

# Physically and psychologically hazardous jobs and mental health in Thailand

VASOONTARA YIENGPRUGSAWAN<sup>1\*</sup>, LYNDALL STRAZDINS<sup>1</sup>,  
LYNETTE L.-Y. LIM<sup>1</sup>, MATTHEW KELLY<sup>1</sup>, SAM-ANG SEUBSMAN<sup>1,2</sup> and  
ADRIAN C. SLEIGH<sup>1</sup> THE THAI COHORT STUDY TEAM<sup>†</sup>

<sup>1</sup>National Centre for Epidemiology and Population Health, The Australian National University, Canberra, ACT, Australia and <sup>2</sup>School of Human Ecology, Sukhothai Thammathirat Open University, Nonthaburi, Thailand

\*Corresponding author. E-mail: [vasoontara.yieng@anu.edu.au](mailto:vasoontara.yieng@anu.edu.au); [vasoontara.yieng@gmail.com](mailto:vasoontara.yieng@gmail.com)

<sup>†</sup>Thailand: Jaruwan Chokhanapitak, Suttanit Hounthasarn, Suwanee Khamman, Daoruang Pandee, Suttinan Pangsap, Tippawan Prapamontol, Janya Puengson, Sam-ang Seubsman, Boonchai Somboonsook, Nintita Sripaiboonkij, Pathumvadee Somsamai, Duangkae Vilainerun, Wanee Wimonwattanaphan, Cha-aim Pachanee, Benjawan Tawatsupa, Wimalin Rimpeekool, Tewarit Somkotra  
Australia: Chris Bain, Emily Banks, Cathy Banwell, Bruce Caldwell, Gordon Carmichael, Tarie Dellora, Jane Dixon, Sharon Friel, David Harley, Matthew Kelly, Tord Kjellstrom, Lynette Lim, Anthony McMichael, Tanya Mark, Adrian Sleigh, Lyndall Strazdins, Susan Jordan, Janneke Berecki-Gisolf, Roderick McClure, Vasoontara Yiengprugsawan.

## SUMMARY

*This paper investigates associations between hazardous jobs, mental health and wellbeing among Thai adults. In 2005, 87 134 distance-learning students from Sukhothai Thammathirat Open University completed a self-administered questionnaire; at the 2009 follow-up 60 569 again participated. Job characteristics were reported in 2005, psychological distress and life satisfaction were reported in both 2005 and 2009. We derived two composite variables grading psychologically and physically hazardous jobs and reported adjusted odds ratios (AOR) from multivariate logistic regressions. Analyses focused on cohort members in paid work: the total was 62 332 at 2005 baseline and 41 671 at 2009 follow-up. Cross-sectional AORs linking psychologically hazardous jobs to psychological distress ranged from 1.52 (one hazard) to 4.48 (four hazards) for males and a corresponding 1.34–3.76 for*

*females. Similarly AORs for physically hazardous jobs were 1.75 (one hazard) to 2.76 (four or more hazards) for males and 1.70–3.19 for females. A similar magnitude of associations was found between psychologically adverse jobs and low life satisfaction (AORs of 1.34–4.34 among males and 1.18–3.63 among females). Longitudinal analyses confirm these cross-sectional relationships. Thus, significant dose–response associations were found linking hazardous job exposures in 2005 to mental health and wellbeing in 2009. The health impacts of psychologically and physically hazardous jobs in developed, Western countries are equally evident in transitioning Southeast Asian countries such as Thailand. Regulation and monitoring of work conditions will become increasingly important to the health and wellbeing of the Thai workforce.*

**Key words:** hazardous jobs; psychological health; longitudinal study; Thailand

## INTRODUCTION

With most men and women spending more than a third of their adult time at work, workplace conditions can be potent determinants of population health. Decades of research in developed, Western economies have shown that adverse work conditions are associated with psychological distress and poor mental health, now a leading cause of population disease burden. Hazards at work range from the contractual (job insecurity) to the psychosocial (the authority to make decisions about work conditions, workloads and job demands), the physical (dangerous or hazardous physical work environments) and the ability to maintain a work–life balance (D'Souza *et al.*, 2003; Broom *et al.*, 2006; Kopp *et al.*, 2008; Kompier *et al.*, 2009; Strazdins *et al.*, 2010; Marchand and Durand, 2011). Work hazards shown to be determinants of mental health include job insecurity, excessive job demands, poor job control and job strain (high demands and low control) (Karasek, 1996; Bosma *et al.*, 1997; Stansfeld and Candy, 2006).

However, very few studies have assessed whether these employment hazards show the same associations (and therefore induce the same health burdens) in developing or transitioning economies. Yet, in Thailand, depression now ranks in the top 10 disease burdens for men and top 4 for women. Tackling the causes of mental health, including its social determinants, is now a World Health Organization and Thai Government priority (WHO, 2011).

