

ORIGINAL ARTICLE

Characteristics of suicide decedents with no federally funded mental health service contact in the 12 months before death in a population-based sample of Australians 45 years of age and over

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Abstract

Introduction: More than half of suicide decedents have no contact with mental health services 12 months before death. It is uncertain if they have different characteristics than decedents who use mental health services.

Methods: A case-series design. Participants 45 years and older, who died by suicide (2006–2018). Comparisons were made between those who did and did not have contact with mental health services, using individually linked data from federal services in the Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS).

Results: Of 186 cases, 71% had no contact with mental health services. Physical health services were used equally by 75%. Psychiatric medication use was uncommon, except for antidepressants, 50% with mental health service contact and 20% with no contact. Older age, lower income, involuntarily unemployed, firearms as suicide method, greater physical disability, less functional impairment due to emotional problems and lesser proportions with mental illness, were associated with no contact with mental health services.

Conclusions: For suicide prevention, middle-older aged adults may have less requirement for mental health intervention, and greater requirement for the development of complementary interventions focused on physical health and social issues, which are not necessarily best delivered by clinical mental health services.

KEYWORDS

case series, mental health services, no contact, suicide

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INTRODUCTION

Mental illness and suicide are closely linked; a systematic review of psychological autopsy studies reported 91% likely to have mental disorder (Cavanagh et al., 2003). However, psychological autopsy may inflate estimates of mental illness (Hjelmeland et al., 2012); in part by informant recall bias (Pirkis et al., 2019).

Treatment coverage for mental disorders is low even in high-income countries; only one third of mentally ill Australian residents consulted any mental health professional (Andrews et al., 2001). In the UK (Appleby et al., 1999), Taiwan (Lee et al., 2008), and Australia (Sveticic et al., 2012), less than half of suicide decedents (coronial data) contacted mental health services 12 months before death. It is unclear if decedents had no contact with mental health services because of service availability, a preference to avoid mental health services despite suffering mental illness, or because of an absence of mental illness.

The earliest systematic review of suicide decedent health service use found 41% had contact with psychiatric inpatient and 11% community-based care, 12 months before death (Pirkis & Burgess, 1998), while later reviews estimated lesser proportions (25%–33%) having any mental health contact 12 months before death (Luoma et al., 2002; Stene-Larsen & Reneflot, 2019; Walby et al., 2018). In comparison, general practitioner contact in the year before death varied little over reporting periods, (75%–83%) (Luoma et al., 2002; Pirkis & Burgess, 1998; Stene-Larsen & Reneflot, 2019), although these contacts may have included mental and physical health services.

Whatever the precise estimates, most suicide decedents do not have contact with mental health services in the year before death, so prevention measures deployed through existing mental health services cannot impact them.

Suicide decedents having no contact with mental health services are not well characterized. In coronial cases, the accuracy of mental disorder or mental health service use might be limited by informant or source information (Sutherland et al., 2018), or are available only for those in contact with mental health services (Appleby et al., 1999). A recent systematic review reported non-contact with mental health service in suicide decedents was associated with male sex, younger or older age, rural location, no psychiatric diagnosis, no past suicidal behavior, no contact with general health services, and more likely to use violent means of suicide (Tang et al., 2021). A recently proposed Australian national and state population-based case-series study aims to better address these questions in the future (Chitty et al., 2020).

Accurate characterization of this no-contact suicide population might help to inform more appropriate

interventions, some of which might not be optimally delivered from within mental health services.

Aims

For a population-based sample of middle-older aged adults resident in Australia who died by suicide, we sought to:

1. estimate the proportion of suicide decedents who had no contact with mental health services in the 12 months prior to death;
2. describe the pattern of mental health service use, general health (non-mental health) service use, and psychoactive medications use among suicide decedents with or without mental health service contact in the 12 months before death;
3. compare the demographic, physical health and mental health variables, in suicide decedents with no-mental health service contact to those with mental health service contact in the 12 months prior to death.

METHODS

Study design

We used a case-series study design, enumerating all “45 and Up Study” participants who died by suicide (2006–2018), and compared those who did, and did not, contact federally funded mental health services (Medicare and PBS) 12 months prior to death (described below).

The 45 and Up study

The “45 and Up Study” was a prospective cohort study of 267,153 participants aged 45 years and older, randomly sampled from the Services Australia Medicare enrollment database, which provides near complete coverage of the New South Wales (NSW) population (45 and Up Study et al., 2008). The eligible population was not restricted to people in independent living and included residential care residents.

The baseline survey, used in this study, was collected between 2006 and 2009 and was probabilistically linked to a number of routinely collected administrative databases.

Case-series selection

All suicide deaths were identified in the NSW Cause of Death Unit Record File using the ICD-10 codes for

intentional self-harm (X60-X84), over the follow-up period 2006–2018. Method of suicide was defined as hanging, poisoning (solids and liquids), poisoning (gas), jumping (from a height), firearms, drowning, and other methods.

