



People Who Die by Suicide Without Receiving Mental Health Services: A Systematic Review

Samantha Tang^{1*}, Natalie M. Reily¹, Andrew F. Arena¹, Philip J. Batterham², Alison L. Calear², Gregory L. Carter³, Andrew J. Mackinnon¹ and Helen Christensen¹

¹ Black Dog Institute, University of New South Wales, Sydney, NSW, Australia, ² Centre for Mental Health Research, Research School of Population Health, Australian National University, Canberra, ACT, Australia, ³ School of Medicine and Public Health, University of Newcastle, Newcastle, NSW, Australia

OPEN ACCESS

Edited by:

Marinos Kyriakopoulos,
King's College London,
United Kingdom

Reviewed by:

Gianluca Serafini,
San Martino Hospital, Scientific
Institute for Research, Hospitalization
and Healthcare (IRCCS), Italy
Jorge Gaete,
University of the Andes, Chile

*Correspondence:

Samantha Tang
samantha.tang@blackdog.org.au

Specialty section:

This article was submitted to
Public Mental Health,
a section of the journal
Frontiers in Public Health

Received: 06 July 2021

Accepted: 16 December 2021

Published: 18 January 2022

Citation:

Tang S, Reily NM, Arena AF,
Batterham PJ, Calear AL, Carter GL,
Mackinnon AJ and Christensen H
(2022) People Who Die by Suicide
Without Receiving Mental Health
Services: A Systematic Review.
Front. Public Health 9:736948.
doi: 10.3389/fpubh.2021.736948

Introduction: The majority of people who die by suicide have not had contact with mental health professionals in the year prior to death. To date, this majority group has largely been ignored, with most existing research focusing on predictors of suicide such as past suicide attempts. Identifying the characteristics of people who die by suicide without receiving services, often with a fatal first attempt, is crucial to reduce suicide rates through guiding improvements to service pathways and “just in time” interventions.

Methods: In this systematic review, PsycInfo, PubMed, CINAHL, and Web of Science were searched for peer-reviewed articles published from 1980 to 1st March 2021. Included studies examined predictors of non-receipt of formal mental health services among people who died by suicide. Data were extracted from published reports and the quality of included studies was assessed using a modified version of the Joanna Briggs Institute Checklist for Analytical Cross Sectional Studies. This review was registered with PROSPERO, CRD 42021226543.

Results: Sixty-seven studies met inclusion criteria, with sample sizes ranging from 39 to 193,152 individuals. Male sex, younger or older age, and rural location were consistently associated with non-receipt of mental health services. People not receiving mental health services were also less likely to have a psychiatric diagnosis, past suicidal behavior or contact with general health services, and more likely to use violent means of suicide. There was some evidence that minority ethnicity and psychosocial stressors were associated with service non-receipt.

Conclusion: People who die by suicide without receiving mental health services are likely to have diverse profiles, indicating the need for multifaceted approaches to effectively support people at risk of suicide. Identifying the needs and preferences of individuals who are at risk of suicide is crucial in developing new support pathways and services, and improving the quality of existing services.

Systematic Review Registration: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42021226543.

Keywords: suicide, systematic review, healthcare utilization, coronial data, mental health services

INTRODUCTION

Suicide is the leading cause of death for Australians aged 15–49 (1). Notably, over two-thirds of individuals who die from suicide do not receive professional mental health support (including seeing a general practitioner or mental health professional for mental health or substance use reasons) in the year prior to death. (2). Research has focused on understanding suicide risk factors [for reviews, see (3–5)], but not on identifying factors specifically for those who did not receive mental health services prior to suicide. Although it is not possible to obtain first-hand reports from people who have died by suicide, coronial data can provide insights into the characteristics of this population and guide opportunities for suicide prevention efforts by policymakers, researchers, and service providers.

The current systematic review provides a comprehensive overview of predictors of non-receipt of formal mental health services among people who died by suicide, consolidating work in existing reviews on predictors of service utilization among those with common mental health issues (6, 7). To our knowledge, only two other systematic reviews have examined predictors of service use in a suicidal population. A systematic review by Han et al. (8), which examined predictors of help-seeking across different levels of suicidality, found that help-seeking for suicidality was associated with female gender, older age, non-minority ethnicity, presence of mental health issues, and greater severity of suicidality. However, this review did not have a primary focus on people who died by suicide. Furthermore, a systematic review by Hom et al. (9) examined barriers and facilitators of help-seeking for suicidality, but this review did not examine other factors associated with help-seeking, such as demographic and diagnostic characteristics.

