

ORIGINAL RESEARCH

Cumulative impact of high job demands, low job control and high job insecurity on midlife depression and anxiety: a prospective cohort study of Australian employees

Lay San Too  ^{1,2}, Liana Leach  ³, Peter Butterworth ^{2,4}

¹Centre for Mental Health, Melbourne School of Population and Global Health, The University of Melbourne, Parkville, Victoria, Australia

²Centre for Research on Ageing, Health & Wellbeing, Research School of Population Health, The Australian National University, Canberra, Australian Capital Territory, Australia

³National Centre for Epidemiology and Population Health, Research School of Population Health, The Australian National University, Canberra, Australian Capital Territory, Australia

⁴Melbourne Institute of Applied Economic and Social Research, The University of Melbourne, Parkville, Victoria, Australia

Correspondence to

Dr Lay San Too, Centre for Mental Health, Melbourne School of Population Health and Global Health, The University of Melbourne, Parkville, Victoria, Australia; tiffany.too@unimelb.edu.au

Received 24 June 2020

Revised 9 October 2020

Accepted 14 October 2020

ABSTRACT

Objective There is a lack of evidence concerning the prospective effect of cumulative exposure to psychosocial job stressors over time on mental ill-health. This study aimed to assess whether cumulative exposure to poor quality jobs places employees at risk of future common mental disorder.

Methods Data were from the Personality and Total Health Through Life project ($n=1279$, age 40–46 at baseline). Data reported on the cumulative exposure to multiple indicators of poor psychosocial job quality over time (ie, a combination of low control, high demands and high insecurity) and future common mental disorder (ie, depressive and/or anxiety symptom scores above a validated threshold) 12 years later. Data were analysed using logistic regression models and controlled for potential confounders across the lifespan.

Results Cumulative exposure to poor-quality work (particularly more secure work) on multiple occasions elevated the risk of subsequent common mental disorder, independent of social, health, verbal intelligence and personality trait confounders ($OR=1.30$, 95% CI 1.06 to 1.59).

Conclusions Our findings show that cumulative exposure to poor psychosocial job quality over time independently predicts future common mental disorder—supporting the need for workplace interventions to prevent repeated exposure of poor quality work.

Key messages

What is already known about this subject?

► Globally, mental ill-health is a leading cause of disability burden. Adverse psychosocial job conditions have been shown to be a contributing factor to mental ill-health. However, evidence for the prospective effect of cumulative exposure to poor quality jobs over time is scarce. Our review showed that there is a significant knowledge gap about the effect of cumulative exposure to job stressors over time on common mental disorder (ie, anxiety and/or depression).

What are the new findings?

► Our findings show that cumulative exposure to poor job quality over time increases the risk of future common mental disorder. The risk is robust for cumulative exposures to high job insecurity (but not related to high job demands and low job control).

How might this impact on policy or clinical practice in the foreseeable future?

► This study provides strong evidence that repeated exposure to poor psychosocial job quality places employees at an elevated risk of common mental disorder. These findings underline the important role of adequate psychosocial job quality in preserving mental health and suggest that the risk of common mental disorder could be reduced by ensuring better quality work (particularly more secure work).

INTRODUCTION

Mental ill-health is a key contributor to the global prevalence of disability.¹ Well-established factors associated with mental ill-health include adverse psychosocial job conditions such as high job strain (ie, high demands and low control at work), job insecurity, effort-reward imbalance and a lack of social support from supervisors and colleagues.^{2–6} This research field is primarily influenced by Karasek's job demands-control model.⁷ The model posits that job strain, a state engendered by high job demands and low job control, elevates the risk of employees' health problems. Psychosocial job factors are potentially modifiable; demonstration of their causal association with mental ill-health would build the evidence base to inform workplace mental health policy and promote public health benefits.



© Author(s) (or their employer(s)) 2020. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Too LS, Leach L, Butterworth P. *Occup Environ Med* Epub ahead of print: [please include Day Month Year]. doi:10.1136/oemed-2020-106840

While there is evidence that poor psychosocial job conditions lead to subsequent mental health problems,^{2 3 5 8} only a small number of studies have examined whether the accumulation of such exposure over time has an even greater negative impact on mental health. For example, a meta-analysis showed that those exposed to job strain on two occasions had a greater risk of hospital-treated depression than those exposed to job strain on only one occasion.⁹ An analysis of 14 waves of data from an Australian national panel study found that improvements in job security were associated

with decreasing symptoms of depression and anxiety (measured by the NDS-5) and also found that cumulative exposure to job security over six consecutive waves predicted better mental health.¹⁰ A Danish study analysed data from individuals aged 15–30 years and initially free from depressive disorder and showed that low job control was associated with increased risk of first-time hospital-treated depression.¹¹ However, the study found no additional cumulative effect of exposure to low job control on subsequent depression.¹¹

A recent British study examined the impact of job strain on subsequent common mental disorder (symptoms of depression and/or anxiety measured by the nine-item psychological subscale of the Malaise Inventory) in mid-aged adults.¹² The study showed that high job demands, low job control and high job strain at age 45 years predicted common mental disorder at age 50 years. In this study, Harvey and colleagues attempted to address concerns about reverse causation and residual confounding by excluding individuals with common mental disorder at age 45 years (rather than earlier in life where education and career trajectories could be affected) and controlled for multiple confounding variables across the life-course. The study used a high-quality rigorous approach to investigate causality but did not consider the impact of accumulated poor quality work over time. If additional occasions/exposures to poor job quality are associated with worse mental health outcomes, the adverse consequences may increase over time, providing a greater incentive to focus on this group of workers. The current study adds to the sparse literature examining the impact of cumulative exposure to adverse psychosocial job conditions over time on subsequent mental health using Australian community data collected over a 12-year period. We adapted the methodology used in Harvey *et al*¹² (with a similarly aged longitudinal cohort) to examine cumulative exposure to poor quality jobs and subsequent common mental disorder (assessing symptoms of anxiety and/or depression using the Goldberg Anxiety and Depression scales). To address concerns about reverse causation, the analyses controlled for prior common mental disorder. To address concerns about residual confounding, the analyses controlled for a variety

of confounding variables across life-course including physical health, substance misuse and parental responsibilities: measures not included in previous studies.^{12 13} We hypothesised that cumulative exposure to poor quality job would predict later common mental disorder, after controlling for confounding variables across time. The current study was reported according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement for cohort studies.¹⁴

