

# Prevalence of Chronic Mental and Physical Disorders, Impact on Work Productivity and Correlates of Alcohol Use Disorders and Nicotine Dependence across Occupations

Janhavi Ajit Vaingankar, <sup>1</sup>MSc, Mythily Subramaniam, <sup>1,2</sup>MHSM, Siow Ann Chong, <sup>1</sup>MMed, Vincent YF He, <sup>1</sup>BSc, Edimansyah Abidin, <sup>1</sup>PhD, Louisa Picco, <sup>1</sup>MPH, Wei Yen Lim, <sup>1,2</sup>PhD, Sin Eng Chia, <sup>2</sup>MD

## Abstract

**Introduction:** This study assessed occupational differences in the prevalence of mental and physical disorders in an employed general population sample in Singapore and investigated the impact of these disorders on work productivity losses in terms of work-loss days and work-cutback days. The association of occupation with alcohol use disorders (AUD) and nicotine dependence (ND) was also investigated. **Materials and Methods:** Data from a population-based mental health survey of a representative sample of multi-ethnic residents aged 18 years and above were used. The World Health Organization's (WHO) Composite International Diagnostic Interview (CIDI) was administered to establish the lifetime diagnosis of key mental disorders. Self-report on sociodemographic characteristics, productivity loss, ND, and lifetime physical conditions were obtained. Nine occupational groups were included in this analysis. **Results:** The sample comprised 4361 participants with a mean (SD) age of 42.2 (11.9) years, ranging between 19 to 80 years. 'Associate professionals and technicians' (26.2%), 'Services and sales workers' (17.7%) and 'Professionals' (15.4%) were the 3 predominant occupational categories. Sociodemographic characteristics differed significantly across occupations ( $P < 0.001$ ). The lifetime prevalences of having 'any mental disorder' and 'any physical disorder' were 13.0% and 37.9%, respectively; major depressive disorder was the most prevalent mental disorder (5.9%) and hypertension was the most common physical disorder (15.6%). There were no significant differences in work productivity loss across occupations. Sociodemographic and occupational correlates for AUD and ND were identified. **Conclusion:** Sociodemographic and health disparities exist in the major occupational categories in Singapore. The strength of the associations between occupation and AUD and ND are significant, indicating the need for preventative measures in select occupations.

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**Key words:** Major depressive disorder, Multi-ethnic, Population-based

## Introduction

Singapore is an island city-state in Southeast Asia with a multi-ethnic population comprising 74.2% Chinese, 13.4% Malays, 9.2% Indians, and the rest belonging to 'Other' ethnic groups.<sup>1</sup> In 2011, 78% of the resident population aged 25 to 64 years was employed<sup>2</sup> and there were over 2 million residents in the workforce with 90% in full-time employment. Of these, 47.8% were in professional, managerial, executive and technical (PMET) occupations and 52.2% held non-PMET jobs. While working conditions and workplace health and safety are regularly monitored to achieve sustainable improvement in the health of workers in Singapore,<sup>3</sup> limited information on the effect of occupation on mental and physical health of workers has been documented.

Studies conducted elsewhere have reported the impact of job characteristics, such as environmental and working conditions, and physical and psychological demands of the job on health outcomes.<sup>4-6</sup> Sociodemographic determinants of health also vary in occupational groups as recruitment criteria differ across jobs, which are also mediated by education and, in turn, linked to illnesses. The nature of the job itself influences health, such as exposure to hazardous materials or psychologically stressful working conditions.<sup>7</sup> Differences in the prevalence of major depression and anxiety,<sup>8,9</sup> alcohol abuse,<sup>10</sup> cigarette smoking and nicotine dependence (ND),<sup>11</sup> hypertension,<sup>12</sup> diabetes,<sup>13</sup> cardiovascular diseases,<sup>14</sup> and cancers<sup>15</sup> have been established among employed populations by occupational

<sup>1</sup>Research Division, Institute of Mental Health, Singapore

<sup>2</sup>Saw Swee Hock School of Public Health, National University of Singapore, Singapore

Address for Correspondence: Ms Janhavi Ajit Vaingankar, Research Division, Institute of Mental Health, 10 Buangkok View, Singapore 539747.

Email: janhavi\_vaingankar@imh.com.sg

levels. Studies have also documented the impact of mental and physical health on loss of work productivity<sup>6,16</sup> with a higher risk of productivity loss being associated with physical health conditions in the presence of comorbid psychological distress and depression.<sup>17</sup> Addictive behaviours such as excessive drinking and smoking with or without dependence, can lead to health and safety issues at workplaces,<sup>18</sup> and are associated with work strain, dysfunctional occupational performance and productivity loss.<sup>19</sup>

The association of employment status with various physical and mental conditions is well documented in Singapore.<sup>20-24</sup> The prevalence of mental illness alone and comorbid mental-physical disorders is 2.5% and 2.4% respectively, in Singapore's employed population, and there exists a nearly 3-fold higher risk of productivity loss in these groups as compared to the healthy population.<sup>22</sup> However, to the best of our knowledge, a limited number of studies have reported prevalence disparities and determinants of illnesses across occupational levels using a standard occupational classification<sup>25-27</sup> and there is a lack of generalisable knowledge on the prevalence and impact of chronic disorders among different occupations in Singapore.

The purpose of this study was to assess occupational differences in the prevalence of mental and physical disorders in a large representative sample of residents in Singapore. In addition, the impact of these disorders on work productivity losses in terms of work-loss days and work-cutback days was assessed. Given the link between addictions and health and safety risks in occupations,<sup>28</sup> the study also investigated the effect of occupation on alcohol use disorders (AUD) and ND after controlling for other sociodemographic characteristics.

