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# Social determinants and psychological distress among Aboriginal and Torres Strait islander adults in the Australian state of Victoria: A cross-sectional population based study



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## ABSTRACT

Aboriginal and Torres Strait Islander adults in the Australian state of Victoria have a higher prevalence of psychological distress than their non-Aboriginal and Torres Strait Islander counterparts. We sought to explain this inequality, focussing on the social determinants of health. We used population-based survey data from the 2008 Victorian Population Health Survey; a cross-sectional landline computer-assisted telephone survey of 34,168 randomly selected adults. We defined psychological distress as a score of 22 or more on the Kessler 10 Psychological Distress scale. We used logistic regression to identify socio-demographic characteristics and social capital indicators that were associated with psychological distress. We then created multivariable models to explore the association between psychological distress and Aboriginal and Torres Strait Islander status that incorporated all significant socioeconomic status (SES) and social capital variables, adjusting for all non-SES socio-demographic characteristics. Aboriginal and Torres Strait Islander Victorians (24.5%) were more than twice as likely than their non-Aboriginal and Torres Strait Islander counterparts (11.3%) to have psychological distress (odds ratio (OR) = 2.56, 95% confidence interval; 1.67–3.93). Controlling for SES, negative perceptions of the residential neighbourhood, lack of social support from family, social and civic distrust, and all non-SES socio-demographic variables (age, sex, marital status, household composition, and rurality), rendered the previously statistically significant inequality in the prevalence of psychological distress, between Aboriginal and Torres Strait Islander Victorians and their non-Aboriginal and Torres Strait Islander counterparts, insignificant at the  $p = 0.05$  level (OR = 1.50; 0.97–2.32). Psychological distress is an important health risk factor for Aboriginal and Torres Strait Islander adults that has yet to be widely acknowledged and addressed. Addressing the underlying inequalities in SES and social capital may be the key to addressing the inequality in psychological distress.

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## 1. Background

Psychological distress is an important incident and/or secondary risk factor for a number of diseases and conditions including: fatigue, migraine, cardiovascular disease, chronic obstructive

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pulmonary disease, cerebrovascular disease, injury, obesity, and depression and anxiety (Andrews and Slade, 2001; Hamer et al., 2012; Holden et al., 2010; Stansfeld et al., 2002). Moreover, psychological distress is associated with a higher risk of mortality, even after adjusting for potential confounders such as socioeconomic status (SES) (Pratt, 2009). Psychological distress is also a significant risk factor for the lifestyle risk factors of smoking, excessive consumption of alcohol, and drug use (Holden et al., 2010). Therefore, the evidence shows that psychological distress impacts negatively on health both directly and indirectly.

Aboriginal and Torres Strait Islander Australians have consistently been shown to have a higher prevalence of psychological

distress than their non-Aboriginal and Torres Strait Islander counterparts; ranging from 50% to three times higher (Jorm et al., 2012). In the state of Victoria, the age-adjusted prevalence of psychological distress among Aboriginal and Torres Strait Islander adults was 22.0%, compared with 11.3% of non-Aboriginal and Torres Strait Islander adults (Markwick et al., 2011). The 2004–05 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) collected additional data on the impact and cause of psychological distress. Over half of those with psychological distress reported not always being able to carry out their normal daily activities, one-third had consulted a health professional about their distress, and 41% reported that their distress had nothing to do with their physical health (Cunningham and Paradies, 2012).

It is important to remember that the Aboriginal and Torres Strait Islander population of Australia is not a homogeneous group, as there are significant linguistic, cultural and experiential differences, based on geographic location (Australian museum, 2014). For

example, the Northern Territory has the highest proportion of Aboriginal and Torres Strait Islander people (27%), many of whom live in remote communities. By contrast, the Aboriginal and Torres Strait Islander population of the state of Victoria constitutes less than 1% of the total state population, is more widely dispersed across the state, and there are no remote communities (Australian Bureau of Statistics, 2012). Yet the majority of studies of Aboriginal and Torres Strait Islander health and wellbeing were conducted in either remote or rural communities, or using the national datasets which masks regional differences (Biddle, 2014). It cannot be assumed that the health and the determinants of the health of Aboriginal and Torres Strait Islander peoples are the same across the country.

Life stressors have been shown to be causally related to psychological distress with the individual's psychological resources and resources in the social environment (social capital) mediating or moderating the impact of life stressors on psychological distress

