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ORIGINAL ARTICLE

Age differences in associations between psychological distress and chronic conditions

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Abstract
Objective To examine associations between psychological distress (PD) and chronic health conditions among different age groups in a representative population sample.
Methods PD measured by the Kessler-10, and the presence of diagnosed chronic conditions were self-reported by respondents aged 18 years and over in a South Australian continuous computer-assisted telephone interviewing surveillance system from July 2002 to June 2007 ($n = 26{,}376$).
Results The overall prevalence of PD was 9.8% (95% CI 9.5–10.2). In age-specific adjusted multivariate models, arthritis and mental health conditions remained significantly associated with PD for all age groups, cardiovascular disease was significantly associated with PD among those aged 35 years and over, asthma was associated with PD for respondents aged 50 years and over, and osteoporosis was associated with PD for 50–64 year olds. Being born outside of Australia, United Kingdom or Ireland, current smoking, low level of education, and low income also remained significantly associated with PD for all age groups.
Conclusions Young people experience a higher prevalence of PD than older age groups, irrespective of the presence of chronic conditions.

Keywords Psychological distress · Chronic disease · Surveillance · Age-specific · Self-report

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Introduction

Chronic conditions, such as arthritis, asthma, cardiovascular disease, diabetes, and osteoporosis are recognised as health priorities in Australia because of the burden they place on individuals and the health system. People with chronic conditions often experience comorbidities, including psychological distress (PD), mental health problems, and impaired health-related quality of life, and are frequent, long-term users of health services (National Health Priority Action Council 2006). A comorbidity, such as PD can impact on the severity, progression, and management of chronic conditions and affect a person's ability to cope with illness and adhere to treatment (Dimatteo et al. 2000). Public health has a role to play in the primary prevention and early intervention both for chronic conditions and for PD.

Previous studies have examined the prevalence of PD among people with chronic conditions, but have sometimes been limited by the use of patient samples (Hislop et al. 2008; Keefe and Williams 1990; Panicker et al. 2008) or have not compared the relationship across different age groups (CDC 2004; Hislop et al. 2008; Keefe and Williams 1990; Kokkonen et al. 2001; Rasul et al. 2007; Surtees et al. 2008). Other studies have investigated PD among different age groups, but have not examined the factors associated with PD within different age groups. A higher

prevalence of serious PD has been observed for younger people among those with chronic conditions, such as diagnosed diabetes (Li et al. 2009), arthritis (Shih et al. 2006), or self-reported disability (Okoro et al. 2009). The findings have not been consistent, however, with PD prevalence higher among participants aged 45–64 years than those aged 18–44 or 65 years and over in a United States study (Pratt et al. 2007). The Kessler-10 (K10) scale, a valid instrument measuring anxiety and depressive disorders in the general population (Clinical Research Unit for Anxiety and Depression 2007; Kessler and Mroczek 1994), was used as the measure of PD in this study. Previous studies have also used other scales, including the Kessler-6 (Li et al. 2009), the Centre for Epidemiological Studies-Depression Scale (Hislop et al. 2008), and the General Health Questionnaire (Rasul et al. 2007), so care is required when comparing prevalence estimates of PD.

The ageing population in Australia means that there is necessarily a focus on chronic conditions. It is acknowledged that chronic conditions occur across the life cycle (National Health Priority Action Council 2006), but the overall increasing prevalence of chronic conditions with older age may result in the importance of the impact of mental health issues among younger people with chronic conditions being less well recognised. Age may be an important factor in the relationship between chronic conditions and PD because people at various life stages may experience different stressors, priorities, and health status. The Australian National Mental Health Strategy and Action Plans include prevention of, and early intervention for, mental health problems as priorities (Council of Australian Governments 2006; Department of Health and Ageing 2009). Understanding the relationship between PD and chronic conditions will help to identify where such prevention and early intervention activities should occur. This study used data from a large representative population surveillance system to examine (1) the prevalence of PD among people with chronic conditions, and whether this varied by age group, and (2) associations between chronic conditions and PD for different age groups after adjusting for demographic, socioeconomic, and health-related variables.

