

Death by suicide among aged care recipients in Australia 2008–2017

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Abstract

Objective: To characterize the features of aged care users who died by suicide and examine the use of mental health services and psychopharmacotherapy in the year before death.

Design: Population-based, retrospective exploratory study

Setting and participants: Individuals who died while accessing or waiting for permanent residential aged care (PRAC) or home care packages in Australia between 2008 and 2017.

Measurements: Linked datasets describing aged care use, date and cause of death, health care use, medication use, and state-based hospital data collections.

Results: Of 532,507 people who died, 354 (0.07%) died by suicide, including 81 receiving a home care package (0.17% of all home care package deaths), 129 in PRAC (0.03% of all deaths in PRAC), and 144 approved for but awaiting care (0.23% of all deaths while awaiting care). Factors associated with death by suicide compared to death by another cause were male sex, having a mental health condition, not having dementia, less frailty, and a hospitalization for self-injury in the year before death. Among those who were awaiting care, being born outside Australia, living alone, and not having a carer were associated with death by suicide. Those who died by suicide more often accessed Government-subsidized mental health services in the year before their death than those who died by another cause.

Conclusions: Older men, those with diagnosed mental health conditions, those living alone and without an informal carer, and those hospitalized for self-injury are key targets for suicide prevention efforts.

Key words: Suicide, aged care, mental health, inequalities

Introduction

Older adults record the highest age-specific suicide rate of any age group in most countries (World Health Organization, 2019). In Australia, the age-adjusted suicide rate among men aged 85 and older (36.2/100,000 person-years) is three times that observed in the general population (12.1/100,000 person-years) (Australian Institute of Health and Welfare, 2022b). While this translates to a low

number of deaths overall (approximately 74 deaths per year), each suicide is potentially preventable, usually resulting from profound distress (De Leo *et al.*, 2013), with major associated impacts on family and community (McKay, Pond and Wand, 2022). Older people who self-harm report higher suicidal intent than younger people (Miret *et al.*, 2010) and use more lethal methods of self-injury (Schmutte *et al.*, 2019). Epidemiological research to understand death by suicide in the older population and inform suicide prevention is therefore crucial.

Approximately 36% of Australians aged over 65 years access aged care services each year (Department of Health, 2021), and two-thirds of older people will use an aged care service in their lifetime

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(Chomik and Townley, 2019). This includes over 243,000 people living in permanent residential aged care (PRAC) and over 176,000 accessing home care packages that provide in-home support to promote independence (e.g. cleaning, personal care) (Department of Health, 2021). The prevalence of mental health conditions among people receiving aged care services is high, with up to 57% of older people living in PRAC meeting criteria for at least one psychological disorder (usually depression, 46.2%) (Amare *et al.*, 2020). Aged care users experience varied cognitive or functional impairments for which they require support or accommodations (Chomik and Townley, 2019). They also have high rates of loneliness (Ogrin *et al.*, 2021) and dementia (Harrison *et al.*, 2019), and some receive low-quality aged care services (Royal Commission into Aged Care Quality and Safety, 2021), contributing to their high risk for mental health conditions.

Epidemiological studies of aged care users across care settings and examination of how factors associated with death by suicide vary by service setting are missing. People accessing different types of aged care services have important demographic and clinical differences (Inacio *et al.*, 2021) that likely affect their risk for death by suicide. Understanding these differences can inform targeted suicide prevention efforts. In addition, it is not known how often aged care users who die by suicide access mental health services or pharmacological treatment for mental health conditions in the time leading up to death. Identifying gaps in care can help with the appropriate allocation of resources.

The aim of this population-based study was to examine the cohort of older people who died by suicide in Australia while accessing aged care services between 2008 and 2017. Our objectives were to (a) characterise the demographic and clinical features of those who died by suicide and identify factors recorded at assessment for aged care services associated with death by suicide and (b) examine the prevalence of mental health services and psychopharmacotherapy use in the year before death.

Methods

We conducted an exploratory study using the National Historical Cohort of the Registry of Senior Australians (ROSA) (Inacio *et al.*, 2019). The ROSA is a de-identified data platform of aged care users in Australia, which contains linked data from the Australian Institute of Health and Welfare's (AIHW) National Aged Care Data Clearinghouse and National Death Index (NDI), Australian Government Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS)

datasets, and state-based hospital data collections (New South Wales, Victoria, South Australia, and Queensland only). This study obtained ethical approvals from the University of South Australia Human Research Ethics Committee (Ref: 200489), the Australian Institute of Health and Welfare Ethics Committee (Ref: EO2018/1/418), the South Australian Department for Health & Wellbeing Human Research Ethics Committee (Ref: HREC/18/SAH/90) for the inclusion of South Australian, Victorian and Queensland hospitalisation datasets, and the New South Wales Population & Health Services Research Ethics Committee (Ref: 2019/ETH12028).