Study factors

Mental health and non-mental health services contact

Medicare (MBS) is the publicly funded, federally administered universal healthcare scheme in Australia, and is the main way residents access mental health care, via general practitioners and mental health professionals, while most medication prescriptions are provided under the Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS). Private mental health services and veteran mental health services are also subsidized by Medicare. The services are provided in various settings: consulting rooms, hospitals, home visits, by telephone, and videoconferencing. In 2016–17, 2.5 million people received Medicare-subsidized mental health-specific services and 4.2 million patients received mental health-related prescriptions (Australian Institute of Health and Welfare, 2019). In 2016–17, the Australian Government spent \$3.0 billion on mental health-related services; 55.8% on Medicare-subsidized mental health-specific services and mental health-related medications, with a further 23.8% spent on programs and initiatives funded by the Department of Health, 6.5% on Department of Veterans' Affairs programs and 5.2% on private health insurance premium rebates (Australian Institute of Health and Welfare, 2019).

Public hospital-based services and some mental health community services are provided by state and territory funding, with limited medication access, accounting for \$6.0 billion in 2016–17. In 2017–18, 9.5 million community mental health service contacts were provided nationally to over 430,000 people, and 286,985 mental health-related Emergency Department presentations, 39% of which resulted in admission to a hospital, more than 260,000 mental health-related hospitalizations, for over 3.5 million patient days, with 79.0% occurring in public hospitals (Australian Institute of Health and Welfare, 2019).

Health service contacts were retrieved from the MBS database, which provides information on federally subsidized health and medical services (not state-subsidized public services and hospitals).

MBS contacts (2004–2018) were identified for the 12 months before suicide and classified using the codes in Table S1 (we only used data from 2005 in the analyses).

Mental health-related services were classified into four categories: (i) general practitioner (GP), (mental health treatments and management plans); (ii) psychiatrist (PSY); (iii) focused psychological therapies (Focus), usually supplied by a psychologist; and (iv) other mental health services (Other), including other allied health services, and developmental disorder and disability services. All participants were classified as having had any contact (or no contact) with at least one of these services in the 12 months before death.

Service contacts for non-mental health-related services (physical services) included any other MBS registered service in the database not including those mental health services listed. Dental care is excluded from MBS.

Use of medication for mental health indications

The use of dispensed medications, usually indicated for mental illness, was identified based on individual linkage to the Pharmaceutical Benefits Scheme (PBS) database, for government subsidized and co-payment prescriptions (dispensed 2004 to 2018). Mental health-related medications were classified as psycholeptics (WHO ATC code N05) and psychoanaleptics (N06); and then sub-classified as antipsychotics (N05A), anxiolytics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A), and psychostimulants and nootropics (N06B).

All dispensed prescriptions of these medications in the 12 months before a suicide death were used in the analyses. We used a similar method to identify all opioid medications dispensed, as a proxy measure of moderate to severe pain. We did not include antiepileptics (N03), anti-parkinson (N04), anti-dementia (N06D), or other nervous system (N07) medications,

Demographic, physical, and mental health characteristics

Participant characteristics were limited to those in the original 45 and Up Study baseline questionnaire, which were used as potential covariates in this study.

Demographics included age, sex, migrant and marital status, educational achievement, gross annual household income, employment status, and area-based socio-economic status, derived using the Index of Relative Socioeconomic Disadvantage, (Australian Bureau of Statistics, 2018). Migrant status was defined as “Australian-born” and “Non-Australian born.” Marital status was defined as “With Partner” (Married, de facto) or “Without partner” (Single, separated, divorced, widowed.). Income

level was based on the question: “What is your usual yearly household income before tax from all sources?”, categorized as “<\$30,000,” “\$30,000–\$69,999,” and “\$70,000 or more.” Participants were classified for employment status into “Employed” (in full-time employment, in part-time employment, self-employed, or unpaid work); “Retired voluntarily” (due to reaching usual retirement age, or due to lifestyle reasons); “Unemployed” (those in the labor force and looking for employment); “Retired involuntarily” (due to redundancy, or to care for a family member/friend, or those who could not find a job), and “Not in the labour force (NILF)” (due to disability or illness, looking after home or family, full-time study, or “other” reason).

Physical characteristics included self-report of any cancer, any cardiovascular disease, and current height and weight (calculated body mass index [BMI]). Items from the physical limitation domain of the SF-36 (McHorney et al., 1993) measured health-related physical limitations, (reverse scored) classified by scores: 0–59 severe, 60–89 moderate, 90–99 minor, and 100 no limitation.

Mental Health characteristics included self-reported (lifetime) diagnosis of anxiety or depression, and self-report of usual weekly alcohol intake. Specific instruments were used to measure social support, Duke Social Support Index (DSSI; Koenig et al., 1993), problems with work or daily activity from the SF-36, and psychological distress (K10; Kessler et al., 2002).

Record linkage and institutional ethics approval

MBS and PBS data were provided by Services Australia, and record linkage with deterministic matching was facilitated by the Sax Institute using a unique identifier provided by Services Australia. Record linkage was conducted following institutional ethics approvals (NSW Population & Health Services Research Ethics Committee [HREC/18/CIPHS/29]; ACT Health Human Research Ethics Committee [2018. ETH.00174]; ACT Calvary Public Hospital Bruce Human Research Ethics Committee [39–2018]; Western Sydney University Human Research Ethics Committee [RH12891]). Linked data were accessed via the Secure Unified Research Environment (SURE) (<https://www.saxinstitute.org.au/our-work/sure/>). The conduct of the 45 and Up Study was approved by the University of New South Wales.

Data analysis

Service use in the 12 months before death was investigated visually, in a series of plots showing the proportion

of decedents each month that had any contact, by service use type; and the percentage of decedents each month that had any single medication dispensed from each medication group. The graphs do not take account of number of medications, dosage, or quantities of medications.