Methods

The South Australian Monitoring and Surveillance System (SAMSS) is a continuous, monthly, cross-sectional telephone monitoring system of a random representative sample of South Australians of all ages (approximately $n = 600$ per month). SAMSS is designed to systematically monitor trends in the prevalence of chronic conditions, risk factors, behaviours, and other health-related issues for the South Australian health system (Department of Health SA 2002). All households in South Australia with a telephone number listed in the Electronic White Pages (EWP) are eligible for selection via simple random sampling. The monthly samples are independent of each other, and non-response or ineligible data are not replaced or carried over to the following month's sample. A letter about the purpose of the survey is mailed to selected households prior to interview. The person who was last to have a birthday in the selected household is interviewed via Computer Assisted Telephone Interviewing (CATI) by trained interviewers. Up to 10 callbacks are made to interview the selected person. The average monthly response rate between July 2002 and June 2007 was 69.6%, with an average yearly response rate ranging from 68.6% in 2003–2004 to 71.0% in 2005–2006. The current analyses included respondents aged 18 years and over who were interviewed between July 2002 and June 2007 and had complete K10 data ($n = 26{,}376$). Only 0.1% of respondents aged 18 years and over had missing data on K10.

The K10 comprises 10 questions asking how often during the past 4 weeks the respondent felt 'tired out for no good reason', 'nervous', 'so nervous that nothing could calm you down', 'hopeless', 'restless or fidgety', 'so restless you could not sit still', 'depressed', 'everything was an effort', 'so sad that nothing could cheer you up', and 'worthless'. Responses for each question were scored from one (none of the time) to five (all of the time). The 10 items were summed to result in a total score ranging between 10 and 50, where 50 indicated a high risk of anxiety or a depressive disorder. Respondents with a score of 22 or above were defined as having PD (Health West 2001).

Respondents were asked whether a doctor had ever told them that they had arthritis, cardiovascular disease (heart attack, heart disease, stroke, and/or angina), diabetes, or osteoporosis. Asthma was defined as a diagnosis of asthma, and experience of symptoms or taking prescribed medication for asthma in the past 12 months (Australian Centre for Asthma Monitoring 2003). Respondents with a mental health condition were defined as those who had been told by a doctor in the last 12 months that they had anxiety, depression, a stress-related problem, or any other mental health problem, or were currently receiving treatment for any of these conditions.

Respondents were asked to report their height without shoes and their weight (undressed in the morning). Body mass index (weight in kilograms divided by height in metres squared) was calculated from these responses, with obesity classified as a BMI of 30 kg/m^2 or higher (World Health Organization 2000). Respondents who smoked daily or occasionally were classified as current smokers, those who smoked in the past, but not currently were classified as ex-smokers, and those who had never smoked

or had tried it a few times, but not smoked regularly were classified as nonsmokers. Respondents were asked the number of standard drinks they consumed per day. Risk of harm from alcohol in the long-term was defined as more than 14 standard drinks per week, or more than 2 on an average day for women and more than 28 standard drinks per week, or more than 4 on an average day for men (National Health and Medical Research Council 2001).

Additional demographic and socioeconomic factors collected included age, gender, marital status, country of birth, highest level of education, and gross annual household income.

Data were weighted by age, sex, geographical area (metropolitan/rural), and probability of selection in the household to the most recent South Australian estimated residential population data to account for different probabilities of selection and response rates among demographic groups, thus ensuring that the sample accurately reflected the South Australian population (Australian Bureau of Statistics 2004). Five years of data (July 2002 to June 2007) were joined together to be able to examine prevalence of PD among small groups. The prevalence of each chronic condition, including PD, did not significantly change over the 5-year period. Data were analysed using SPSS version 15.0 (SPSS Inc, Chicago, Illinois, USA).

Chi square tests were used to compare the prevalence of PD between age groups. Differences were reported as significant when $p < 0.05$ and $p < 0.001$. Variables that were associated with PD in univariate analyses ($p < 0.25$) (Hosmer and Lemeshow 1989) were entered into a multivariate model. Models were produced for each age group and for the total sample. The variance inflation factor was used to check for multicollinearity among the variables included in the model. Multicollinearity was not found to be a concern (variance inflation factor <25). Nonsignificant ($p \geq 0.05$) covariates were removed until a final model was obtained.

Results

The overall prevalence of PD was 9.8% (95% CI 9.5–10.2). Characteristics of respondents in each age group are listed in Table 1. The prevalence of PD was significantly higher among 18–34 year olds (11.4%) and significantly lower among respondents aged 65 years and over (7.2%). As age increased, the average number of chronic conditions increased, ranging from 0.4 for 18–34 year olds to 0.5 (35–49 years), 0.8 (50–64 years), and 1.3 for those 65 years and over. The prevalence of psychological distress among those with at least one chronic condition (asthma, arthritis, cardiovascular disease, diabetes, mental health, and osteoporosis) was statistically significantly higher (15.8%) compared to those without a chronic condition (4.8%). The prevalence of each chronic condition increased with increasing age group, except for asthma, which was more common among 18–34 year olds, and mental health condition, which was more common among 35–64 year olds (Table 1).

