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Mortality in hospital patients with and without mental disorders: A data-linkage cohort study

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ABSTRACT

Objective: In the general population, people with mental disorders have increased mortality. This association, however, has not been explored in a population who at some time were inpatients of a public hospital.
Methods: The sampling frame was patients admitted to an Australian regional public hospital 1996–2010. Those with known mental disorder were compared with an equal number of randomly selected patients without known mental disorder, matched for age, sex, and year of admission. Mortality outcomes were determined by linkage of hospital data and the National Death Index.
Results: We identified 15,356 patients with mental disorder and 15,356 without known mental disorder, 25.2% of the former and 17.3% of the latter died during the study period. The odds ratio (OR) for death in those with mental disorder was 2.20 (95% confidence interval: 2.01–2.41) after adjusting for confounders, and their mean age at death was 4.6 years younger ($p < 0.001$). Other independent risk factors for mortality were being Indigenous (OR 1.72, 1.32–2.24), not partnered (OR 1.55, 1.36–1.76) or having multiple comorbidities (OR 1.65, 1.43–1.90). In the model that included multiple interactions, the ORs for death in Indigenous patients with mental disorder were markedly higher (6.6–9.5), regardless of other risk factors.
Discussion: Among patients with a history of public hospital admission, those with mental disorders have higher mortality than those without mental disorders. This gap in life expectancy mandates increased attention, by clinicians and health services alike, to preventable causes of death in people with mental illness.

1. Introduction

It is widely recognized that mental disorders are associated with increased mortality; a recent meta-analysis that included 203 studies from 29 countries found that the pooled relative risk of all-cause mortality among persons with mental illness was 2.22 and estimated that globally 8 million deaths a year could be attributed to mental disorders (Walker et al., 2015). People with mental disorders have a high prevalence of risk factors that predispose them to physical illness and premature death, e.g. poor diet, sedentary lifestyle, alcohol, smoking and other substance use, and the adverse effects of anti-psychotic medications (Bartlem et al., 2015; Burns and Teesson, 2002; Collins et al., 2012; Davidson et al., 2001; Harris and Barraclough, 1998; Lawrence et al., 2009). In addition to lifestyle factors, people with mental disorders are subjected to social stigma (Griffiths et al., 2006), which is known to extend into the healthcare setting and might contribute to inequitable healthcare provision (Lawrence and Kisely, 2010; Wu et al., 2013). A recent Australian study found that the gap between life expectancy of people with mental disorders and general population had widened in the last three decades (Lawrence et al., 2013).

Our review of Australian literature from 2001 to 2016 found no studies that compared the mortality of hospital patients with mental disorders to hospital patients without mental disorders. Two studies that investigated the standardized mortality ratio (SMR, the control group was the general population) of mental health patients reported contrasting results. Lawrence et al. (2001) reported a SMR of 2.5 in Western Australians with mental disorders, whereas Drew (2005) reported a SMR 1.08 among residents of the Australian Capital Territory with mental disorders. The latter study, however, had significant limitations including possible inaccuracies in the databases, exclusion of substance users and use of an historical cohort, so mental health patients may have died before the start of follow-up. A systematic review of mortality in schizophrenia found median SMR for all-cause mortality

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to be 2.58, with a random-effects pooled SMR of 2.50 (95% confidence interval 2.18–2.43) (Saha et al., 2007).

Our study aimed to compare the mortality rates of two groups of hospital patients – those with known mental disorder, and those without known mental disorder. We chose hospital patients because the data required to allow a data-linkage study are not available for community-treated patients and hospital patients are likely to be at higher risk.

2. Methods

2.1. Design

Retrospective cohort data-linkage study.

2.2. Participants

The sampling frame was all persons admitted to a regional public hospital from 1 July 1996 to 31 December 2010 ("hospital patients"). Amongst these, two groups of patients were selected:

Group 1 (patients with mental disorder): Those who had at least one past or current diagnosis of mental disorder coded according to the International Classification of Diseases, 9th or 10th Revision (World Health Organization, 1992).

Group 2 (patients without mental disorder): An equal number of those who had no ICD-9 or ICD-10 coded diagnosis of a mental disorder were randomly selected and matched 1:1 with Group 1, based on age, sex, and year of admission.