**Table 1**  
Psychological distress by socio-demographic characteristics in Victoria: Univariable analysis.

Socio-demographic characteristic	Psychological distress (K10 $\geq$ 22) <sup>a</sup>		Univariable analysis	
	N <sup>b</sup>	Weighted % (95% CI)	Crude odds ratio (95% CI)	p value
<b>Non-Aboriginal</b>	3778	11.3 (10.7–11.8)	1.00	
Aboriginal	80	24.5 (17.5–33.2)	2.56 (1.67–3.93)	<0.001
<b>18–24 years</b>	244	14.3 (12.2–16.6)	1.00	
25–34 years	436	12.5 (11.0–14.1)	0.85 (0.68–1.08)	0.181
35–44 years	718	10.4 (9.4–11.5)	0.70 (0.56–0.87)	0.001
45–54 years	880	12.3 (11.2–13.5)	0.84 (0.68–1.04)	0.109
55–64 years	834	10.7 (9.7–11.8)	0.72 (0.58–0.89)	0.002
65 + years	766	9.0 (8.1–9.9)	0.59 (0.48–0.73)	<0.001
<b>Male</b>	1283	9.7 (8.9–10.6)	1.00	
Female	2595	13.0 (12.3–13.8)	1.39 (1.24–1.56)	<0.001
<b>Married or living with a partner</b>	2001	9.0 (8.5–9.6)	1.00	
Not married or living with a partner	1849	16.2 (15.0–17.4)	1.94 (1.74–2.17)	<0.001
<b>Household without a child</b>	2589	11.6 (10.9–12.3)	1.00	
Household with a child	1271	11.0 (10.1–11.9)	0.94 (0.84–1.05)	0.279
Not a lone parent of a child	3464	10.9 (10.4–11.5)	1.00	
Lone parent of a child	392	22.9 (20.0–26.2)	2.43 (2.02–2.93)	<0.001
Household size <sup>c</sup>	3878	–	1.00 (1.00–1.00)	0.001
<b>One person household</b>	973	14.3 (13.2–15.5)	1.00	
Two person household	1278	10.2 (9.5–11.1)	0.68 (0.60–0.78)	<0.001
Three person household	626	12.6 (11.4–13.9)	0.86 (0.74–1.01)	0.059
Four person household	553	10.1 (9.0–11.4)	0.68 (0.58–0.79)	<0.001
Five people or more in household	418	12.2 (10.6–13.9)	0.83 (0.69–1.00)	0.045
<b>Resides in metropolitan Victoria</b>	1619	11.5 (10.9–12.2)	1.00	
Resides in rural Victoria	2259	11.1 (10.3–12.0)	0.96 (0.87–1.07)	0.476
<b>Socioeconomic status</b>				
<b>Household income<sup>c</sup></b>	3333	–	1.39 (1.34–1.45)	<0.001
Greater than \$80,000	424	6.2 (5.4–7.1)	1.00	
\$60,001–\$80,000	319	9.6 (8.2–11.1)	1.60 (1.28–2.00)	<0.001
\$40,001–\$60,000	525	12.4 (11.0–14.0)	2.13 (1.74–2.61)	<0.001
\$20,001–\$40,000	967	15.0 (13.7–16.4)	2.66 (2.22–3.19)	<0.001
\$20,000 or less	1098	21.4 (19.5–23.4)	4.11 (3.41–4.95)	<0.001
<b>Employed</b>	1650	9.2 (8.5–9.9)	1.00	
Unemployed	235	23.6 (19.6–28.2)	3.06 (2.38–3.93)	<0.001
Not in labour force	1968	13.9 (13.0–14.8)	1.60 (1.43–1.78)	<0.001
<b>Completed tertiary education</b>	725	7.5 (6.8–8.4)	1.00	
Completed secondary education	539	11.0 (9.7–12.4)	1.52 (1.27–1.81)	<0.001
Completed TAFE <sup>d</sup>	901	12.8 (11.6–14.1)	1.79 (1.53–2.10)	<0.001
Completed primary education or less	1665	15.1 (14.0–16.2)	2.18 (1.89–2.50)	<0.001
<b>Owned a home or mortgage</b>	2820	10.3 (9.8–10.9)	1.00	
Rented a home	1022	15.5 (14.2–17.0)	1.59 (1.41–1.81)	<0.001
<b>No financial stress</b>	2603	9.2 (8.7–9.7)	1.00	
Financial stress	1144	27.0 (24.9–29.3)	3.66 (3.22–4.17)	<0.001
<b>Food secure</b>	3077	9.8 (9.3–10.4)	1.00	
Food insecure	792	38.6 (35.0–42.3)	5.76 (4.88–6.80)	<0.001

95% CI = 95% confidence interval.

<sup>a</sup> K10 = Kessler 10 Psychological Distress Scale.

<sup>b</sup> N = raw unweighted sample size; however, prevalence and prevalence odds ratio estimates are based on weighted data.

<sup>c</sup> Continuous variable.

<sup>d</sup> TAFE = Technical And Further Education; with or without completion of secondary education.

(Ensel and Lin, 1991). For example, a lack of adequate social support and connections has consistently been linked to depressive symptoms (Kawachi and Berkman, 2001). Aboriginal and Torres Strait Islander Australians are more likely than their non-Aboriginal and Torres Strait Islander counterparts to suffer major life stressors, such as the premature death of a family member, being a victim of crime, and racism at the personal, societal, and institutional level (Australian Institute of Health and Welfare, 2011; Ferdinand et al., 2012; Henry et al., 2004). Therefore, the higher prevalence of psychological distress among Aboriginal and Torres Strait Islander Australians may be explained by a greater frequency of life stressors and/or the unique nature of particular life stressors to this population, for example, being a victim of racism and discrimination. In addition, deficits in social capital may reduce the ability to cope with life stressors, resulting in a higher prevalence of psychological distress.

While there is no universally agreed definition of social capital, the 'social cohesion approach' defines social capital by its function: the trustworthiness of the social environment makes possible reciprocity exchanges, norms and sanctions (Bird et al., 2010).

Social capital is broken down into three types: bonding, bridging, and linking. In the context of Aboriginal and Torres Strait Islander communities, bonding social capital refers to relationships within the Aboriginal and Torres Strait Islander community, bridging social capital to relationships between the Aboriginal and Torres Strait Islander and non-Aboriginal and Torres Strait Islander communities, and linking social capital to relationships between the Aboriginal and Torres Strait Islander community and the formal institutions of power (Mignone, 2009). Of the few studies that have investigated social capital among Aboriginal and Torres Strait Islander people in Australia, the majority are qualitative and focussed on rural or remote Aboriginal and Torres Strait Islander communities. These studies reported high levels of bonding social capital but low levels of bridging and linking social capital (Brough et al., 2006; Browne-Yung et al., 2013; Thorpe et al., 2013). Although Berry (2009) and Biddle (2012) did not distinguish between the three types of social capital, they both showed that low levels of social capital were associated with psychological distress and sadness among Aboriginal and Torres Strait Islander people (Berry, 2009; Biddle, 2012).