Study cohort

This study included all non-Aboriginal or Torres Strait Islander people aged 65 years or older who had an aged care eligibility assessment (ACAT), who were approved for a home care package or PRAC, and who died between 1 July 2008 and 30 June 2017 ($n=532,507$). ACAT assessments are used to determine eligibility for formal aged care services in Australia and are completed by clinically trained medical, nursing, or allied health professionals. An assessment of functional and cognitive limitations determines the level of support required (if any) for the older person to continue to live safely at home or their need for residential care. Home care packages are provided to people aged 65 years and over who are assessed as able to live safely at home but with the clinical need for formal personal care and support (Royal Commission into Aged Care Quality and Safety, 2019). Waiting times to access a home care package range from 21 to 187 days (Visvanathan *et al.*, 2018). Residential care provides support and accommodation for people who have been assessed as needing higher levels of care than can be provided in the home.

Individuals were grouped according to the service they were receiving at the time of their death (home care package, PRAC, or awaiting care). All analyses were stratified according to service use because of existing evidence demonstrating important differences between the users of each service that are likely to influence the relationships under examination here. For example, people living in PRAC are far more likely to be frail, have dementia, not have a carer, and be nearing the end of their lives than those living in the community (Inacio *et al.*, 2021). Existing evidence also suggests that suicide rates and factors influencing death by suicide differ between those living in PRAC and those living in the community (e.g. Murphy *et al.*, 2018). As such, it is not appropriate to pool these groups together to examine their suicide mortality, factors associated with

suicide mortality, or mental health service use before death.

Outcomes

Death by suicide was the primary outcome of the study and defined where the primary or secondary cause of death (as reported in the NDI) was in the International Statistical Classification of Disease and Related Health Problems-Tenth Revision-Australian Modification system (ICD-10-AM) (Australian Consortium for Classification Development, 2020, p. 10) range S00-T75, T79 (injury, poisoning, and certain other consequences of external causes), and first reported external cause of the injury was coded as ‘intentional self-harm’ range X60-X84. These criteria have been previously defined and validated by the AIHW (Australian Institute of Health and Welfare, 2022b). The date and causes of death are provided to the NDI from state and territory Registrars of Births, Deaths, and Marriages, the National Coronial Information System, and the Australian Bureau of Statistics. The NDI records death date with 93.7% accuracy (Magliano *et al.*, 2003). Secondary causes of death were also examined for health conditions that reflected an ‘end-of-life trajectory’ based on ICD-10-AM codes defined by Humphrey *et al.* (2021).

Covariates

We examined sociodemographic and health features of the cohort, including age at death, sex, country of birth, remoteness (for PRAC residents, based on residential address before entry to PRAC), residential socioeconomic index (based on residential postcode mapped to the Index of Relative Socioeconomic Disadvantage (Australian Bureau of Statistics, 1996)), number of comorbid health conditions at aged care eligibility assessment (using a validated medication-based comorbidity index based on 6-months of medication use prior to assessment (Inacio *et al.*, 2019)), frailty (using a validated, continuous frailty index measure for these data (Khadka *et al.*, 2020)), dementia status, and presence of a mental health condition. Dementia status (yes or no) was determined from the aged care eligibility and entry into permanent care funding assessments (if a person became a permanent resident) and dispensing of medications prescribed for the treatment of Alzheimer’s disease in the 6 months prior to aged care eligibility assessment (Cations *et al.*, 2020). In assessments, assessors record up to 10 major diseases or disorders that have an impact on the person’s need for assistance, together with documented evidence of a diagnosis from a medical practitioner. Data about the level of cognitive impairment were not used to identify people with

dementia in this study. The presence of a mental health condition was ascertained from assessments for aged care eligibility and entry into permanent care funding assessments (if the person became a permanent resident) (Cations *et al.*, 2022). Both the eligibility and entry into permanent care funding assessments capture health conditions affecting individuals’ care needs. See Supplementary Table S1 for all codes used to identify mental health conditions. Time from aged care eligibility assessment to death was included as a covariate in all models.