The prevalence of PD among respondents with a mental health condition was significantly higher than among people with arthritis, asthma, cardiovascular disease, diabetes, or osteoporosis (Table 2). Among people reporting arthritis, cardiovascular disease, diabetes, or osteoporosis the prevalence of PD was significantly higher among 18–34 year olds and significantly lower among respondents aged 65 years and over (Table 2). Among respondents with asthma or mental health conditions, the prevalence of PD did not significantly vary across age groups.

In univariate analyses, each chronic condition was significantly associated with a higher prevalence of PD for all age groups (Table 3). Younger respondents were more likely to have PD (overall model, Table 3) and this association remains after adjustment for demographic, socioeconomic, chronic condition, and risk factor variables (Table 4). In age-specific adjusted multivariate models, arthritis and mental health conditions remained significantly associated with PD for all age groups, cardiovascular disease was significantly associated with PD among those aged 35 years and over, asthma was associated with PD for respondents aged 50 years and over, and osteoporosis was associated with PD for 50–64 year olds (Table 4). While approximately one-quarter of 18–34 year olds with cardiovascular disease or diabetes, and one-third of this age group with osteoporosis had PD (Table 2), the absolute number of young people with these conditions was small and these conditions did not remain significantly associated with PD in the adjusted multivariate model for this age group.

In multivariate models, being born outside of Australia, United Kingdom or Ireland, current smoking, low level of education, and low income were independently associated with PD for all age groups (Table 4). Respondents aged 18–34 years who were female, living in a step, blended, sole parent or shared care parenting family, or had a BMI of 30 kg/m^2 or greater were more likely to have PD. Respondents in this young age group who were classified as overweight were less likely to have PD. Among respondents aged 35–49 years, being separated, divorced, widowed or never married, or of Aboriginal or Torres Strait Islander origin, were significantly associated with PD. BMI classifications of underweight, overweight or obese, risky or high-risk alcohol consumption, and being female were associated with a higher prevalence of PD among 50–64 year olds. Respondents aged 50–64 years who were living alone, or with a partner, but with no children, were less likely to have PD.

Table 1 Characteristics (%, 95% CI) of participants by age group, South Australian Monitoring and Surveillance System, 2002–2007

	18–34 years ($n = 7,599$)	35–49 years ($n = 7,675$)	50–64 years ($n = 6,044$)	65 years and over ($n = 5,099$)	Overall ($n = 26,376$)
Male	50.9 (49.8–52.0) ↑	49.6 (48.5–50.7)	49.9 (48.7–51.2)	43.6 (42.2–44.9) ↓	48.9 (48.3–49.5)
Born in Australia	89.0 (88.2–89.7) ↑	78.7 (77.8–79.6)	72.2 (71.1–73.3) ↓	68.8 (67.5–70.1) ↓	78.3 (77.8–78.8)
Married or living with partner	46.0 (44.9–47.1) ↓	80.8 (79.9–81.6) ↑	81.7 (80.7–82.6) ↑	63.2 (61.9–64.6) ↓	67.6 (67.0–68.1)
Family structure of step or blended family, sole parent, or shared care parenting	11.9 (11.2–12.6) ↑	13.9 (13.2–14.7) ↑	4.5 (4.0–5.1) ↓	0.8 (0.6–1.0) ↓	8.6 (8.3–9.0)
Education secondary school or less	52.2 (51.1–53.3) ↓	47.4 (46.3–48.5) ↓	53.9 (52.7–55.2)	71.0 (69.7–72.2) ↑	54.8 (54.2–55.4)
Gross annual household income $20,000 or less	5.0 (4.5–5.5) ↓	6.3 (5.8–6.9) ↓	13.7 (12.8–14.6) ↓	48.2 (46.8–49.5) ↑	15.7 (15.3–16.1)
Current smoker	25.8 (24.8–26.8) ↑	24.0 (23.0–24.9) ↑	15.2 (14.3–16.1) ↓	7.4 (6.7–8.1) ↓	19.3 (18.8–19.8)
BMI $\geq$ 30 kg/m^2	11.7 (11.0–12.5) ↓	21.2 (20.3–22.2) ↑	22.7 (21.6–23.7) ↑	15.7 (14.8–16.8) ↓	17.8 (17.3–18.2)
Risk from alcohol in the long-term	4.6 (4.2–5.1) ↑	4.3 (3.9–4.8) ↑	3.9 (3.4–4.4)	2.3 (1.9–2.8) ↓	3.9 (3.7–4.2)
Psychological distress	11.4 (10.7–12.1) ↑	9.9 (9.2–10.6)	10.1 (9.3–10.9)	7.2 (6.5–7.9) ↓	9.8 (9.5–10.2)
Arthritis	3.4 (3.0–3.8) ↓	12.1 (11.4–12.9) ↓	32.6 (31.5–33.8) ↑	50.2 (48.8–51.6) ↑	21.6 (21.1–22.1)
Asthma	17.4 (16.5–18.3) ↑	12.5 (11.7–13.2) ↓	11.6 (10.8–12.5) ↓	11.8 (11.0–12.7) ↓	13.6 (13.2–14.0)
Cardiovascular disease	0.5 (0.4–0.7) ↓	1.9 (1.6–2.2) ↓	8.5 (7.9–9.3)	27.8 (26.6–29.1) ↑	8.0 (7.7–8.4)
Diabetes	1.3 (1.1–1.6) ↓	4.1 (3.7–4.6) ↓	8.7 (8.1–9.5) ↑	15.9 (14.9–16.9) ↑	6.6 (6.3–6.9)
Osteoporosis	0.3 (0.2–0.4) ↓	1.1 (0.9–1.4) ↓	4.9 (4.4–5.5) ↑	13.9 (13.0–14.9) ↑	4.2 (4.0–4.5)
Mental health condition	13.3 (12.6–14.1) ↓	15.9 (15.1–16.7) ↑	16.3 (15.4–17.2) ↑	10.8 (10.0–11.7) ↓	14.2 (13.8–14.7)