The public hospital involved in this study is the major campus and referral center of a regional health service that includes 31 smaller hospitals and facilities directly servicing a population of 280,000 persons and a geographical area of 90,000 square kilometers. It additionally services a sparely populated remote area of over 200,000 square kilometers. The majority of patients reside in a medium-size city (population 150,000) and the remainder in smaller towns and on farms.

2.3. Data collection

The Queensland Hospital Admitted Patient Data Collection (QHAPDC) was used to identify participants that fit the selection and matching criteria. The death status of each participant as of 31 December 2012 was obtained by linking the data from the QHAPDC to the National Death Index (NDI) maintained by the Australian Institute of Health and Welfare (AIHW). The AIHW performed the data linkage, and the final dataset was made available in a de-identified format.

The underlying causes of death and comorbidities of the patients were classified into different physical health disorders according to ICD-10 chapters (World Health Organization, 1992). The total number of comorbidities for each subject was extracted and compared between the groups, whereby subjects were considered to have multiple comorbidities if they had two or more physical illnesses.

2.4. Statistical analysis

Descriptive statistics were used to present baseline characteristics and compare the matched groups. Bivariate conditional logistic regression was performed to evaluate the association between mortality status and multiple variables e.g. presence of a mental disorder, presence of multiple comorbidities, relationship status, health insurance status, country of birth and Indigenous status. Multiple conditional logistic regression analysis was performed to compare the mortality of patients known to have a mental disorder with those without any known mental disorder, accounting for the aforementioned covariates. Interactions between significant predictors were also tested. T-test was performed to compare the mean age at death between the two groups and chi-squared test was performed to compare the underlying causes of death between the matched groups. A p-value < 0.05 was considered statistically significant. IBM SPSS Statistics version 22® and Stata® (version 14) were used for statistical analyses.

Mortality rates were standardized by age, using direct standardisation. Mortality rate ratio was calculated as the ratio of the mortality rate within the population of people admitted for mental illness to the rate of those admitted patients with no mental illness.

Table 1
Characteristics of participants with and without mental disorder.

Demographic Characteristic		Patients with mental disorder (n = 15,356)	Patients without mental disorder (n = 15,356)	p-value[a]
Sex	Female	7152 (46.6%)	7146 (46.5%)	0.945
Age Group	0–4	121 (0.8%)	111 (0.7%)	0.192
	5–9	167 (1.1%)	124 (0.8%)	
	10–14	491 (3.2%)	462 (3.0%)	
	15–19	1534 (10.0%)	1615 (10.5%)	
	20–24	1620 (10.5%)	1604 (10.4%)	
	25–34	2951 (19.2%)	3046 (19.8%)	
	35–44	2641 (17.2%)	2619 (17.1%)	
	45–54	1788 (11.6%)	1800 (11.7%)	
	55–64	728 (4.7%)	658 (4.3%)	
	65+	2784 (18.1%)	2771 (18.0%)	
Relationship Status	Partnered	4751 (30.9%)	7423 (48.3%)	< 0.001
	Not partnered	9776 (63.7%)	7327 (47.7%)	
	Not stated	829 (5.4%)	606 (3.9%)	
Country of Birth	Born overseas	7745 (50.4%)	8976 (58.5%)	< 0.001
Insurance Status	None	12749 (83.0%)	12370 (80.6%)	< 0.001
	Private	1408 (9.2%)	2203 (14.3%)	
	Unknown	1199 (7.8%)	783 (5.1%)	
Indigenous Status	Indigenous	1472 (9.6%)	676 (4.4%)	< 0.001
Number of co- morbidities	0	2217 (14.4%)	2015 (13.1%)[b]	< 0.001
	1	3184 (20.7%)	4827 (31.4%)	
	2	2129 (13.9%)	3310 (21.6%)	
	3	1649 (10.7%)	1864 (12.1%)	
	4	1415 (9.2%)	1151 (7.5%)	
	5+	4762 (31.0%)	2189 (14.3%)	

[a] Pearson's chi-square test for difference in proportions between patients with and without mental disorder.
[b] Not including the primary admission diagnosis.

Table 2
Results of bivariate and multiple regression analysis using conditional logistic regression for the effect of variables on mortality.

