *Journal of Applied Psychology* 1991;76(845):855.
102. Wilkins K, Beaudet MP. Work stress and health. 1998;10(3):47-62.
103. Salminen S, Kivimaki M, Elovainio M, Vahtera J. Stress factors predicting injuries of hospital personnel. 2003;44(1):32-36.
104. Swaen GM, van Amelsvoort LP, Bultmann U, Slangen JJ, Kant IJ. Psychosocial work characteristics as risk factors for being injured in an occupational accident. 2004;46(6):521-527.
105. Murata K, Kawakami N, Amari N. Does job stress affect injury due to labor accident in Japanese male and female blue-collar workers? 2000;38(2):246-251.
106. Goetzel RZ, Anderson DR, Whitmer RW, Ozminkowski RJ, Dunn RL, Wasserman J. The relationship between modifiable health risks and health care expenditures. An analysis of the multi-employer HERO health risk and cost database. The Health Enhancement Research Organization (HERO) Research Committee. 1998;40(10):843-854.

107. Dollard MF, Winefield AH. Mental health: overemployment, underemployment, unemployment and healthy jobs. *Australian e-Journal for the Advancement of Mental Health* 2002;1(3):1-26.
108. Chapman Walsh D, Jennings SE, Mangione T, Merrigan DM. Health promotion versus health protection? Employees' perceptions and concerns. *Journal of Public Health Policy* 1991;12(2):148-164.
109. LaMontagne AD. Integrating health promotion and health protection in the workplace. In: Moodie R, Hulme A, editors. *Hands-on Health Promotion*. Melbourne: IP Communications, 2004:285-298.
110. Eakin JM. Work-related determinants of health behavior. In: Gochman D, editor. *Handbook of Health Behavior Research I: Personal and Social Determinants*. New York: Plenum Press, 1997:337-357.
111. Hellerstedt WL, Jeffery RW. The association of job strain and health behaviours in men and women. *International Journal of Epidemiology* 1997;26(3):575-583.
112. Green KL. Issues of control and responsibility in workers' health. *Health Education Quarterly* 1988;15(4):473-486.
113. Landsbergis PA, Schnall PL, Dietz DK, Warren K, Pickering TG, Schwartz JE. Job strain and health behaviors: results of a prospective study. *Amer J Health Promotion* 1998;12(4):237-245.
114. Polanyi MFD, Frank JW, Shannon HS, Sullivan TJ, Lavis JN, Bertera RL, et al. Promoting the determinants of good health in the workplace. In: Poland B, Green LW, Rootman I, editors. *Settings for Health Promotion: Linking Theory and Practice*. Thousand Oaks, CA: Sage Publications, 2000:138-174.
115. Radi S, Ostry A, LaMontagne AD. Job stress and other working conditions: Relationships with smoking status in a representative sample of working Australians. *Occ Environ Medicine* in review.
116. Ostry A, Radi S, Louie AM, LaMontagne AD. Psychosocial and other working conditions in relation to Body Mass Index in a representative sample of Australian workers. *BMC Public Health* 2006 Mar 2;6(1)(53).
117. Head J, Stansfeld SA, Siegrist J. The psychosocial work environment and alcohol dependence: a prospective study. *Occupational and Environmental Medicine* 2004;61(3):219-224.
118. Dollard MF, Winefield AH. A test of the demand-control/support model of work stress in correctional officers. *Journal of Occupational Health Psychology* 1998;3(3):243-264.
119. Macleod J, Davey SG. Psychosocial factors and public health: a suitable case for treatment? 2003;57(8):565-570.
120. Macleod J, Davey-Smith G, Heslop P, Metcalfe C, Carroll D, Hart C. Are the effects of psychosocial exposures attributable to confounding? Evidence from a prospective observational study on psychological stress and mortality. *Journal of Epidemiology & Community Health* 2001;55(12):878-84.
121. Belkic K, Landsbergis P, Schnall PL, Baker D, Theorell T, Siegrist J, et al. Psychosocial factors: review of the empirical data among men. In: Schnall PL, Belkic K, Landsbergis P, Baker D, editors. *The Workplace and Cardiovascular Disease. State of the Art Reviews in Occupational Medicine*. Philadelphia: Hanley & Belfus, Inc., 2000:24-46.
122. Boggild H, Knutsson A. Shift work, risk factors and cardiovascular disease. *Scandinavian Journal of Work, Environment & Health* 1999;25(2):85-99.

123. Tenkanen L, Sjoblom T, Harma M. Joint effect of shift work and adverse life-style factors on the risk of coronary heart disease. *Scandinavian Journal of Work, Environment & Health*. 1998;24(5):351-7.
124. van der Hulst M. Long work hours and health. *Scand J Work Environ Health* 2003;29(3):171-188.
125. Spurgeon A, Harrington JM, Cooper CL. Health and safety problems associated with long working hours: a review of the current position. *Occupational and Environmental Medicine* 1997;54:367-375.
126. Matthers CD, Vos ET, Stevenson CE, Begg SJ. The Australian Burden of Disease Study: measuring the loss of health from diseases, injuries and risk factors. *Med J Aust* 2000;172:592-596.
127. WHO. World Health Report 2001. Mental health: New Understanding, New Hope. Geneva: World Health Organization, 2001.
128. NOHSC. NOHSC On-Line Statistics Interactive 2 (NOSI 2). Canberra: National Occupational Health & Safety Commission (NOHSC).
129. Russell GM, Roach SM. Occupational stress: a survey of management in general practice. *The Medical Journal of Australia* 2002;176(8):367-370.
130. Steven ID, Shanahan EM. Work-related stress: care and compensation. *The Medical Journal of Australia* 2002;176(8):363-364.