↑↓ Statistically significantly higher or lower than other age groups combined ($p < 0.05$)

Discussion

These data show that the prevalence of PD is significantly higher among younger people than older people, irrespective of the presence of chronic conditions, demographic, socioeconomic, and other health-related variables. It has been stated previously that there is little evidence that the risk of psychosocial problems is linked to types of specific illnesses (Koopmans and Lamers 2000; Geist et al. 2003), but this study demonstrated that the association of PD with specific chronic conditions is not consistent for all age groups. Among the total sample aged 18 years and over, each chronic condition was independently associated with higher levels of PD, but variations were present across age groups. Cardiovascular disease and osteoporosis were not significantly associated with PD among young respondents after taking into account other variables and only a small number of young respondents reported having these chronic conditions. Asthma was more common among 18–34 year olds, but was not associated with PD among younger respondents. Side effects of treatment of asthma have been shown to be more common among older people (deShazo and Stupka 2009), which may contribute to increased levels of PD. Arthritis and mental health conditions were associated with PD for all age groups, and consistent with a previous study, diabetes was not associated with PD among any specific age group in adjusted models (Li et al. 2009).

The results are consistent with previous findings for people with self-reported disability, diagnosed diabetes or arthritis, where the prevalence of serious PD was higher among younger people (Li et al. 2009; Okoro et al. 2009; Shih et al. 2006). PD among young people with chronic conditions may be associated with treatment noncompliance, school absenteeism, behavioural problems, and risky behaviours, such as alcohol use and sexual activity (Geist et al. 2003; Guthrie et al. 2003). Young adults with chronic conditions may account for a considerable portion of the work of general practitioners and specialists but limited attention is likely to be spent on the psychosocial impact of these conditions (Geist et al. 2003). The results indicate that awareness of the relationship between PD and chronic conditions, and providing primary care interventions aimed at addressing the impact of PD, are important aspects for the care of people with chronic conditions, particularly young people. In addition to managing the disease and its treatment, and how this influences family and peer relationships, young people also have to cope with the demands associated with physical changes, and establishing independence, employment, and a personal identity (Geist et al. 2003; Kokkonen et al. 2001).