Variable	Bivariate Regression Analysis			Multiple Regression Analysis		
	OR	95% CI	p-value	OR	95% CI	p-value
Mental disorder	2.60	2.39–2.83	< 0.001	2.20	2.01–2.41	< 0.001
Multiple comorbidities[a]	2.27	2.00–2.58	< 0.001	1.65	1.43–1.90	< 0.001
Not partnered[b]	2.19	1.95–2.46	< 0.001	1.55	1.36–1.76	< 0.001
Indigenous	2.43	1.92–3.08	< 0.001	1.72	1.32–2.24	< 0.001
Insured[c]	0.64	0.55–0.75	< 0.001	0.87	0.73–1.05	0.143
Overseas born	1.52	1.33–1.74	< 0.001	1.11	0.95–1.30	0.175

OR – odds ratio; 95%CI – 95% confidence interval.
[a] Two or more physical illnesses based on ICD 9 or 10 codes.
[b] Not married or in a de facto relationship.
[c] Had private health insurance.

2.5. Ethics approval

Ethics approval was obtained from Darling Downs Human Research Ethics Committee (HREC/11/QTDD/72), the Australian Institute of Health and Welfare (AIHW) (EC2012/3/40) and The University of Queensland Human Research Ethics Committee (2013000681). In addition, Public Health Act (PHA) approval was obtained to use the retrospective data (PHA RD005195).

3. Results

3.1. Participant characteristics

Among patients admitted to the regional public hospital, 15,356 persons with mental disorder were identified. From the remaining 211,915 with no mental disorder, 15,356 were randomly selected matched 1:1 for age, sex and year of admission. There were no significant differences in sex and age between the groups (Table 1). Significantly higher proportions of those with mental disorder were not partnered, Indigenous, born in Australia, uninsured or had multiple (two or more) comorbidities ($p < 0.001$).

3.2. Mortality

There were 3874 (25.2%) deaths amongst patients with mental disorder, and 2654 (17.3%) deaths amongst those without mental disorder, with SMR of 2.63 if standardized against Queensland population and 2.55 if standardized against the general Australian population for the year 2001.

The odds ratio of mortality for patients with mental disorder compared to patients without mental disorder was 2.20 (95% confidence interval (CI): 2.01–2.41) after adjusting for differences in comorbidities, relationship status, health insurance status, country-of-birth and Indigenous status (Table 2). While all tested covariates were significantly associated with mortality in the bivariate analysis, the protective effect of private health insurance status and detrimental effect of being born in Australia were negated in the multiple regression analysis. Multiple comorbidities, not being partnered and Indigenous background were independent risk factors for mortality.

Interaction effects among significant predictors are shown in Table 3. Compared to the reference group (no mental illness, not Indigenous, not partnered, and no multiple comorbidities), the highest odds ratios for mortality (6.60–9.47) were seen amongst Indigenous Australians with mental disorder regardless of whether partnered or with multiple morbidities.

3.3. Mean age at death

The mean age (SD) at death was 70.7 (35.5) and 75.3 (17.0) years for those with and without mental disorder, respectively, a difference of

Table 3
Multiple regression model with multiple interactions between mental illness, marital status, indigenous status and comorbidity status, with adjustment.

Variables					OR	95% CI		p-value
	Mental Illness	Indigenous	Not Partnered[b]	Multiple comorbidities[a]				
Interaction term	No	No	No	No	Reference			
				Yes	1.71	1.33	2.19	< 0.001
			Yes	No	1.58	1.19	2.12	0.002
				Yes	3.14	2.43	4.07	< 0.001
		Yes	No	No	4.83	1.73	13.51	0.003
				Yes	1.55	0.67	3.60	0.308
			Yes	No	5.66	2.46	13.04	< 0.001
				Yes	4.08	2.24	7.44	< 0.001
	Yes	No	No	No	2.25	1.63	3.09	< 0.001
				Yes	4.37	3.42	5.60	< 0.001
			Yes	No	3.78	2.92	4.90	< 0.001
				Yes	5.56	4.41	7.01	< 0.001
		Yes	No	No	9.47	2.05	43.70	0.004
				Yes	6.60	3.06	14.25	< 0.001
			Yes	No	7.32	3.14	17.07	< 0.001
				Yes	8.49	5.24	13.75	< 0.001
Privately insured					0.88	0.74	1.06	0.178
Overseas born					1.13	0.97	1.32	0.127

OR – odds ratio; 95%CI – 95% confidence interval.
[a] Two or more physical illnesses based on ICD 9 or 10 codes.
[b] Not married or in a de facto relationship.