We recognize that people may not use formal services for variety of reasons, including service inaccessibility or unaffordability, stigma, poor mental health literacy, preference for informal support, or negative past healthcare experiences. Identifying the characteristics associated with non-use of services within this population is critical to address these barriers, develop alternative pathways into services, re-design current services, and inform the development of novel interventions or more appropriate “care” models.

We focused on non-receipt of formal mental health services, rather than informal support as the primary outcome, given the focus of available literature, and since formal service use data is more easily verifiable by administrative health records linkage. Additionally, formal services are more likely to deliver evidence-based treatments compared to informal supports. One complexity in the literature is that studies consider a range of timeframes of mental health service use, ranging from non-use at time of death to non-use across an individual's lifetime. Shorter timeframe studies that classify decedents as “not in services” based on data from the weeks before death may miss service use in the months before death. Longer timeframe studies that classify decedents as “in services” based on lifetime use may inaccurately reflect service use in response to direct precipitants of suicide. In this review, we did not

set limits on the timeframe examined; rather, this information was extracted from included studies. A second complexity is that studies vary in the data source used to ascertain service utilization and predictors of non-receipt of services. Studies that use psychological autopsies to acquire data through interviewing bereaved family, friends, or health professionals may yield unreliable reports (10). Studies that use coronial and/or health administrative data are also subject to methodological limitations (e.g., missing data) and are limited to examining risk factors that can be ascertained after death. To increase the comprehensiveness of the review, we included service use data and data on predictors of non-receipt of services from all aforementioned sources.

The aims of the review were to: (1) determine robust risk factors for non-receipt of formal mental health services among people who died by suicide, regardless of age; and (2) examine whether these risk factors are stable across different timeframes and types of services (e.g., inpatient vs. outpatient services).

MATERIALS AND METHODS

Search Strategy and Selection Criteria

This systematic review adhered to PRISMA guidelines (11) and was prospectively registered with PROSPERO (CRD 42021226543). The research team included individuals with lived experience of suicidality, who helped to shape the inclusion criteria and interpretation of findings for this review. Four electronic databases (PsycInfo, PubMed, CINAHL, and Web of Science) were searched from 1st January 1980 to 1st March 2021, with no language restrictions. The search strategy included a combination of three key blocks of terms related to: (i) suicide, (ii) health service utilization, and (iii) dying by suicide (see **Supplementary Materials**). Reference lists of included papers were examined to identify any additional papers.

Eligible studies were observational studies published in a peer-reviewed journal that examined one or more predictors of non-receipt of formal mental health services amongst people who died by suicide. Predictors specific to certain populations or regions (e.g., military rank, number of deployments, US census region, years spent living in a specific country) were excluded. Formal mental health services use was defined as seeing a general practitioner (GP), psychologist, psychiatrist, or other mental health professional in an emergency department (ED), inpatient or outpatient setting for mental health or substance use problems, or receiving a prescription for psychotropic medication. Studies that did not distinguish between mental health and non-mental health services, or formal and informal supports were excluded. No restrictions were placed on timeframe of service use, but the timeframe needed to be ascertainable from the article or through secondary sources (e.g., public information on the database). Studies that examined “past” or “previous” service contact were assumed to be examining lifetime service use.

Following removal of duplicates, all titles and abstracts were screened for suitability by ST, and a subset of 20% was screened by

TABLE 1 | Description of strength of evidence ratings.

Level of evidence	Description
Consistent evidence	>50% of observations find a significant association in one direction, with no substantial significant findings in the opposite direction for variable is examined by ≥ 3 studies
Some evidence	30–50% of observations find a significant association in one direction, with no substantial significant findings in the opposite direction for variables examined by ≥ 3 studies
Unlikely association	<30% of observations found a significant association in one direction for variables examined by ≥ 3 studies
Insufficient studies	Variables examined by <3 studies

NR, with high interrater reliability ($\kappa = 0.96$). Both authors then independently screened full-text articles for inclusion ($\kappa = 0.85$). Any disagreements were resolved through discussion with a third author (HC). At the full-text screening stage, three non-English articles were translated into English using Google Translate. One article, in French, and another, in German, were manually cross-checked by AJM. The third article, in Norwegian, was corrected by checking unclear expressions using alternative translators or by exploring where unclear terms were used in other contexts.