Some jobs combine more than one hazard, especially jobs for the low skilled, vulnerable segments of the labour force, and these combinations of hazards can be particularly detrimental to health. Grzywacz and Dooley (2003) classified jobs in terms of number of hazards to describe an employment continuum in the USA (optimal, economically good, psychologically good, barely adequate and inadequate employment). They found that the negative associations with physical and mental health among adults strengthened as the number of hazards increased (Grzywacz and Dooley, 2003). Similar associations have been observed in Europe (Drobnič *et al.*, 2010) and Australia (Butterworth *et al.*, 2011). Other studies have shown that the timing of work is also linked to adult mental health. Shift work, extended working hours and night work disrupt circadian patterns leading to anxiety, depression,

mental distress and poor family relationships (Caruso, 2006; Virtanen *et al.*, 2010; Tucker and Folkard, 2012).

As noted above, most studies addressing the influence of workplace conditions on mental health and wellbeing have come from Western developed countries, where jobs are largely in the service and knowledge sectors. Much less is known about the way employment may affect mental health in transitioning middle-income countries, especially those in Southeast Asia. But it is likely that the mix of jobs now found in these economies exposes significant groups of workers to psychological as well as physical hazards (Buapetch *et al.*, 2008; Maizura *et al.*, 2010; Jirapongsuwan *et al.*, 2011; Charoenpaitoon *et al.*, 2012).

Until recently, Thailand has been a predominantly agricultural society. Before the 1980s, when economic growth accelerated, the agricultural sector accounted for over 70% of the workforce; by 2010 this proportion had fallen to just under 40% (NSO, 2012). The new jobs which have taken the place of agriculture have been in manufacturing and the 'modern' services and knowledge economy sectors. These jobs have generated better economic prosperity and physically safer workplaces for many Thais but some are characterized by psychosocial hazards such as lack of autonomy, high workloads, long work hours and shift work. In parallel to knowledge and service jobs, Thailand's economy also contains a substantial manufacturing, construction and agro-industry sector; in these jobs physical hazards predominate including chemical exposure, heat stress, noise and vibration and atmospheric pollutants (Kelly *et al.*, 2010). The overall consequences for physical health are well documented, with between 150 000 and 200 000 Thai workers injured at work annually over the last 10 years (Thai Health Promotion Foundation, 2010). But there is virtually no research examining the extent these physical exposures at work also contribute to mental health.

The present study examines cross-sectional and longitudinal associations between hazardous jobs and mental health and wellbeing in a large national cohort of Thai adults. Many jobs combine more than one hazard and so we classify jobs in terms of number of psychological hazards and number of physical hazards. Analyses first estimate the cross-sectional associations between extent of exposures hazardous jobs, and mental health and wellbeing. A set of prospective

analyses then examine the longitudinal influences of psychologically and physically hazardous jobs recorded at baseline in 2005; their association with mental health and wellbeing is based on follow-up in 2009.

## METHODS

### Data

The Thai Cohort Study (TCS) was established in 2005 to study the health-risk transition within the Thai population as it moved away from traditional patterns of illness (maternal and child mortality and infectious diseases) to emerging chronic diseases and injury. Distance-learning Thai adults living and working all over Thailand and enrolled at Sukhothai Thammathirat Open University were recruited. For the 2005 baseline 87 134 mainly young adults participated, providing information on socio-demo-geographic, environmental, occupational, dietary and physical activity. They also reported on height, weight, wellbeing, injury, doctor-diagnosed illness, health service use and health behaviour (Sleigh *et al.*, 2008; Seubsman *et al.*, 2012). A 4-year follow-up was conducted in 2009 ( $n = 60\,569$ , response rate 70%).

This study analyses both the 2005 baseline and the 2009 follow-up data. The analysis was restricted to those who reported doing >20 hours per week paid work; the cohort members included in the analyses were 62 332 at 2005 baseline and 41 671 at 2009 follow-up.

### Measures and definitions

#### Job characteristics

*Psychologically adverse jobs* were assessed by scores derived from four binary variables. Scores (1 or 0) for each variable assessed the presence (or absence) of each adverse work condition, these were then summed to derive a count of adverse conditions, the total ranging from 0 (least adverse) to 4 (most adverse):

- Job security ('how secure do you feel about your job or career future in your current occupation'; 'not at all secure' = 1 'other' = 0)
- Decisions at work ('I have a good deal of say in decisions at work'; 'never' = 1 'other' = 0)
- Repetition at work ('I have to do the same things over and over'; 'often' = 1 'other' = 0)

- Time pressure at work ('I have to work very fast'; 'often' = 1 'other' = 0)

Similarly, *physical hazards* were assessed by summing the presence of ('often' = 1 'other' = 0) five variables. For each variable, the question was: 'During the last 12 months, how often have you experienced at work each of the following' (1) *vibrations from machinery*; (2) *loud noise*; (3) *uncomfortably high temperature*; (4) *vapours/fumes/dust* and (5) *handling dangerous products*. Scores from each of these variables were summed with the total ranging from 0 (least adverse) to 4+ (most adverse).