Descriptive statistics were presented for suicide decedents with (i) no mental health service use and (ii) any mental health service use, for each of the domains, demographic, physical, and mental health characteristics. A series of univariate logistic models (Sperandei, 2014) were also specified to investigate associations between each study factor and the mental health service group classification. Given the exploratory nature of this study, no multiple comparison correction was applied to the models (Bender & Lange, 2001). All analyses were performed using R, version 3.6.3 (R Core Team, 2020).

RESULTS

Mental health service use 12 months before death

There were 186 decedents. Of these cases, 71% ($n = 132$) had no mental health service contacts 12 months before death. The average interval between completing the baseline interview and death was 4.72 (± 2.49) years, with a range from 0.05 year (19 days) to 10.67 years.

Figure 1a shows the pattern of mental health services used during 12 months before death service users. For the decedents who used mental health services, a psychiatrist was the most common mental health contact, although this was exceeded by general practitioner mental health service in the month(s) prior to death. There were increased mental health service contacts by both general practitioners and psychiatrists in the 3 months before death; 30% by a general practitioner and 19% by a psychiatrist in the 1 month before death. The range of focussed psychological therapy was 4%–13%, in the 12-month period.

Non-mental health service use 12 months before death

For non-mental health (physical) services, most had some service use; for those with no contact (range 59%–71%) and for those with mental health services contact (61%–93%). Mental health service contacts had an increase in proportion with physical health service use in the 6 months before death, and the no-contact group had an increased proportion of physical health service use in the 3 months before death.

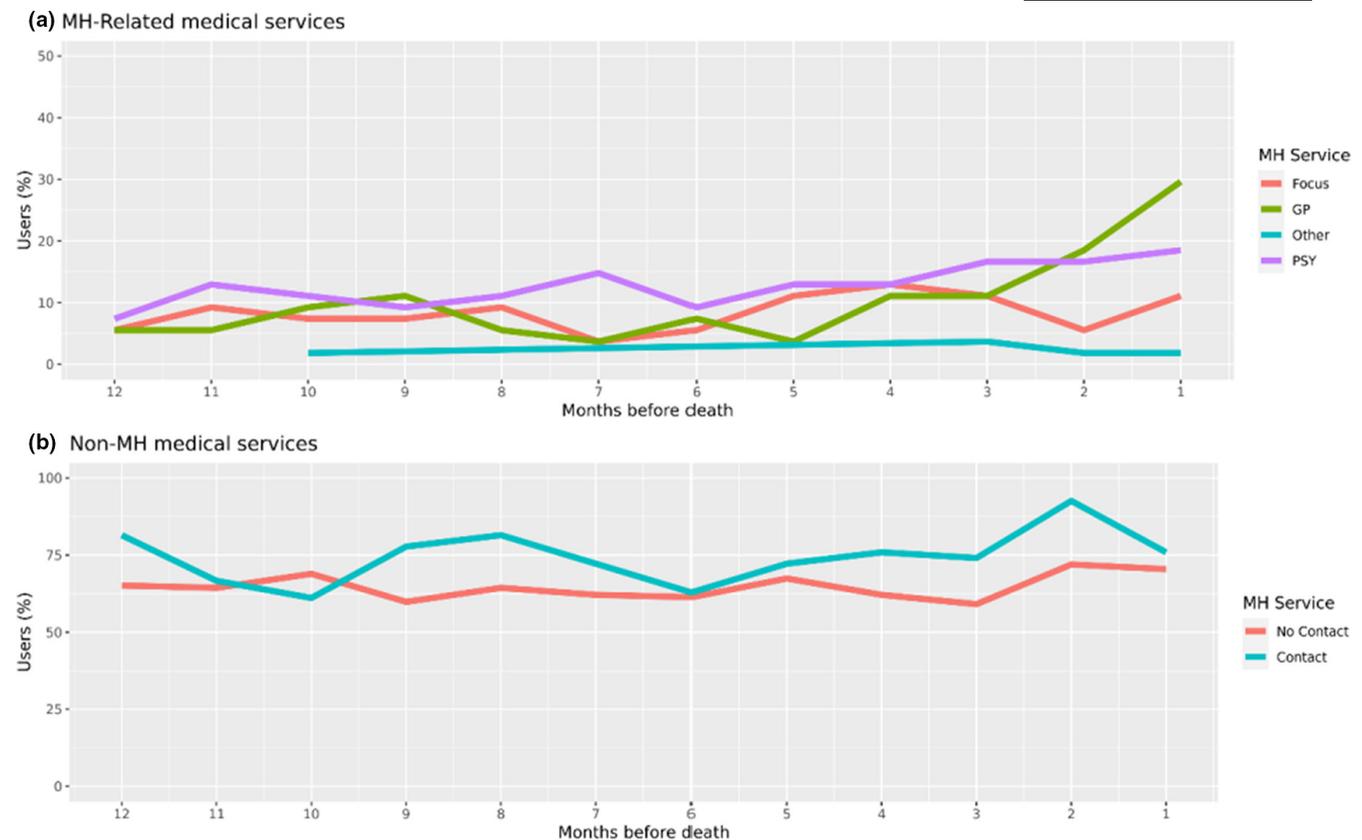


FIGURE 1 (a) Mental health services used in the 12 months before death by those using mental health services. All percentages are expressed with the denominator of $n = 54$ (contact with mental health services) only. Focus, Focussed psychological interventions delivered by Psychologist or Clinical Psychologist; GP, General Practitioner; PSY, Psychiatrist. (b): Non-mental (physical) health services used in the 12 months before death by contact and no contact with mental health service groups. Percentages are expressed with the denominators of $n = 54$ (contact with mental health services) and $n = 132$ (non-contact with mental health service), respectively.