Mental health service and psychotropic medication use

We examined Government-subsidised mental health service use in 1 year prior to death using MBS claims data. Mental health services were identified using their designated Medicare item codes and grouped into: family group therapy/general practitioner (GP) mental health treatment (MBS group A06/A20), psychiatrist attendances (MBS group A08), psychological therapy services delivered by a clinical psychologist (MBS group M06), psychological therapy services delivered by a registered psychologist, occupational therapist or social worker (MBS group M07), and mental health services delivered under a comprehensive health management plan (MBS items 10956 and 10968). See Supplementary Table S1 for item codes used. Each service group was coded as a binary variable (yes/no), and we calculated the number of days from last service use to death.

Dispensing of psychotropic medications in 1 year prior to death was assessed using PBS dispensing records. Dispensing of anxiolytic, antidepressant, and antipsychotic medications was determined using the WHO Anatomical and Therapeutic Chemical (ATC) classification system (Supplementary Table S1) and coded as a binary variable (yes/no).

Hospital admissions data collections (admitted hospitalizations only) for New South Wales, Victoria, Queensland, and South Australia were used to examine unplanned hospital admissions for any reason, for mental health or psychogeriatric care (flagged under ‘care type’), and for self-injury in 1 year prior to death. A hospitalization for self-injury was identified according to the same criteria described above for suicide deaths, as previously defined (Australian Institute of Health and Welfare, 2022b) using the ICD-10-AM system (World Health Organization, 1992) (see Supplementary Table S1 for codes). Self-injury was defined where the principal admission diagnosis was recorded as ‘injury, poisoning and certain other consequences of

external causes', the first reported external cause of the injury was coded as 'external', and the injury did not result in death (i.e. where their discharge disposition was other than 'death'). Hospitalizations for self-injury include both those with and without suicidal intent.

Analysis

All analyses were stratified by the service received at the time of death: home care package, PRAC, or awaiting care. The proportion of all deaths caused by suicide was calculated for all groups. For people accessing home care packages or PRAC, we calculated mortality rates and 95% confidence intervals (CI) for death by suicide using the total number of non-Aboriginal or Torres Strait Islanders service users in the given year (current users at 30 June plus new admissions until the following 30 June, from AIHW de-identified datasets) as the denominator. Mortality rates were adjusted for sex and age using direct standardization with 2012 as the reference year. Standardized mortality rates were not calculated for those waiting for care as population-level data about this group are not publicly available. Multivariate logistic regression models examined sociodemographic and health factors associated with suicide mortality compared to mortality due to another cause. Due to the multiple models (one for each service group), our significance levels (α) were adjusted using the step-down Bonferroni method. In all analyses, missing data (1.98%) were managed via case-wise deletion. A sensitivity analysis was conducted to examine whether hospitalization for self-injury was associated with death by suicide using only the individuals in New South Wales, Victoria, Queensland, and South Australia where hospitalization records were available. Use of Medicare-subsidised mental health services and psychotropic medications in the year prior to death is reported descriptively, using percentages, medians, and interquartile ranges. All analysis were conducted using SAS version 9.4 (SAS Institute, 2003).

Results

Of 532,507 people who died after being approved for a home care package or PRAC between July 2008 and June 2017, 354 (0.07%) died by suicide. This included 81 people receiving a home care package (0.17% of all home care package deaths), 129 people living in PRAC (0.03% of all deaths in PRAC), and 144 people approved for but awaiting care (0.23% of

all deaths while awaiting care). Of those who died by suicide waiting for services, 110 (76.4%) were approved for PRAC compared to 87.2% of those who died by other causes. The average yearly age- and sex-adjusted suicide mortality rate among home care package recipients was 12.1 per 100,000 (95% CI: 4.6–19.7) and for PRAC residents was 6.4 per 100,000 (95% CI: 3.1–9.4) (see Supplementary Table S2 for yearly population counts). Among the study cohort who died by suicide, the most coded concurrent (secondary) causes of death on the national death index register in all care settings were major depressive disorder (13.3%), asphyxiation (12.4%), and unspecified dementia (4.5%). Nearly 38% ($n=134$) of people who died by suicide had a palliative condition recorded as a secondary cause of death, while palliative conditions were present in 92.0% ($n=489,539$) of those who died by other causes.