Other *job-related covariates* include *job sectors* (private employee, employer/self-employed, own farm, other), *employment status* (permanent, fixed term contract, casual/other, not applicable such as employer or self-employed), *paid work hours per week* (20–40, 41–60, 60+), *whether doing shiftwork at nights/weekends*, *work after 6 p.m.* (never, sometimes, often) and *travel time to work* (<30 min, 30 min to 1 h, >1 h, do not have to travel).

#### Cohort characteristics

Cohort characteristics adjusted for in the multivariate analyses include age group, marital status, occupation, personal monthly income (Thai Baht) and rural–urban residence. Except for occupation groups, other attributes were available both in 2005 baseline and 2009 follow-up.

#### Psychological distress

Psychological distress was based on the Kessler-6 which included questions 'In the past 4 weeks, how often did you feel: (1) *nervous* (2) *restless or fidgety* (3) *everything was an effort* (4) *so sad nothing can cheer you up* (5) *hopeless* (6) *worthless*?' Responses were scored from 5 'all the time' 4 'most of the time' 3 'some of the time' 2 'a little of the time' 1 'none of the time'.

Kessler psychological distress questions were available both in 2005 baseline and 2009 follow-up; in 2005 only the first three questions were asked and in 2009 all of the six questions were asked. In 2009, a little more than 10% of the cohort members reported Kessler-6 scores normally categorized as psychological distress (a total score  $\geq 13$  out of the possible 24) (Kessler *et al.*, 2003; Kuriyama *et al.*, 2009). Therefore, for both 2005 and 2009, all the scores from each Kessler

question were summed and the total score was ranked into deciles; the bottom decile was then classified as having psychological distress. This approach was based partly on the prevalence of psychological distress among Thai cohort members and partly on prevalence studies among adults in other Asian studies (~10% of study population reported K6 total score  $\geq 13$ ) (Fushimi *et al.*, 2012; Nakaya *et al.*, 2013). Sensitivity analyses showed that the three questions asked in 2005 and the six questions asked in 2009 were moderately correlated ( $r = 0.42$ ;  $p < 0.001$ ) and using just those three items for the 2009 measures in longitudinal analyses led to a similar pattern of findings.

### *Personal wellbeing*

Personal wellbeing was measured using the international standard 'life satisfaction' question 'Thinking about your own life and personal circumstances, how satisfied are you with your life as a whole?' Responses ranged from 0 'completely dissatisfied' to 10 'completely satisfied' (Cummins *et al.*, 2003; The International Wellbeing Group, 2006). Recent studies analysing TCS members have found this wellbeing measure captures well the overall life satisfaction and happiness among adult Thais (Yiengprugsawan *et al.*, 2010, 2012). For both 2005 and 2009 the response was converted into deciles; the lowest decile was classified as having low life satisfaction. The 'life satisfaction question' used was also part of the World Values Survey reported between 2005 and 2008 (World Values Survey, 2011). A low life satisfaction (score  $\leq 4$  out of 10) prevalence of ~10% was noted among Asian countries: 7.3% of Thais, 8% of Vietnamese, 9.3% of Japanese and 11.9% of Taiwanese. Thus, the lowest decile was a suitable cut-off to identify low life satisfaction for this analysis of Thai data. However, a different cut-off might be needed in other settings to reflect the different prevalence of low life satisfaction. For example, in Europe the prevalence is lower: (2.1% Dutch, 2.9% Norwegian, 3.7% British) but are much higher in Africa (40.7% in Ethiopia) and the Middle-East (46.3% in Iraq).

### **Data analyses**

Data scanning and editing were conducted using Thai Scandevet software. Further data editing of the baseline study was completed using SQL and SPSS software; data analyses were done using

Stata version 12. Individuals with missing data for analyses presented here were excluded and so totals vary a little according to the information available. First, we present results of the 2005 baseline cross-sectional analyses of the association between job conditions and mental health and wellbeing. The two outcomes—psychological distress and life satisfaction had a positive correlation coefficient of 0.18 indicating that the two outcome measures are not strongly correlated. For this cross-sectional analysis we reported adjusted odds ratios (AOR) and 95% confidence intervals based on multivariate logistic regression.