Consistent with the current results, smoking has previously been shown to be independently associated with PD (Hamer et al. 2008), and PD has also been associated with a lower probability of quitting smoking (Cosci et al. 2009). The relationship between cardiovascular disease and PD

Table 2 Prevalence of psychological distress (%, 95% CI) among people with chronic conditions, by age group, South Australian Monitoring and Surveillance System, 2002–2007

	18–34 years		35–49 years		50–64 years		65 years and over		Overall	
Arthritis	71/259	27.3 (22.3–33.1) ↑	206/929	22.1 (19.6–24.9) ↑	305/1,959	15.5 (14.0–17.2)	244/2,560	9.5 (8.5–10.7) ↓	825/5,708	14.5 (13.6–15.4)
Asthma	204/1,321	15.4 (13.6–17.5)	141/956	14.8 (12.6–17.6)	119/698	17.0 (14.4–20.0)	83/603	13.7 (11.2–16.7)	547/3,578	15.3 (14.1–16.5)
Cardiovascular disease	11/41	26.9 (15.7–41.9) ↑	43/147	29.1 (22.5–37.1) ↑	91/513	17.7 (14.7–21.3) ↑	142/1,419	10.0 (8.6–11.7) ↓	287/2,120	13.5 (12.1–15.1)
Diabetes	24/100	23.8 (16.7–33.2) ↑	47/315	15.0 (11.4–19.3)	90/525	17.1 (14.2–20.6) ↑	78/808	9.7 (7.8–11.9) ↓	239/1,748	13.7 (12.1–15.4)
Osteoporosis	7/19	33.7 (19.1–59.0) ↑	19/87	21.5 (14.5–31.6)	63/297	21.3 (16.9–26.2) ↑	80/711	11.2 (9.1–13.8) ↓	169/1,114	15.1 (13.2–17.4)
Mental health condition	393/1,010	38.9 (36.0–42.0)	424/1,219	34.8 (32.2–37.5)	359/977	36.7 (33.7–39.7)	182/551	33.0 (29.2–37.1)	1358/3,757	36.1 (34.6–37.7)

↑↓ Statistically significantly higher or lower than other age groups combined ($p < 0.05$)

has also been demonstrated to be largely explained by behaviours, such as smoking and alcohol risk (Hamer et al. 2008). In the present study, at least among respondents aged 35 years and over, cardiovascular disease has remained independently associated with PD, indicating that a focus on health behaviour change alone will not be sufficient to eliminate PD among people with cardiovascular disease.

The increased level of PD observed among migrants has been attributed to the variety of stressors placed on their physical, social, and psychological adaptation abilities (Weishaar 2008), and also to the difficult life events and circumstances experienced in the country of origin (Dalgard et al. 2006; Leavey et al. 2007). The association of a living in a step, blended, sole parent or shared care parenting family with PD among young people, even after adjustment for socioeconomic and health-related factors, is consistent with previous work among adolescents (Roustit et al. 2007).

A previous population-based study observed a similar association between PD and socioeconomic status and this relationship was only partly explained by the experience of recent traumatic life events (Myer et al. 2008). Other studies have also reported higher levels of PD among groups who are socioeconomically disadvantaged (Grzywacz et al. 2004; Pratt et al. 2007). It has been suggested that improving the income of economically disadvantaged people could reduce exposure to stressful life conditions, improve mental well-being, increase health-promoting behaviours, and reduce risk factors associated with chronic conditions (Schulz et al. 2008).

The use of cross-sectional data in this study limits the ability to investigate causal relationships between chronic conditions and PD. One proposed mechanism is that PD could cause immunosuppression, leading to decreased physical functioning (Penninx et al. 1998). Physical disabilities, such as those related to chronic conditions, may also predict the onset of psychological issues (Bruce and Hoff 1994). Without longitudinal data it is also not possible to examine whether the observed higher prevalence of PD among young people is a cohort effect that will stay with this group as they age, as demonstrated in a previous path analysis study where approximately 80% of PD disparities among a cohort aged 42 years was present almost two decades earlier (Miech et al. 2007). Such results strengthen the case for interventions to reduce PD that focus on young adults and seek to improve their mental wellbeing over the long-term.

The sampling frame, generated from the EWP, means that people without a listed telephone number were ineligible for selection. This is unlikely to have affected the results, however, as the majority of households owned telephones and such surveys have been shown to be

Table 3 Univariable odds ratios (95% CI) for variables associated with psychological distress, by age group, South Australian Monitoring and Surveillance System, 2002–2007