Table 4
The frequency and proportion of deaths in all patients with and without mental disorder due to different categories of underlying causes.

Cause of death (ICD-10 categories)	Group 1 (With mental disorder) (n = 15,356)	Group 2 (Without mental disorder) (n = 15,356)	p-value	Male in Group 1 (n = 8204)	Male in Group 2 (n = 8210)	p-value	Female in Group 1 (n = 7152)	Female in Group 2(n = 7146)	p-value
Circulatory	1186 (7.7)	906 (5.9)	< 0.001	605 (7.37)	419 (5.10)	< 0.001	581 (8.12)	487 (6.82)	0.003
Neoplastic	504 (3.3)	613 (4.0)	< 0.001	309 (3.77)	372 (4.53)	0.014	195 (2.73)	241 (3.37)	0.025
Not known[a]	449 (2.9)	330 (2.1)	< 0.001	248 (3.02)	198 (2.41)	0.016	201 (2.81)	132 (1.85)	< 0.001
Accidental	413 (2.7)	125 (0.8)	< 0.001	270 (3.29)	85 (1.04)	< 0.001	143 (2.00)	40 (0.56)	< 0.001
Respiratory	321 (2.1)	217 (1.4)	< 0.001	182 (2.22)	118 (1.44)	< 0.001	139 (1.94)	99 (1.39)	0.009
Psychiatric	243 (1.6)	61 (0.4)	< 0.001	119 (1.45)	28 (0.34)	< 0.001	124 (1.73)	33 (0.46)	< 0.001
Gastrointestinal	174 (1.1)	85 (0.6)	< 0.001	104 (1.27)	40 (0.49)	< 0.001	70 (0.98)	45 (0.63)	0.020
Neurological	166 (1.1)	51 (0.3)	< 0.001	91 (1.11)	18 (0.22)	< 0.001	75 (1.05)	33 (0.46)	< 0.001
Endocrine/Metabolic	158 (1.0)	106 (0.7)	0.001	88 (1.07)	53 (0.65)	0.003	70 (0.98)	53 (0.74)	0.125
Genitourinary	64 (0.4)	70 (0.5)	0.603	37 (0.45)	30 (0.37)	0.390	27 (0.38)	40 (0.56)	0.111
Infectious	41 (0.3)	27 (0.2)	0.089	25 (0.30)	13 (0.16)	0.051	16 (0.22)	14 (0.20)	0.716
Others	39 (0.3)	5 (< 0.1)	< 0.001	18 (0.22)	1 (0.01)	< 0.001	21 (0.29)	4 (0.06)	< 0.001
Suicide	36 (0.2)	6 (< 0.1)	< 0.001	30 (0.36)	4 (0.05)	< 0.001	6 (0.08)	2 (0.03)	0.158
Musculoskeletal	28 (0.2)	21 (0.1)	0.317	12 (0.15)	7 (0.09)	0.250	16 (0.22)	14 (0.20)	0.716
Miscellaneous[b]	26 (0.2)	22 (0.1)	0.563	10 (0.1)	10 (0.12)	0.998	16 (0.22)	12 (0.17)	0.451
Assault	18 (0.1)	3 (< 0.1)	0.001	12 (0.1)	3 (0.04)	0.020	6 (0.08)	0 (0)	0.014
Medical error	8 (< 0.1)	6 (< 0.1)	0.593	3 (0.04)	4 (0.05)	0.706	5 (0.07)	2 (0.03)	0.257

n(%).
[a] Cause of death not finalized in the National Death Index.
[b] Deaths due to ophthalmological, perinatal, congenital, hematological or dermatological conditions.

4.6 years ($p < 0.001$). Mean age at death was 19.9 years lower among Indigenous Australians compared to non-Indigenous Australians (53.6 *vs* 73.6, $p < 0.001$).

3.4. Primary causes of death

Table 4 shows the number of deaths due to different causes, stratified by ICD-10 chapters and the percentage of deaths due to each cause. The four most common primary cause of death (mental disorder *vs* without mental disorder) were circulatory diseases (7.7% *vs* 5.9%), neoplasms (3.3% *vs* 4.0%), accidents (2.7% *vs* 0.8%), and respiratory diseases (2.1% *vs* 1.4%). Patients with mental disorder had higher death rates for every category with the exception of neoplasms and genitourinary diseases.