We also performed longitudinal follow-up analyses (job conditions in 2005 and psychological distress and life satisfaction in 2009), adjusting for job characteristics in 2005, baseline psychological distress or low life satisfaction in 2005, cohort attributes (age, marital status, income, residence in 2009). We have noted correlation coefficients between dependent and independent variables which all were  $< 0.20$  ( $p < 0.001$ ). As well correlation coefficients between all independent variables were  $< 0.30$  ( $p < 0.001$ ) and multicollinearity was not detected in the models. Furthermore, our longitudinal design separates measures temporally, a recommend method for reducing common method variance (Podsakoff *et al.*, 2003).

### **Ethical issues**

Ethics approval was obtained from Sukhothai Thammathirat Open University Research and Development Institute (protocol 0522/10) and the Australian National University Human Research Ethics Committee (protocol 2004/344 and 2009/570 for follow-up). Informed written consent was obtained from all participants.

## **RESULTS**

Cohort characteristics in 2005 and sex stratified prevalence of psychological distress and life satisfaction are presented in Table 1. Slightly more than half of cohort members were females, the majority aged  $< 40$  years, and approximately half were residing in urban areas. At 2005 baseline, 14.9% reported having psychological distress and 13.9% reported low satisfaction in life. Both psychological distress and low life satisfaction measures, respectively, were more prevalent among younger groups, those not currently married, lower income, skilled/manual workers and urban

**Table 1:** Prevalence of psychological distress and low life satisfaction by cohort attributes, TCS 2005

Cohort attributes ( <i>n</i> = 62 332)	Overall % <sup>a</sup> ( <i>n</i> )	2005 Baseline % prevalence					
		Psychological distress			Low life satisfaction		
		Overall	Males	Females	Overall	Males	Females
Sex							
Male	45.6 (28 441)	13.6			13.6		
Female	54.4 (33 888)	16.0			13.7		
Age (years)							
<30	50.8 (31 666)	17.9	17.0	18.5	15.9	16.5	15.6
30–39	33.9 (21 132)	12.7	12.3	13.2	12.4	12.9	11.9
40+	15.3 (9525)	9.3	8.8	10.2	8.9	9.2	8.3
Marital status							
Married	43.7 (25 697)	11.9	10.6	13.6	9.8	9.6	10.1
Never married	52.6 (30 952)	16.7	16.5	16.8	15.9	17.6	14.9
Separated, divorced, widowed	3.8 (2209)	16.3	14.9	17.0	18.7	18.0	19.0
Household monthly income (Baht)							
<7000	34.4 (21 387)	17.6	17.0	17.9	18.6	20.6	17.5
7000–10 000	25.9 (16 131)	15.1	14.2	15.8	13.6	13.8	13.3
20 001–20 000	27.5 (17 133)	12.8	11.6	14.1	10.5	10.6	10.5
>20 000	12.2 (7595)	11.4	10.4	12.7	7.1	7.5	6.5
Occupation							
Professionals	18.0 (11 001)	14.3	13.5	15.1	9.9	9.7	10.0
Office workers	35.0 (21 418)	14.0	11.9	15.2	12.6	12.3	12.8
Skilled/manual workers	27.7 (16 974)	17.2	15.6	19.0	19.5	19.8	19.4
Others	19.4 (11 865)	13.7	12.7	14.7	14.0	14.2	13.8
Geographical residence							
Rural	47.2 (29 235)	14.2	13.0	15.2	12.5	12.6	12.5
Urban	52.8 (32 717)	15.5	14.1	16.6	14.6	14.6	14.6

<sup>a</sup>Column %.

residents (Table 1). For example, lower income compared with higher income groups (17.6 versus 11.4% reporting psychological distress and 18.6 versus 7.1% reporting for low life satisfaction) and urban compared with rural residents (15.5 versus 14.2% reporting psychological distress and 14.6 versus 12.5% reporting low life satisfaction).

Job characteristics reported in Tables 2 and 3 included adverse job characteristics, physical hazards and other covariates (job sectors, employment status, working hours, shift work, extended work hours and travel time) by sex and occupation groups. Skilled and manual workers were more likely to report both psychologically adverse jobs (especially low job security and less decision at work) and physical hazards (vibrations, loud noises, high temperature, vapours/fumes/dust/ and handling dangerous products). Women tended to report more adverse jobs, while men reported more physical hazards. Skilled workers were more likely to be in casual contracts and to report working >40 h a week. Professionals or managers and office workers

reported commonly working after 6 p.m. and reported commuting >1 h each way. Urban residents reported longer travelling times to work compared with rural residents.

Multivariate analyses of psychological distress and life satisfaction were reported with AORs and 95% CI separately by sex (Table 4). Increments of psychologically adverse job characteristics showed clear gradients with psychological distress outcomes both among males (AOR ranged from 1.52 to 4.48) and females (AOR 1.34 to 3.76). A similar magnitude of association linked psychologically adverse jobs to low life satisfaction (AORs 1.34–4.34 among males and 1.18–3.63 among females). Increased physical hazards also showed a dose–response relationship with psychological distress among males (AORs 1.75–2.76) and females (AORs 1.70–3.19). A similar magnitude of association was found between physically hazardous jobs and low life satisfaction (AORs 1.25–1.73 among males and 1.31–1.91 among females).