Data Analysis

ST and NR extracted data into a custom spreadsheet, recording: article, authors, year of publication, region/country, sample characteristics (size, age, and time period of death), data source(s), type of mental health service use (any, specialist, inpatient/ED, or mental health-related primary care), timeframe of mental health service use (within 1 month of death, within 1 year of death, or over 1 year prior to death/lifetime), predictors assessed, and main findings. Specialized mental health services include services provided within a particular setting (e.g., only outpatient, only a specified clinic/hospital) or by a particular type of mental health professional (e.g., only psychiatrists or psychologists).

A narrative synthesis approach was undertaken because significant variability in the designs, analyses and variables examined in included studies (see **Supplementary Table 1**) precluded a meta-analytic approach. Given the number and breadth of risk factors examined across studies, the below findings are reported by strength of evidence for an association with non-receipt of care, with variables with “consistent evidence” described first, followed by variables with “some evidence” and “unlikely association” for ease of interpretation of the results. See **Table 1** for definitions.

Quality Assessment

Study quality was assessed using a modified version of the Joanna Briggs Institute Checklists for Cohort and Analytical Cross-Sectional Studies (12) (see **Supplementary Table 2**). Studies were rated “adequate,” “partial,” “poor,” or “unclear” on each item by two independent reviewers (ST and AA), with consensus achieved through discussion.

RESULTS

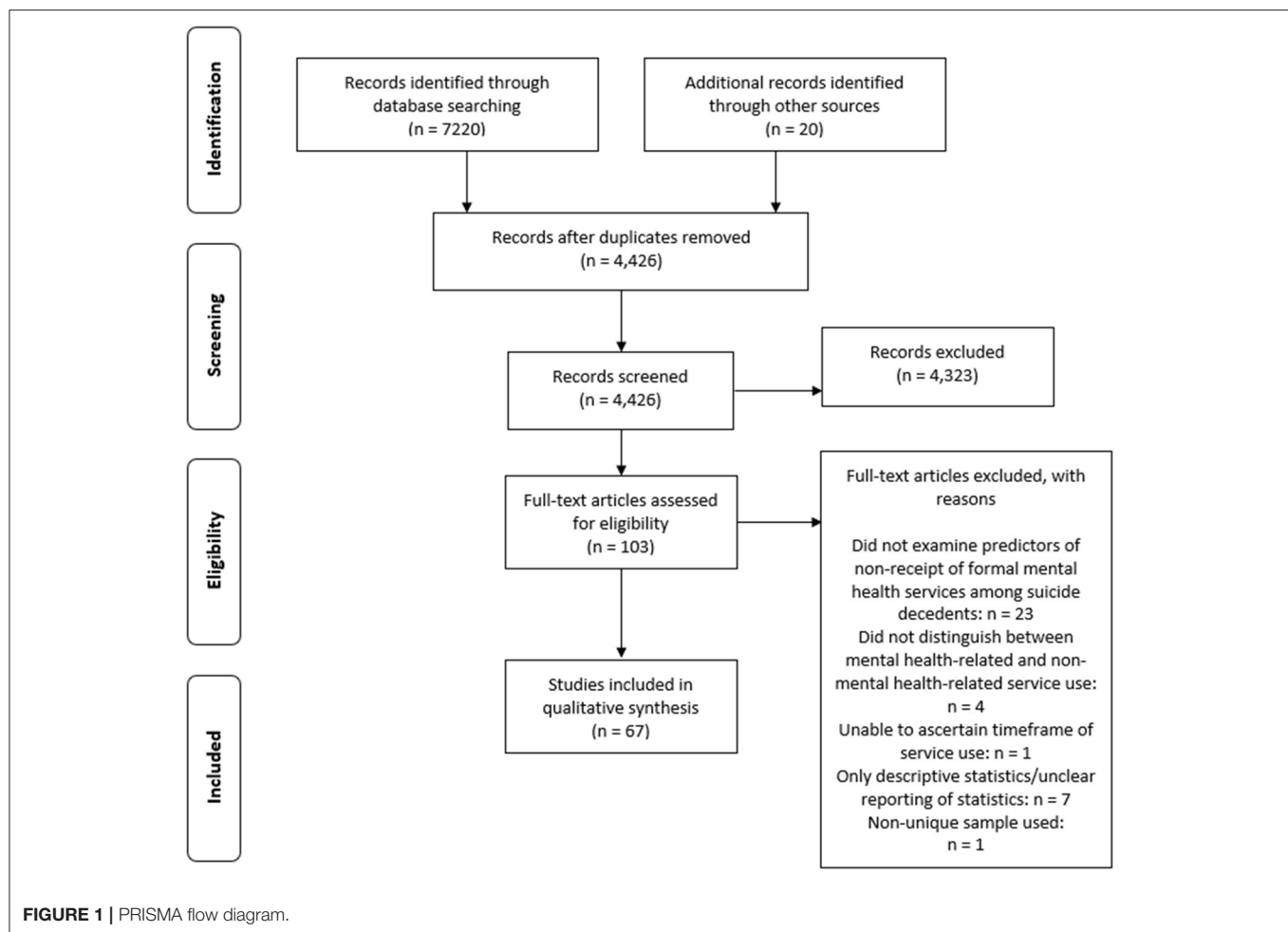
A total of 7,240 articles were identified. After removing duplicates and excluding studies based on abstracts, full text, or overlapping samples, 67 were eligible for inclusion (see **Figure 1**). The majority of included studies were from the United States ($n = 19$), the United Kingdom ($n = 11$), Canada ($n = 8$), Australia ($n = 7$), or Taiwan ($n = 5$). Most studies included a broad age range, though some exclusively examined adults over 50 ($n = 8$), or young people under 25 ($n = 10$). The type of services was highly varied, with “any” and “specialist outpatient” being most common. Timeframe of service use was also varied with lifetime, and within 1 year of death being most common (see **Supplementary Table 1**). **Supplementary Table 3** presents characteristics of included studies. **Table 2** presents a summary of the results for each risk factor. We examined findings across different timeframes and types of services and found little difference in the pattern of results, except for financial stressors where the association between experiencing a stressor and non-use of services was only seen for short timeframes of care (described below). As such, our results collapse across timeframe and type of mental health service use.