There were 36 suicides in those with mental disorder, which accounted for 0.9% of all-cause mortality; this was significantly higher than the six suicides in group 2, which only accounted for 0.3% of the all-cause mortality of this group.

4. Discussion

This data-linkage study found that hospital patients with a mental disorder had an OR of mortality of 2.2 compared with those without mental disorder. The major causes of mortality were cardiovascular disorders, neoplasms, accidents and respiratory diseases, with significant differences between the two groups. Those with mental disorders had higher death rates for every category with the exception of neoplasms and genitourinary disorders.

The findings are consistent with those of Lawrence et al. (2001), who reported SMR of 2.5 for patients with mental illness in the general population of Western Australia and systematic review by Saha et al. (2007), who found SMR for patients with schizophrenia for all-cause mortality to be 2.58. Our study found similar results; the SMR using 2010 Queensland population was 2.63 and using 2001 Australian population was 2.55. Since our cohort was collected at least two years before follow-up, our study does not have the methodological limitation of the study of Drew (2005) where some patients may have died before the start of follow-up.

The mean age at death was 4.6 years earlier in those with mental disorder compared to those without mental disorder (70.7 *vs* 75.3 years respectively). Both groups compare unfavorably to the median age at death for general Queenslanders in 2010 of 80.4 years (Australian Bureau of Statistics, 2012). The lower average age at death in our study is primarily likely due to only including hospital patients. Furthermore, our cohort is a rural population (mortality rate ratios 1.12–1.25), and the inclusion of a significant portion (7%, 9.6% group 1, 4.4% group 2) of Indigenous persons who die younger - In 2010–2012, the estimated life expectancy at birth for Indigenous males was 69.1 years and 73.7 years for females, 10.6 and 9.5 years lower than the life expectancy of non-Indigenous males and females, respectively. For the period 2008–2012, 65% of Indigenous deaths occurred before the age of 65, compared with 19% of non-Indigenous deaths (AIHW, 2017). The negative effect of increasing rurality is more marked in Indigenous Australians - mortality rate ratios 1.25–2.6 (Andreasyan et al., 2007). The 20-year difference in mean age at death between Indigenous and non-Indigenous Australians in this study is the largest we have observed. Furthermore, we have recently found that the rate of current common mental disorders among Indigenous Australians is 4.2-times higher than that of the general Australian population (Nasir et al., 2018). Comorbid mental disorder was 3- to 4-times higher. These findings, together with our current results, suggest that mental disorders are likely a major contributor to the 10-year lower life expectancy of this markedly disadvantaged group, comprising just 3.3% of the total Australian population.

Patients with mental disorders had higher death rates for every disease category except neoplasms and genitourinary disorders. The lower proportion of cancer-related deaths among patients with mental disorders is at odds with other studies, e.g. Lawrence et al. (2001), who found that the incidence of cancers among people with mental illness was the same as people without mental illness, but cancer mortality was higher. Competing risks for death (eg external causes and premature death from many other causes) among those with mental disorders were likely to reduce cancer-related deaths.

Suicides were significantly higher in those with mental disorders, as expected. Suicide, however, was responsible for only 0.6% of all deaths across the cohort (Table 4), substantially lower than the proportion in the general population of 2.5% for males and 0.9% for females (Australian Bureau of Statistics, 2012). It is possible that suicide was not finalized as a cause of death in the NDI for a large number of subjects. These deaths may have instead been classified in the “not known” or “accidental” category, resulting in an under-representation of the true impact of suicide in the analysis.

While group 2 was constituted by patients without a known mental disorder according to the Queensland Hospital Admitted Patient Data Collection (QHAPDC) data, 61 (0.4%) patients in this group died of a 'psychiatric' cause, according to the NDI. This may be either because the mental disorder diagnosis was missed at the time of the admission or that these patients developed a mental disorder after their last admission. Alternatively, they could have been diagnosed and managed in a primary health care setting without any hospitalization. While this is a potential source of inaccuracy of the data, it is a very small percentage.