METHODS

Participants

Participants were from the Personality and Total Health (PATH) Through Life project.¹⁵ PATH is a prospective community survey that commenced at the Australian National University (ANU) in 1999 and has been jointly hosted by the ANU and the University of New South Wales since 2019. The survey focuses on individual health and well-being trajectories across the life-course. Three cohorts of participants (young, midlife and older adults) were randomly selected from the Australian Electoral Rolls of Australian Capital Territory and the neighbouring town of Queanbeyan. Participants have been interviewed approximately every 4 years since 1999. The current study considers data from waves 1–4 from the midlife cohort. At wave 1, 3919 mid-aged people (40–46 years) were selected and invited to participate in the survey and 65% (n=2530) provided responses. Of baseline participants, 93% completed the survey at wave 2, 86% at wave 3 and 71% at wave 4 (figure 1).

During the first three waves, individuals were invited to complete a questionnaire using a laptop computer and complete physical and cognitive tests administered by an interviewer in their own home or at the ANU. At wave 4, all study participants were invited to complete the questionnaire online, while those who remained resident in the local region were invited to complete physical and cognitive tests in the same way as previous waves. All participants provided informed consent to take part at each wave of the study, and each wave of data collection was approved by the Human Research Ethics Committee of the ANU.

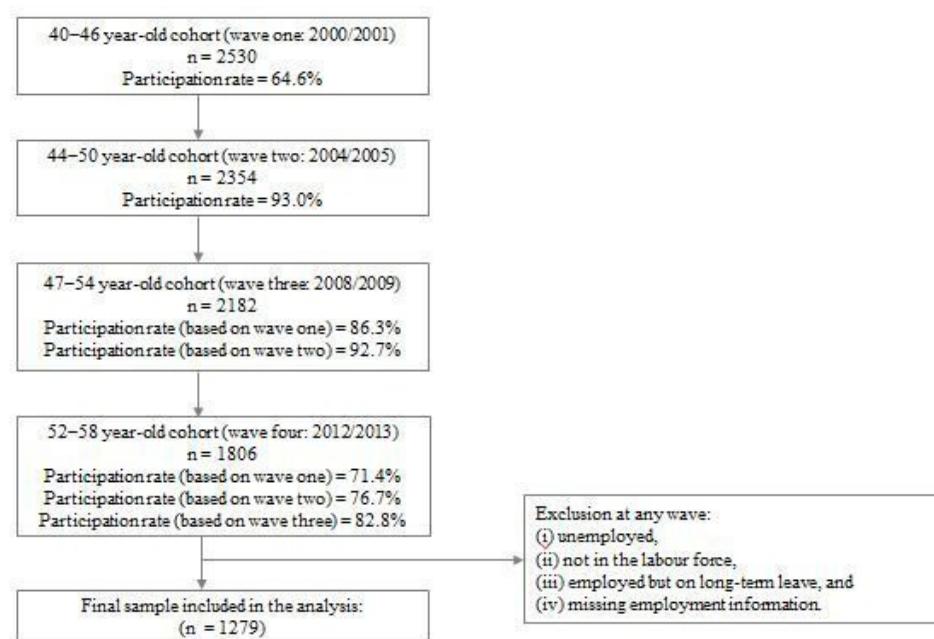


Figure 1 Study profile.

Table 1 Sample characteristics by wave 4 common mental disorder (n=1279)

Variable	Common mental disorder (wave 4)				χ^2 test/t-test (no vs yes)		
	Total				No	Yes	P value
	n	%	n	%	n	%	
Sex (wave 1)							0.910
Male	645	50.4	512	50.7	129	49.2	
Female	634	49.6	497	49.3	133	50.8	
Education attainment (wave 1)							0.070
Incomplete high school	328	25.7	247	24.5	77	29.4	
Completion of high school	404	31.6	312	30.9	90	34.4	
Completion of tertiary study	547	42.8	450	44.6	95	36.3	
Childhood adversity (wave 1)							0.001
No	919	71.9	751	74.4	162	61.8	
Yes	356	27.8	256	25.4	98	37.4	
Unknown	4	0.3	2	0.2	2	0.8	
Common mental disorder (wave 1)							<0.001
No	978	76.5	843	83.6	128	48.9	
Yes	297	23.2	164	16.3	132	50.4	
Unknown	4	0.3	2	0.2	2	0.8	
Partner status (wave 3)*							0.776
No partner	260	20.3	203	20.1	56	21.4	
Having a partner	1019	79.7	806	79.9	206	78.6	
Occupational class (wave 3)†							0.021
High	723	56.5	579	57.4	142	54.2	
Medium	329	25.7	250	24.8	73	27.9	
Low	227	17.8	180	17.8	47	17.9	
Parental responsibilities (wave 3)‡							0.265
No	954	74.6	756	74.9	194	74.1	
Yes	325	25.4	253	25.1	68	26.0	
Number of adverse non-work life events (wave 3)							<0.001
0	619	48.4	506	50.2	110	42.0	
1	426	33.3	347	34.4	78	29.8	
≥2	234	18.3	156	15.5	74	28.2	
Number of chronic physical health conditions (wave 3)							0.005
30	514	40.2	420	41.6	88	33.6	
1	501	39.2	398	39.4	102	38.9	
≥2	264	20.6	191	18.9	72	27.5	
Smoking status (wave 3)							0.198
Never/past smoker	1126	88.0	893	88.5	225	85.9	
Current smoker	152	11.9	116	11.5	36	13.7	
Unknown	1	0.1	0	0	1	0.4	
Risky alcohol consumption (wave 3)							0.610
No	1183	92.5	935	92.7	240	91.6	
Yes	91	7.1	69	6.8	22	8.4	
Unknown	5	0.4	5	0.5	0	0	
	Mean	SD	Mean	SD	Mean	SD	p-value
IQ at age (wave 1)	51.0	5.3	51.0	5.5	51.1	4.6	0.786
Neuroticism (wave 1)§	3.8	3.1	3.2	2.8	6.0	3.4	<0.001
Extraversion (wave 1)§	7.0	3.6	7.1	3.6	6.4	3.8	0.002
Psychoticism (wave 1)§	2.0	1.5	2.1	1.5	1.8	1.5	0.003