Other significant covariates with psychological distress included having casual work and

**Table 2:** TCS 2005: overall proportions and prevalence of job characteristics by sex, occupation and residence

Job characteristics	Overall <sup>a</sup>	2005 Baseline % prevalence						
		Sex		Occupation			Residence	
		Males	Females	Professionals/ managers	Office assistants	Skilled/ manual workers	Rural	Urban
<b>Psychologically adverse jobs</b>								
Job security 'not at all secure'	14.2	11.9	16.2	8.6	11.1	20.9	15.5	13.1
Decision at work 'never/rarely'	13.0	13.8	12.3	6.6	12.7	18.2	13.0	12.9
Do the same thing over 'often'	70.3	67.1	73.0	64.0	71.5	74.6	70.5	70.2
Have to work very fast 'often'	51.5	48.6	54.0	55.7	53.4	51.7	49.6	53.2
<b>Psychological hazard scores</b>								
0 least adverse	13.8	16.2	11.9	16.5	12.6	11.3	13.9	13.7
1	36.5	37.8	35.4	39.0	37.0	33.2	36.9	36.1
2	38.2	35.9	40.2	38.2	40.5	37.8	37.7	38.8
3	9.8	8.8	10.7	5.6	8.7	14.6	9.9	9.7
4 most adverse	1.7	1.3	1.9	0.7	1.1	3.2	1.7	1.7
<b>Physical hazards—'often'</b>								
Vibrations from machinery	8.5	11.2	6.1	5.6	4.3	16.8	8.1	8.8
Loud noise	9.5	10.3	8.7	7.6	5.5	16.3	8.9	10.0
High temperature	18.8	22.3	15.8	15.5	14.6	25.4	20.1	17.6
Vapours, fumes, dust	14.8	17.2	12.9	11.6	9.1	24.4	13.9	15.7
Handling dangerous products	5.7	6.3	5.2	4.8	2.9	10.6	5.8	5.7
<b>Physical hazard scores</b>								
0 least adverse	66.8	63.2	69.8	71.8	75.5	52.8	66.3	67.2
1	18.7	19.3	18.2	17.1	16.4	21.5	19.6	17.9
2	8.3	9.2	7.5	6.9	5.4	12.6	8.0	8.5
3	3.8	4.7	3.0	2.7	1.8	7.4	3.8	3.8
4+ most adverse	2.5	3.6	1.5	1.4	0.9	5.7	2.3	2.7

<sup>a</sup>Figures in overall category represent column % for each cluster of job characteristics or scores.

frequently working after 6 p.m. (AOR 1.29, 95% CI 1.16–1.45 among males and AOR 1.33, 95% CI 1.15–1.45 among females); doing shift work was also associated with psychological distress (AOR 1.29, 95% CI 1.15–1.45 among females but not among males). Reported travelling time of >1 h was associated with psychological distress for both males and females (AORs 1.34 and 1.28, respectively). Being private employees and employment on a casual contract were significantly associated with low life satisfaction, along with travel time of >30 min to work.

In order to confirm the cross-sectional results, we also analysed the influence of psychologically adverse jobs and physical hazards at baseline in 2005 on the 4-year follow-up outcomes in 2009. Separate multivariate analyses of 2009 psychological distress and 2009 low life satisfaction (as outcomes), adjusting for potential covariates (sociodemographic attributes in 2009, job-related covariates in 2005 and baseline psychological distress/low life satisfaction in 2005), are presented in Table 5. Not surprisingly, we observed an association between baseline job conditions in 2005

and psychological distress in 2009 (psychologically adverse job scores, AORs ranged from 1.21 to 1.92 among males and 1.06 to 1.35 among females and physically hazardous jobs, AORs ranged from 1.18 to 1.53 among males and 1.16 to 1.54 among females). The 4-year follow-up response also showed a similarly moderate incremental association between job characteristics in 2005 and reported low life satisfaction in 2009. As well, the models included baseline 2005 mental health and life satisfaction outcomes as indirect job condition inputs for the 2009 assessment. The 2005 health/wellbeing outcomes strongly influenced the 2009 outcomes; thus the 2009 outcomes reflect the direct and indirect effects of job conditions in 2005.