**Table 2**  
Psychological distress by social capital in Victoria: Univariable analysis.

Social capital	Psychological distress (K10 $\geq$ 22) <sup>a</sup>		Univariable analysis	
	N <sup>b</sup>	Weighted % (95% CI)	Crude OR (95% CI)	p value
<b>Social environment</b>				
<b>Social contact</b>				
10 or more people	1383	8.7 (8.0–9.4)	1.00	
5 to 9 people	1113	12.4 (11.4–13.5)	1.49 (1.30–1.70)	<0.001
Less than 5 people	1370	16.5 (15.3–17.8)	2.08 (1.83–2.37)	<0.001
<b>Neighbourhood tenure</b>				
More than 10 years	1952	10.7 (10.0–11.5)	1.00	
6 to 10 years	763	11.3 (10.2–12.6)	1.06 (0.92–1.22)	0.430
1 to 5 years	834	11.5 (10.4–12.7)	1.08 (0.94–1.24)	0.262
Less than 1 year	316	15.4 (13.1–18.1)	1.52 (1.23–1.86)	<0.001
<b>Perception of neighbourhood</b>				
Average, good or very good	1964	9.3 (8.7–10.0)	1.00	
Poor for 1 of 6 characteristics	357	15.6 (13.4–18.2)	1.80 (1.48–2.20)	<0.001
Poor for 2 of 6 characteristics	215	19.0 (15.3–23.4)	2.29 (1.74–3.01)	<0.001
Poor for 3 of 6 characteristics	162	25.1 (19.8–31.2)	3.26 (2.39–4.46)	<0.001
Poor for 4 to 6 characteristics	203	28.1 (22.6–34.3)	3.80 (2.81–5.14)	<0.001
<b>Social support</b>				
<b>Able to get help from family</b>				
Unable to get help from family	731	24.0 (21.5–26.6)	2.71 (2.32–3.15)	<0.001
<b>Able to get help from neighbours</b>				
Unable to get help from neighbours	1334	18.5 (17.2–20.0)	2.32 (2.07–2.60)	<0.001
<b>Able to get help from friends</b>				
Unable to get help from friends	516	28.7 (25.4–32.2)	3.43 (2.87–4.10)	<0.001
<b>Able to get help<sup>c</sup></b>				
Unable to get help from 1 of 3 <sup>c</sup>	1102	15.4 (14.1–16.8)	2.00 (1.77–2.27)	<0.001
Unable to get help from 2 of 3 <sup>c</sup>	424	27.6 (24.2–31.3)	4.19 (3.46–5.07)	<0.001
Unable to get help from 3 of 3 <sup>c</sup>	192	39.0 (31.8–46.7)	7.02 (5.08–9.71)	<0.001
<b>Social and civic trust</b>				
<b>Feel safe</b>				
Don't feel safe	1306	17.8 (16.5–19.2)	2.03 (1.81–2.27)	<0.001
<b>Trust most people</b>				
Do not trust most people	1303	20.7 (19.1–22.3)	2.62 (2.33–2.95)	<0.001
<b>Valued by society</b>				
Not valued by society	1243	27.5 (25.4–29.7)	3.79 (3.35–4.30)	<0.001
<b>Opportunities to have a say</b>				
No opportunities to have a say	1444	17.8 (16.5–19.2)	2.09 (1.87–2.35)	<0.001
<b>Positive for civic and social trust<sup>d</sup></b>				
Negative for 1 of 4 <sup>d</sup>	930	11.2 (10.2–12.4)	1.82 (1.57–2.12)	<0.001
Negative for 2 of 4 <sup>d</sup>	779	20.2 (18.3–22.2)	3.64 (3.10–4.27)	<0.001
Negative for 3 of 4 <sup>d</sup>	456	30.6 (27.0–34.4)	6.35 (5.19–7.76)	<0.001
Negative for ALL <sup>d</sup>	211	42.2 (36.0–48.7)	10.53 (7.94–13.97)	<0.001

OR = odds ratio, 95% CI = 95% confidence interval.

<sup>a</sup> K10 = Kessler 10 Psychological Distress Scale.

<sup>b</sup> N = raw unweighted sample size; however, prevalence and prevalence odds ratio estimates are based on weighted data.

<sup>c</sup> Composite variable; help from family, neighbours and/or friends.

<sup>d</sup> Composite variable; feel safe, trust people, feel valued by society, and/or have opportunities to have a say.

SES is also strongly associated with psychological distress, where people of low SES consistently have higher levels of psychological distress compared with people of high SES (Phongsavan et al., 2006). Aboriginal and Torres Strait Islander people continue to be a severely socially and economically disadvantaged population in Australia. Therefore, it is possible that the higher prevalence of psychological distress reflects, at least in part, the lower SES of Aboriginal and Torres Strait Islander Australians.

The purpose of this study was to explain the higher prevalence of psychological distress among Aboriginal and Torres Strait Islander adults, compared with their non-Aboriginal and Torres Strait Islander counterparts, in the state of Victoria. However, in the absence of data relating to specific life stressors, but with a dataset rich in socio-demographic and social capital data, we decided to focus on the role of SES and social capital. We aimed to: (1) determine if various socio-demographic characteristics and measures of social capital were associated with psychological distress, (2) investigate the individual impact of each socio-demographic characteristic and measure of social capital on the association between psychological distress and Aboriginal and Torres Strait Islander status, and (3) determine if SES and social capital explained, at least in part, this association, after controlling for all non-SES socio-demographic characteristics.

For ease of reading, but not to take away from their distinct ethnic identities, we will use 'Aboriginal' to refer to both Aboriginal and Torres Strait Islander Victorians in the remainder of the paper.

## 2. Methods

### 2.1. Data source

Data were collected as part of the Victorian Population Health Survey (VPHS) in 2008; a cross-sectional, state-wide, landline computer-assisted telephone interview survey conducted to

provide information on the health and well-being of Victorians (Markwick et al., 2011).

### 2.2. Study design and sample size

The primary sampling unit was an individual aged 18 years and older who lived in a private dwelling, randomly selected across the state of Victoria using random digit dialling, and stratified by Local Government Area (LGA). The person in the household with the most recent birthday was selected for interview. The survey sample was stratified by Local Government Area (LGA), of which there are 79 in the state of Victoria, with a target sample size of 426 individuals per LGA. The total sample achieved was 34,168 completed interviews, including 339 Aboriginal respondents. The response rate, defined as the proportion of households where contact was made and an interview completed, was 65%.

### 2.3. Weighting

In order to control for participation bias, the survey data were weighted to reflect the age/sex/geographic distribution of the estimated resident population of Victoria and the probability of selection of the household and respondent within the household. The data were not weighted for ethnicity as this was not part of the original study design, which was to provide prevalence estimates for the whole population by LGA.

### 2.4. Ethics statement

The Department of Health Human Research Ethics Committee approved the survey in accordance with the guidelines of the Declaration of Helsinki.

**Table 3**

Individual impact of socio-demographic characteristics and social capital on the association between psychological distress and Aboriginal status: bivariable analysis.