*Partner status was grouped into two categories. Individuals who were separated, divorced, widowed or never married were classified as 'no partner' while those who were married or in a de facto relationship were classified as 'having a partner'.

†Occupational class contained three skill categories: 'high' (managers and administrators/professionals), 'medium' (associate professionals/tradespersons and related workers/ advanced clerical and service workers) and 'low' (intermediate production and transport workers/elementary clerical, sales and service workers/ labourers and related workers).

‡Parental responsibilities were generated based on whether respondents reported having a child younger than 15 years.

§Higher score indicates higher neuroticism, extraversion and psychoticism.

Table 2 Descriptive statistics on cumulative job exposures from wave 1 to wave 3 and mental health outcome at wave 4

	n	%
Cumulative poor job quality (waves 1 to 3)*		
0	750	58.6
1	350	27.4
2	129	10.1
3	44	3.4
Unknown	6	0.5
Cumulative low job control (waves 1 to 3)		
0	691	54.0
1	262	20.5
2	186	14.5
3	139	10.9
Unknown	1	0.1
Cumulative high job demands (waves 1 to 3)		
0	588	46.0
1	306	23.9
2	227	17.8
3	156	12.2
Unknown	2	0.2
Cumulative high job insecurity (waves 1 to 3)		
0	673	52.6
1	374	29.2
2	146	11.4
3	81	6.3
Unknown	5	0.4
Common mental disorder (wave 4)		
No	1009	78.9
Yes	262	20.5
Unknown	8	0.6

*Cumulative measure represents the number of waves in which two or three psychosocial adversities (ie, low job control, high job demands, high job insecurity) were reported—see measures section for further details.

In this study, participants were excluded if they were not employed (ie, unemployed or not active in the labour force), employed but on long-term leave or did not provide information on their employment status at any wave (figure 1).

Measures

Outcome variable

Anxiety and depression (referred to as common mental disorder) were assessed using the Goldberg Anxiety and Depression scales.¹⁶ Each scale comprises nine binary items ('yes' or 'no') asking questions about anxiety or depressive symptoms that an individual has experienced in the past month. The total score for each measure was computed by summing the number of 'yes' responses, and this was dichotomised using established cut-off points indicative of symptoms of anxiety or depressive disorders (ie, thresholds determined using the gold standard Composite International Diagnostic Interview—a fully structured diagnostic interview used to assess mental disorders according to the Diagnostic and Statistical Manual of Mental Disorders (DSM)/International Classification of Diseases (ICD) criteria).^{17 18} A measure of common mental disorder at each wave was generated based on the presence of likely depressive and/or anxiety disorder.

Exposure variables

Job control and job demands were assessed using 19 items taken from the Whitehall II study.¹⁹ Fifteen items assessed job control

(eg, skill discretion: 'Do you have a choice in deciding how you do your job?'; decision authority: 'Does your job provide you with a variety of interesting things?') and four assessed job demands (eg, 'Do you have to work very intensively'). These items offered four response categories: 'often', 'sometimes', 'rarely' and 'never'. Following the methodology used in previous studies,^{6 20–22} the average scores for job control and job demands were calculated and dichotomised into '1' high and '0' low, identifying approximately 30% of respondents with the greatest job adversity (ie, low job control, high job demands). One item: 'How secure do you feel about your job or career future in your current workplace?' with four response categories ('not at all secure', 'moderately secure', 'secure', 'extremely secure') was used to assess job insecurity. Individuals who selected either of the former two categories were classified as having '1' high job insecurity while those who selected the other categories were classified as having '0' low job insecurity.

A measure of cumulative psychosocial job adversity over time was generated in two steps. First, the sum of the adversities in each domain (low control, high demands and high insecurity) was generated for each of the first three waves, producing scores ranging between 0 and 3. Second, to generate an overall measure of cumulative poor job quality over time, we generated a variable representing the number of waves in which each respondent reported either two or three psychosocial job adversities, producing a summary scale ranging from 0–3 waves in which adverse job quality was experienced.

Covariates

We considered a range of variables that have a potential confounding effect on the association of cumulative poor job quality with subsequent common mental disorder.^{23–25} Some of these were not available for inclusion in Harvey *et al*'s study¹² but were identified as potential confounders that should be addressed in subsequent research^{12 13}, including physical health, substance misuse and parental responsibility. Baseline (time-invariant) covariates included sex, educational attainment, childhood adversity, verbal intelligence (IQ) and personality traits. Wave 3 (47–54 years) covariates included partner status, occupational class, parental responsibilities, non-work life events, chronic physical conditions, smoking status and risky alcohol consumption. Common mental disorder at waves 1, 2 and 3 was also included as a covariate.