## Materials and Methods

Data collected during the Singapore Mental Health Study (SMHS) were used. The study design and procedures are described in detail elsewhere.<sup>29</sup> Briefly, the SMHS is a representative cross-sectional survey of the Singapore population aged 18 years and above. The survey was conducted between December 2009 to December 2010. Singapore residents (citizens and permanent residents) were randomly selected from a sampling frame of all residents using a national database. Residents aged 18 years and above, and those capable of providing informed consent and completing the interview in English, Mandarin or Malay languages were included in the study. Exclusion criteria were institutionalisation or residence outside Singapore during the survey period, non-resident status, being under 18 years of age, and the inability to complete the survey due to severe physical or mental conditions or language barriers. Disproportionate stratified sampling was used to oversample older residents aged 65 years and above and

residents of Malay and Indian ethnicity. The study was approved by the institutional ethics committee and written informed consent was obtained from all participants and parents/guardians of participants aged 18 to 20 years. A total of 6616 residents participated in the survey, giving a response rate of 75.9%. A total of 71% of the respondents were employed. Data from 4361 participants (constituting 65.9% of the total study sample and 94.9% of 4594 employed participants) could be categorised under the Singapore Standard Occupational Classification (SSOC).<sup>30</sup>

### *Classification of Occupation*

Participants reported their current employment status at the time of the survey to the interviewers as: employed (regardless of full-time or part-time employment), unemployed (those looking for work/unemployed, temporarily laid off, never worked, or disabled) or economically inactive (comprising homemakers, students, and retirees). In the pilot phase of the survey (n = 174), a list of occupational categories based on the 2003 Standard Occupational Classification (SOC) (USA) was presented to the employed participants. However, interviewers and participants required considerable time to verify against the standard definitions leading to administrative burden. Given the length of the survey (an average of 2 hours) and that occupational data were being collected as a secondary study objective, a decision to use an open-ended question on occupation was taken. Employed participants were then asked to describe the type of work they normally did and their job title using an open-ended question ("What is your job called?"). Interviewers were specifically trained to obtain adequate and correct information. In instances where participants held multiple jobs, information on the job where they spent the most time was recorded, and if they spent equal amounts of time, details of the job that required higher skill/educational requirement were collected. These data were first reviewed by two team members (JAV and VH) and then categorised under the guidance of another team member (SEC), who is an occupational physician with more than 20 years practice in occupational health, into 10 major occupational groups based on the SSOC:

- 1) Business owners: Business owners or partners, entrepreneurs and contractors who employed other professionals were categorised under this group.
- 2) Legislators, senior officials and managers: Participants who belonged to senior or top management such as chief executive officers, chairmen or directors, or managed, directed or supervised activities at various government or non-government organisations or businesses were grouped under this category.
- 3) Professionals: This group included professional roles that applied scientific, analytical, accounting, research or

artistic theories or provided consultation on these.

4) Associate professionals and technicians: Participants who provided subordinate or related tasks to the professional categories were grouped here.

5) Clerical support workers: This included administrative and clerical support staff responsible for recording, organising and carrying out other clerical duties affiliated with finances, operations, information and appointments.

6) Services and sales worker: Service provision in retail, wholesale, travel, housekeeping, catering, transport, personal care and hygiene, etc were classified in this group.

7) Agricultural and fishery workers: Participants were included under this category if they were responsible for growing and harvesting animals, plants or fishery to generate income for themselves or others.

8) Craftsmen and related trades workers: Participants with specific knowledge and skills in construction, maintenance, machinery, handicrafts, etc, were included in this group.

9) Plant and machine operators and assemblers: Participants classified in this group operated or assembled industrial or agricultural machinery or equipment.

10) Cleaners, labourers and related worker: This group included participants who performed simple routine tasks that required considerable manual work and physical effort.

Apart from these 10 occupational groups, the SSOC also lists an additional category 'X' which comprises all other professions which cannot be classified into the above and these include army, navy and civil defense personnel among others. The category 'Agricultural and fishery workers' (n = 3) and 'X' (n = 218) were not included in this analysis due to low sample size and high heterogeneity, respectively, and in order to avoid misinterpretation of the estimates.

### Assessments

**Mental disorders:** The World Mental Health (WMH) Composite International Diagnostic Interview 3.0 (CIDI 3.0) was used to establish the lifetime diagnosis of mental disorders as per the Diagnostic and Statistical Manual, Fourth Edition, of the American Psychiatric Association (DSM-IV).<sup>31</sup> Select modules of the CIDI 3.0 were administered by trained interviewers to the participants to establish diagnoses of mood disorders (major depressive disorder, dysthymia, bipolar disorder), anxiety disorders (generalised anxiety disorder, obsessive compulsive disorder) and AUD (alcohol abuse, alcohol dependence) using diagnostic rules of hierarchy.

**ND:** ND was established with the 6-item modified Fagerstrom Test for Nicotine Dependence (FTND) scale.<sup>32</sup> It establishes point prevalence of nicotine dependence by determining difficulty in refraining from smoking where

it is forbidden, smoking more in the morning, inability to give up the first morning cigarette, smoking when bedridden because of illness, depth of inhalation and time after awakening before smoking the first cigarette. A total score of 5 and above denotes significant ND.<sup>33</sup> The internal consistency of the scale in the present study was high (Cronbach's alpha of 0.73).

**Chronic physical conditions:** Participants were presented with a list of 15 chronic physical conditions and asked to report if they were 'ever told by a doctor' that they had any of these. The disorders were then reclassified into 8 types of physical disorders: 1) respiratory disorders (asthma, chronic lung disease such as chronic bronchitis or emphysema), 2) diabetes, 3) hypertension and high blood pressure, 4) chronic pain (arthritis or rheumatism, back problems including disk or spine, migraine headaches), 5) cancer, 6) neurological disorders (epilepsy, convulsion, Parkinson's disease), 7) cardiovascular disorders (stroke or major paralysis, heart attack, coronary heart disease, angina, congestive heart failure or other heart disease), and 8) ulcer and chronic inflamed bowel (stomach ulcer, chronic inflamed bowel, enteritis, or colitis).