Secondary independent variables	Adjusted odds ratio <sup>a</sup> (95% CI)			% change from crude OR
	Non-Aboriginal	Aboriginal	p value	
<b>Socio-demographic characteristics</b>	<b>1.0</b>	<b>2.46 (1.61–3.77)</b>	<b>&lt;0.001</b>	<b>4%</b>
Age	1.0	2.48 (1.62–3.81)	<0.001	3%
Sex	1.0	2.59 (1.68–4.00)	<0.001	–1%
Unmarried or not living with a partner	1.0	2.45 (1.60–3.75)	<0.001	4%
Household with a child	1.0	2.58 (1.68–3.96)	<0.001	–1%
Lone parenthood	1.0	2.57 (1.67–3.95)	<0.001	0%
Household size	1.0	2.52 (1.64–3.86)	<0.001	2%
Geographic location (rurality)	1.0	2.57 (1.67–3.95)	<0.001	0%
<b>Socioeconomic status (SES)</b>	<b>1.0</b>	<b>1.71 (1.15–2.56)</b>	<b>0.008</b>	<b>33%</b>
Total annual household income	1.0	2.30 (1.52–3.47)	<0.001	10%
Employment status	1.0	2.41 (1.58–3.67)	<0.001	6%
Level of educational attainment	1.0	2.44 (1.60–3.73)	<0.001	5%
Lack of home ownership (wealth)	1.0	2.31 (1.51–3.52)	<0.001	10%
Financial stress	1.0	2.32 (1.48–3.65)	<0.001	9%
Food insecurity	1.0	1.90 (1.29–2.80)	0.001	26%
<b>Social environment</b>	<b>1.0</b>	<b>2.26 (1.53–3.33)</b>	<b>&lt;0.001</b>	<b>12%</b>
Low social contact	1.0	2.54 (1.67–3.85)	<0.000	1%
Short neighbourhood tenure	1.0	2.44 (1.61–3.70)	<0.001	5%
Perception of neighbourhood as poor or very poor	1.0	2.38 (1.59–3.57)	<0.001	7%
<b>Social support</b>	<b>1.0</b>	<b>2.50 (1.63–3.85)</b>	<b>&lt;0.001</b>	<b>2%</b>
Inability to get help from family	1.0	2.37 (1.51–3.71)	<0.001	7%
Inability to get help from neighbours	1.0	2.53 (1.66–3.85)	<0.001	1%
Inability to get help from friends	1.0	2.68 (1.74–4.14)	<0.001	–5%
<b>Civic and social trust</b>	<b>1.0</b>	<b>2.23 (1.47–3.37)</b>	<b>&lt;0.001</b>	<b>13%</b>
Did not feel safe walking alone down street after dark	1.0	2.49 (1.60–3.86)	<0.001	3%
Did not agree most people can be trusted	1.0	2.40 (1.60–3.63)	<0.001	6%
Did not feel valued by society	1.0	2.40 (1.59–3.63)	<0.001	6%
Did not believe there are opportunities to have a say	1.0	2.44 (1.58–3.76)	<0.001	5%

95% CI = 95% confidence interval.

<sup>a</sup> Crude odds ratio (OR) = 2.56 (1.67–3.93).

**Table 4**  
Individual impact of socioeconomic status (SES) and social capital on the association between psychological distress and Aboriginal status, after controlling for non-SES socio-demographic characteristics<sup>a</sup>: multivariable analysis.

Secondary independent variables	Adjusted odds ratio <sup>b</sup> (95% CI)			% change from crude OR
	Non-Aboriginal	Aboriginal	p value	
<b>Socioeconomic status (SES)</b>	<b>1.0</b>	<b>1.68 (1.13–2.51)</b>	<b>0.010</b>	<b>34%</b>
Total annual household income	1.0	2.12 (1.40–3.20)	<0.001	17%
Employment status	1.0	2.26 (1.50–3.41)	<0.001	12%
Level of educational attainment	1.0	2.27 (1.50–3.44)	<0.001	11%
Lack of home ownership (wealth)	1.0	2.32 (1.52–3.53)	<0.001	9%
Financial stress	1.0	2.25 (1.43–3.56)	<0.001	12%
Food insecurity	1.0	1.90 (1.29–2.82)	0.001	26%
<b>Social environment</b>	<b>1.0</b>	<b>2.19 (1.48–3.26)</b>	<b>&lt;0.001</b>	<b>14%</b>
Low social contact	1.0	2.40 (1.58–3.64)	<0.000	6%
Short neighbourhood tenure	1.0	2.39 (1.58–3.61)	<0.001	7%
Perception of neighbourhood as poor or very poor	1.0	2.31 (1.54–3.46)	<0.001	10%
<b>Social support</b>	<b>1.0</b>	<b>2.45 (1.59–3.77)</b>	<b>&lt;0.001</b>	<b>4%</b>
Inability to get help from family	1.0	2.31 (1.49–3.6)	<0.001	10%
Inability to get help from neighbours	1.0	2.47 (1.62–3.76)	<0.001	3%
Inability to get help from friends	1.0	2.57 (1.66–3.96)	<0.001	0%
<b>Civic and social trust</b>	<b>1.0</b>	<b>2.12 (1.41–3.21)</b>	<b>&lt;0.001</b>	<b>17%</b>
Did not feel safe walking alone down street after dark	1.0	2.34 (1.52–3.61)	<0.001	8%
Did not agree most people can be trusted	1.0	2.31 (1.55–3.46)	<0.001	10%
Did not feel valued by society	1.0	2.31 (1.53–3.49)	<0.001	10%
Did not believe there are opportunities to have a say	1.0	2.36 (1.54–3.62)	<0.001	8%

95% CI = 95 per cent confidence interval.

<sup>a</sup> The non-SES socio-demographic characteristics controlled for included age, sex, marital status, presence of a child in the household, household size, lone parenthood, and geographic location (rurality).

<sup>b</sup> Crude odds ratio (OR) = 2.56 (1.67–3.93).

## 2.5. Variables

Psychological distress was the outcome variable and was measured using the Kessler 10 Psychological Distress Scale (K10), that has been validated against the Australian population (Andrews and Slade, 2001). The K10 consists of 10 questions that are summed to yield scores ranging from 10 to 50. We defined psychological

distress as a K10 score of 22 or more. The reference group consisted of those who scored less than 22.