For childhood adversity, participants were asked about childhood experiences up to the age of 16 years and were categorised as having childhood adversity if they responded 'yes' to any of eight items taken from the Parental Bonding Instrument,²⁶ the British National Survey of Health and Development,²⁷ the US National Comorbidity Survey²⁸ or an open-ended question.²⁹ These items covered neglect, authoritarian upbringing, witnessing physical/sexual abuse as well as verbal abuse, psychological abuse, physical abuse, physical punishment and sexual abuse by a parent. The open-ended descriptions were coded into the relevant closed items where appropriate.

Verbal IQ was measured using the Spot-the-Word test.³⁰ This involves a lexical decision task in which 60 item pairs comprising a word and an invented non-word are presented, and the individual is required to identify the real word. The total number of correct responses was categorised into quintiles. The personality traits neuroticism, extraversion and psychoticism were included because they may influence self-reported job conditions and common mental disorder and thus inflate the observed association. The measures of personality were obtained from the

Table 3 ORs and 95% CIs from logistic regression models assessing the relationship between cumulative poor job quality and subsequent common mental disorders

	Model 1 (adding sociodemographics, childhood adversity, verbal intelligence)	Model 2 (adding personality traits)	Model 3 (adding common mental disorders at wave 1)	Model 4 (adding non-work life events, health, and substance use)	Model 5 (adding common mental disorders at waves 2 and 3)
Cumulative poor job quality	1.80 (1.53 to 2.11)***	1.59 (1.33 to 1.89)***	1.49 (1.25 to 1.78)***	1.49 (1.24 to 1.79)***	1.30 (1.06 to 1.59)*
Sex					
Male (ref.)	1.00	1.00	1.00	1.00	1.00
Female	1.02 (0.76 to 1.37)	0.82 (0.59 to 1.14)	0.86 (0.61 to 1.19)	0.90 (0.64 to 1.26)	0.84 (0.58 to 1.22)
Education attainment					
Incomplete high school (ref.)	1.00	1.00	1.00	1.00	1.00
Completion of high school	0.97 (0.66 to 1.41)	0.94 (0.63 to 1.42)	0.98 (0.64 to 1.48)	1.04 (0.68 to 1.59)	0.93 (0.58 to 1.49)
Completion of tertiary study	0.67 (0.44 to 1.02)	0.65 (0.41 to 1.02)	0.71 (0.44 to 1.13)	0.76 (0.47 to 1.22)	0.76 (0.45 to 1.28)
Partner status					
No partner (ref.)	1.00	1.00	1.00	1.00	1.00
Having a partner	1.04 (0.73 to 1.49)	1.20 (0.82 to 1.76)	1.33 (0.90 to 1.97)	1.50 (0.99 to 2.25)	1.55 (0.99 to 2.42)
Occupational class					
High (ref.)	1.00	1.00	1.00	1.00	1.00
Medium	0.97 (0.68 to 1.39)	0.86 (0.58 to 1.26)	0.84 (0.56 to 1.25)	0.81 (0.54 to 1.21)	0.79 (0.51 to 1.23)
Low	0.76 (0.49 to 1.17)	0.67 (0.42 to 1.06)	0.67 (0.42 to 1.09)	0.70 (0.43 to 1.14)	0.76 (0.45 to 1.29)
Parental responsibilities					
No (ref.)	1.00	1.00	1.00	1.00	1.00
Yes	1.14 (0.81 to 1.60)	1.12 (0.78 to 1.61)	1.07 (0.74 to 1.55)	1.14 (0.78 to 1.65)	1.17 (0.78 to 1.75)
Childhood adversity					
No (ref.)	1.00	1.00	1.00	1.00	1.00
Yes	1.67 (1.23 to 2.25)**	1.54 (1.11 to 2.14)*	1.43 (1.02 to 2.00)*	1.37 (0.97 to 1.94)	1.44 (0.99 to 2.09)
IQ					
Quintile 1 (low) (ref.)	1.00	1.00	1.00	1.00	1.00
Quintile 2	0.91 (0.55 to 1.51)	0.95 (0.56 to 1.64)	0.90 (0.52 to 1.56)	0.85 (0.48 to 1.50)	0.79 (0.43 to 1.46)
Quintile 3	0.97 (0.59 to 1.60)	0.96 (0.56 to 1.64)	0.91 (0.53 to 1.57)	0.95 (0.54 to 1.65)	0.89 (0.48 to 1.64)
Quintile 4	1.11 (0.70 to 1.75)	1.06 (0.65 to 1.75)	1.06 (0.64 to 1.76)	1.07 (0.64 to 1.78)	1.16 (0.66 to 2.04)
Quintile 5 (high)	0.85 (0.52 to 1.40)	0.90 (0.53 to 1.54)	0.82 (0.47 to 1.40)	0.82 (0.47 to 1.44)	0.83 (0.45 to 1.52)
Neuroticism					
Quintile 1 (low) (ref.)	1.00	1.00	1.00	1.00	1.00
Quintile 2	1.41 (0.71 to 2.82)	1.28 (0.64 to 2.57)	1.37 (0.67 to 2.82)	1.26 (0.60 to 2.67)	
Quintile 3	2.25 (1.05 to 4.83)*	1.76 (0.81 to 3.82)	1.88 (0.84 to 4.17)	1.40 (0.61 to 3.22)	
Quintile 4	2.86 (1.46 to 5.60)**	2.20 (1.11 to 4.35)*	2.40 (1.18 to 4.86)*	1.92 (0.92 to 4.00)	
Quintile 5 (high)	9.04 (4.60 to 17.75)***	5.42 (2.69 to 10.91)***	5.99 (2.90 to 12.37)***	3.11 (1.44 to 6.71)**	
Extraversion					
Quintile 1 (low) (ref.)	1.00	1.00	1.00	1.00	1.00
Quintile 2	0.77 (0.48 to 1.24)	0.74 (0.45 to 1.20)	0.74 (0.45 to 1.22)	0.83 (0.48 to 1.45)	
Quintile 3	0.72 (0.44 to 1.19)	0.72 (0.43 to 1.20)	0.71 (0.42 to 1.20)	0.88 (0.50 to 1.56)	
Quintile 4	0.95 (0.56 to 1.64)	0.88 (0.51 to 1.54)	0.81 (0.46 to 1.43)	0.83 (0.44 to 1.56)	
Quintile 5 (high)	0.79 (0.47 to 1.31)	0.80 (0.47 to 1.34)	0.77 (0.45 to 1.32)	0.77 (0.43 to 1.39)	
Psychoticism					
Quintile 1 (low) (ref.)	1.00	1.00	1.00	1.00	1.00
Quintile 2	0.73 (0.47 to 1.13)	0.71 (0.45 to 1.11)	0.68 (0.43 to 1.08)	0.75 (0.46 to 1.23)	
Quintile 3	0.55 (0.35 to 0.88)*	0.53 (0.33 to 0.86)*	0.53 (0.33 to 0.86)*	0.51 (0.30 to 0.87)*	
Quintile 4	0.63 (0.38 to 1.04)	0.59 (0.35 to 0.98)*	0.58 (0.34 to 0.98)*	0.43 (0.24 to 0.77)**	
Quintile 5 (high)	0.66 (0.39 to 1.13)	0.67 (0.39 to 1.15)	0.69 (0.40 to 1.20)	0.58 (0.32 to 1.04)	
Common mental disorders (baseline)					
No (ref.)		1.00	1.00	1.00	1.00
Yes		2.83 (2.01 to 4.00)***	2.64 (1.85 to 3.75)***	1.63 (1.09 to 2.44)*	
Common mental disorders (wave 2)					