Medications dispensed 12 months before death

Medications commonly used for mental health indications were infrequently dispensed in both mental health service contact and non-contact groups, except for antidepressants (Figure 2). Antidepressants were the most commonly dispensed; for the mental health service use group (range 32%–61%; increased in 6 months before death); and for the non-contact group (range 11%–21%; no increase before death).

There were virtually no psychostimulants dispensed; with modest but essentially equal prescription of anxiolytics <10% and sedative-hypnotic medications <10% each month. Antipsychotic medications were dispensed to around <12% of the mental health service use group and around 5% each month of the non-contact group.

Opioids were dispensed (range 4%–17%) in the mental health service use group and (11–21%) each month for the non-contact group, with increased proportions in the 6 months before death.

Demographic comparisons

There were no substantial differences by gender, migrant status, marital status, highest educational level, or levels of IRSAD social disadvantage (Table 1). Non-contacts with mental health services were more likely to be older (referent group age 45–54 years); retired involuntarily (referent group employed); and less likely to have an annual income of AUS \$70 K or more (referent group AUS <\$30 K). The commonest suicide methods were hanging, poisoning (solids or liquids), and firearms, with only suicide by firearms being statistically greater in the non-contact group.

Physical health comparisons

There were no differences in the proportions for any previous cancer or cardiovascular disease, BMI, general health, memory, or quality of life. Increasing role limitation due to physical illness (SF-36) as a continuous variable (and

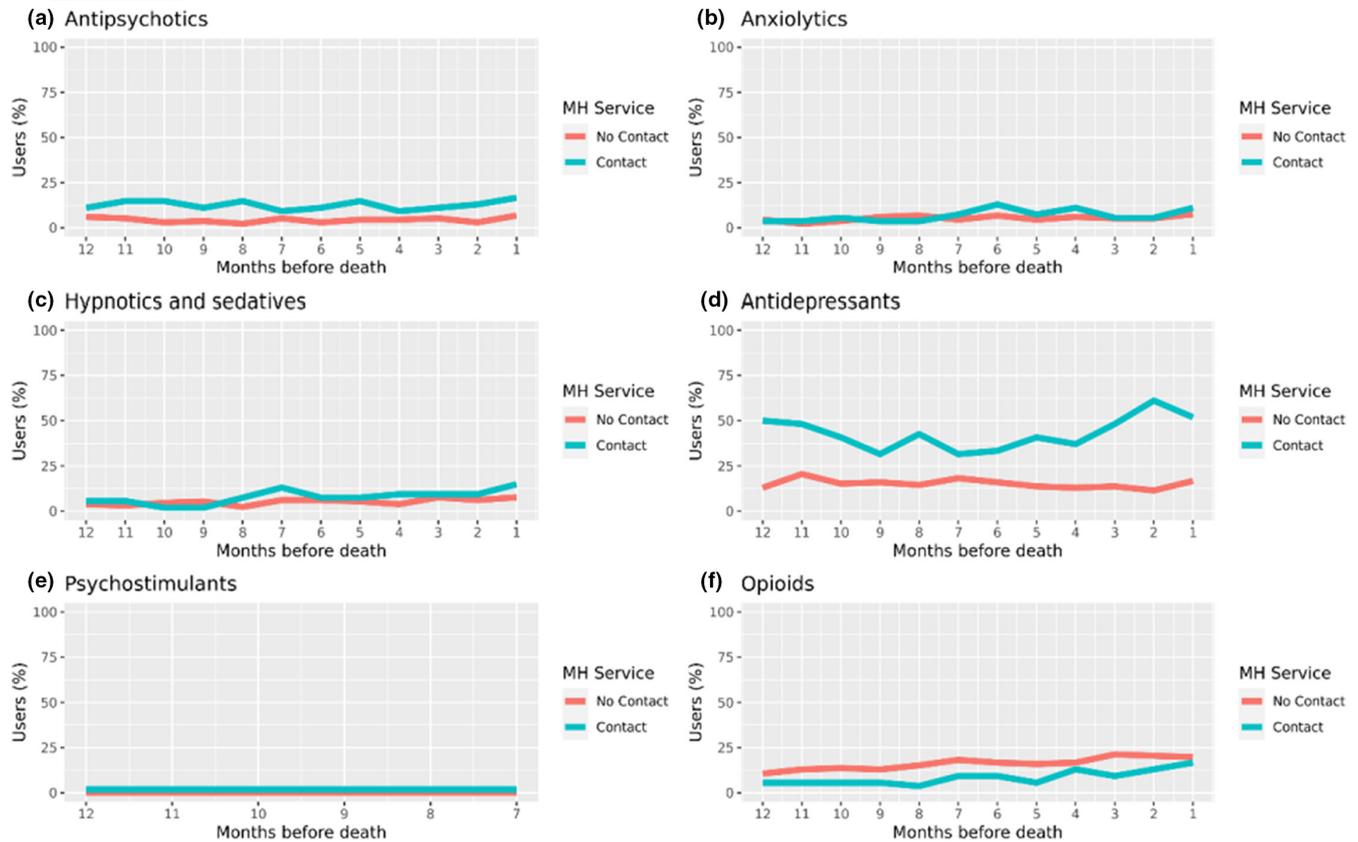


FIGURE 2 Medication dispensed in the 12 months before death by contact and no contact with mental health service groups. Percentages are expressed with the denominator of $n = 54$ (contact with mental health services) and $n = 132$ (no contact with mental health service), respectively

severe category) was significantly associated with greater likelihood of having no contact with mental health services (Table 2).