Aim 1: factors associated with death by suicide

Characteristics of the cohort, separated by service type and death by suicide, are presented in Table 1, and results of logistic regression modeling of factors associated with suicide mortality compared with mortality due to another cause are presented in Table 2. Having a mental health condition was associated with a higher odds for death by suicide compared to death from another cause among all groups (PRAC: aOR=4.30, 95% CI: 3.00–6.18; home care package: aOR=3.02, 95% CI: 1.91–4.77; awaiting care: aOR=4.11, 95% CI: 2.89–5.86), and dementia was associated with a lower odds of death by suicide among all groups (PRAC: aOR=0.32, 95% CI: 0.22–0.47; home care package: aOR=0.30, 95% CI: 0.13–0.70; awaiting care: aOR=0.42, 95% CI: 0.20–0.86). Women were less likely to die by suicide than men in PRAC (adjusted odds ratio (aOR)=0.26, 95% confidence interval (CI): 0.18–0.38) and among those waiting for care (aOR=0.56, 95% CI: 0.39–0.80), but not among those with home care packages (aOR=0.75, 95% CI: 0.48–1.17). Increasing frailty was associated with lower odds of death by suicide among those living in PRAC (aOR=0.54, 95% CI: 0.42–0.69). Among those who were awaiting care, living alone (aOR=1.80, 95% CI: 1.22–2.65) and being born outside Australia (aOR=2.28, 95% CI=1.57–3.31) were associated with higher odds for suicide mortality compared to death from another cause, while having a carer (aOR=0.56, 95% CI: 0.31–0.68) and increasing frailty (aOR=0.53, 95% CI: 0.42–0.67) were associated with lower odds.

Table 1. Demographic characteristics of aged care users who died, by cause of death and service type at death

	HOME CARE PACKAGE (<i>n</i> =47,317) <i>n</i> (%) or Mean (SD)		RESIDENTIAL AGED CARE (<i>n</i> =423,884) <i>n</i> (%) or Mean (SD)		AWAITING CARE (<i>n</i> =61,306) <i>n</i> (%) or Mean (SD)	
	Suicide (<i>n</i> =81, 0.17%)	Other (<i>n</i> =47,236, 99.8%)	Suicide (<i>n</i> =129, 0.03%)	Other (<i>n</i> =423,755, 99.9%)	Suicide (<i>n</i> =144, 0.23%)	Other (<i>n</i> =61,162, 99.8%)
Age at death	81.3 (8.2)	84.5 (7.5)	80.9 (8.5)	86.8 (7.2)	79.9 (8.0)	83.5 (7.6)
Female	40 (49.4)	26,702 (56.5)	36 (27.9)	258,551 (61.0)	51 (35.4)	30,006 (49.1)
Born outside Australia	35 (43.6)	17,369 (37.0)	47 (36.4)	123,153 (29.2)	71 (50.4)	17,340 (29.4)
Non-English Speaking	7 (8.6)	6228 (13.3)	14 (10.9)	38,512 (9.1)	16 (11.4)	4869 (8.3)
Living outside major city	19 (23.5)	15,762 (33.4)	40 (31.0)	133,537 (31.5)	43 (30.0)	23,170 (37.9)
Socioeconomic status						
Most disadvantaged – 1	16 (19.8)	8796 (18.7)	20 (15.5)	80,181 (19.0)	32 (22.4)	12,402 (20.3)
2	12 (14.8)	9233 (19.6)	27 (20.9)	83,781 (19.8)	18 (12.6)	12,807 (21.0)
3	14 (17.3)	9420 (20.0)	24 (18.6)	83,153 (19.7)	24 (16.8)	12,145 (19.9)
4	21 (25.9)	8492 (18.0)	26 (20.2)	76,402 (18.1)	28 (19.6)	10,805 (17.7)
Least disadvantaged – 5	18 (22.2)	11,226 (23.8)	32 (24.8)	99,222 (23.5)	41 (28.7)	12,929 (21.2)
Number of health conditions						
0–4	30 (37.0)	14,595 (30.9)	36 (27.9)	133,111 (31.4)	63 (43.8)	19,052 (31.2)
5–9	45 (55.6)	27,348 (59.7)	77 (59.7)	248,068 (58.5)	69 (47.9)	35,431 (57.9)
10 +	6 (7.4)	5293 (11.2)	16 (12.4)	42,576 (10.1)	12 (8.3)	6679 (10.9)
Frailty^a						
0–0.19	21 (25.9)	8027 (17.0)	35 (27.1)	82,959 (19.6)	55 (38.2)	11,579 (18.9)
0.2–0.29	36 (44.4)	21,378 (45.3)	63 (49.2)	195,662 (46.3)	68 (47.2)	28,394 (46.4)
0.3 +	24 (29.6)	17,770 (37.7)	30 (23.4)	144,001 (34.1)	21 (14.6)	21,163 (34.6)
Lives alone	42 (51.9)	19,714 (36.8)	N/A	N/A	83 (57.6)	22,271 (36.4)
Carer available	57 (70.4)	40,431 (88.3)	N/A	N/A	92 (64.8)	53,615 (88.8)
Mental health condition	38 (46.9)	10,573 (22.4)	75 (58.1)	103,720 (24.5)	68 (47.2)	11,560 (18.9)
Mental health condition at entry into PRAC	N/A	N/A	82 (63.6)	166,105 (39.2)	N/A	N/A
Dementia	6 (7.4)	10,695 (22.6)	37 (28.7)	232,714 (54.9)	9 (6.3)	9657 (15.8)
Palliative condition	39 (48.2)	43,029 (91.1)	43 (33.3)	389,769 (92.0)	52 (36.1)	56,741 (92.8)
Days from aged care eligibility assessment to death (median, IQR)	347 (158–754)	361 (122–797)	357 (148–792)	726 (281–1360)	242 (71–691)	128 (30–456)
Days from PRAC entry to death (median, IQR)	N/A	N/A	263 (106–696)	527 (145–1157)	N/A	N/A