Consistent Evidence of Association With Non-receipt of Services

There was consistent evidence of an association between non-receipt of services and a number of demographic, diagnostic, and suicide-related variables. Most studies indicated that males were less likely to receive services compared to females (13–31). A number of studies found that male sex was only associated with non-receipt of services in certain subgroups [e.g., non-Indigenous Australians (32), young adults (33)] or under certain circumstances (34–36) [e.g., inpatient, not outpatient services (37), within 1 year of death, but not 1 month of death (34, 35)]. Although some studies found no relationship (24, 38–42), no study found that females were less likely to access services compared to males.

Age also predicted non-receipt of services in most studies. Some studies using general population samples (13, 21, 28, 43) and US military samples (24, 35) found that non-receipt of services was associated with younger age. In contrast, a number of studies of the general population found that non-receipt of services was associated with older age (18, 22, 30, 39). Almost all significant findings compared age groups using diverse age categories. Samples exclusively of young people under 25 (33), and of older adults over 65 had mixed findings (17, 44). While these findings may appear to be inconsistent, both young age and old age are likely risk factors for non-receipt of services. In line with this interpretation, two studies found that service use within 1 year of death was less pronounced among both younger and older decedents (20, 26). Six studies found no association (19, 38, 40, 45–47), which, when taken in the context of the other findings, may implicate a bimodal pattern of risk for both younger and older people, given that these studies included a broad age range and continuous age measures.

Regarding location, four studies found that decedents residing in rural locations were less likely to have received any mental



health services compared to those residing in urban locations (27, 48–50). An Australian study found that non-receipt of mental health services was predicted by rural location only among Indigenous Australians (32). Three studies found no association (39, 44, 51).