Aboriginal status was the primary independent variable of interest, and was determined by asking the question “Are you of Aboriginal or Torres Strait Islander origin?” Respondents who stated that they were Aboriginal (n = 258), Torres Strait Islander (n = 40) or both (n = 41) were combined. Non-indigenous

**Table 5**  
Impact of socioeconomic status (SES) and social capital on the association between psychological distress and Aboriginal status, controlled for non-SES socio-demographic characteristics: final multivariable models.

Multivariable model <sup>a</sup>	Adjusted odds ratio <sup>b</sup> (95% CI)			Social determinants in model
	Non-Aboriginal	Aboriginal	p value	
(1) Variables that changed crude OR by 7% or more <sup>c</sup>	1.0	1.50 (0.97–2.33)	0.070	Six SES variables, neighbourhood tenure, perception of neighbourhood, inability to get help from family, and all four social and civic trust variables.
(2) Variables that changed crude OR by 8% or more <sup>d</sup>	1.0	1.52 (0.98–2.34)	0.062	Six SES variables, perception of neighbourhood, inability to get help from family, and all four social and civic trust variables.
(3) Variables that changed crude OR by 9% or more <sup>e</sup>	1.0	1.53 (0.99–2.35)	0.055	Six SES variables, perception of neighbourhood, inability to get help from family, and one social trust <sup>f</sup> and one civic trust variable <sup>f</sup> .
(4) Variables that changed crude OR by 10% or more <sup>g</sup>	1.0	1.50 (0.97–2.32)	0.066	Five of six SES variables <sup>h</sup> , perception of neighbourhood, inability to get help from family, and one social trust <sup>f</sup> and one civic trust variable <sup>f</sup> .
(5) Variables that changed crude OR by 11% or more <sup>i</sup>	1.0	1.66 (1.11–2.47)	0.013	Five of six SES variables <sup>h</sup> .
(6) Variables that changed crude OR by 12% or more <sup>j</sup>	1.0	1.70 (1.14–2.54)	0.010	Four of six SES variables <sup>k</sup> .

OR = odds ratio, 95% CI = 95 per cent confidence interval.

<sup>a</sup> Every model was adjusted for all non-SES socio-demographic characteristics: age, sex, marital status, household with a child, household size, lone parenthood, and rurality.

<sup>b</sup> Crude OR = 2.56 (1.67–3.93).

<sup>c</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 0.83$ ,  $p = 0.59$ ;  $\chi^2_{LR}(4) = 6.43$ ,  $p = 0.17$ ; area under ROC curve = 0.75.

<sup>d</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 0.84$ ,  $p = 0.58$ ;  $\chi^2_{LR}(4) = 123.5$ ,  $p < 0.001$ ; area under ROC curve = 0.75.

<sup>e</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 0.97$ ,  $p = 0.46$ ;  $\chi^2_{LR}(2) = 1.44$ ,  $p = 0.49$ ; area under ROC curve = 0.75.

<sup>f</sup> Included distrust of most people and not feeling valued by society.

<sup>g</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 1.05$ ,  $p = 0.40$ ;  $\chi^2_{LR}(11) = 847.2$ ,  $p < 0.001$ ; area under ROC curve = 0.75.

<sup>h</sup> Included household income, employment status, education, financial stress and food insecurity.

<sup>i</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 0.92$ ,  $p = 0.50$ ;  $\chi^2_{LR}(13) = 848.7$ ,  $p < 0.001$ ; area under ROC curve = 0.71.

<sup>j</sup> Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 1.20$ ,  $p = 0.29$ ;  $\chi^2_{LR}(4) = 68.2$ ,  $p < 0.001$ ; area under ROC curve = 0.71.

<sup>k</sup> Included household income, employment status, financial stress and food insecurity.



Victorians constituted the reference group.

## 2.6. Socio-demographic variables

The socio-demographic variables that we investigated (Table 1) included: age, sex, marital status, household composition (presence of a child in a household, lone parenthood, and household size), geographic location (rural Victoria or metropolitan Melbourne), and six indicators of SES (total annual household income, employment status, education, home ownership, financial stress, and food insecurity). Total annual household income included income before tax from all sources such as social security payments, child support, and investments over the previous 12 months. We defined financial stress as being unable to raise \$2000 within 2 days in an emergency, and food insecurity as a response in the affirmative to the question: “In the last 12 months, were there any times that you ran out of food, and couldn't afford to buy more?”

## 2.7. Social capital

We measured three domains of social capital (Table 2): (1) the social environment (social contact, neighbourhood tenure, and perception of the residential neighbourhood); (2) social support (ability to get help from family, neighbours and friends); and (3) social and civic trust.

We measured social contact by asking how many people the respondent had spoken with on the previous day, neighbourhood tenure by asking how long the respondent had lived in their neighbourhood, and perception of the residential neighbourhood by asking a series of six questions, creating a composite variable based on the number of negative answers. The six questions were “How would you rate the area in which you live for (1) easy access to recreational and leisure facilities such as parks, bike tracks and recreational areas? (2) good facilities and services such as shops, childcare, schools and libraries, (3) opportunities to volunteer in local groups, (4) a wide range of community and support groups, (5) being an active community where people do things and get involved in local issues and activities, and (6) being a pleasant environment with nice streets, well planned, and open spaces?”

We assessed social trust by asking two questions: “Do you feel safe walking alone down your street after dark?” and “Do you agree that most people can be trusted?”, and civic trust by asking two questions: “Do you feel valued by society?” and “Do you feel there are opportunities to have a real say on issues that are important to you?”

## 2.8. Missing data (unweighted)

Less than 5% of respondents refused to answer or were unable to answer the survey questions for all variables; with the exception of, total annual household income (15%), perception of neighbourhood (22%), feeling safe walking down street alone after dark (7%), and feeling valued by society (6%). Missing data was excluded from the analysis in the case of the outcome variable, but retained as a category for all independent variables.

## 2.9. Statistical analysis

We analysed the survey data using the Stata statistical software package version 12 (StataCorp, 2011a) and used the following steps to analyse the data:

- 1 Univariable logistic regression to identify independent variables that were significantly associated with psychological distress (Tables 1 and 2).