Abbreviations: IQR=Interquartile Range; N/A=Not applicable; PRAC=Permanent residential aged care; SD=Standard deviation; ^a Higher scores equate to greater frailty

Table 2. Results of logistic regression modeling of factors from time of aged care eligibility assessment associated with mortality from suicide compared to mortality due to other causes, by service at the time of death

	HOME CARE PACKAGE ^a (<i>n</i> =46,032)	RESIDENTIAL AGED CARE ^a (<i>n</i> =419,735)	AWAITING CARE ^a (<i>n</i> =56,910)
	aOR (95%CI)	aOR (95%CI)	aOR (95%CI)
Age (per 1 year increment)	0.97 (0.95–1.00)	0.95 (0.93–0.97)	0.96 (0.94–0.98)
Women vs men	0.75 (0.48–1.17)	0.26 (0.18–0.38)	0.56 (0.39–0.80)
Born outside Australia (yes vs no) ^b	1.50 (0.93–2.42)	1.37 (0.91–2.07)	2.28 (1.57–3.31)
Non-English Speaking (yes vs no) ^b	0.50 (0.22–1.16)	1.09 (0.58–2.03)	1.15 (0.65–2.04)
Living outside major city (yes vs no) ^b	0.57 (0.32–1.01)	1.14 (0.74–1.75)	0.88 (0.57–1.36)
Socio-economic status ^c	0.98 (0.83–1.16)	1.11 (0.97–1.27)	1.11 (0.97–1.27)
Living alone (yes vs no) ^{b,d}	1.01 (0.62–1.65)	N/A	1.80 (1.22–2.65)
Availability of a carer (yes vs no) ^{b,d}	0.57 (0.33–0.98)	N/A	0.56 (0.31–0.68)
Number of health conditions ^c	0.72 (0.52–1.00)	0.94 (0.72–1.23)	0.75 (0.59–0.97)
Frailty index ^c	0.76 (0.56–1.04)	0.54 (0.42–0.69)	0.53 (0.42–0.67)
Dementia (yes vs no) ^b	0.30 (0.13–0.70)	0.32 (0.22–0.47)	0.42 (0.20–0.86)
Mental health condition (yes vs no) ^b	3.02 (1.91–4.77)	4.30 (3.00–6.18)	4.11 (2.89–5.86)

Abbreviations: ACAT=Aged Care Assessment; aOR=adjusted odds ratio; CI=confidence interval.

Boldface denotes $\alpha < 0.05$ after Bonferroni correction; ^a time from approval to death included in modeling as a covariate; ^b 'no' is comparator group; ^c continuous variable per increment displayed in Table 1; ^d not included in modeling for residential aged care

Aim 2: service use and psychotropic medications in year before death

Use of government-subsidised mental health services and psychotropic medications is presented in Table 3. Among those who died by suicide receiving home care packages (*n*=81), 14.8% had accessed a GP mental health service in the year before death (compared to 3.1% among those who died of other causes), 7.4% had a psychiatry attendance (1.9% for other deaths), and <1% accessed allied mental health services (0.9% for other deaths). Just over 28% were dispensed an anxiolytic medication in the year before death (compared to 39.8% among other deaths), 56.8% were dispensed and antidepressant (15.7% among others), and 11.1% were dispensed an antipsychotic medication (15.7% among others). None were admitted to the hospital for a psychiatric attendance in the year prior to death (0.12% among others).

Among PRAC residents who died by suicide (*n*=129), 7.8% accessed a GP mental health service in the year before death (compared to 1.8% among others), while 10.9% accessed psychiatry (2.0% among others), and 2.3% accessed allied mental health (0.7% among others). More than 37%, 62%, and 37% were dispensed an anxiolytic medication, antidepressant medication, and

antipsychotic medication in the year before death, respectively, compared to 50%, 36%, and 36% among those who died of other causes. Nine percent of those who died by suicide were admitted to hospital for a self-injury in the year prior to death, compared to 0.1% among those who died of other causes.