continued

Table 3 continued

	Model 1 (adding sociodemographics, childhood adversity, verbal intelligence)	Model 2 (adding personality traits)	Model 3 (adding common mental disorders at wave 1)	Model 4 (adding non-work life events, health, and substance use)	Model 5 (adding common mental disorders at waves 2 and 3)
No (ref.)				1.00	
Yes				1.88 (1.25 to 2.84)**	
Common mental disorders (wave 3)					
No (ref.)				1.00	
Yes				6.60 (4.50 to 9.70)***	
Adverse non-work life events					
0 (ref.)			1.00	1.00	
1			0.84 (0.58 to 1.22)	0.77 (0.51 to 1.16)	
≥2			1.70 (1.13 to 2.56)*	1.43 (0.91 to 2.24)	
Chronic physical health conditions					
0 (ref.)			1.00	1.00	
1			1.20 (0.84 to 1.73)	1.14 (0.77 to 1.69)	
≥2			1.45 (0.95 to 2.21)	1.35 (0.86 to 2.14)	
Smoking status					
Never/past smoker (ref.)			1.00	1.00	
Current smoker			1.14 (0.69 to 1.86)	1.17 (0.68 to 2.01)	
Risky alcohol consumption					
No (ref.)			1.00	1.00	
Yes			1.16 (0.63 to 2.13)	1.19 (0.62 to 2.28)	

*p<0.05; **p<0.01; ***p<0.001.

Eysenck Personality Questionnaire.³¹ For each of these measures, scale totals were categorised into quintiles.

Adverse life events were measured using an extended version of the List of Threatening Experiences Questionnaire,³² which has good validity and reliability.³² The questionnaire includes 16 items pertaining to adverse life events in the past 6 months. The analyses included the nine items about non-work events, but excluded four employment-related events and three events only applicable to those with partners. The nine items included questions concerning serious illness/injury/assault, death of a close family member or friend, relationship separation, serious problems within close relationships, financial crisis, legal problems and loss of something valuable. The number of life events was summed and divided into three categories: none, one or two or more events.

A variety of self-report chronic physical health conditions such as heart problems, hypertension, cancer, arthritis, thyroid problems, epilepsy, asthma, diabetes and stroke were coded into a summary variable, representing the experience of none, one or two or more chronic conditions. Smoking status was grouped into never/past smoker and current smoker. Hazardous/harmful alcohol consumption³³ (a score of eight or more) was screened by the Alcohol Use Disorders Identification Test³⁴ and categorised into 'no' and 'yes'.

Statistical analysis

We calculated descriptive statistics of the sample characteristics at baseline as well as cumulative exposures to poor psychosocial job quality (waves 1–3) and common mental disorder at wave 4. The association between cumulative poor job quality and subsequent common mental disorder was then assessed using logistic regression models. The initial model was a simple model with

no covariates, and we tested whether the cumulative exposure is adequately represented by a linear model. Following the methodology used in Harvey *et al*'s study, a set of relevant covariates across the lifecourse were entered into subsequent models. The first model included sociodemographic covariates (some assessed at baseline other more proximal factors assessed at wave 3), childhood adversity and IQ (model 1). This was followed by models including personality traits (model 2), baseline common mental disorder (model 3) and proximal life events, physical health and substance use (assessed at wave 3) (model 4). We also assessed the association after controlling for common mental disorder at all prior waves (model 5). In addition, we assessed the interaction between cumulative job quality over time and baseline mental health (using model 3). Finally, we repeated the main analyses but focused exclusively on the cumulative exposure to each individual psychosocial job stressor (low job control, high job demands and high job insecurity) over time.