- 2 Bivariable logistic regression to investigate the impact of each significant independent variable on the association between psychological distress and Aboriginal status (Table 3).
- 3 Multivariable logistic regression to further investigate the impact each independent variable had on the association between psychological distress and Aboriginal status, controlling for all non-SES socio-demographic characteristics which were treated as nuisance variables (Table 4).
- 4 Posited that any SES or social capital variable that confounded the association between psychological distress and Aboriginal status was a potential explanatory variable, independent of non-SES socio-demographic characteristics. We determined confounding by comparing the crude odds ratio (OR) of the association between psychological distress and Aboriginal status with the adjusted OR when each variable was included in the model (McNamee, 2003).
- 5 Given that there is no universally agreed threshold degree of change that distinguishes between an important confounder and one that is not, we fitted six multivariable models based on the percentage degree of change that each variable made to the crude OR (Table 5). For example, the first model only included variables that reduced the crude OR by 7% or more, the second model only included those that reduced the crude OR by 8%, and so forth. If the association between psychological distress and Aboriginal status was then rendered statistically insignificant, we judged the model to largely explain the association. We use the term “largely” rather than “fully” in recognition of the fact that any p-value used to declare statistical insignificance is essentially arbitrary. Therefore, one cannot rule out that other variables may still contribute to explaining the association.

We determined statistical significance at the  $p < 0.05$  level. We tested for interaction by fitting interaction terms between the main independent variable of interest (Aboriginal status) and all factors that were found to be statistically significantly associated with psychological distress. There was no evidence of interaction.

We evaluated the adequacy of the final models using the Hosmer–Lemeshow goodness-of-fit test developed specifically for complex survey data (Archer et al., 2007). However, in the absence of any other diagnostic tests using complex survey data, it is suggested that diagnostic evaluation also be based on those available for ordinary logistics regression (Hosmer et al., 2013). These included the likelihood ratio chi square test ( $\chi^2_{LR}$ ) and area under the receiver operating characteristics (ROC) curve.

We used the STATA survey (svy) commands which were designed specifically for analysing data from surveys. Before any of the survey estimation commands can be used, the svyset command was used to specify the variables that describe the stratification, sampling weight, and the primary sampling unit. These commands correct the standard errors for the effects of clustering and stratification, as well as the impact of sampling weights when computing the 95% confidence intervals (StataCorp, 2011b).

## 3. Results

All LGAs contributed respondents to the Aboriginal sample, with a maximum of 3% of the total sample from any given LGA.

Table 1 shows psychological distress by socio-demographic characteristics. Aboriginal Victorians were more than twice as likely as their non-Aboriginal counterparts to have psychological distress (OR = 2.56; 95% confidence interval (CI): 1.67–3.93).

Being female, unmarried or not living with a partner, and/or a lone parent was positively associated psychological distress. Whether a household had a dependent child or not and being resident in rural Victoria were not associated with psychological

distress. By contrast, age was inversely associated with psychological distress, with increasing age appearing to be protective against psychological distress. Household size appeared to demonstrate a u-shaped relationship where psychological distress was associated with both lone person households and households with large numbers of people.

All six indicators of SES were inversely associated with psychological distress, the largest effect size being for food insecurity (OR = 5.76; 4.88–6.80).

Table 2 shows psychological distress by social capital. Social contact and perception of the residential neighbourhood were both positively associated with psychological distress. By contrast, neighbourhood tenure was only associated with psychological distress if the individual had lived in their neighbourhood for less than one year.

Lack of social support was positively associated with psychological distress and showed a strong dose–response relationship with the largest effect size for the inability to get help from all three sources of social support (OR = 7.02; 5.08–9.71).

All four measures of social and civic trust were positively associated with psychological distress, and showed a strong dose–response relationship with the largest effect size for those who responded negatively for all four measures (OR = 10.53; 7.94–13.97).

Table 3 shows the results of the bivariable analysis, where the primary association of interest was the association between psychological distress and Aboriginal status, with each socio-demographic characteristic and measure of social capital individually included to investigate their impact.

None of the socio-demographic characteristics, with the exception of all indicators of SES, made a large impact on the association between psychological distress and Aboriginal status. Controlling for all indicators of SES collectively reduced the crude OR by 33%.

### 3.1. Social capital

Controlling for the three indicators of the individual's social environment collectively reduced the crude OR by 12%. In contrast,

controlling for the three indicators of social support collectively only reduced the crude OR by 2%. However, this appeared to be due to two of the indicators influencing the crude OR in opposite directions. Controlling for the inability to get help from family reduced the crude OR by 7%, while controlling for the inability to get help from friends increased the crude OR by 5%. Controlling for the four measures of social and civic trust collectively reduced the crude OR by 13%.

Table 4 shows the results of the first multivariable analysis which investigated the impact that each measure of SES and social capital had on the primary association of interest (psychological distress and Aboriginal status), after controlling for all non-SES socio-demographic characteristics. We observed an increase in the impact of household income, employment status, education, home ownership, and financial stress on the crude OR of the association between psychological distress and Aboriginal status. However, controlling for non-SES socio-demographic characteristics made no difference to the impact of food insecurity.

Controlling for all non-SES socio-demographic characteristics, we observed an increase in the impact of all three measures of an individual's social environment, all three measures of social support, and four measures of social and civic trust on the crude OR of the association between psychological distress and Aboriginal status.

Table 5 shows the results of the final multivariable analysis. All models controlled for the non-SES socio-demographic characteristics. Six models were fitted based on the percentage change to the crude OR of the association between psychological distress and Aboriginal status. In models 1 to 4, the OR was reduced from 2.56 to 1.5 and were no longer statistically significant; suggesting that all models largely explained the association between psychological distress and Aboriginal status.