Among those awaiting care who died by suicide (*n*=144), 11.8% accessed a GP mental health service in the year before death (compared to 3.0% among others), while 10.4% accessed psychiatry (1.5% among others), and 3.5% accessed allied mental health (0.8% among others). Nearly 38% were dispensed an anxiolytic medication in the year before death (compared to 15.7% among other deaths), 50.7% were dispensed and antidepressant (35.6% among others), and 13.2% were dispensed an antipsychotic medication (13.9% among others). Over 8% of those who died by suicide were admitted to the hospital for self-injury in the year before death, compared to 0.1% among those who died by other causes.

Sensitivity analysis demonstrated that a hospital admission for self-injury in the year before death was a strong risk factor for death by suicide compared to death from another cause among PRAC residents (aOR=44.7, 95%CI: 22.3–89.7) and those awaiting care (aOR=63.2, 95%CI: 27.4–154.9) (see Supplementary Table S2). Sensitivity analysis was not

Table 3. Medicare subsidised mental health service and psychotropic medication use in 1 year prior to death, by cause of death and service at time of death

	HOME CARE PACKAGE (<i>n</i> =47,317) <i>n</i> (%) or Mean (SD)		RESIDENTIAL AGED CARE (<i>n</i> =423,884) <i>n</i> (%) or Mean (SD)		AWAITING CARE (<i>n</i> =61,306) <i>n</i> (%) or Mean (SD)	
	Suicide (<i>n</i> =81, 0.17%)	Other (<i>n</i> =129, 0.03%)	Suicide (<i>n</i> =129, 0.03%)	Other (<i>n</i> =81, 0.17%)	Suicide (<i>n</i> =144, 0.23%)	Other (<i>n</i> =61,162, 99.8%)
Mental health services						
GP Mental Health Treatment Plan/Family Group Therapy (A06 + A20)	12 (14.8)	1441 (3.1)	10 (7.8)	7564 (1.8)	17 (11.8)	1807 (3.0)
Days last claim to death, median (IQR)	236.5 (94–266)	188 (96–283)	180 (76–328)	181 (85–275)	163 (71–262)	170 (86–263)
Psychiatry services (A08)	6 (7.4)	902 (1.9)	14 (10.9)	8626 (2.0)	15 (10.4)	921 (1.5)
Days last claim to death, median (IQR)	221.5 (102–229)	177 (77–270)	73.5 (71–270)	173 (71–270)	101 (47–304)	161 (63–266)
Psychological therapy services^a (M06)/Focused Psychological Strategies^b (M07)	<5	416 (0.9)	<5	2853 (0.7)	5 (3.5)	485 (0.8)
Days last claim to death, median (IQR)	189 (26–313)	178 (81.5–277)	185 (33–361)	164 (61–268)	101 (47–304)	161 (63–266)
Mental health service under Comprehensive Health Management Plan (M03)	0 (0.0)	5 (0.01)	0 (0.0)	147 (0.03)	0 (0.0)	5 (0.01)
Days last claim to death, median (IQR)	N/A	219 (106–280)	N/A	169 (77–267)	N/A	N/A
Psychotropic medication						
Anxiolytic	23 (28.4)	18,786 (39.8)	48 (37.2)	202,995 (47.9)	54 (37.5)	9624 (15.7)
Antidepressant	46 (56.8)	7397 (15.7)	81 (62.8)	152,954 (36.1)	73 (50.7)	21,474 (35.6)
Antipsychotic	9 (11.1)	7397 (15.7)	48 (37.2)	152,954 (36.1)	19 (13.2)	8492 (13.9)
Unplanned hospitalizations^c						
	Suicide (<i>n</i> =68)	Other (<i>n</i> =38,766)	Suicide (<i>n</i> =109)	Other (<i>n</i> =369,459)	Suicide (<i>n</i> =119)	Other (<i>n</i> =52,134)
Any	40 (58.8)	33,299 (85.9)	77 (70.6)	244,962 (66.3)	80 (67.2)	44,741 (85.8)
Psychiatric	0 (0.0)	185 (0.5)	6 (5.5)	1742 (0.5)	5 (4.2)	221 (0.4)
Self-injury	0 (0.0)	47 (0.12)	10 (9.2)	278 (0.1)	10 (8.4)	47 (0.1)

^aDelivered by a Clinical Psychologist; ^b Delivered by a Registered Psychologist, Occupational Therapist, or Social Worker; ^c New South Wales, Victoria, South Australia, and Queensland only. Abbreviations: GP=General practitioner, IQR=interquartile range; SD=Standard deviation.

conducted for home care package recipients as no hospitalizations for self-injury were identified in this group.