The effect of private health insurance and country of origin was no longer significant in multiple regression analysis. Being Indigenous, however, remained an independent risk factor for increased mortality. The Indigenous group had a 70% increased risk of death than the non-indigenous group despite being substantially younger with far fewer being 65 years or older (4.0% *vs* 19.4%). This result adds to the extensive list of healthcare areas where Indigenous Australians remain disadvantaged (AIHW, 2017) and highlights the likely major contribution of mental illness to the Indigenous health gap. Being single was also an independent risk factor, which may be explained by the benefits of having a supportive partner in caring for mental/physical illnesses, encouraging adherence with medication, or through the correlation of persons with less severe mental or physical illness having fewer lifestyle risk factors.

In the analysis that included interactions, the general pattern amongst the non-Indigenous population was that each of the independent risk factors showed an additive effect on increasing mortality, as would be expected. In the Indigenous population, however, the protective effect of being partnered or not having multiple comorbidities was not apparent. Although this may be due to a true differential effect of these risk factors in Indigenous Australians, it could be because deaths in this group are observed in the mid-life (24–64 years) whereas most of the deaths among non-Indigenous Australians are observed in the older age groups (75 + years). A survivor effect could play a role among Indigenous Australians. Also, the findings need to be interpreted with caution because of the relatively low numbers in the Indigenous subgroups. While among patients without mental disorder there was no gender difference in death rate, among patients with mental disorder, males had a significantly higher death rate than females.

We believe that our study has a number of strengths, not the least being its large size (more than 30,000 patients with and without mental disorder combined), using hospital patients as comparison and being able to capture and adjust for many important covariates. By using the National Death Index, rather than state data to capture deaths we did not miss interstate deaths.

The study has some limitations. Although we were able to adjust for multiple comorbidities, we were unable to adjust for their severity. The possibility exists that some participants with mental illnesses were included in the comparison group (e.g. patients who had only seen their GP or a private psychiatrist for a mental disorder), although this would weaken the effect size, a limitation common to studies in this field. The dataset did not contain information on patient lifestyle, although other non-study data suggest persons with mental disorders are more likely to have risky lifestyle. The dataset may have contained unverifiable errors in patient records, an issue raised previously by Drew (2005) and Lawrence et al. (2013), and an ongoing problem for retrospective studies dependent on large third-party databases. Patients who are hospitalized with mental illness are likely to have more severe illness than those in the general community and evidence exists that community mortality is overestimated in hospital-based studies (Crump et al., 2013). Since a regional hospital cohort was used, our results may not be generalizable to the general Australian population. The hospital, however, services a population of at least 280,000 persons that is broadly representative of the Australian population except that none reside in a major metropolitan city. Finally, we did not examine classes of mental disorders, specific diagnoses nor severity, and so we were unable to assess for heterogeneity of mortality outcomes related to these variables.

Further research that allows for comparison among areas of different remoteness, as well as to account for lifestyle factors and severity of illness is required. Furthermore, a dire need exists to implement and evaluate interventions to improve the health of people with mental illness. The Royal Australian and New Zealand College of Psychiatrists has called for collaborative effort from a broad range of stakeholders involved in mental health, including governments, consumers and health-care providers including psychiatrists, to address the differences in physical illness and life expectancy between those who live with mental illness and the general population (RANZCP, 2015).

Declaration of interest

None to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2019.01.015.

References

Andreasyan, K., Hoy, W.E., Kondalsamy-Chennakesavan, S., 2007. Indigenous mortality in remote Queensland, Australia. Aust. N. Z. J. Public Health 31, 422–427. https://doi.org/10.1111/j.1753-6405.2007.00112.x.

Australian Bureau of Statistics (ABS), 2012. Catalogue 33303.0 Cause of Death Australia.

Australian Institute of Health and Welfare, 2017. Trends in Indigenous mortality and life expectancy, 2001–2015: evidence from the Enhanced Mortality Database. AIHW, Canberra Cat. no. IHW 174.

Bartlem, K.M., Bowman, J.A., Bailey, J.M., Freund, M., Wye, P.M., Lecathelinais, C., McElwaine, K.M., Campbell, E.M., Gillham, K.E., Wiggers, J.H., 2015. Chronic disease health risk behaviours amongst people with a mental illness. Aust. N. Z. J. Psychiatr. 49, 731–741. https://doi.org/10.1177/0004867415569798.