Mental health comparisons

There were no differences for alcohol use, psychological distress (High vs. Low on Kessler -10), social support scores (DSSI), or for problems with work or daily activities because of emotional problems.

The non-contact group was less likely to report a diagnosis of anxiety or depression and to have lower perceived levels of achievement (Table 3).

DISCUSSION

Suicide without mental health service contact

In this study of middle-older aged Australians aged over 45 years, 71% of suicide decedents were not in contact with Medicare-funded mental health services in the 12 months

before death. This estimate may have been inflated by the absence of data for decedents who exclusively used state-provided inpatient and outpatient mental health services or the recording of Medicare item numbers by general practitioners. Other studies have provided various estimates, and comparisons of rates are made more difficult by the heterogeneity of the populations studied, the method of suicide case classification, the period before death, and the definitions of mental health service. However, a selection of international studies yielding similar estimates with diverse populations included: 71% of all UK suicides 12 months before death (Hamdi et al., 2008), 72% of >65 years old suicides in Ohio 2 months before death (Sweeney et al., 2020), and 70% of >65 years old suicides in New Zealand (Cheung et al., 2017), had no contact with mental health services. In Queensland Australia, 75% of all ages (Sveticic et al., 2012); 59% for rural (mean age 45 years); and 54% for urban males (mean age 43 years) (McPhedran & De Leo, 2013); and for farming 59% managers (mean age 55 years) and 83% of laborers (mean age 35 years) (Arnautovska et al., 2015), had no contact with mental health services 3 months before death. In any case, likely more than half of suicide decedents do not use mental health services in the year before death. The most basic explanation for this is threefold.

TABLE 1 Demographic characteristics of participants

Variable	Level	Mental health service use		OR	CI
		Contact, <i>n</i> = 54 (29%)	No contact, <i>n</i> = 132 (71%)		
Age (years)	45–54	21 (38.9)	27 (20.5)	1.00	
	55–64	9 (16.7)	35 (26.5)	3.02	1.224–7.952
	65+	24 (44.4)	70 (53)	2.27	1.088–4.757
Sex	Male	36 (66.7)	103 (78)	1.00	
	Female	18 (33.3)	29 (22)	0.56	0.281–1.145
Migrant	Not Australian-born	37 (68.5)	88 (67.7)	1.00	
	Australian-born	17 (31.5)	42 (32.3)	1.04	0.53–2.086
Marital	With partner	40 (74.1)	77 (59.7)	1.00	
	Without partner	14 (25.9)	52 (40.3)	1.93	0.972–3.998
Education	Up to High School	22 (40.7)	56 (42.4)	1.00	
	Trade or certificate	15 (27.8)	40 (30.3)	1.05	0.487–2.296
	University or higher	17 (31.5)	36 (27.3)	0.83	0.39–1.791
Income (\$000/year)	<30	14 (28)	56 (45.9)	1.00	
	30–69	11 (22)	25 (20.5)	0.57	0.226–1.444
	70 or more	19 (38)	23 (18.9)	0.30	0.128–0.697
	No response	6 (12)	18 (14.8)	0.75	0.258–2.375
Employment	Employed	27 (50)	50 (37.9)	1.00	
	Retired voluntarily	9 (16.7)	27 (20.5)	1.62	0.683–4.097
	Unemployed	<5 (0)	<5 (3)		
	Retired involuntarily	9 (16.7)	40 (30.3)	2.40	1.044–5.936
	NILF	9 (16.7)	11 (8.3)	0.66	0.243–1.823
IRSD (quintile)	1 (low disadvantage)	8 (15.4)	18 (14.8)	1.00	
	2	15 (28.8)	42 (34.4)	1.24	0.435–3.414
	3	5 (9.6)	22 (18)	1.96	0.554–7.471
	4	12 (23.1)	21 (17.2)	0.78	0.254–2.306
	5 (high disadvantage)	12 (23.1)	19 (15.6)	0.70	0.227–2.103
Suicide method	Cutting	<5 (3.7)	8 (6.1)	1.00	
	Drowning	<5 (5.6)	6 (4.5)	0.50	0.052–3.964
	Firearms	<5 (7.4)	23 (17.4)	1.44	0.175–8.974
	Gases	6 (11.1)	13 (9.8)	0.54	0.068–3.061
	Hanging	20 (37)	47 (35.6)	0.59	0.084–2.605
	Jumping	7 (13)	5 (3.8)	0.18	0.02–1.093
	Poisoning	9 (16.7)	25 (18.9)	0.42	0.042–3.385
	Other	<5 (5.6)	5 (3.8)	0.69	0.093–3.46

Note: Results in bold indicate a significant result (CI95% interval does not cross OR of 1.00).

Abbreviations: IRSD, index of relative socio-economic disadvantage (for post-code of usual area of residence); NILF, not in the labour force.