Discussion

This study identifies the suicide mortality rate and risk profiles of older adults who die by suicide while accessing or waiting for aged care in Australia. While the absolute number of suicide deaths in our study was low, suicide mortality was approximately half as common among older adults living in PRAC (6.4/100,000) than among those living at home receiving home care package services (12.1/100,000). This pattern is consistent with previous Australian research using data from coronial systems (6.3/100,000, years 2000–2013) (Murphy *et al.*, 2018) and community-based longitudinal studies (12.5/100,000, years 2006–2009) (Erlangsen *et al.*, 2021).

The suicide mortality rate among both home care and PRAC recipients in the aged care population is lower than among the general population of older Australian adults (approximately 66/100,000) (Australian Institute of Health and Welfare, 2022b). This may suggest that community and PRAC aged care services confer protection against death by suicide, possibly because they provide regular safety monitoring (Lohman *et al.*, 2021) and reduce access to means for suicide (Chauliac *et al.*, 2020). Aged care services may also promote psychological well-being by reducing social isolation and improving functional independence (Royal Commission into Aged Care Quality and Safety, 2019). It is also likely that the functional and cognitive limitations that necessitate the use of aged care services also reduces the ability to attempt or complete suicide (Murphy *et al.*, 2018). This is supported by our finding that increasing frailty is associated with lower odds of death by suicide among those living in residential aged care and waiting for care.

Within our cohort, 114 people waiting for care died by suicide (0.23% of all deaths). International research has identified that an impending transition to residential aged care is a risk factor for suicide in older adults (Mezuk *et al.*, 2014, 2019). While these individuals may have been receiving low-level community support not captured in our dataset, previous Australian research has demonstrated that waiting for a higher level of aged care services confers a risk for premature institutionalization and early mortality (Visvanathan *et al.*, 2018), and higher health system costs (Yu and Byles, 2020). These data emphasize the importance of research to examine the psychological experiences of those waiting for care and that policy and organizational initiatives to decrease wait times for care services remain

urgent (Royal Commission into Aged Care Quality and Safety, 2021).

Among those living in residential aged care and those waiting for care, older men were more likely to die by suicide than women. This is consistent with literature from the general population in which older men record the highest age-adjusted suicide rate of any group both in Australia (Australian Institute of Health and Welfare, 2022b) and internationally (World Health Organization, 2019). Older men experience greater psychological distress in response to physical illness, widowhood, and bereavement than older women (Conejero *et al.*, 2018) and use more lethal methods of self-injury (Canetto, 2017). Men are also less likely to be referred to and gain benefits from late-life suicide prevention interventions than women (Lapierre *et al.*, 2011). Our results continue to emphasize the need for evidence-based and targeted interventions to improve equity for older men. Those with mental health conditions at the entry to aged care and those hospitalized for self-injury are also key targets for suicide prevention interventions, given the large effects of these factors on suicide mortality. In addition, those waiting for care in our cohort recorded higher odds of suicide death where they were born outside Australia, were living alone, and were without an available carer. Social and cultural factors like these have been identified as important risk moderators of suicide risk among older adults in other settings (Gilman *et al.*, 2013; e.g. Li and Katikireddi, 2019).

Effectively preventing suicide in older adults requires multicomponent interventions that target social isolation, clinical symptoms, access to lethal methods, stigma, help seeking, and access to mental health services (de Mendonça Lima *et al.*, 2021). Both Australian (Almeida *et al.*, 2012; Krysinska *et al.*, 2016) and international research (de Mendonça Lima *et al.*, 2021) demonstrate that so-called ‘gatekeeper’ interventions are effective strategies for suicide prevention that could be applied in aged care settings. These interventions target professionals delivering aged and health care in the identification of suicidal ideation and facilitate access to intervention and are associated with improved professional competence and confidence in preventing suicide (Holmes *et al.*, 2021) as well as reduced suicide deaths (Krysinska *et al.*, 2016). Interventions aiming to reduce social isolation are also effective in preventing suicide in older adults (De Leo, Carollo and Dello Buono, 1995; Leo, Buono and Dwyer, 2002; Vanderhorst and McLaren, 2005). However, implementing suicide prevention programs is challenging in aged care settings, where skills in mental health are underrepresented in the workforce (Jones *et al.*, 2007). Policy initiatives to promote access to mental health care will be important in this context.