Regarding diagnostic variables, studies consistently found that the absence of any mental health diagnosis predicted non-receipt of services across different timeframes and service types (38, 45, 46, 52–55). Specific diagnostic categories that were consistently associated with a greater likelihood of receiving services were mood disorders or symptoms, including depression and bipolar disorder (20, 26, 38, 44, 46, 56, 57), and schizophrenia and related disorders (37, 47, 58). There was also consistent evidence to suggest that non-receipt of services was associated with the absence of alcohol and/or substance abuse in general samples (37, 38, 50) and in certain subgroups [e.g., non-Indigenous Australians (32)]. An additional study found that non-receipt of services was associated with presence of blood alcohol at the time of death (59). However, four studies found no association for alcohol and/or substance abuse (44–46, 53).

Regarding suicide-related variables, the majority of studies found that non-receipt of mental health services was associated

with more violent methods of suicide (e.g., firearm or hanging) compared to less violent methods (e.g., drug overdose) (13, 14, 20, 22, 25, 26, 39, 42, 50, 60–62). One study found that males, but not females, who were not receiving services were less likely to die by drug overdose compared to those receiving services (31). Two studies found that suicide by carbon monoxide poisoning was associated with not receiving services (50, 63). A minority of studies found no association (37, 38, 44, 45, 47, 64). All but two studies (47, 50) found that the absence of past suicidal behavior also consistently predicted non-receipt of services (14, 20, 25, 26, 31, 32, 37, 38, 42, 44–46, 64, 65). That is, decedents who had made a previous suicide attempt were more likely to have received services. Studies also consistently found that those not receiving non-mental health services, such as physical healthcare services and social services were also less likely to receive mental health services in the period before suicide (25, 31, 32, 45, 46, 49).

Some Evidence of Association With Non-receipt of Services

There was some evidence of an association between non-receipt of services, and ethnicity and employment status. Several studies

TABLE 2 | Summary of variables assessed, including strength of evidence for the relationship between each variable and non-receipt of mental health services.

Variable	Total # of studies	Total # of observations	Direction (variable associated with non-receipt of mental health services)	Total # of observations in this direction	Summary of evidence for risk factors for non-receipt of mental health services
Demographic					
Sex	31	50	Male	31	Consistent evidence for male sex
			Null	19	
Age	23	30	Older age	10	Evidence for both younger and older age*
			Younger age	8	
			Middle age	1	
			Bimodal (older and younger age)	2	
			Null	9	
Location	8	14	Rural location	8	Consistent evidence for rural location
			Null	6	
Ethnicity	13	15	Non-White ethnicity	5	Some evidence for ethnic minority status
			Indigenous	2	
			Null	8	
Employment status	7	10	Being employed	4	Some evidence for being employed
			Being retired	1	
			Null	5	
Marital status	11	15	Being married	2	Unlikely association for marital status
			Never having been married	1	
			Being widowed	2	
			Null	10	
Living situation	6	7	Living alone	2	Unlikely association for living situation
			Null	5	
Education level	4	5	Low neighborhood education	2	Unlikely association for individual education level; insufficient evidence for neighborhood education level
			Null	3	
Occupation	7	9	Farm laborer (compared to farm manager)	1	Insufficient studies (given heterogeneity among studies)
			Non-farming/agriculture occupation among those living rurally	1	
			Marine Corp (compared to Army)	1	
			Null	6	
Income level	2	3	High income	2	Insufficient studies
			Low neighborhood income	1	
Religion	2	2	Null	2	Insufficient studies
Sexual orientation	1	2	Null	2	Insufficient studies
Parental status	1	2	No children	2	Insufficient studies
Perinatal status	1	5	Suicide death during perinatal period	1	Insufficient studies
			Null	4	
Political views	1	1	Being socially conservative	1	Insufficient studies
Diagnostic					
Any MH diagnosis	8	10	Absence of any MH diagnosis	10	Consistent evidence for absence of any MH diagnosis
Mood disorder/depressed mood	10	15	Absence of mood disorder/depressed mood	12	Consistent evidence for absence of mood disorder/depressed mood
			Null	3	

(Continued)