The Hosmer–Lemeshow goodness-of-fit tests indicated that all models provided a good fit to the data. However, model 4, which only included variables that changed the crude OR by 10% or more, was reduced to 9 explanatory variables, compared with 13 variables in model 1. Model 5 included variables that changed the crude OR by 11% or more and was reduced to 5 explanatory variables (all SES). However, the association between psychological distress and Aboriginal status was statistically significant; suggesting that SES

**Table 6**  
Recommendations for policy directions and interventions.

Evidence	Policy directions	Interventions
Inequalities in bonding social capital	<ul style="list-style-type: none"> <li>Support for further research to understand the causes including determining if this is linked to being a member of the stolen generations.</li> <li>Formal recognition of the need to support Aboriginal families and to provide culturally appropriate resources.</li> </ul>	<ul style="list-style-type: none"> <li>Adapt and implement <i>The family wellbeing Program</i><sup>a</sup></li> <li>Adapt and implement the Australian government initiative: <i>Bringing them Home and Indigenous mental health program</i><sup>b</sup></li> </ul>
Inequalities in bridging and linking social capital	<ul style="list-style-type: none"> <li>Formal recognition of racism as a key determinant of the health and wellbeing of Aboriginal Victorians, and a potential cause of low bridging and linking social capital.</li> <li>Promote social inclusion, but not to the detriment of Aboriginal culture.</li> </ul>	<ul style="list-style-type: none"> <li>Anti-racism public media campaigns.</li> <li>Development and incorporation of anti-racism education programs into primary and secondary school curricula.</li> <li>Mandatory sustainable Aboriginal cultural awareness training for all public servants, educators, law enforcement personnel, and health care sector staff.</li> <li>Development and implementation of Programs that focus on encouraging social participation by Aboriginal Victorians.</li> </ul>
Inequalities in socioeconomic status (SES)	<ul style="list-style-type: none"> <li>Formal recognition of the harm to health and wellbeing of large inequalities in SES.</li> <li>Commitment to reducing the household income, educational and employment gaps.</li> </ul>	<ul style="list-style-type: none"> <li>Improve employment support and training.</li> <li>Increase access to affordable housing.</li> <li>Increase educational opportunities.</li> </ul>

<sup>a</sup> An exemplar of a comprehensive program delivered in the Northern Territory and Queensland, shown to be effective, that focussed on enhancing an individual's sense of empowerment and control over his/her life, as well as a community's collective self-esteem. The program involved addressing trauma and dysfunction and developing problem solving, conflict resolution and communication skills.

<sup>b</sup> An exemplar of a suite of programs delivered across Australia, shown to be effective, that involved tracing and reconnecting family members, as well as counselling stolen generation members.

Sources: (Anderson et al., 2004; Berman and Paradies, 2010; Dudgeon et al., 2014).

alone only partially explained the association. Therefore model 4 largely explained the association with the least number of explanatory variables. Moreover, all diagnostic tests indicated that the model was adequate: Hosmer–Lemeshow goodness-of-fit test =  $F(9,34082) = 1.05$ ,  $p = 0.40$ ;  $\chi^2_{LR}(11) = 847.2$ ,  $p < 0.001$ ; area under ROC curve = 0.75.

Low SES, poor perception of the neighbourhood, inability to get help from family, and social and civic distrust largely explained the higher prevalence of psychological distress among Aboriginal compared with non-Aboriginal adults in Victoria.

#### 4. Discussion

We show that inequalities in social capital and SES largely explained the higher prevalence of psychological distress among Aboriginal adults in Victoria, compared with their non-Aboriginal counterparts.

The social capital measures that partially explained the association between psychological distress and Aboriginal status included the ability to get social support from family, an indicator of bonding social capital. Our finding that Aboriginal Victorians were significantly less able to get help from family when needed and that this partially explained the association between psychological distress and Aboriginal status, suggests an inequality in bonding social capital. Families are an important source of support, and lack of family support is likely to increase personal vulnerability, particularly during difficult times. It is worth noting that Aboriginal Victorians bore the highest burden of child removal of any state in Australia; a systematic attempt by Australian governments from the late 1800s to the 1970s to ‘assimilate’ Aboriginal people, commonly referred to as ‘the stolen generations’ (Perkins and Langton, 2010). It is possible that our finding reflects the success of these past government policies. This finding would indicate an important area for further research. Moreover, consideration should be given to developing policies and interventions, in consultation with key Aboriginal organisations, to support those who lack family support and reduce intergenerational transmission of its consequences (see Table 6).

Our finding of lower bonding social capital is in contrast with the majority of studies which found high levels of bonding social capital among Aboriginal communities (Browne-Yung et al., 2013). However, almost all these studies were qualitative, did not directly compare between Aboriginal and non-Aboriginal people, and were conducted in remote or rural Aboriginal-dominated communities. It is therefore unclear if our finding is unique to the Victorian experience or because of differences in the study design and the inclusion of a non-Aboriginal comparator group. However, another study that also used a quantitative study design to directly compare levels of social capital between Aboriginal and non-Aboriginal residents of rural New South Wales, found no differences in social capital, although the author points out that the sample size was very small (Berry, 2009).

The social capital measure of perception of the neighbourhood also partially explained the association between psychological distress and Aboriginal status. This was based on the response to six questions: those relating to the physical environment may reflect linking as well as bridging social capital since the formal institutions of power are responsible for the physical environment, while those related to the social environment may reflect bridging social capital. Our finding that Aboriginal Victorians were more likely to rate their neighbourhoods as poor for both the physical and social environment suggests inequalities in both bridging and linking social capital.

The final two social capital indicators that partially explained the association between psychological distress and Aboriginal

status were social and civic trust. Social and civic trust are important indicators of social capital that enable cooperative and altruistic behaviours which enhance the collective wellbeing and the attainment of collective goals. For example, trust in our civic institutions and the people who run them, (e.g. the healthcare system), is essential for maximising an individual's health and wellbeing. Social trust is an indicator of bridging social capital and our finding that Aboriginal Victorians were less likely to agree that most people could be trusted, suggests lower bridging capital. Similarly, civic trust is an indicator of bridging and linking social capital. Therefore our finding that Aboriginal Victorians were less likely to feel valued by society, suggests lower bridging and linking social capital. Consistent with our findings, trust has been shown to be inversely associated with psychological distress even after adjusting for socio-demographic, SES, and health-related factors (Phongsavan et al., 2006). Moreover, our findings are also consistent with the majority of studies conducted across Australia that found lower levels of bridging and linking social capital among Aboriginal populations (Brough et al., 2006; Browne-Yung et al., 2013).