**Work productivity:** Select items from the 30-day functioning module of the CIDI 3.0 were used to assess the impact of mental and physical disorders on work productivity in terms of work-loss days (absenteeism) and work-cutback days (presenteeism). Participants were asked to report the number of days where they were totally unable to work or had to cut back on the type or quantity of work due to 'problems with their physical health, mental health, or use of alcohol or drugs' in the month prior to the survey.

**Sociodemographic characteristics:** In addition to the above, information on participants' age, gender, ethnicity, marital status, highest education level attained and all sources of personal income, (in Singapore dollars in the year prior to the interview) was collected during the survey.

### Statistical Analysis

Sampling weights were derived for the data based on the Department of Statistics, Singapore's population estimates for the year 2007. Weighted analyses to adjust for the oversampling and post-stratification by age and ethnicity were carried out using the Statistical Analysis Software (SAS) System version 9.2 (SAS Institute, Cary, NC). Mean and standard deviations (SD)/standard errors (SE) were calculated for continuous variables. Frequencies and percentages were calculated for categorical variables. Bivariate associations between occupational groups and other categorical variables were investigated with chi-square ( $\chi^2$ ) tests, while analysis of variance (ANOVA) was carried out to establish mean differences in work productivity

by occupations. Determinants of AUD (participants having either alcohol abuse or dependence) and ND were investigated using multiple logistic regression model by evaluating multivariate significance using Wald ( $\chi^2$ ) tests based on design-corrected coefficient variance-covariance matrices. SE and significance tests were estimated using the Taylor series linearisation method to adjust for the weighting. Statistical significance was set at  $P < 0.05$  using 2-sided tests.

## Results

### Occupation and Sociodemographic Characteristics

The study sample comprised 4361 participants with a mean (SD) age of 42.2 (11.9) years, ranging between 19 and 80 years. The distribution of occupation and sociodemographic characteristics within this study sample is presented in Table 1. Majority of the participants were aged 35 to 49 years (41%), followed by 18 to 34 years (31.3%), 50 to 64 years (23.7%) and 65 years and above (4%); secondary level education (27.8%) was the largest educational group in the sample. The top 3 occupational categories were ‘Associate professionals and technicians’ (which constituted 26.2% of the sample), ‘Services and sales worker’ (17.7%) and ‘Professionals’ (15.4%). Age, gender, ethnicity, marital status, education and income differed significantly ( $P < 0.001$ ) across the 9 occupational categories (Table 2). The most common occupational group among participants who were single (32.3%) or married (24.3%) were ‘Associate professionals and technicians’, whereas ‘Services and sales’ was the most common occupation among those separated or divorced (26.2%), and ‘Cleaners, labourers and related workers’ (30.9%) was the most common group among participants who were widowed.

### Prevalence of Mental and Physical Disorders by Occupation

Table 3 presents the prevalence of lifetime mental and physical disorders among participants in the various occupations. The lifetime prevalence of any mental disorder and any physical disorder was 13% and 37.9%, respectively. Major depressive disorder (MDD) (5.9%) was the most prevalent DSM-IV mental disorder. AUD which constituted participants with either alcohol abuse or dependence were the second highest (4.3%), followed by obsessive compulsive disorder (3.2%). A total of 5.3% of the participants had ND. The prevalence of AUD and ND was significantly different ( $P < 0.001$ ) across the occupational groups (Table 3). The highest prevalence of AUD was among ‘Business owners’ (12%) while ND was highest among ‘Craftsmen and related trades workers’ (24.8%) (Table 3).

Hypertension was the most common physical disorder (15.6%), followed by chronic pain (14.1%) and respiratory

conditions (8.6%) (Table 2). Significant differences were observed at the bivariate level in the prevalence of diabetes ( $P = 0.002$ ), hypertension ( $P = 0.001$ ) and neurological conditions ( $P = 0.003$ ) across occupations. ‘Craftsmen and related trades workers’ showed the highest prevalence of these 3 disorders—diabetes (14.8%), hypertension (26.5%) and neurological conditions (11.9%) (Table 3).

Comorbid mental and physical disorders were highest among the ‘Legislators, senior officials and managers’ (10%) and lowest among ‘Cleaners, labourers and related workers’ (2.3%). Detailed estimates are reported in Table 4.

Table 1. Sociodemographic Characteristics of the Sample (n = 4361)

	n	Adjusted % (SE)
<b>Age (years)</b>		
18 – 34	1465	31.3 (0.0)
35 – 49	1829	41.0 (0.0)
50 – 64	983	23.7 (0.0)
65 and above	84	4.0 (0.0)
<b>Gender</b>		
Men	1866	47.2 (1.1)
Women	2495	52.8 (1.1)
<b>Ethnicity</b>		
Chinese	1375	77.6 (0.0)
Malay	1498	11.6 (0.0)
Indian	1304	8.2 (0.0)
Others	184	2.6 (0.0)
<b>Marital status</b>		
Single	1122	27.9 (0.9)
Married	2987	65.9 (0.9)
Separated/divorced	191	4.7 (0.5)
Widowed	61	1.5 (0.3)
<b>Education level</b>		
Pre-primary	89	2.6 (0.4)
Primary	511	12.7 (0.7)
Secondary	1298	27.8 (0.9)
Pre-U/junior college/diploma	882	21.2 (0.9)
Vocational	531	8.8 (0.6)
University	1050	26.9 (0.9)
<b>Income (SGD)*</b>		
Below 20,000	1623	35.0 (1.0)
20,000 – 49,999	1787	41.9 (1.0)
50,000 and above	894	23.1 (0.9)

SE: Standard error

\*Denotes personal income in Singapore dollars in 1 year prior to the interview.