We speculate that some decedents have mental illness but do not access potentially relevant mental health services; because of under-recognition of mental illness; or despite recognition of mental illness, because of treatment cost, social stigma, lack of insight, dissatisfaction with mental health services, or lack of availability of services. Only 29% of the non-contact group reported a diagnosis of anxiety or depression (our data sets did not cover other

less prevalent mental illnesses) and a substantial minority were dispensed antidepressant and antipsychotic medications, although the indications may have been non-mental health diagnoses, for example, chronic pain or insomnia. Those with a common mental illness might benefit from access to mental health service for treatment (Rihmer, 2001) and specific effective clinical interventions for suicide (Hofstra et al., 2020).

TABLE 2 Physical health characteristics of participants

Variable	Level	Mental health service use		OR	CI 95%
		Contact, <i>n</i> = 54 (29%)	No contact, <i>n</i> = 132 (71%)		
Any cancer	No	32 (59.3)	76 (57.6)	1.00	
	Yes	22 (40.7)	56 (42.4)	1.07	0.57–2.06
Any CVD	No	26 (48.1)	59 (44.7)	1.00	
	Yes	28 (51.9)	73 (55.3)	1.15	0.61–2.17
BMI	Normal	23 (43.4)	56 (44.4)	1.00	
	High	30 (56.6)	70 (55.6)	0.96	0.50–1.83
Health	Excellent	6 (11.3)	17 (13.5)	1.00	
	Very good	14 (26.4)	23 (18.3)	0.58	0.18–1.77
	Good	23 (43.4)	39 (31)	0.60	0.19–1.67
	Fair	6 (11.3)	37 (29.4)	2.18	0.60–7.95
	Poor	<5 (7.5)	10 (7.9)	0.88	0.20–4.16
Memory	Excellent	6 (11.3)	20 (15.6)	1.00	
	Very good	12 (22.6)	31 (24.2)	0.77	0.24–2.34
	Good	17 (32.1)	42 (32.8)	0.74	0.24–2.09
	Fair	14 (26.4)	27 (21.1)	0.58	0.18–1.72
	Poor	<5 (7.5)	8 (6.2)	0.60	0.13–2.87
Quality of life	Excellent	9 (17)	14 (11.3)	1.00	
	Very good	12 (22.6)	37 (29.8)	1.98	0.68–5.76
	Good	17 (32.1)	34 (27.4)	1.29	0.45–3.56
	Fair	8 (15.1)	33 (26.6)	2.65	0.85–8.50
	Poor	7 (13.2)	6 (4.8)	0.55	0.13–2.17
SF-36	No limitation	13 (25)	24 (20.9)	1.00	
Physical limitation domain	Minor	17 (32.7)	25 (21.7)	0.80	0.32–1.98
	Moderate	14 (26.9)	26 (22.6)	1.01	0.39–2.58
	Severe	8 (15.4)	40 (34.8)	2.71	1.00–7.76
		Mean (SD)	Mean (SD)	OR	CI 95%
SF-36	Role limitation- physical health	81.5 (24.7)	67.9 (32.1)	0.98	0.97–0.99

Note: Results in bold indicate a significant result (CI95% interval does not cross OR of 1.00).

Abbreviations: BMI, body mass index; CVD, cardiovascular disease; SF-12, short form-12.

Some suicide decedents do not have mental illness (Milner et al., 2013), and so mental health service interventions are not appropriate; and they may have a different pattern of risk factors for suicide and therefore intervention requirements. We conducted exploratory analyses to identify possible risk factors, which may inform the development of future interventions.

There may be a small number of suicide decedents who are misclassified as non-contact with mental health services, because they receive all mental health care exclusively within the state health systems. (i.e., no Medicare-funded mental health service). Accessing mental health service exclusively within the state funded services, although uncommon, might be expected to occur in

socioeconomically disadvantaged and severely mentally unwell patients (e.g., long-term hospitalization patients). Around a quarter of suicide decedents had no healthcare contact in the year before death, and so suicide prevention interventions will also require a population-based preventive component in addition to the availability of clinical services.

Mental health service use

In 2016–17, 2.5 million people (10% of the population) received Medicare-subsidized mental health-specific services, mostly by general practitioners. In 2007 National

TABLE 3 Mental health characteristics

Variable	Level	Mental health service use		OR	CI 95%
		Contact, <i>n</i> = 54 (29%)	No contact, <i>n</i> = 132 (71%)		
Any anxiety or depression	No	26 (48.1)	94 (71.2)	1	
	Yes	28 (51.9)	38 (28.8)	0.38	0.19–0.72
Distress (K-10)	Low	41 (85.4)	97 (84.3)	1	
	High	7 (14.6)	18 (15.7)	1.09	0.44–2.98
Problems with work or daily activity because of emotional problems					
Achieved less than you would have liked	No	25 (50)	81 (68.6)	1	
	Yes	25 (50)	37 (31.4)	0.46	0.23–0.90
Worked on activities less carefully	No	35 (72.9)	99 (84.6)	1	
	Yes	13 (27.1)	18 (15.4)	0.49	0.22–1.12
Reduced time spent on activities	No	35 (72.9)	98 (81.7)	1	
	Yes	13 (27.1)	22 (18.3)	0.60	0.28–1.35
		Mean (SD)	Mean (SD)		
DSSI: social support		8.2 (1.8)	7.8 (1.9)	0.87	0.73–1.04
Alcohol use (days/week)		3.4 (2.6)	3.2 (2.9)	0.98	0.87–1.10
Alcohol use (drinks/week)		7.4 (8.8)	8 (12.4)	1.00	0.98–1.04

Note: Results in bold indicate a significant result (CI 95% interval does not cross OR of 1.00).