TABLE 2 | Continued

Variable	Total # of studies	Total # of observations	Direction (variable associated with non-receipt of mental health services)	Total # of observations in this direction	Summary of evidence for risk factors for non-receipt of mental health services
Schizophrenia and related disorders	6	13*	Absence of schizophrenia and related disorders	11	Consistent evidence for absence of schizophrenia and related disorders
			Null	2	
Alcohol/substance abuse	10	15	Absence of alcohol/substance abuse	8	Consistent evidence for absence of alcohol/substance use
			Null	7	
Family history of mental illness/suicidality	4	6	Absence of family history of mental illness	1	Unlikely association for family history of mental illness/suicidality
Anxiety	2	3	Absence of anxiety disorder	2	Insufficient studies
			Null	1	
Personality disorder	2	2	Null	2	Insufficient studies
Adjustment disorder	1	2	Absence of adjustment disorder	2	Insufficient studies
Problem gambling	1	3	Absence of problem gambling	3	Insufficient studies
Suicide-related					
Method of suicide	20	24	Violent methods	15	Consistent evidence for violent methods of suicide
			Carbon monoxide	2	
			Null	7	
Past suicidal behavior	16	20	Absence of past suicidal behavior	18	Consistent evidence for absence of past suicide attempts
			Null	2	
Disclosure of suicide intent to others	7	9	Absence of disclosure	4	Some evidence for the absence of disclosure
			Null	5	
Location/time of death	4	4	Null	4	Unlikely association for location/time of death
Suicide note	7	7	No suicide note	2	Unlikely association for no suicide note
			Null	5	
Time from initial onset of suicidal behavior	1	2	Short time period between initial onset of suicidal behavior and death	2	Insufficient studies
Perceived suicide risk	2	2	Low perceived risk	1	Insufficient evidence
			Null	1	
Psychosocial stressors/precipitating events					
Any stressor	4	4	Presence of any recent stressor	2	Some evidence for presence of any stressor
			Null	2	
Financial/job problems	9	13	Presence of financial/job problems	4	Some evidence for presence of financial/job problems
			Null	9	
Criminal/legal problems	5	6	Presence of criminal/legal problems	2	Some evidence for experiencing criminal/legal problems
Physical health problems	10	11	Absence of physical health problems	1	Unlikely association for physical health problems
			Presence of physical health problems	3	
			Null	7	
Family or relationship or interpersonal problems	6	8	Presence of family/relationship/interpersonal problems	1	Unlikely association for experiencing family or relationship or interpersonal problems
			Null	7	
Recent loss (incl. suicide or other death of close person)	6	7	Null	7	Unlikely association for experiencing recent loss

(Continued)

TABLE 2 | Continued

Variable	Total # of studies	Total # of observations	Direction (variable associated with non-receipt of mental health services)	Total # of observations in this direction	Summary of evidence for risk factors for non-receipt of mental health services
Housing problems/homelessness	2	2	Being homeless	1	Insufficient studies
			Null	1	
Immigration	1	1	Null	1	Insufficient studies
Life events in childhood	1	1	Null	1	Insufficient studies
Perpetuating violence	1	1	Perpetrator of violence	1	Insufficient studies
Victim of violence	1	1	Null	1	Insufficient studies
Other variables					
Contact with other services (e.g., GP, social services)	6	10	Absence of contact with other services	8	Consistent evidence for absence of contact with other services
			Null	2	
Family history of psychiatric contact	1	2	Absence of family history of psychiatric contact	1	Insufficient studies
			Null	1	
Social problem-solving	1	1	Null	1	Insufficient studies
Impulsivity	1	1	Null	1	Insufficient studies
Academic performance	1	1	Null	1	Insufficient studies

The results reported in this table were based on the most adjusted analyses provided. Observations refer to distinct instances of a result for different types/timeframes of mental health service use, or non-overlapping samples or predictors.

*See Results text for clarification.

The bold values represent variables that consistently predict non-receipt of mental health services.

found that non-White compared to White (14, 20, 30, 35, 66), and Indigenous compared to non-Indigenous decedents (14, 20, 30, 66) were less likely to have received services. No studies found that ethnic minority groups were more likely to receive services, but a number found no association (19, 32). Among studies examining employment status, two found that non-receipt of mental health services was associated with being employed (47, 64), and one found that non-receipt of inpatient, but not outpatient services, was associated with being employed (37). In contrast, another study found that being retired, but not being employed, predicted lower odds of service use (39). Three studies found no association (42, 45, 46).