Table 2. Occupation and Sociodemographic Distribution (in Percentage) of the Participants (n = 4361)

	All Occupations	Business Owners†	Legislators, Senior Officials and Managers†	Associate Professionals and Technicians†	Clerical Support Workers†	Services and Sales Worker†	Craftsmen and Related Trades Workers†	Plant and Machine Operators and Assemblers†	Cleaners, Labourers and Related Workers†
Overall sample	-	3.2	12.3	15.4	26.2	17.7	2.9	6.6	7.0
Age (years)*									
18–34	31.3	1.4	9.2	2.6	35.0	19.3	1.4	2.6	1.5
35–49	41.0	3.8	15.4	16.9	25.4	14.3	2.9	6.5	5.8
50–64	23.7	4.9	11.3	6.5	18.0	22.0	4.4	11.5	12.8
65 and above	4.0	0.3	10.8	11.7	15.7	14.2	5.1	9.1	27.6
Gender*									
Men	47.2	4.6	15.3	16.6	24.7	14.4	4.0	11.6	5.7
Women	52.8	1.7	9.0	14.0	28.0	21.3	1.6	0.9	8.5
Ethnicity*									
Chinese	77.6	3.6	12.7	15.5	25.7	17.5	3.1	6.6	6.7
Malay	11.6	0.9	3.8	9.3	30.3	21.0	3.1	8.0	11.6
Indian	8.2	2.3	12.0	18.0	28.9	17.3	1.2	6.6	5.7
Others	2.6	2.6	39.5	30.9	15.0	9.8	0.3	-	-
Marital status*									
Single	27.9	1.7	9.6	2.1	32.3	16.4	2.8	3.6	4.5
Married	65.9	3.8	13.6	14.2	24.3	17.5	3.0	7.6	7.5
Separated/divorced	4.7	3.1	11.4	8.7	22.4	26.2	3.0	8.6	6.0
Widowed	1.5	4.1	7.3	0.9	9.4	22.4	0.3	11.5	30.9
Education level*									
Pre-primary	2.6	-	-	0.2	13.0	16.5	9.7	17.6	42.6
Primary	12.7	4.3	1.5	1.1	9.8	27.7	10.0	16.3	24.5
Secondary	27.8	3.8	8.2	3.5	22.8	27.8	2.8	9.0	7.8
Pre-U/junior college/diploma	21.2	3.8	12.9	16.3	39.9	13.6	0.6	1.5	1.2
Vocational	8.8	4.5	4.6	5.2	34.1	20.5	4.2	12.6	3.2
University	26.9	1.4	24.8	38.6	25.4	5.0	0.2	0.3	0.3
Income (SGD)* ‡									
Below 20,000	35.0	2.1	1.4	6.4	18.7	28.3	4.6	10.6	18.2
20,000–49,999	41.9	4.1	8.2	15.5	33.8	16.3	2.6	6.8	1.3
50,000 and above	23.1	2.7	36.0	29.4	23.8	4.0	0.7	0.5	0.3

\*Significant differences in proportions at  $P < 0.001$  between occupational groups, chi-square test.

†Table presents weighted row percentages.

‡Denotes personal income in Singapore dollars in 1 year prior to the interview.

Table 3. Prevalence of Lifetime Mental and Physical Disorders across Occupational Categories (n = 4361)

Lifetime Conditions	All Occupations		Business Owners		Legislators, Senior Officials and Managers		Professionals		Associate Professionals and Technicians		Clerical Support Workers		Services and Sales Workers		Craftsmen and Related Trades Workers		Plant and Machine Operators and Assemblers		Cleaners, Labourers and Related Workers	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
MDD	5.9	4.1	6.9	6.9	6.9	6.2	4.9	7.7	2.2	3.5	2.2	7.7	2.2	3.5	2.2	7.7	2.2	3.5	2.2	2.2
Bipolar disorder	1.2	0.5	1.6	1.0	1.0	1.0	2.6	1.6	-	1.2	0.2	1.6	-	1.2	0.2	1.6	-	1.2	0.2	0.2
GAD	0.8	0.5	1.2	1.0	1.0	0.7	2.1	0.6	-	0.2	0.1	0.6	-	0.2	0.1	0.6	-	0.2	0.1	0.1
OCD	3.2	2.2	2.4	3.1	3.1	5.0	3.8	2.7	-	2.5	2.7	3.8	-	2.5	1.6	2.7	-	2.5	1.6	1.6
Alcohol abuse†	3.8	11.1	6.6	2.5	2.5	3.9	1.1	1.8	7.3	6.6	1.1	1.8	7.3	6.6	1.8	1.8	7.3	6.6	1.8	1.8
Alcohol dependence†	0.5	0.9	1.1	0.4	0.4	0.1	0.2	1.2	-	0.3	0.2	1.2	-	0.3	-	1.2	-	0.3	-	-
Alcohol use disorder (Abuse/dependence)†	4.3	12.0	7.7	2.9	2.9	4.0	1.3	3.0	7.3	6.9	1.3	3.0	7.3	6.9	1.8	3.0	7.3	6.9	1.8	1.8
Nicotine dependence†	5.3	4.6	5.5	1.9	1.9	4.7	2.6	5.2	24.8	9.3	2.6	5.2	24.8	9.3	6.2	5.2	24.8	9.3	6.2	6.2
Diabetes*	6.2	1.7	6.5	2.4	2.4	6.0	5.9	5.7	14.8	11.0	5.9	5.7	14.8	11.0	10.9	5.7	14.8	11.0	10.9	10.9
Hypertension*	15.6	16.0	12.7	11.3	11.3	14.4	16.4	14.5	26.5	21.7	16.4	14.5	26.5	21.7	21.7	14.5	26.5	21.7	21.7	21.7
Respiratory conditions	8.6	2.3	9.0	9.3	9.3	10.5	9.1	9.0	3.8	4.2	9.1	9.0	3.8	4.2	4.2	9.0	3.8	4.2	4.2	4.2
Chronic pain	14.1	14.1	13.5	15.1	15.1	15.3	12.4	14.9	16.3	10.1	12.4	14.9	16.3	10.1	10.1	14.9	16.3	10.1	10.1	10.1
Cancer	0.4	-	1.2	0.1	0.1	0.5	0.1	0.4	-	0.1	0.1	0.4	-	0.1	0.1	0.4	-	0.1	0.1	0.1
Neurological conditions*	3.0	1.8	0.8	4.3	4.3	2.7	2.4	3.9	11.9	2.7	2.4	3.9	11.9	2.7	2.7	3.9	11.9	2.7	2.7	2.7
Cardiovascular conditions	1.8	4.1	2.0	1.8	1.8	1.2	0.1	1.8	4.2	4.4	0.1	1.8	4.2	4.4	1.7	1.8	4.2	4.4	1.7	1.7
Ulcers	2.1	2.1	2.2	4.2	4.2	1.9	2.9	1.6	2.5	0.6	2.9	1.6	2.5	0.6	0.3	1.6	2.5	0.6	0.3	0.3