	18–34 years OR (95% CI)	35–49 years OR (95% CI)	50–64 years OR (95% CI)	65 years and over OR (95% CI)	Overall OR (95% CI)
Age group (years)					
65 and over	–	–	–	–	1.00
50–64	–	–	–	–	1.45 (1.27–1.66)**
35–49	–	–	–	–	1.42 (1.25–1.62)**
18–34	–	–	–	–	1.67 (1.47–1.89)**
Arthritis					
No	1.00	1.00	1.00	1.00	1.00
Yes	3.09 (2.33–4.10)**	3.18 (2.66–3.80)**	2.30 (1.94–2.72)**	2.10 (1.68–2.63)**	1.81 (1.65–1.97)**
Asthma					
No	1.00	1.00	1.00	1.00	1.00
Yes	1.55 (1.31–1.83)**	1.72 (1.41–2.09)**	2.03 (1.63–2.53)**	2.37 (1.83–3.08)**	1.83 (1.65–2.02)**
Cardiovascular disease					
No	1.00	1.00	1.00	1.00	1.00
Yes	2.88 (1.44–5.78)*	3.90 (2.71–5.61)**	2.09 (1.64–2.67)**	1.72 (1.38–2.14)**	1.49 (1.30–1.70)**
Diabetes					
No	1.00	1.00	1.00	1.00	1.00
Yes	2.47 (1.55–3.93)**	1.65 (1.20–2.27)*	1.98 (1.55–2.54)**	1.50 (1.15–1.95)*	1.50 (1.30–1.73)**
Osteoporosis					
No	1.00	1.00	1.00	1.00	1.00
Yes	3.97 (1.54–10.23)*	2.54 (1.51–4.25)**	2.59 (1.93–3.46)**	1.82 (1.40–2.37)**	1.68 (1.42–1.99)**
Mental health condition					
No	1.00	1.00	1.00	1.00	1.00
Yes	8.24 (7.04–9.65)**	9.74 (8.29–11.45)**	11.27 (9.39–13.53)**	11.73 (9.31–14.78)**	9.78 (8.96–10.68)**
Sex					
Male	1.00	1.00	1.00	1.00	1.00
Female	1.83 (1.58–2.11)**	1.36 (1.17–1.58)**	1.70 (1.43–2.02)**	1.41 (1.13–1.76)*	1.56 (1.43–1.69)**
Country of birth					
Australia	1.00	1.00	1.00	1.00	1.00
United Kingdom/ Ireland	0.73 (0.46–1.17)	1.06 (0.84–1.34)	1.10 (0.85–1.42)	1.24 (0.94–1.62)	0.97 (0.84–1.11)
Other	1.37 (1.08–1.73)*	1.22 (0.96–1.55)	1.83 (1.48–2.26)**	1.53 (1.15–2.05)*	1.41 (1.25–1.59)**
Aboriginal or Torres Strait Islander					
No	1.00	1.00	1.00	1.00	1.00
Yes	0.90 (0.43–1.92)	3.61 (2.04–6.39)**	1.79 (0.74–4.37)	0.11 (0.01–11.94)	1.76 (1.19–2.60)*
Marital status					
Married/living with partner	1.00	1.00	1.00	1.00	1.00
Separated/divorced/ widowed/never married	1.26 (1.09–1.46)*	2.73 (2.32–3.20)**	1.84 (1.52–2.23)**	1.36 (1.10–1.69)*	1.66 (1.53–1.80)**
Family structure					
Family with child(ren) and both biological parents	1.00	1.00	1.00	1.00	1.00
Step/blended family, sole parent, shared care parenting	1.97 (1.62–2.41)**	2.35 (1.92–2.86)**	1.62 (1.11–2.37)*	0.89 (0.21–3.72)	2.06 (1.80–2.34)**
Adult living alone or with partner, no children	0.94 (0.77–1.14)	2.00 (1.66–2.42)**	1.03 (0.84–1.26)	0.99 (0.52–1.88)	1.06 (0.96–1.16)