Burns, L., Teesson, M., 2002. Alcohol use disorders comorbid with anxiety, depression and drug use disorders: Findings from the Australian National Survey of Mental Health and Well Being. Drug Alcohol Depend. 68, 299–307. https://doi.org/https://doi.org/10.1016/S0376-8716(02)00220-X.

Collins, E., Tranter, S., Irvine, F., 2012. The physical health of the seriously mentally ill: an overview of the literature. J. Psychiatr. Ment. Health Nurs. 19, 638–646. https://doi.org/10.1111/j.1365-2850.2011.01831.x.

Crump, C., Ioannidis, J.P., Sundquist, K., Winkleby, M.A., Sundquist, J., 2013. Mortality in persons with mental disorders is substantially overestimated using inpatient psychiatric diagnoses. J. Psychiatr. Res. 47, 1298–1303. https://doi.org/10.1016/j.jpsychires.2013.05.034.

Davidson, S., Judd, F., Jolley, D., Hocking, B., Thompson, S., Hyland, B., 2001. Cardiovascular risk factors for people with mental illness. Aust. N. Z. J. Psychiatr. 35, 196–202. https://doi.org/10.1046/j.1440-1614.2001.00877.x.

Drew, L.R., 2005. Mortality and mental illness. Aust. N. Z. J. Psychiatr. 39, 194–197. https://doi.org/10.1080/j.1440-1614.2005.01543.x.

Griffiths, K.M., Nakane, Y., Christensen, H., Yoshioka, K., Jorm, A.F., Nakane, H., 2006. Stigma in response to mental disorders: a comparison of Australia and Japan. BMC Psychiatry 6, 21. https://doi.org/10.1186/1471-244x-6-21.

Harris, E.C., Barraclough, B., 1998. Excess mortality of mental disorder. Br. J. Psychiatry 173, 11–53.

Lawrence, D., Hancock, K.J., Kisely, S., 2013. The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: Retrospective analysis of population based registers. BMJ 346 f2539. https://doi.org/10.1136/bmj.f2539.

Lawrence, D., Holman, C.D.J., Jablensky, A.V., 2001. Preventable Physical Illness in People with Mental Illness. The University of Western Australia, Perth.

Lawrence, D., Kisely, S., 2010. Inequalities in healthcare provision for people with severe mental illness. J. Psychopharmacol. 24, 61–68. https://doi.org/10.1177/1359786810382058.

Lawrence, D., Mitrou, F., Zubrick, S.R., 2009. Smoking and mental illness: results from population surveys in Australia and the United States. BMC Public Health 9, 285. https://doi.org/10.1186/1471-2458-9-285.

Nasir, B.F., Toombs, M.R., Kondalsamy-Chennakesavan, S., Kisely, S., Gill, N.S., Black, E., Hayman, N., Ranmuthugala, G., Beccaria, G., Ostini, R., Nicholson, G.C., 2018. Common mental disorders among Indigenous people living in regional, remote and metropolitan Australia: a cross-sectional study. BMJ Open 8 (6), e020196 2018 Jun 30. https://doi.org/10.1136/bmjopen-2017-020196.

RANZCP, 2015. Keeping Body and Mind Together – Improving the physical health and life expectancy of people with serious mental illness. Royal Australian and New Zealand College of Psychiatrists, Melbourne.

Saha, S., Chant, D., McGrath, J., 2007. A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? Arch. Gen. Psychiatr. 64, 1123–1131. https://doi.org/10.1001/archpsyc.64.10.1123.

Walker, E.R., McGee, R.E., Druss, B.G., 2015. Mortality in mental disorders and global disease burden implications: a systemic review and meta-analysis. JAMA Psychiatr. 72, 334–341. https://doi.org/10.1001/jamapsychiatry.2014.2502.

World Health Organization, 1992. International Classification of Diseases and Health Related Problems - ICD 10, 10th Revision ed. .

Wu, S.I., Chen, S.C., Juang, J.J., Fang, C.K., Liu, S.I., Sun, F.J., Kao, K.L., Dewey, M., Prince, M.J., Stewart, R., 2013. Diagnostic procedures, revascularization, and in-patient mortality after acute myocardial infarction in patients with schizophrenia and bipolar disorder. Psychosom. Med. 75, 52–59. https://doi.org/10.1097/PSY.0b013e31827612a6.