GAD: Generalised anxiety disorder; MDD: Major depressive disorder; OCD: Obsessive compulsive disorder

\*Significant differences at  $P < 0.05$ .

†Significant differences at  $P < 0.001$  between occupational groups, chi-square test.

Table 4. Prevalence of Lifetime Mental and Physical Disorders across Occupational Categories (n = 4361)

Lifetime Disorders	All Occupations			Business Owners			Legislators, Senior Officials and Managers			Professionals			Associate Professionals and Technicians		
	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI
MDD	5.9	0.5	5.0–6.9	4.1	2.5	1.2–13.0	6.9	1.5	4.4–10.6	6.9	1.3	4.7–10.0	6.2	1.0	4.6–8.4
Dysthymia	0.3	0.1	0.2–0.6	-	-	-	0.5	0.5	0.1–3.0	0.7	0.5	0.2–2.6	0.2	0.1	0.1–0.4
Bipolar disorder	1.2	0.2	0.9–1.8	0.5	0.3	0.1–1.9	1.6	0.8	0.6–4.2	1.0	0.5	0.3–2.9	1.0	0.4	0.5–2.0
GAD	0.8	0.2	0.5–1.3	0.5	0.3	0.1–1.9	1.2	0.6	0.4–3.4	1.0	0.5	0.3–2.8	0.7	0.3	0.3–1.6
OCD	3.2	0.4	2.6–4.1	2.2	1.8	0.4–0.2	2.4	0.9	1.2–4.8	3.1	0.9	1.7–5.6	5.0	0.9	3.5–7.2
Alcohol abuse†	3.8	0.4	3.0–4.6	11.1	4.1	5.2–21.9	6.6	1.6	4.1–10.5	2.5	0.7	1.4–4.4	3.9	0.8	2.6–5.9
Alcohol dependence†	0.5	0.1	0.3–0.8	0.9	0.7	0.2–3.7	1.1	0.5	0.4–2.9	0.4	0.2	0.1–1.1	0.1	0.1	0.0–0.3
Alcohol use disorder (abuse/dependence)†	4.3	0.4	3.5–5.2	12.0	4.1	5.9–22.7	7.7	1.7	5.0–11.7	2.9	0.8	1.7–4.8	4.0	0.8	2.7–6.0
Nicotine dependence*	5.3	0.5	4.4–6.2	4.6	2.6	1.5–13.2	5.5	1.5	3.2–9.2	1.9	0.8	0.8–4.4	4.7	0.8	3.4–6.5
Diabetes*	6.2	0.5	5.3–7.3	1.7	0.6	0.8–3.4	6.5	1.6	3.9–10.5	2.4	0.9	1.1–5.0	6.0	1.1	4.2–8.5
Hypertension*	15.6	0.8	14.1–17.2	16.0	4.7	8.9–27.3	12.7	2.1	9.1–17.4	11.3	1.8	8.2–15.3	14.4	1.6	11.6–17.7
Respiratory conditions	8.6	0.6	7.5–9.8	2.3	1.8	0.5–10.5	9.0	1.8	6.0–13.3	9.3	1.5	6.7–12.7	10.5	1.2	8.3–13.2
Chronic pain	14.1	0.7	12.7–15.6	14.1	4.5	7.4–25.4	13.5	2.0	9.9–18.0	15.1	2.0	11.5–19.5	15.3	1.5	12.6–18.5
Cancer	0.4	0.1	0.2–0.7	-	-	-	1.2	0.7	0.4–3.6	0.1	0.1	0.0–0.4	0.5	0.3	0.2–1.7
Neurological conditions*	3.0	0.4	2.3–3.9	1.8	1.8	0.2–11.5	0.8	0.5	0.2–2.8	4.3	1.1	2.5–7.2	2.7	0.7	1.6–4.5
Cardiovascular conditions	1.8	0.3	1.3–2.5	4.1	2.5	1.2–13.0	2.0	0.8	0.9–4.4	1.8	0.8	0.7–4.4	1.2	0.5	0.5–2.6
Ulcers	2.1	0.3	1.6–2.9	2.1	1.8	0.4–11.0	2.2	0.9	0.9–5.0	4.2	1.1	2.5–7.0	1.9	0.6	1.0–3.6
Any mental disorder	13.0	0.7	11.7–4.4	18.5	4.9	10.7–30.0	16.5	2.3	12.5–21.5	12.6	1.7	9.6–16.4	14.0	1.4	11.5–17.1
Any physical disorder	37.9	1.0	35.9–40.0	31.7	5.9	21.5–44.1	36.5	3.0	30.8–42.6	34.0	2.6	29.1–39.3	39.9	2.0	36.0–44.0
No mental or physical disorder	54.4	1.1	52.3–56.5	54.7	6.3	42.3–66.5	55.5	3.1	49.4–61.5	58.6	2.7	53.2–63.8	52.4	2.1	48.3–56.4
Only mental disorder	6.7	0.5	5.8–7.8	11.8	4.1	5.9–22.5	6.5	1.5	4.2–10.0	6.8	1.3	4.6–9.8	6.9	1.0	5.2–9.3
Only physical disorder	32.6	1.0	30.7–34.6	26.9	5.6	17.4–39.1	28.0	2.8	22.8–33.8	28.8	2.5	24.1–33.9	33.6	2.0	29.8–37.6
Mental and physical disorder	6.3	0.5	5.4–7.4	6.6	3.1	2.6–15.9	10.0	1.9	6.8–14.4	5.9	1.2	3.9–8.7	7.1	1.1	5.3–9.5