Table 3 continued

	18–34 years OR (95% CI)	35–49 years OR (95% CI)	50–64 years OR (95% CI)	65 years and over OR (95% CI)	Overall OR (95% CI)
Related or unrelated adults living together	1.23 (1.00–1.52)*	2.42 (1.80–3.26)**	1.38 (1.01–1.87)*	1.11 (0.53–2.34)	1.48 (1.28–1.70)**
Other/Not stated	4.41 (2.46–7.91)**	0.38 (0.07–2.17)	1.75 (0.74–4.14)	0.34 (0.02–5.25)	2.01 (1.31–3.08)*
Highest level of education					
Secondary or less	1.00	1.00	1.00	1.00	1.00
Trade/certificate/ diploma	0.82 (0.69–0.98)*	0.65 (0.54–0.78)**	0.72 (0.59–0.89)*	0.87 (0.66–1.14)	0.78 (0.70–0.86)**
Degree or higher	0.61 (0.50–0.73)**	0.52 (0.43–0.64)**	0.50 (0.39–0.64)**	0.41 (0.24–0.69)*	0.58 (0.52–0.66)**
Gross annual household income					
More than $20,000	1.00	1.00	1.00	1.00	1.00
$20,000 or less	2.88 (2.25–3.68)**	5.71 (4.63–7.05)**	3.42 (2.80–4.17)**	1.54 (1.23–1.94)**	2.04 (1.85–2.25)**
Not stated	1.07 (0.90–1.28)	1.93 (1.52–2.46)**	1.78 (1.39–2.27)**	0.81 (0.53–1.24)	1.36 (1.21–1.53)**
Smoking status					
Nonsmoker	1.00	1.00	1.00	1.00	1.00
Ex-smoker	1.24 (1.03–1.48)*	1.29 (1.07–1.56)*	1.16 (0.96–1.41)	1.06 (0.85–1.33)	1.16 (1.05–1.28)*
Current smoker	1.95 (1.65–2.30)**	2.57 (2.13–3.10)**	2.23 (1.78–2.79)**	1.64 (1.14–2.38)*	2.21 (2.00–2.45)**
Body mass index (kg/m^2)					
Acceptable (≥18.5 and <25)	1.00	1.00	1.00	1.00	1.00
Underweight (<18.5)	1.57 (1.13–2.19)*	1.83 (1.06–3.17)*	2.70 (1.35–5.39)*	1.46 (0.71–3.02)	1.78 (1.39–2.28)**
Overweight (≥25 and <30)	0.74 (0.61–0.89)*	0.91 (0.76–1.10)	1.28 (1.02–1.59)*	1.15 (0.89–1.50)	0.93 (0.84–1.03)
Obese (≥30)	1.63 (1.33–2.00)**	1.34 (1.10–1.63)*	2.00 (1.59–2.51)**	1.59 (1.17–2.15)*	1.52 (1.36–1.69)**
Not stated	1.35 (1.05–1.75)*	1.32 (0.97–1.79)	1.81 (1.28–2.56)*	1.67 (1.17–2.38)*	1.41 (1.21–1.65)**
Risk of harm from alcohol in the long-term					
Nondrinker/low risk	1.00	1.00	1.00	1.00	1.00
Risky/High risk	1.30 (0.95–1.77)	1.46 (1.06–2.02)*	1.65 (1.14–2.38)*	0.83 (0.39–1.78)	1.43 (1.19–1.72)**

* $p < 0.05$; ** $p < 0.001$

Table 4 Multivariable odds ratios (95% CI) for variables associated with psychological distress, by age group, South Australian Monitoring and Surveillance System, 2002–2007

	18–34 years	35–49 years	50–64 years	65 years and over	Overall
Age group (years)					
65 and over	–	–	–	–	1.00
50–64	–	–	–	–	1.96 (1.66–2.31)**
35–49	–	–	–	–	2.46 (2.03–2.98)**
18–34	–	–	–	–	3.44 (2.82–4.20)**
Arthritis					
No	1.00	1.00	1.00	1.00	1.00
Yes	2.27 (1.64–3.16)**	2.05 (1.67–2.52)**	1.43 (1.17–1.74)**	1.58 (1.24–2.02)**	1.70 (1.52–1.91)**
Asthma					
No	–	–	1.00	1.00	1.00
Yes	–	–	1.44 (1.11–1.87)*	1.91 (1.42–2.56)**	1.32 (1.17–1.48)**
Cardiovascular disease					
No	–	1.00	1.00	1.00	1.00
Yes	–	2.06 (1.33–3.19)*	1.49 (1.11–2.00)*	1.37 (1.07–1.75)*	1.49 (1.26–1.76)**
Diabetes					
No	–	–	–	–	1.00
Yes	–	—	–	–	1.28 (1.08–1.51)*