## DISCUSSION

Using data from a large national Thai cohort studied in 2005 and 2009 we found that elevations in self-reported psychological distress and wellbeing (low life satisfaction) were predicted by

**Table 3:** TCS 2005: overall proportions of job covariates by sex, occupation and residence

Job covariates	Overall	2005 Baseline proportions (%) <sup>a</sup>						
		Sex		Occupation			Residence	
		Males	Females	Professionals/ managers	Office assistants	Skilled/ manual workers	Rural	Urban
<b>Job sector</b>								
Government/state enterprise	47.2	52.4	42.9	53.0	60.9	30.1	53.0	42.1
Private employee	35.8	30.1	40.7	33.0	35.6	47.0	28.4	42.4
Employer/self-employed <sup>b</sup>	10.0	9.9	10.2	10.6	1.9	12.7	8.7	11.2
Own farm <sup>b</sup>	3.2	4.4	2.1	1.3	0.5	6.1	6.3	0.4
Others <sup>b</sup>	3.8	3.2	4.2	2.1	1.1	4.2	3.7	3.8
<b>Employment status</b>								
Permanent	60.5	65.4	56.4	70.7	74.3	48.3	55.6	65.0
Fixed-term contract	12.5	9.2	15.2	9.4	13.4	14.0	14.4	10.7
Casual/other	9.6	7.8	11.1	5.7	7.9	13.7	11.0	8.4
Not reported <sup>b</sup>	17.4	17.6	17.3	14.3	4.3	23.5	19.1	15.9
<b>Paid work hours per week</b>								
20–39	35.5	36.0	35.1	43.7	48.3	20.9	36.0	35.1
40+	46.5	45.7	47.2	41.3	46.2	56.2	44.1	48.7
Not reported <sup>b</sup>	18.0	18.4	17.7	15.0	5.6	23.0	19.9	16.3
<b>Shift work at night/weekends</b>								
Yes	27.8	30.0	26.0	23.9	22.2	37.5	27.3	28.3
<b>Work after 6 p.m.</b>								
Never	21.1	16.7	24.7	18.2	22.9	18.2	23.2	19.1
Sometimes	44.6	46.7	42.8	43.8	36.6	53.2	42.2	46.8
Often	34.4	36.5	32.5	38.0	40.5	28.7	34.6	34.1
<b>Travel time</b>								
<30 min	53.4	53.5	53.4	50.9	56.9	52.7	56.3	50.8
30 min–1 h	22.9	22.3	23.5	24.5	24.6	23.4	20.5	25.2
>1 h	9.1	9.5	8.8	11.5	10.0	7.4	7.5	10.5
Do not have to travel	14.6	14.8	14.4	13.1	8.5	16.6	15.7	13.5

<sup>a</sup>Figures represent column % for each cluster of values for job covariates (except shift work for which only 'yes' values are shown).

<sup>b</sup>Three categories of job sector (employer/self-employed, own farm and others) were not required to report employment status and paid work hours per week.

exposure to psychological and physical hazards at work. Previous research on psychosocial hazards has largely been undertaken in developed, relatively affluent nations. In developing economies, attention has been centred on injuries or physical exposures associated with manufacturing, construction and agricultural industries. Our study suggests that in transitional economies such as Thailand, where the burdens from poor mental health are rising, both psychological and physical hazards at work are important contributors. Longitudinal analyses of 2005 exposure and 2009 health outcomes confirmed covariate-adjusted associations for psychologically adverse and/or physically hazardous jobs with psychological distress and low life satisfaction.

Our results are consistent with previous reports on the relationship between adverse job characteristics and poor health outcomes. These

include large cohort studies in Canada, Holland and Belgium reporting that job insecurity and decision-making ability were significantly associated with psychological distress (Bultmann *et al.*, 2002; Godin *et al.*, 2005; Marchand *et al.*, 2005). As well, the Whitehall II study in Britain found that working overtime, shift work, low job control and work stress were significant risk factors for the development of coronary heart disease (Steptoe and Willemsen, 2004; Virtanen *et al.*, 2010). Long working hours were also reported to associate with negative health behaviours such as poor diet and low exercise levels (Caruso, 2006) as well as short sleep (both males and females) and smoking (among males) (Artazcoz *et al.*, 2009).

One of the strengths of our study is that we could consider the relationship between psychologically and physically hazardous jobs both