CI: Confidence interval; GAD: Generalised anxiety disorder; MDD: Major depressive disorder; OCD: Obsessive compulsive disorder; SE: Standard Error

\*Significant differences at  $P < 0.05$ .

†Significant differences at  $P < 0.001$  between occupational groups, chi-square test.

Table 4. Prevalence of Lifetime Mental and Physical Disorders across Occupational Categories (n = 4361) (Con't)

Lifetime Disorders	Clerical Support Workers			Services and Sales Workers			Craftsmen and Related Trades Workers			Plant and Machine operators and Assemblers			Cleaners, Labourers and Related Workers		
	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI	%	SE	95% CI
MDD	4.9	1.3	2.9–8.2	7.7	1.4	5.5–10.9	2.2	1.8	0.4–0.4	3.5	1.5	1.5–8.0	2.2	0.9	1.0–4.9
Dysthymia	0.1	0.1	0.0–0.4	0.2	0.1	0.1–0.5	-	-	-	-	-	-	0.8	0.8	0.1–5.7
Bipolar disorder	2.6	1.2	1.1–6.1	1.6	0.6	0.8–3.2	-	-	-	1.2	0.8	0.3–4.4	0.2	0.1	0.0–0.8
GAD	2.1	1.1	0.7–5.8	0.6	0.3	0.2–1.8	-	-	-	0.2	0.1	0.1–0.8	0.1	0.1	0.0–0.8
OCD	3.8	1.4	1.8–7.8	2.7	0.7	1.6–4.4	-	-	-	2.5	1.3	1.0–6.6	1.6	0.9	0.5–4.6
Alcohol abuse†	1.1	0.6	0.4–3.3	1.8	0.5	1.0–3.3	7.3	3.4	2.8–17.5	6.6	2.2	3.4–12.3	1.8	0.8	0.8–4.3
Alcohol dependence†	0.2	0.1	0.0–0.6	1.2	0.5	0.5–2.8	-	-	-	0.3	0.2	0.1–1.0	-	-	-
Alcohol use disorder (abuse/dependence)†	1.3	0.6	0.5–3.3	3.0	0.7	1.8–4.9	7.3	3.4	2.8–17.5	6.9	2.2	3.7–12.5	1.8	0.8	0.8–4.3
Nicotine dependence*	2.6	1.1	1.1–5.7	5.2	1.0	3.5–7.0	24.8	5.8	15.2–37.7	9.3	2.5	5.4–15.6	6.2	1.8	3.5–11.0
Diabetes*	5.9	1.7	3.3–10.4	5.7	1.1	3.9–8.2	14.8	4.8	7.6–26.8	11.0	2.7	6.7–17.4	10.9	2.7	6.6–17.6
Hypertension*	16.4	2.7	11.7–22.6	14.5	1.9	11.3–18.6	26.5	5.8	16.8–39.2	25.7	3.8	18.9–33.9	21.7	3.7	15.3–29.9
Respiratory conditions	9.1	1.9	6.0–13.5	9.0	1.4	6.7–12.0	3.8	2.1	1.3–10.7	6.1	1.9	3.3–11.1	4.2	1.3	2.3–7.6
Chronic pain	12.4	2.3	8.6–17.6	14.9	1.8	11.7–18.9	16.3	4.8	8.8–28.0	11.0	2.6	6.9–17.2	10.1	2.5	6.1–16.2
Cancer	0.1	0.1	0.0–0.6	0.4	0.3	0.1–2.0	-	-	-	0.1	0.1	0.0–0.8	0.1	0.1	0.0–0.5
Neurological conditions*	2.4	1.1	0.9–6.0	3.9	1.1	2.2–6.9	11.9	5.0	5.1–25.4	1.2	0.9	0.3–4.9	2.7	1.4	1.0–7.2
Cardiovascular conditions	0.1	0.1	0.0–0.6	1.8	0.6	0.8–3.6	4.2	2.8	1.1–14.5	4.4	1.7	2.0–9.2	1.7	0.9	0.6–4.5
Ulcers	2.9	1.3	1.2–6.8	1.6	0.6	0.7–3.4	2.5	2.0	0.5–11.7	0.6	0.3	0.2–1.5	0.3	0.2	0.1–0.9
Any mental disorder	12.6	2.3	8.7–17.8	13.0	1.6	10.2–16.6	9.1	3.8	3.9–19.8	10.5	2.5	6.5–16.4	5.5	1.5	3.2–9.3
Any physical disorder	37.0	3.5	30.5–44.1	36.4	2.4	31.8–41.3	53.0	6.7	40.0–65.6	43.5	4.2	35.5–51.9	38.2	4.1	30.4–46.5
No mental or physical disorder	53.1	3.6	46.1–60.0	55.2	2.5	50.2–60.0	44.2	6.7	31.8–57.3	51.3	4.2	43.0–59.6	57.7	4.2	49.4–65.6
Only mental disorder	8.7	2.0	5.4–13.6	7.3	1.2	5.2–10.0	2.3	2.0	0.4–12.1	4.9	1.7	2.5–9.6	3.2	1.2	1.5–6.5
Only physical disorder	34.3	3.4	28.0–41.3	31.8	2.4	27.4–36.6	46.7	6.7	34.1–59.8	38.2	4.1	30.5–46.5	36.8	4.1	29.1–45.2
Mental and physical disorder	3.9	1.2	2.2–6.9	5.8	1.2	3.9–8.5	6.8	3.3	2.5–16.9	5.6	1.9	2.8–10.6	2.3	0.9	1.1–5.0

CI: Confidence interval; GAD: Generalised anxiety disorder; MDD: Major depressive disorder; OCD: Obsessive compulsive disorder; SE: Standard Error

\*Significant differences at  $P < 0.05$ .