There was very little missing data for each variable (ie, lowest was 0.78%, n=10 for IQ). Our analyses were based on observations with no missing data (complete data analyses). All analyses were conducted using Stata SE V.14.³⁵

RESULTS

Table 1 shows the sample characteristics. There were 1279 mid-aged participants, who were employed at all interview occasions, included in this study. Of these participants, half were men, 26% did not complete high school, 28% experienced at least one childhood adversity and 23% experienced threshold-level symptoms of common mental disorder at baseline. At age 47–54 years (8 years later), 20% of participants did not have a partner, 18% were in low-skilled occupation, 25% had a youngest child aged under 15 years, 18% had experienced two or more recent

adverse non-work life events, 21% had more than one chronic physical health condition, 12% were current smokers and 7% consumed alcohol at the hazardous/harmful level. The covariates significantly associated with common mental disorder at wave 4 included childhood adversity, common mental disorder (wave 1), occupational class, non-work adverse life events and chronic physical health conditions.

Table 2 shows the descriptive statistics for cumulative job quality exposures across the first three waves and common mental disorder at the last wave. Approximately 41% of participants were employed in a poor quality job on at least one occasion. There was a greater proportion of participants experiencing high job demands (54%) than high job insecurity (47%) and low job control (46%) at one or more occasions. Approximately 21% of participants were identified with a likely common mental disorder (ie, above threshold level symptoms) at wave 4.

Cumulative exposure to poor quality work and common mental disorder

In a simple model, cumulative exposure to poor job quality was significantly associated with subsequent common mental disorder (OR 1.80, 95%CI 1.54 to 2.10). Each cumulative job adversity increased the odds of subsequent common mental disorder by 80%. This simple model was also tested using a categorical variable to represent cumulative exposure and the pattern of results confirmed that there was a linear trend in the association between cumulative exposure and poorer mental health (ie, 1 vs 0 exposures OR 2.01, 95%CI 1.46 to 2.76, $p<0.001$; 2 vs 0 exposures OR 3.86, 95%CI 2.56 to 5.82, $p<0.001$; 3 vs 0 exposures OR 4.17, 95%CI 2.21 to 7.88, $p<0.001$). This association remained in the subsequent models adjusted for the extensive range of covariates (see **table 3**). The OR was 1.30 in the final model (model 5: 95%CI 1.06 to 1.59), showing that each additional exposure to poor job quality over time was associated with a 30% increase in the odds of subsequent common mental disorder. At model 3, the inclusion of a term representing the interaction between cumulative poor job quality and baseline common mental disorder was not statistically significant and did not improve overall model fit ($p=0.737$), suggesting the effect of cumulative job quality was not dependent on baseline mental health.

Neuroticism, psychoticism and earlier common mental disorder were significantly associated with common mental disorder at wave 4 in model 5. There was a modest negative association between psychoticism and common mental disorder, with the likelihood of common mental disorder greatest among those with the lowest psychoticism score.

Cumulative exposure to the individual job stressors

Simple models conducted for each of the poor job quality measures separately (low control, high demands, high insecurity) showed that as cumulative exposure over time increased, the odds of common mental disorder also increased (low control: OR 1.31, 95%CI 1.16 to 1.48; high demands: OR 1.29, 95%CI 1.14 to 1.46; high insecurity: OR 1.57, 95%CI 1.37 to 1.81). The effects for high insecurity remained significant after adjusting for all covariates (**table 4**; model 5: OR 1.32, 95%CI 1.09 to 1.59); however, the effect for low control was no longer significant after including baseline common mental disorder in model 3 and the effect for high demands became non-significant after including common mental disorder at all prior waves.

DISCUSSION

The current study shows that cumulative exposure to psychosocial job stressors over time elevates the risk of subsequent common mental disorder, independent of a range of confounding variables across the lifespan. When considering each of the job adversities separately, the findings also show that increased susceptibility to common mental disorder follows repeated exposures to high job insecurity, but this is not reliably the case for high job demands or low job control.

The present findings show that cumulative exposure to poor psychosocial job quality over time is associated with future common mental disorder. The public health implication is that if left unaddressed, each additional experience of poor quality work (particularly job insecurity) deteriorates mental health. The significant result for cumulative job insecurity and the non-significant result for cumulative job control are consistent with the previous findings.^{10 11} Our methodology is adopted and adapted from Harvey *et al*'s study, which rigorously considered concerns about reverse causation and residual confounding. Unlike Harvey *et al*,¹² we did not exclude individuals who experienced symptoms of common mental disorder but instead controlled for baseline mental health (in addition to mental health at waves 2–3) in our analysis. By doing so, the current study takes an additional step to minimise the healthy worker effect in our results (a form of sample selection bias) and improves the generalisability of our findings. Aligned with Harvey *et al*'s study,¹² we controlled for sociodemographic covariates, verbal IQ, personality traits and non-work life events across time. We also controlled for additional potential residual confounding such as physical health, substance misuse and parental responsibility, which were not included in Harvey *et al*'s study.¹²

The current study adopts a rigorous approach to assess the association of cumulative adverse job exposures with subsequent common mental disorder. Thus, the present findings provide significant contributions to the field. Nevertheless, the

Table 4 ORs and 95% CIs from logistic regression models assessing the relationship between cumulative job stressors and subsequent common mental disorders