**Table 4:** Cross-sectional job effects on psychological distress and low life satisfaction by sex, TCS 2005

Job characteristics in 2005	AORs [95% CIs] <sup>a</sup> for 2005 outcomes			
	Psychological distress		Low life satisfaction	
	Males ( <i>n</i> = 25 167)	Females ( <i>n</i> = 30 251)	Males ( <i>n</i> = 25 226)	Females ( <i>n</i> = 30 245)
Psychologically hazardous job				
0 least hazardous (reference)	1.00	1.00	1.00	1.00
1	1.52 [1.32–1.75]	1.34 [1.17–1.54]	1.35 [1.18–1.56]	1.18 [1.03–1.36]
2	2.24 [1.95–2.57]	2.14 [1.88–2.45]	1.79 [1.56–2.04]	1.61 [1.40–1.84]
3	3.35 [2.84–3.94]	3.09 [2.66–3.60]	3.51 [3.00–4.10]	3.07 [2.64–3.58]
4 most hazardous	4.48 [3.41–5.87]	3.76 [3.02–4.68]	4.34 [3.34–5.64]	3.63 [2.93–4.53]
Physically hazardous job				
0 least hazardous (reference)	1.00	1.00	1.00	1.00
1	1.75 [1.60–1.92]	1.70 [1.57–1.84]	1.25 [1.13–1.37]	1.31 [1.20–1.43]
2	1.92 [1.70–2.16]	2.08 [1.87–2.31]	1.51 [1.33–1.70]	1.50 [1.34–1.69]
3	2.50 [2.15–2.89]	2.39 [2.06–2.80]	1.56 [1.18–1.56]	1.50 [1.26–1.78]
4+ most hazardous	2.76 [2.34–3.25]	3.19 [2.61–3.89]	1.73 [1.18–1.56]	1.91 [1.54–2.37]
Job sector				
Government/state enterprise (reference)	1.00	1.00	1.00	1.00
Private employee	1.10 [0.99–1.21]	1.09 [1.01–1.18]	1.52 [1.38–1.68]	1.38 [1.26–1.50]
Employer/self-employed	1.30 [1.00–1.68]	1.19 [0.93–1.51]	1.43 [1.12–1.84]	1.22 [0.95–1.57]
Own farm	1.21 [0.91–1.62]	1.18 [0.86–1.60]	1.26 [0.96–1.67]	1.19 [0.86–1.65]
Others	1.24 [0.93–1.67]	1.05 [0.82–1.36]	1.14 [0.86–1.52]	1.48 [1.14–1.93]
Employment status				
Permanent (reference)	1.00	1.00	1.00	1.00
Fixed term contract	1.10 [0.99–1.21]	0.96 [0.87–1.06]	1.30 [1.15–1.48]	1.15 [1.15–1.48]
Casual/other	1.12 [0.98–1.29]	1.03 [0.92–1.14]	1.48 [1.29–1.69]	1.25 [1.29–1.69]
Not reported <sup>b</sup>	1.02 [0.80–1.31]	1.04 [0.83–1.33]	1.32 [1.00–1.68]	1.24 [0.98–1.59]
Paid hours work per week				
20–40 (reference)	1.00	1.00	1.00	1.00
40+	1.05 [0.96–1.16]	1.03 [0.95–1.12]	1.03 [0.93–1.14]	1.10 [1.01–1.21]
Not reported <sup>b</sup>	1.00 [0.83–1.22]	1.16 [0.96–1.39]	0.96 [0.79–1.17]	0.98 [0.98–1.59]
Shift work at night/weekends				
No (reference)	1.00	1.00	1.00	1.00
Yes	1.01 [0.93–1.10]	1.25 [1.15–1.35]	1.05 [0.97–1.15]	1.04 [0.96–1.13]
Work after 6 p.m.				
Never (reference)	1.00	1.00	1.00	1.00
Sometimes	1.04 [0.92–1.10]	1.13 [1.03–1.24]	1.05 [0.97–1.15]	1.07 [0.97–1.17]
Often	1.29 [1.15–1.45]	1.33 [1.21–1.45]	1.16 [1.04–1.30]	1.03 [0.93–1.13]
Travel time				
<30 min (reference)	1.00	1.00	1.00	1.00
30 min–1 h	1.19 [1.09–1.31]	1.06 [0.98–1.14]	1.20 [1.1–1.32]	1.12 [1.03–1.22]
>1 h	1.34 [1.18–1.51]	1.28 [1.14–1.43]	1.32 [1.16–1.50]	1.46 [1.30–1.65]
Do not have to travel	0.98 [0.87–1.11]	0.98 [0.89–1.09]	1.02 [1.04–1.30]	1.02 [1.04–1.30]

<sup>a</sup>Cross-sectional ORs adjusted for 2005 socio-demo-geographic covariates (age, marital status, household income, residence).