In our analysis, individuals with dementia were less likely to die by suicide. However, the relationship between dementia and suicide is complex and poorly understood (Draper, 2015). It is possible that people with dementia experience a higher risk of suicide soon after diagnosis which then decreases as their ability to attempt or complete suicide declines (Muñoz *et al.*, 2020; Günak *et al.*, 2021). However, high-quality research examining this hypothesis is scarce (Draper, 2015). In our cohort, individuals with dementia are identified relatively late in the course of their disease (Cations *et al.*, 2020, 2021). As such, our finding of lower risk for suicide in those with dementia does not necessarily reflect that people with dementia experience less psychological distress or suicidal ideation; just that they are less likely to have died from suicide.

Finally, results of this study demonstrate that those who died by suicide accessed more mental health services in the year before their death than those who died by other causes. However, more than 80% of those who died by suicide did not access any Medicare subsidized mental health service in the year before their death. Our previous research demonstrates that government subsidized mental health services are underused by older adults (Bartholomaeus *et al.*, 2022) and aged care users in Australia (Cations *et al.*, 2022) and are less likely to be used by older people than younger people (Draper and Low, 2010). Older adults experience important barriers to accessing mental health services, including lower help-seeking (Polacsek, Boardman and McCann, 2019) and a low level of mental health expertise among the aged care workforce (Jones *et al.*, 2007). While it is possible that those in our cohort were accessing mental health services not captured within the ROSA (e.g., via mental health professionals employed by the aged care organisation, state-based mental health services, or privately funded), the low use of Medicare-funded services identified here identifies an important potential target for suicide prevention efforts.

Strengths of this study include our data source's comprehensive national coverage of aged care users in Australia and integrate aged care and health care service records for these individuals. These cross-sectoral data allow us to provide a broad profile of aged care users who die by suicide across aged care settings. However, limitations of this study include that older people who are not approved to receive home care packages or residential aged care are not included in our cohort. The data therefore reflect a minority of all late-life suicides in Australia. In addition, we were unable to ascertain episodes of self-injury that did not result in death as the primary care, ambulance, and emergency department data

within our available data sources do not capture this type of information. Most self-injury is managed outside of hospitals or in emergency departments and does not usually result in a hospital admission (Australian Institute of Health and Welfare, 2022b). Data regarding private hospital admissions (approximately 8% of all unplanned hospitalizations (Australian Institute of Health and Welfare, 2022a)) were also not available for this study. As such, self-injury is likely underestimated in our data.

Our study also was not able to examine key individual factors associated with suicide, including bereavement, loneliness, and financial difficulties (Conejero *et al.*, 2018) or organizational factors (e.g. living in a larger facility, Murphy *et al.*, 2018). The data source contains information collected for administrative datasets and assessments for aged care services, which may not include in-depth personal or contextual details surrounding the person's experience with care or their death. Linkage with state-based suicide registers (available in Victoria, New South Wales, and Queensland) and the Australian Defence Suicide Database may help to add depth as these sources include data from coronial records, police, and Defence systems. We echo existing calls for more qualitative research with older adults experiencing suicidal ideation (Wand and Reppermund, 2022) to better understand the phenomenology and lived experience of this population and inform suicide prevention efforts. Our examination of mental health service use is not comprehensive and does not include mental health services not subsidized by Medicare. Governance arrangements also meant that we were not able to include Aboriginal and Torres Strait Islander older adults in our cohort, whose risk for suicide is twice that of non-Aboriginal and Torres Strait Islander Australians (Australian Institute of Health and Welfare, 2022b). Finally, the large size of our sample has produced some statistically significant associations even in the case of small effects. These results should be interpreted with caution.

Each death by suicide is potentially preventable, and evidence suggests that most deaths by suicide among older adults result from psychological distress (De Leo *et al.*, 2013). Results of this study describe the characteristics and risk profiles of Australians entering or accessing aged care services for which an ACAT is required who die by suicide and examine how these differ between care settings. Our results suggest that older men, those with diagnosed mental health conditions, those living alone and without an informal carer, and those hospitalized for self-injury are key targets for suicide prevention efforts. Collaboration between aged and mental health care services will be required to implement multicomponent suicide prevention interventions,

and research to guide implementation (including barriers and facilitating factors for implementation) will be important to this process.

Conflicts of interest

None of the authors have any relevant conflicts of interest.

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Descriptions of author(s)' roles

MC conceptualized this study, conducted data analysis, and drafted and edited the manuscript. MCI and CL oversaw study development and data analysis and contributed to manuscript editing. BD, GC, MCr, CW, and KE contributed to manuscript reviewing and editing.

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Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S104161022300008X>

Data statement

These data have not been previously presented orally or by poster at scientific meetings.

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