Abbreviations: DSSI, Duke Social Support Index; K-10, Kessler 10.

Survey of Mental Health and Wellbeing, one-third of people with a mental disorder (12 months) accessed any mental health services, (general practitioner 71%, 38% psychologist-38%, psychiatrist-23%) (Australian Bureau of Statistics, 2008). In our study, 29% of suicide decedents used (at least one) Medicare-funded mental health service, delivered almost equally by a general practitioner or psychiatrist, which suggests there may have been some recognition or selection bias for more severe mental illness or suicidality and greater access to the relatively less available and more expensive psychiatrist consultations.

Non-mental (physical) health service use

Both service contact groups used non-mental (physical) health services commonly and at a similar rate, with increased use in the 3 months before death. Systematic reviews have also reported high rates of primary care service use (for physical or mental health reasons) in mental health non-contact groups, ranging from 75% to 83% (Pirkis & Burgess, 1998; Stene-Larsen & Reneflot, 2019), similar to our study for non-contacts (59%–71%) and contacts with mental health service (61%–93%) groups, over 12 months. In our study, suicide decedents with non-contact with mental health service had greater role limitation due to physical illness but similar use of physical medical services, suggesting only a modest reduction in

medical help-seeking behavior. Contact with physical health services offer an opportunity for suicide prevention, which might be focussed on physical illness and disability in addition to (recognized and unrecognized) mental health conditions. Physical conditions that might be associated with suicide include malignancy, neurological, pain, chronic respiratory, liver, male genital disorders, and arthritis (Fassberg et al., 2016).

Medication for mental illness use

The exposure to psychoactive medications is not often reported in relation to mental health service use, so further examination of this question might be warranted. Antidepressants are commonly prescribed, with 1 in 8 Australians dispensed antidepressants in 2014–15 (Australian Institute of Health and Welfare, 2016).

Antidepressants were the most commonly dispensed psychiatric medications, with a modestly increased rate the months before death. Antidepressant medications were dispensed for less than 50% of decedents in most months, greater in the mental health service use group. Despite frequent contact with general practitioners (for physical health services), there was relatively infrequent prescription of antidepressants, antipsychotics, hypnotics, and anxiolytics in the non-contact with mental health services group, which would suggest that these patients were not recognized as having the mental illnesses associated

with suicide (depression, anxiety, schizophrenia, and bipolar disorder). Mental illness is also under-recognized by general practitioners, with the rule of diminishing halves: Only half are recognized; only half of those are treated; and only half of those are effectively treated (Wittchen et al., 2003). It is also possible that the antidepressant prescribing may be relatively low because of concerns about medication-induced suicidal behaviors, even in this middle-aged and older population (Carter et al., 2022).

Participant characteristics

There were surprisingly few differences in demographic, physical health, or mental health characteristics that distinguished contact and non-contact with mental health service groups although the study was limited by the available sample size. No contact with mental health services in the 12 months before death was associated with older age, lower annual income, being involuntarily unemployed, firearms as the suicide method, greater severity of physical disability, less functional impairment due to emotional problems and lower proportions of mental illness.

These differences suggest that interventions and services accessing this population might need to be via physical health services directed at physical function (and possibly pain); and social services directed at low income, the impact of becoming unemployed, and the impact of aging, rather than exclusively via the traditional route of clinical mental health services.

Demographics

An increased risk of no contact for older age groups has been found in population-based studies in Taiwan (Lee et al., 2008) and Finland (Pitkälä et al., 2005) and for both older and younger ages in United States (Niederkrotenthaler et al., 2014); or no age-based risk in Italy (Giupponi et al., 2014) and the UK (Hamdi et al., 2008). A recent systematic review reflected this variability of results and concluded that both younger and older ages were less likely to have contact with mental health services in the period before suicide (Tang et al., 2021). Our study showed no significant gender differences, similar to veteran (Ryan et al., 2020) and incarcerated populations (Choi et al., 2019) in the United States. However, males were less likely to have contact with mental health service in the UK (Hamdi et al., 2008; Salib & Green, 2003), and in older aged suicides in the United States (Sweeney et al., 2020).

Marital status is not usually associated in other studies (Choi et al., 2019; Giupponi et al., 2014; Hamdi et al., 2008);

employment status inconsistent (Giupponi et al., 2014; Hamdi et al., 2008; Law et al., 2010); and income level no reported associations (Ahmedani et al., 2014; Law et al., 2010) with non-contact with mental health services.

Physical health

A diagnosis of cancer or cardiovascular disease (and physical health service use) was similar in suicide decedents who used and did not use mental health services, similar to studies showing no differences in physical health problems (Choi et al., 2019; Hamdi et al., 2008; Niederkrotenthaler et al., 2014). However, in Queensland, for non-indigenous, recent treatment for physical illness and alcohol misuse *increased* the likelihood of mental health service use, 3 months before death (Sveticic et al., 2012).

Opioid medications were dispensed in the non-contact group for around 10%–20% of decedents in any given month, higher 3 months before death. Opioid medications were dispensed in the contact with mental health services group for 5%–17% in any given month, higher 3 months before death. We had no direct measure of acute or chronic pain syndromes. These results might be interpreted as more treated moderate to severe chronic pain in the non-contact with mental health services group and new onset or recurrence of pain in the months preceding death in both groups; or a “stockpiling” of medications planned for use in suicide. These results warrant further investigation.