	Model 1 (adding sociodemographics, childhood adversity, verbal intelligence)	Model 2 (adding personality traits)	Model 3 (adding common mental disorders at wave 1)	Model 4 (adding non-work life events, health, and substance use)	Model 5 (adding common mental disorders at waves 2 and 3)
Cumulative low job control	1.35 (1.16 to 1.56)***	1.19 (1.01 to 1.40)*	1.14 (0.97 to 1.34)	1.13 (0.95 to 1.34)	1.05 (0.87 to 1.27)
Cumulative high job demands	1.33 (1.16 to 1.53)***	1.25 (1.08 to 1.45)**	1.20 (1.03 to 1.40)*	1.20 (1.02 to 1.40)*	1.15 (0.97 to 1.36)
Cumulative high job insecurity	1.52 (1.31 to 1.77)***	1.44 (1.23 to 1.70)***	1.40 (1.18 to 1.66)***	1.43 (1.21 to 1.70)***	1.32 (1.09 to 1.59)**

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

Workplace

following limitations should be considered in the interpretation of our findings. First, as our sample was drawn from Canberra in the Australian Capital Territory and the surrounding region (a professional government town), it comprised a higher proportion of individuals with high-skilled (57%) than medium-skilled (26%) and low-skilled (18%) occupations. For this reason, the results may not be replicated in a sample drawn from more disadvantaged communities (although, education attainment did not play a significant role in the analyses). Second, our sample comprises a narrow age cohort (40–46 years) at baseline. As such, we cannot confirm whether our findings can be generalised to other age groups; for example, adolescents and young adults who may be at the early stage of their careers with lower expectations and norms for job control and security. Third, our study is largely based on self-report data. Job stressors might be over-reported due to recall bias and this may have inflated the observed associations. However, this is mitigated through adjustment for several confounding variables such as personality traits. Fourth, different from Harvey *et al*'s study,¹² our analysis is not restricted to those who remain in the same job during the study period due to unavailability of this data. We assume that this has minimal influence as we assessed the psychosocial job characteristics of each individual's job at the time of interview. Fifth, our analysis identified 23% of the cohort at baseline (aged 40–44 years) with a common mental disorder, which is somewhat greater than most recent national estimates of anxiety and affective disorders among employed Australians aged 35–49 years (18%),³⁶ suggesting some imprecision in our measure and/or cut-point. Sixth, we only measured mental health at times corresponding to each wave (4 years apart), and thus cannot comment on new onset, remission or chronicity between these time points. However, survey data have different advantages over administrative data that do not identify those with untreated disorders. Seventh, common mental disorder was measured using a self-administered questionnaire rather than a clinical diagnostic interview. Thus, our results might differ to studies using clinical diagnoses. Eighth, controlling for common mental disorder at all prior waves may be overcorrection. Ninth, although the PATH study has a low attrition rate, its progression may introduce bias at each wave. Finally, evidence of a negative association between psychotism and common mental disorder was unexpected and warrants further investigation. High scores on the psychotism scale are associated with antisocial behaviour, hostility and depression.³⁷ The current results may reflect our focus on a mid-aged cohort who has been employed over the past 12 years.

In conclusion, the current study provides evidence that cumulative exposure to poor psychosocial job quality is detrimental to mental health. It underlines the important role that repeated exposure to poor quality work (especially insecure work) plays in the development of common mental disorders. This modifiable risk factor should be a focus of workplace policy to prevent common mental disorder in workers, which could then have flow on benefits including a reduction in sickness absence and increased productivity at work.

Acknowledgements The authors thank the study participants, PATH Interviewers, Karen Maxwell and Trish Jacomb; and to the other PATH Chief Investigators: Kaarin Anstey, Helen Christensen, Anthony Jorm, Bryan Rodgers, Andrew Mackinnon, Simon Easteal and Nicolas Cherbuin.

Contributors PB designed and oversaw the study. LST performed the statistical analyses and all authors (LST, PB and LSL) interpreted the findings. LST wrote the first draft of the manuscript and was supported by LSL in subsequent revisions. All authors revised the draft and contributed to the final version of manuscript.

Funding The PATH Through Life Study was funded by the National Health and Medical Research Council (973302, 179805, 418139), and the Australian

Government Agency — Safe Work Australia. It is currently managed by both the ANU and the University of New South Wales. LST was supported by a National Health and Medical Research Council Early Career Fellowship (GNT1156849). PB was supported by ARC Future Fellowship (FT130101444) and a University of Melbourne Faculty of Medicine, Dentistry and Health Sciences Research Fellowship.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The PATH Through Life Project was approved by the Australian National University Human Research Ethics Committee: #M9807; #2002/190; #2006/314 and #2010/542.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. The availability of data is subject to relevant ethics and PATH committee approvals.