Table 4 continued

	18–34 years	35–49 years	50–64 years	65 years and over	Overall
Osteoporosis					
No	–	–	1.00	–	1.00
Yes	–	–	1.45 (1.02–2.06)*	–	1.28 (1.05–1.57)*
Mental health condition					
No	1.00	1.00	1.00	1.00	1.00
Yes	7.19 (6.09–8.48)**	7.56 (6.37–8.97)**	9.66 (7.95–11.74)**	10.79 (8.49–13.71)**	8.10 (7.38–8.89)**
Sex					
Male	1.00	–	1.00	–	1.00
Female	1.40 (1.19–1.65)**	–	1.43 (1.15–1.78)*	–	1.23 (1.11–1.35)**
Country of birth					
Australia	1.00	1.00	1.00	1.00	1.00
United Kingdom/Ireland	0.63 (0.38–1.05)	1.00 (0.70–1.31)	1.13 (0.85–1.50)	1.35 (1.00–1.83)	1.05 (0.90–1.23)
Other	1.64 (1.25–2.13)**	1.44 (1.18–2.01)*	1.98 (1.54-2.53)**	1.84 (1.34–2.54)**	1.76 (1.54–2.01)**
Marital status					
Married/living with partner	–	1.00	–	–	1.00
Separated/divorced/ widowed/never married	–	1.57 (1.28–1.92)**	–	–	1.14 (1.02–1.27)*
Aboriginal or Torres Strait Islander					
No	–	1.00	–	–	–
Yes	–	2.42 (1.21–4.81)*	–	–	–
Family structure					
Family with child(ren) and both biological parents	1.00	–	1.00	–	1.00
Step/blended family, sole parent, shared care parenting	1.38 (1.10–1.73)*	–	1.01 (0.65–1.57)	–	1.25 (1.07–1.46)*
Adult living alone or with partner, no children	0.85 (0.69–1.06)	–	0.64 (0.50–0.82)**	–	0.97 (0.86–1.10)
Related or unrelated adults living together	1.14 (0.91–1.44)	–	0.80 (0.57–1.14)	–	1.11 (0.94–1.31)
Other/Not stated	2.66 (1.32–5.33)*	–	0.95 (0.34–2.63)	–	1.34 (0.81–2.20)
Highest level of education					
Secondary or less	1.00	1.00	1.00	1.00	1.00
Trade/certificate/diploma	0.85 (0.70–1.03)	0.67 (0.55–0.82)**	0.84 (0.66–1.06)	0.84 (0.63–1.14)	0.81 (0.72–0.90)**
Degree or higher	0.65 (0.52–0.81)**	0.65 (0.52–0.82)**	0.62 (0.47–0.83)*	0.41 (0.24–0.71)*	0.64 (0.56–0.73)**
Gross annual household income					
More than $20,000	1.00	1.00	1.00	1.00	1.00
$20,000 or less	1.89 (1.42–2.52)**	2.42 (1.85–3.15)**	2.27 (1.78–2.90)**	1.30 (1.01–1.68)*	1.86 (1.63–2.13)**
Not stated	0.86 (0.70–1.05)	1.70 (1.30–2.23)**	1.63 (1.23–2.15)*	0.71 (0.45–1.14)	1.11 (0.97–1.27)
Smoking status					
Nonsmoker	1.00	1.00	1.00	1.00	1.00
Ex-smoker	1.09 (0.90–1.33)	1.20 (0.97–1.47)	1.20 (0.96–1.49)	1.00 (0.78–1.29)	1.16 (1.04–1.29)*
Current smoker	1.44 (1.19–1.73)**	1.71 (1.38–2.11)**	1.85 (1.42–2.41)**	1.54 (1.02–2.32)*	1.65 (1.46–1.85)**
Body mass index (kg/m^2)					
Acceptable ($\geq$18.5 and $<$25)	1.00	–	1.00	–	1.00
Underweight ($<$18.5)	1.20 (0.83–1.74)	–	2.44 (1.11–5.39)*	–	1.32 (1.00–1.74)
Overweight ($\geq$25 and $<$30)	0.80 (0.66–0.98)*	–	1.43 (1.11–1.84)*	–	1.02 (0.91–1.14)
Obese ($\geq$30)	1.40 (1.12–1.76)*	–	1.49 (1.14–1.94)*	–	1.24 (1.09–1.40)*
Not stated	1.19 (0.89–1.59)	–	1.64 (1.10–2.42)*	–	1.28 (1.08–1.52)*

Table 4 continued

	18–34 years	35–49 years	50–64 years	65 years and over	Overall
Risk of harm from alcohol in the long-term					
Nondrinker/low risk	–	–	1.00	–	–
Risky/High risk	–	–	1.75 (1.14–2.69)*	–	–

Dash indicates variables not included in model

* $p < 0.05$; ** $p < 0.001$

representative, with few health or socioeconomic differences found between those with and without a listed number (Dal Grande et al. 2005; Taylor et al. 1998).

It is also acknowledged that there is an impact on health-related quality of life and limitations in daily activities which are associated with chronic conditions. While their impact is not assessed within this study, these factors may also act as mediators for psychological distress with their impact differing according to age group.

Findings from this study suggest that people of all ages with arthritis, and older age groups with asthma, cardiovascular disease, or osteoporosis, should be assessed for PD when they present to a clinical setting. Young people, migrants, current smokers, and people experiencing socioeconomic disadvantage are also groups who are more likely to experience PD.

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