<sup>b</sup>Not required to report, see footnote for Table 3.

cross-sectionally and longitudinally, and our results show a consistent pattern. The large-scale participation of adults from the mainstream of Thai society residing all over the country and subjected to detailed assessment of socio-demo-geographic attributes is a further strength. It is to be noted that our study is based on educated working Thai adults and the majority are in the formal workforce; hence work conditions might tend to be better than for the general

Thai population. All analyses, however, adjusted for a wide range of work-related and socio-demographic confounders. But we were unable to adjust for some potentially important individual characteristics of workers. For example, personality or prior mental health might influence how the work environment is perceived (Bond and Bunce, 2003). A large Dutch longitudinal study of mental health and work conditions showed that a causal relationship between these

**Table 5:** Longitudinal job effects on psychological distress and low life satisfaction by sex, TCS 2005–2009

Job characteristics in 2005	AORs [95% CIs] <sup>a</sup> for 2009 outcomes			
	Psychological distress		Low life satisfaction	
	Males ( <i>n</i> = 16 766)	Females ( <i>n</i> = 19 633)	Males ( <i>n</i> = 16 612)	Females ( <i>n</i> = 19 482)
Psychologically hazardous job				
0 least hazardous (reference)	1.00	1.00	1.00	1.00
1	1.21 [1.00–1.46]	1.06 [0.89–1.25]	1.31 [1.08–1.58]	0.94 [0.78–1.13]
2	1.50 [1.25–1.80]	1.29 [1.09–1.52]	1.68 [1.39–2.03]	1.24 [1.04–1.48]
3+ most hazardous	1.92 [1.54–2.39]	1.35 [1.12–1.64]	2.13 [1.71–2.65]	1.50 [1.22–1.84]
Physically hazardous job				
0 least hazardous (reference)	1.00	1.00	1.00	1.00
1	1.18 [1.03–1.35]	1.16 [1.04–1.30]	1.25 [1.09–1.43]	1.21 [1.07–1.37]
2	1.41 [1.18–1.67]	1.48 [1.28–1.72]	1.41 [1.19–1.68]	1.34 [1.13–1.59]
3+ most hazardous	1.53 [1.29–1.84]	1.54 [1.27–1.86]	1.58 [1.32–1.88]	1.44 [1.17–1.78]
Baseline 2005 outcome response				
No	1.00	1.00	1.00	1.00
Yes	3.59 [3.18–4.05]	3.82 [3.46–4.21]	5.09 [4.53–5.72]	4.97 [4.46–5.52]

<sup>a</sup>Mutually adjusted for the three variables tabulated here and adjusted for all six job covariates reported in 2005 (shown in Table 3) and the socio-demo-geographic covariates in 2009 (age, marital status, household income, geographic residence).

two phenomena worked in both directions—work conditions had a significant impact on mental health, and individual mental health had a significant impact on the perception of the work environment (De Lange *et al.*, 2004). Our adjustment for baseline mental health helps reduce, but does not eliminate, this possibility. Because we relied on self-report our study is subject to common method variance (Podsakoff *et al.*, 2003). However, the prospective design helps address this problem, temporally separating predictors and outcomes.

There are two other limitations in the prospective aspect of this study. First, the lack of repeat measures of job stressors at follow-up in 2009 makes us depend on the 2005 measures leaving out the possibility of changing job circumstances over the 4-year period. Nevertheless, despite the possibility of misclassification of job characteristics prevailing over the 4-year period, we were still able to find an influence of initial (baseline 2005) job conditions on 2009 outcomes. Secondly, it is plausible that diminished mental health was a direct cause for non-response at 2009 follow-up for a sizeable proportion (one-third) of the eligible cohort members who did not respond (or were not reached). If this is the case, the estimates of association may be biased. However, telephone enquiries made to a random sample of non-respondents indicated that the main reason for non-response was loss of contact due to change of mailing addresses

during the 4-year period. This suggests that response was not linked to outcome.

Some Asian studies have also noted the importance of differing cultural values influencing psychological distress among Asian workers; strong patronage and a supportive network moderated work stress among Chinese and Japanese workers (Siu *et al.*, 2005; Nagami *et al.*, 2010). Thai studies found social support to be one of the positive factors associated with work ability (Jirapongsuwan *et al.*, 2011; Kaewboonchoo *et al.*, 2011). Notwithstanding these observations on the importance of cultural protection in Asian work–stress observations it is noteworthy that in our study Thai workers exhibited overall similar work–health trends to those observed in Western developed country settings.

Our findings suggest that interventions targeting work conditions—both psychosocial and physical—could help address Thailand's rising mental health burden. One limit to the ability of the Thai government to enforce any workplace regulations is the continuing dominance of informal work in the Thai labour market. At present informal workers (including self-employed agricultural workers) make up around 64% of the Thai workforce (ILO, 2011) a proportion in stark contrast to Western, affluent economies. Informal workers in Thailand face higher exposures to workplace hazards and are working much longer hours than their formally employed counterparts (Thai Health Promotion Foundation, 2010) and

are not protected by most existing Occupational Health and Safety regulations. Addressing mental and physical hazards at work for informal workers therefore challenges existing approaches to workplace safety regulation in Thailand (Florey *et al.*, 2007). Longitudinal data emerging from the ongoing TCS will shed light on the pace and prevalence of these changes in work and health in Thailand. Our findings for Thai adult workers raise concerns across the country about the mental health and wellbeing consequences of adverse job conditions.

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