ORCID iDs

Lay San Too <http://orcid.org/0000-0003-3549-9860>

Liana Leach <http://orcid.org/0000-0003-3686-2553>

REFERENCES

- 1 Vos T, Flaxman AD, Naghavi M, *et al*. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the global burden of disease study 2010. *Lancet* 2012;380:2163–96.
- 2 Theorell T, Hammarström A, Aronsson G, *et al*. A systematic review including meta-analysis of work environment and depressive symptoms. *BMC Public Health* 2015;15:738.
- 3 Stansfeld S, Candy B. Psychosocial work environment and mental health—a meta-analytic review. *Scand J Work Environ Health* 2006;32:443–62.
- 4 Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. *Occup Med* 2010;60:277–86.
- 5 Bonde JPE. Psychosocial factors at work and risk of depression: a systematic review of the epidemiological evidence. *Occup Environ Med* 2008;65:438–45.
- 6 Butterworth P, Leach LS, McManus S, *et al*. Common mental disorders, unemployment and psychosocial job quality: is a poor job better than no job at all? *Psychol Med* 2013;43:1763–72.
- 7 Karasek RA. Job demands, job decision latitude, and mental strain: implications for job redesign. *Adm Sci Q* 1979;24:285–308.
- 8 Kim TJ, von dem Knesebeck O. Perceived job insecurity, unemployment and depressive symptoms: a systematic review and meta-analysis of prospective observational studies. *Int Arch Occup Environ Health* 2016;89:561–73.
- 9 Madsen IEH, Nyberg ST, Magnusson Hanson LL, *et al*. Job strain as a risk factor for clinical depression: systematic review and meta-analysis with additional individual participant data. *Psychol Med* 2017;47:1342–56.
- 10 LaMontagne AD, Too LS, Laura Punnett L, *et al*. Changes in job security and mental health: an analysis of 14 annual waves of an Australian working population panel survey. *Am J Epidemiol* 2020;35:kwwa038.
- 11 Svane-Petersen AC, Holm A, Burr H, *et al*. Psychosocial working conditions and depressive disorder: disentangling effects of job control from socioeconomic status using a life-course approach. *Soc Psychiatry Psychiatr Epidemiol* 2020;55:217–28.
- 12 Harvey SB, Sellahewa DA, Wang M-J, *et al*. The role of job strain in understanding midlife common mental disorder: a national birth cohort study. *Lancet Psychiatry* 2018;5:498–506.
- 13 Giga SI. Prolonged exposure to job strain and long-term mental disorders. *Lancet Psychiatry* 2018;5:455–6.
- 14 von Elm E, Altman DG, Egger M, *et al*. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 2007;370:1453–7.
- 15 Anstey KJ, Christensen H, Butterworth P, *et al*. Cohort profile: the path through life project. *Int J Epidemiol* 2012;41:951–60.
- 16 Goldberg D, Bridges K, Duncan-Jones P, *et al*. Detecting anxiety and depression in general medical settings. *BMJ* 1988;297:897–9.
- 17 Kiely KM, Butterworth P. Validation of four measures of mental health against depression and generalized anxiety in a community based sample. *Psychiatry Res* 2015;225:291–8.
- 18 Mackinnon A, Christensen H, Jorm AF, *et al*. A latent trait analysis of an inventory designed to detect symptoms of anxiety and depression using an elderly community sample. *Psychol Med* 1994;24:977–86.
- 19 Bosma H, Marmot MG, Hemingway H, *et al*. Low job control and risk of coronary heart disease in Whitehall II (prospective cohort) study. *BMJ* 1997;314:558.
- 20 Butterworth P, Leach LS, Rodgers B, *et al*. Psychosocial job adversity and health in Australia: analysis of data from the HILDA survey. *Aust N Z J Public Health* 2011;35:564–71.
- 21 Butterworth P, Leach LS, Strazdins L, *et al*. The psychosocial quality of work determines whether employment has benefits for mental health: results from a longitudinal national household panel survey. *Occup Environ Med* 2011;68:806–12.

22 Broom DH, D'Souza RM, Strazdins L, et al. The lesser evil: bad jobs or unemployment? A survey of mid-aged Australians. *Soc Sci Med* 2006;63:575–86.

23 Butterworth P, Rodgers B, Windsor TD. Financial hardship, socio-economic position and depression: results from the path through life survey. *Soc Sci Med* 2009;69:229–37.

24 Stansfeld SA, Clark C, Caldwell T, et al. Psychosocial work characteristics and anxiety and depressive disorders in midlife: the effects of prior psychological distress. *Occup Environ Med* 2008;65:634–42.

25 Hatch SL, Harvey SB, Maughan B. A developmental-contextual approach to understanding mental health and well-being in early adulthood. *Soc Sci Med* 2010;70:261–8.

26 Parker G. Parental characteristics in relation to depressive disorders. *Br J Psychiatry* 1979;134:138–47.

27 Rodgers B. Reported parental behaviour and adult affective symptoms. 1. associations and Moderating factors. *Psychol Med* 1996;26:51–61.

28 Kessler RC, Magee WJ, Adversities C. Childhood adversities and adult depression: basic patterns of association in a US national survey. *Psychol Med* 1993;23:679–90.

29 Henderson AS, Jorm AF, Korten AE, et al. Symptoms of depression and anxiety during adult life: evidence for a decline in prevalence with age. *Psychol Med* 1998;28:1321–8.

30 Baddeley A, Emslie H, Nimmo-Smith I. The Spot-the-Word test: a robust estimate of verbal intelligence based on lexical decision. *Br J Clin Psychol* 1993;32:55–65.

31 Eysenck SBG, Eysenck HJ, Barrett P. A revised version of the psychoticism scale. *Pers Individ Dif* 1985;6:21–9.

32 Brugha TS, Cragg D. The list of threatening experiences: the reliability and validity of a brief life events questionnaire. *Acta Psychiatr Scand* 1990;82:77–81.

33 National Health and Medical Research Council. *Australian alcohol guidelines: health risks and benefits*. Canberra: Department of Health and Ageing, 2001.

34 Saunders JB, Aasland OG, Babor TF, et al. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. *Addiction* 1993;88:791–804.

35 StataCorp. *Stata statistical software: release 14*. College Station, TX: StataCorp LP, 2015.

36 Australian Bureau of Statistics. 4326.0.30.001 - *Microdata: National Survey of Mental Health and Wellbeing, Basic and Expanded CURF*, 2007. Canberra: Australian Bureau of Statistics, 2009.

37 Pickering A, Farmer A, Harris T, et al. A sib-pair study of psychoticism, life events and depression. *Pers Individ Dif* 2003;34:613–23.