Mental illness in suicide decedents

The true prevalence of mental illness in suicide decedents is unknown. Estimates can be biased whether derived from psychological autopsy studies or mental health service use records. Systematic reviews of psychological autopsy studies estimated median prevalence of 91% in case series; 90% in cases and 27% in controls in case-control designs; with a population attributable fraction for mental disorder range from 47% to 74% (Cavanagh et al., 2003). However, psychological autopsy methods may produce overestimates of diagnosis (Hjelmeland et al., 2012). Conversely, a systematic review of recorded mental illness diagnoses found: 66.7% no Axis I (DSM) disorders diagnosis, 37% no diagnosis when including Axis I sub-threshold/mild conditions, and 37% had no personality (Axis II) or Axis I disorders (Milner et al., 2013).

In our study, 52% of the participants in contact with mental health services reported a diagnosis of anxiety or depression at the baseline assessment. Only 29% of

non-contact participants reported any diagnosis of depression or anxiety on the baseline questionnaire, similar to estimates of mental illness in the Australian general community; almost half (45%) met criteria for any lifetime disorder and 20% a 12-month mental disorder (Australian Bureau of Statistics, 2008). In our study, those with no-contact with mental health services also showed less functional impairment due to emotional problems, suggesting the lower proportions of mental illness is plausible and not simply a product of non-contact with mental health services. Suicide decedents not receiving mental health care are reported as less likely to have a psychiatric diagnosis (Choi et al., 2019; Giupponi et al., 2014; Hamdi et al., 2008; Law et al., 2010), or to have past suicidal behavior (Choi et al., 2019; Giupponi et al., 2014; Hamdi et al., 2008; Niederkrötenhaler et al., 2014; Svetcic et al., 2012; Sweeney et al., 2020).

International studies have shown non-contact groups as more likely to use lethal means of suicide (Choi et al., 2019; Giupponi et al., 2014; Sweeney et al., 2020); and in our study, firearms as the suicide method (cutting as referent group) showed increased risk in the non-contact group, while hanging and poisoning, were of similar proportions in contact and non-contact groups.

LIMITATIONS

This was an exploratory case-series study with a restricted number of univariate comparisons, based on classification of mental health service use, which was limited to data from Medicare. Classification of non-contacts with mental health services may have been overestimated by the exclusion of those who exclusively used state-based services, and private services paid “out of pocket.” Coding of general practitioner Medicare item number data may have underestimated mental health-related visits and overestimated non-mental health service visits.

A key limitation in the current study was participants were restricted to those aged 45 years and older. This excluded younger people (around half of all suicide decedents are under 45 years), and these people may have a different pattern of mental health service use and pattern of exposures. Although we used 284 decedents, all the suicide deaths from a large sample (~267k participants) followed over more than 10 years, between-group comparisons are likely affected by a lack of statistical power.

Our measurement of exposures had several limitations: Demographic, physical, and mental health factors were recorded at the time of the 45 and Up baseline questionnaire and the referent period for specific instruments

for physical and mental health measures usually referred to the weeks prior to the baseline questionnaire, not the period immediately before death. Estimates of anxiety and depression were restricted to responses to the question; “has a doctor ever told you have any diagnosis of anxiety or depression?” which may have underestimated these diagnoses and excluded other mental illness diagnoses.

Prior to April 2012, medicines under the Medicare co-pay threshold, which included antidepressants, were not captured in the PBS records. For deaths before 2012, this will underestimate medication use. Medications dispensed directly from an Emergency Department, psychiatric hospital, or community mental health service pharmacy were not recorded by the PBS and so could underestimate medication exposure. Classification of medications, for example, as antipsychotics and antidepressants, do not necessarily reflect the indications for use. In our study, a small number of the non-contact with mental health services group may have used state-based mental health services (Emergency Departments, psychiatric hospital, and community mental health), as their sole medication suppliers.

There are challenges in interpreting the observed associations between those with or without contact with mental health services, given that these are analytic comparisons within a case series. A case series is a selected sub-population and analytic associations are subject to collider bias due to a study design that conditioning on the outcome of interest (Cole et al., 2010). More formal comparison of using a case-control or cohort design would allow for clearer interpretation of these relative differences.

CONCLUSION

Most suicide decedents did not use Medicare-funded mental health services in the year prior to suicide. Reducing suicide rates will require the provision of appropriate interventions, and some of these interventions might be outside the scope of traditional mental health services.

Some suicide decedents have mental illness but do not access potentially useful to them, while others have unrecognized mental illness at least in part because they do not use mental health services. We need to understand why these people do not use potentially beneficial mental health services.

Some suicide decedents do not have mental illness and so current mental health services would not meet their needs. These suicide decedents probably have a different pattern of modifiable risk factors for suicide to those with mental illness and therefore different requirements

for intervention. From our study, we suggest that modifiable risk factors for further investigation and possible intervention (against background risk factors for suicide) might include low income and being retired involuntarily requiring social interventions, and physical role limitation requiring physical health and rehabilitation services. People who received mental health care and medications exclusively within state and territory funded health systems may have been misclassified and should be the focus of future study.

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CONFLICT OF INTEREST

There are no conflicts to declare.

DATA AVAILABILITY STATEMENT

The data for this study are not openly available.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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