†Significant differences at  $P < 0.001$  between occupational groups, chi-square test.



### Impact of Mental and Physical Disorders on Work Productivity

Mean work-loss days (absenteeism) and work-cutback days (presenteeism) due to mental and physical health problems in the month prior to the survey are shown in Table 5. Although differences by occupation in the work-loss days and work-cutback days did not reach statistical significance, wide variations were seen across the 9 groups. ‘Services and sales workers’ reported the highest work-loss (mean 0.74) and work-cutback (mean 0.83) days due to their health.

### Correlates of AUD and ND

After adjusting for all sociodemographic variables and occupations in multivariate analyses, younger participants (those aged 18 to 34 years), men, those with secondary education (versus university education), having a physical condition, and ‘Business owners’ and ‘Legislators, senior officials and managers’ (versus ‘Associate professionals and technicians’) were more likely to have lifetime AUD (Table 4). ‘Business owners’ were 4 times more likely (OR 3.99, 95% CI, 1.46 to 10.88) to have AUD when compared to ‘Associate professionals and technicians’. Younger participants (those aged 18 to 34 years), men, Malays (versus Chinese), those with secondary education or below (versus university education) and ‘Craftsmen and related trades workers’ (versus ‘Associate professionals and technicians’) were more likely to have ND (Table 6).

### Discussion

This is the first population-based study in Singapore that examined the associations between occupational groups, sociodemographic characteristics, and the prevalence of key chronic mental and physical disorders using a representative sample of the population. The large sample size allowed adequate investigation of all the subgroups and provided generalisable estimates. Differences in age, gender, ethnicity, education, marital status and personal income across occupational groups were observed. This is expected and consistent with reports from studies in other populations.<sup>34,35</sup>

Among the employed, the overall prevalence of MDD was 5.9%, which is very close to the prevalence in Singapore’s general population (5.8%).<sup>36</sup> Contrary to the low prevalence of mental disorders among the skilled and unskilled manual jobs in our population, the highest prevalence of hypertension was found among ‘Craftsmen and related trades workers’ (26.5%), ‘Plant and machine operators and assemblers’ (25.7%) and ‘Cleaners, labourers and related workers’ (21.7%). Prevalence estimates across all occupations ranged between 11.3% (seen in ‘Professionals’)

Table 5. Work Days Lost and Cut Down across Occupations Due to Mental-physical Health Problems

Occupational Category	Work-loss Days (in 1 Month)		Work-cutback Days (in 1 Month)	
	Mean	SE	Mean	SE
Business owners	0.12	0.07	0.38	0.19
Legislators, senior officials and managers	0.19	0.05	0.38	0.15
Professionals	0.20	0.04	0.29	0.06
Associate professionals and technicians	0.54	0.13	0.51	0.08
Clerical support workers	0.36	0.14	0.52	0.21
Services and sales worker	0.74	0.33	0.83	0.33
Craftsmen and related trades workers	0.35	0.21	0.31	0.21
Plant and machine operators and assemblers	0.61	0.24	0.62	0.25
Cleaners, labourers and related workers	0.37	0.15	0.36	0.15

SE: Standard error

to 26.5% which is comparable to an American sample which ranged from 10.5% to 28%.<sup>37</sup>

Various theories have tried to explain health disparities among different occupations. Based on Karasek and Theorell’s demand-control theory,<sup>38</sup> jobs with high strain, low decision latitude (one’s control over the work they do) and high physical and psychological demands are associated with negative health outcomes such as physical illnesses and depression. This has been replicated in studies that have shown high prevalence of depression in jobs with higher strain.<sup>39,40</sup> Similarly, higher prevalence of cardiovascular diseases,<sup>41</sup> diabetes<sup>42</sup> and hypertension<sup>43</sup> were seen in strenuous occupations or job roles.

The highest effect of mental and physical health problems on work-loss days and work-cutback days was seen for ‘Services and sales workers’ and lowest among ‘Business owners’. It is possible that ‘Business owners’ had employed subordinates to perform their roles in their health-related absence or alternatively, it could be due to the lack of a formal reporting structure or regular work-hours, as for example, in office-bound jobs, there was an underestimation of the productivity-loss.