Low levels of bridging and linking social capital reported among an urban Aboriginal population in the state of South Australia appeared to be the consequence of social exclusion, due to racism and discrimination (Browne-Yung et al., 2013). Moreover, there is substantial evidence that low levels of trust in society and its institutions among Aboriginal Australians are also the consequence of experiences of racism and discrimination, and result in psychological distress (Awofeso, 2011; Browne-Yung et al., 2013; Ziersch et al., 2011). These findings suggest that racism and discrimination are antecedents of low bridging and linking social capital, which in turn may be antecedents of psychological distress. This does not, however, rule out the possibility and likelihood that there is also a causal pathway in the reverse direction.

Aboriginal Australians continue to be one of the most socially excluded populations, victimised by discrimination and racism at the personal, societal, and institutional levels (Ferdinand et al., 2012; Henry et al., 2004). In 2011, almost every Aboriginal Victorian had experienced at least one episode of racism in the 12 months preceding the survey, and more than 70% had experienced eight or more incidents (Ferdinand et al., 2012). Consequently 50% of all participants had psychological distress and 30% avoided various situations in daily life. Being a victim of racism has deleterious impacts on health via multiple pathways: for example, distrust causing reluctance to attend mainstream health services thus presenting late for medical problems; discrimination in the employment market and education system leading to lower SES; and psychological distress (Henry et al., 2004; Paradies, 2006). In an attempt to cope, being a victim of racism has also been shown to be associated with a higher prevalence of risk-taking behaviours such as smoking (Ziersch et al., 2011). It has long been suggested that racism is a key determinant of the health and wellbeing of Aboriginal Australians.

While we did not collect any specific data about experiences of racism, our findings that there were inequalities in all three type of social capital among Aboriginal Victorians may reflect experiences of racism. This would suggest an important area for intervention. By finding ways to build higher levels of all three types of social capital, spill-over benefits may include the simultaneous challenge of racist attitudes and beliefs, since racism is often borne out of ignorance and lack of cultural exposure (Hodson and Busseri, 2012).

In addition to inequalities in social capital, we found that inequalities in SES also partially explained the association between psychological distress and Aboriginal status. We used six indicators of SES: total annual household income, employment status, education, home ownership (as a proxy for wealth), and financial stress



and food insecurity (as proxies for poverty). All indicators were inversely associated with psychological distress, and capture different facets of SES (Braveman et al., 2001). We chose to use all available indicators of SES in order to minimise residual confounding due to unmeasured aspects of SES. Addressing inequalities in SES is an important area of intervention given the strong and consistent relationship between poor health and low SES (see Table 6).

#### 4.1. Strengths of the study

This is the first population-based study of its kind in the state of Victoria that surveyed both Aboriginal and non-Aboriginal people, enabling direct comparisons to be made between the two populations.

The 2008 VPHS had a good response rate of 65% which was higher than many population-based studies both nationally and internationally.

To the best of our knowledge, with the exception of a small study conducted in a non-representative sample of Aboriginal people in rural New South Wales (Berry, 2009), this is the first time the full Kessler 10 Psychological Distress Scale has been used in an Australian Aboriginal population and directly compared with a non-Aboriginal population in the same study.

#### 4.2. Limitations of the study

The absolute sample size of Aboriginal Victorians was 339 with a power of 80.5% to detect an OR of 1.8,  $\alpha = 0.05$  (2-sided). This may have limited our ability to detect statistically significant differences in smaller effect sizes (Type 1 error).

The data are self-reported and 15.2% (unweighted data) of respondents refused or were unable to indicate their total annual household income, although this was similar between Aboriginal (13.3%) and non-Aboriginal Victorians (15.1%). However, if this measurement error is randomly distributed across the study population (non-differential misclassification), it would be expected to drive the direction of the association between the outcome and primary exposure variable towards the null (Rothman, 2002). We found that the dominant characteristics of both Aboriginal and non-Aboriginal respondents who did not declare their household income were that they were young (less than 25 years of age), female, had a low level of education, and lived in a group household.

The data are cross-sectional and therefore causality and its direction cannot be inferred.

A non-response analysis indicated a selection bias where males and people aged 18–34 years were under-represented. This was corrected for by weighting the data by the sex, age and geographic distribution of the state as well as the probability of being selected. However, since the survey was conducted using computer-assisted telephone interviewing, a further selection bias was introduced by virtue of the fact that only people who could afford a landline telephone connection were included in the sample. Therefore there was an under-representation of very low SES adults. This means that we are likely to have under-estimated the true prevalence of psychological distress in Victoria. However, this does not invalidate our findings but rather suggests that the prevalence of psychological distress may be larger than we have been able to enumerate here.

## 5. Conclusions

While it is well documented that Aboriginal Australians are more likely to suffer from psychological distress than their non-Aboriginal counterparts, little attention has been given to this key

health risk factor beyond acknowledging its existence. By contrast, most public health efforts focus on the lifestyle risk factors of smoking, excessive consumption of alcohol, poor diet, and physical activity on a platform of personal responsibility, thereby continuing to reinforce negative stereotypes and fuel racist perceptions (Bond, 2005; Vos et al., 2009). Psychological distress needs to be acknowledged as an important health risk factor in the Aboriginal population, not least because psychological distress is in itself a risk factor for the lifestyle risk factors. Therefore policies and interventions that seek to address psychological distress and its underlying causes need to be developed and implemented. Our findings suggest that key areas of intervention would be to raise levels of all three types of social capital and to address the socio-economic inequalities among Aboriginal Victorians. Table 6 summarises potential policy directions and interventions supported by our findings. The list, however, is not exhaustive and implicit is the expectation that the rights of Aboriginal people to self-determination, political representation, and participation in all institutional processes, are paramount.

This work makes a contribution by being the first population-based study to quantitatively use a social determinants approach, to investigate inequalities in the prevalence of psychological distress between Aboriginal and non-Aboriginal people, and in an under-investigated part of the country. Moreover, it points the way forward in regard to future points of intervention and identifies the need to routinely include the measurement of experiences of racism in future population-based research of Aboriginal health and wellbeing, given that racism is a key determinant of Aboriginal health.

#### Disclaimer

The views expressed in this article are those of the authors and do not necessarily represent those of the Victorian Department of Health or the Victorian Government of Australia.

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#### Conflict of interest

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