The strong independent relationship of occupational

Table 6. Correlates of Alcohol Use Disorders and Nicotine Dependence

Parameter	Alcohol Use Disorders (Abuse/Dependence)				Nicotine Dependence			
	OR	95% OR Confidence Limits		P Value	OR	95% OR Confidence Limits		P Value
<b>Age (years)</b>								
18 – 34	Ref.				Ref.			
35 – 49	0.4	0.22	0.72	0.0024	0.59	0.35	0.98	0.0433
50 – 64	0.17	0.07	0.41	<.0001	0.45	0.22	0.91	0.0251
65 and above	0.46	0.10	2.25	0.3395	0.54	0.15	2.03	0.365
<b>Gender</b>								
Men	Ref.				Ref.			
Women	0.30	0.18	0.52	<.0001	0.23	0.14	0.40	<.0001
<b>Ethnicity</b>								
Chinese	Ref.				Ref.			
Malay	0.69	0.44	1.08	0.1069	1.48	1.03	2.13	0.0336
Indian	1.19	0.79	1.79	0.4042	1.15	0.79	1.68	0.4711
Others	9.24	4.70	18.18	<.0001	1.99	0.91	4.38	0.0866
<b>Marital Status</b>								
Single	Ref.				Ref.			
Married	1.07	0.59	1.95	0.8275	0.94	0.56	1.56	0.8007
Separated/divorced	2.28	0.93	5.60	0.0714	1.30	0.54	3.13	0.5634
Widowed	-	-	-	-	3.99	0.90	17.78	0.0693
<b>Education</b>								
Pre-primary	2.20	0.32	15.27	0.4242	4.53	1.14	17.97	0.0316
Primary	2.65	0.79	8.95	0.1158	3.92	1.23	12.46	0.0208
Secondary	3.91	1.57	9.77	0.0035	3.09	1.26	7.60	0.0141
Pre-U/junior college/diploma	2.40	1.17	4.94	0.0175	1.06	0.48	2.35	0.8953
Vocational	3.30	1.27	8.59	0.0144	2.23	0.87	5.76	0.0964
University	Ref.				Ref.			
<b>Occupation</b>								
Business owner	3.99	1.46	10.88	0.0069	0.74	0.21	2.67	0.6451
Legislators, senior officials and managers	2.69	1.19	6.08	0.0179	1.65	0.77	3.54	0.197
Professionals	1.01	0.47	2.17	0.9868	0.55	0.20	1.52	0.247
Associate professionals and technicians	Ref.				Ref.			
Clerical support workers	0.46	0.15	1.41	0.1739	0.69	0.26	1.85	0.4556
Services and sales worker	0.75	0.36	1.54	0.4272	0.92	0.49	1.72	0.7831
Craftsmen and related trades workers	1.89	0.61	5.84	0.2682	4.09	1.89	8.87	0.0004
Plant and machine operators and assemblers	1.52	0.64	3.62	0.348	0.94	0.47	1.91	0.8693
Cleaners, labourers and related workers	0.73	0.25	2.12	0.5631	1.03	0.40	2.67	0.951
<b>Income (SGD)*</b>								
Below 20,000	Ref.				Ref.			
20,000 – 49,999	1.05	0.59	1.87	0.8824	1.47	0.90	2.40	0.1231
50,000 and above	0.71	0.27	1.85	0.4806	0.84	0.35	2.01	0.699
<b>Any physical disorder</b>								
No	Ref.				Ref.			
Yes	2.18	1.41	3.36	0.0004	0.89	0.58	1.36	0.5924

OR: Odds ratio

\*Denotes personal income in Singapore dollars in 1 year prior to the interview.

level with AUD and ND after adjusting for the effect of confounders indicates that the findings are of clinical significance, especially in ‘Business owners’ and ‘Craftsmen and related trades workers’. Similar results were found in other studies that identified high alcohol abuse and/or dependence among business owners and increased risk of smoking and cancers among low-skilled occupations.<sup>44-47</sup> The relationship of AUD and ND with occupation level—as with addictions and education level—is non-linear with higher prevalence observed towards the outward ends of the occupational spectrum.<sup>19</sup> While affluence, nature of social networks and means to access are factors that drive alcohol use and smoking behaviours in the higher occupational categories, work-strain and stress have been linked to these among the low-skill manual occupations. In our sample, 3.2% of the participants were ‘Business owners’ with a mixed representation of all sociodemographic characteristics including education. The higher prevalence of ND among residents in ‘Craftsmen and related trades’ as compared to ‘Associate professionals’ is significant considering that these occupational groups are also more likely to be exposed to other hazardous substances through their work.

A key limitation of the study is the cross-sectional design which did not allow assessment of causality. Difference in the time periods for the assessment of mental and physical health conditions and their effect on work productivity is another limitation of the study. Lifetime prevalence of health conditions was used for the analysis, whereas work productivity was rated during the 30 days prior to assessment and occupation was assessed at study entry, which makes the interpretation of associations challenging. It is also proposed that effect of past and present occupations should be considered while investigating its role in health, with preference given to longitudinal study designs.<sup>48</sup> The inclusion of industrial classification in addition to occupation level could have further facilitated the specification of groups at risk; however, this information was not available. This limitation can be addressed by collecting additional data on the industry affiliation of the respondents in future studies. Inclusion of the income as a continuous variable can also aid in elucidating the effects of occupational and industrial categories more robustly. Another important limitation was the use of self-report to obtain information on chronic physical disorders. While such data are believed to have moderate to high reliability, some level of under-reporting is possible, and it may differ by occupational groups. Although there were no statistically significant differences among respondents and non-respondents (24%) in terms of age, gender and ethnicity, systematic differences in the proportion of employed residents could not be assessed due to inadequate data for attrition analyses.

## Conclusion

This is the first comprehensive description of chronic mental and physical disorders (via self-report) in the multi-ethnic workforce in Singapore and highlights disparities in disease prevalence and risk factors across occupations. Occupational groups vary in their sociodemographic characteristics which in turn have been linked to several disabling mental and physical disorders in Singapore’s population.<sup>36,49-51</sup> This significant difference in the distribution of sociodemographic characteristics and mental-physical disorders by occupational level underscores the importance of occupation-specific analyses. Given the impetus for sustaining employees in the workforce and the resulting changes in workforce demographics, there will likely be a differential pattern of mental and physical disorders among occupations based on their composition of risk factors, thereby affecting work productivity in these occupations. Therefore, it is important to tailor effective workplace health interventions based on risk profiles by occupational groups. In addition, business owners, craftsmen and related trades’ workers should be made aware of the increased risks associated with AUD and ND. Public health initiatives in these groups should focus on primary and secondary prevention in lifestyle and behaviours. Longitudinal studies would complement the present study to determine causality of the mental and physical disorders in the workforce.

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