Regarding suicide-related variables, there was some evidence for an association between non-disclosure of suicidal intentions/ideation to others and non-receipt of mental health services. Some studies found that non-receipt of services was associated with the absence of disclosure in general samples (39, 67) and among certain subgroups (e.g., non-Indigenous Australians only) (32) and circumstances (e.g., for inpatient, but not outpatient service use) (37). However, three other studies found no relationship (45, 46, 50).

Regarding psychosocial stressors, some studies explored whether non-receipt of services was associated with experiencing any recent stressors. Two studies found that people who had not received services were more likely to have experienced a stressor prior to their deaths (26, 42), but another two found no

such association (46, 64). Other studies examined the relationship between service use and a specific stressor, with some finding that non-receipt of mental health services in the year before death was associated with experiencing financial problems (20, 44, 47, 68), but not job problems (20, 44) at the time of death. Lifetime service use on the other hand, was not associated with financial or job problems (26, 45, 50, 69). This pattern suggests that recent experiences of financial problems may be a risk factor for dying by suicide without having received mental health services. Additionally, there was some, albeit limited, evidence to suggest that non-receipt of services was associated with experiencing criminal/legal problems prior to suicide (20, 26, 38, 44, 64).

Unlikely Evidence of Association With Non-receipt of Services

The evidence suggested that there was an unlikely association between mental health service use and the following variables: marital status (50, 70, 71), individual education level (45, 47, 64), having a family history of mental illness/suicidality (25, 26, 35, 38, 39, 44–47, 50, 64), location or time of death (13, 45, 47, 64), the presence of a suicide note (37, 42, 45, 64), experiencing physical health problems (24, 44, 60, 72–75), family/relationship problems (25, 26, 39, 45), and experiencing a recent loss (14, 26, 37, 42, 45, 50). Most studies found no association between non-receipt of services and living situation (20, 26, 38, 44, 50, 64), although one study found that elderly

decedents not receiving services were more likely to be living alone (25), which might suggest living alone confers a risk in older populations.

Insufficient Evidence of Association With Non-receipt of Services

There was an insufficient number of studies examining all remaining variables (see **Table 2**). Although occupation was examined in a number of studies, these studies were highly heterogeneous in the occupations examined and no specific occupation was examined by more than two studies (24, 44, 60, 72–75).

Quality of Included Studies

Study quality assessment and ratings are presented in **Supplementary Table 4**. Most studies were adequate on Items 1 and 2, while close to half of studies were rated as partial for item 3 and poor for item 4. Only eight studies scored less than adequate on >50% of the items (31, 36, 53, 54, 56, 68, 73, 76). Excluding these studies did not meaningfully alter the results.

DISCUSSION

Key factors associated with non-receipt of formal mental health services before suicide death identified in this review were male sex, younger or older age, and rural location. These findings are largely consistent with previous reviews of service use among people with mental health issues (6, 7). People not receiving services were less likely to have a psychiatric diagnosis, or contact with non-mental health services. They were also less likely to have past suicidal behavior and more likely to use violent means of suicide, which might suggest their first suicide attempt tends to be fatal. Mood and schizophrenia spectrum disorders were associated with greater likelihood of service receipt compared to other diagnoses. There was some evidence to suggest that people who died by suicide without having received services were more likely to be from an ethnic minority background, and have experienced stressors, such as financial problems.

Consistent with previous research showing that men are less likely to use all types of health services (77), we found that males were less likely than females to have received formal mental health services prior to suicide. This disparity may be due to men's higher levels of stigma toward mental illness and help-seeking (78–82) and/or lack of services that align with men's preferences (83). There is also evidence of lower levels of mental health literacy among men, meaning they may be less likely to recognize symptoms, and less aware of where or how to access help (82). Findings related to the association between non-receipt of services and more violent means of death and the absence of suicide attempt may also be mediated by sex, in that women are more likely to attempt suicide compared to men (84), while men are more likely to use more violent suicide means (85). The use of less violent methods among women may result in higher survival rates for attempts, and subsequent linkage to healthcare services. Lower

rates of mental health service utilization among men may, at least partly, contribute to higher global suicide rates in men relative to women (86), indicating that future research should focus on developing and evaluating service pathways tailored to men's needs.

The association between rural location and non-receipt of clinical services may be due to a number of factors, including geographic and structural barriers to accessing services (87), a culture of self-reliance among those living rurally (88), and threats to livelihood like physical injury and drought (89). There was also some evidence that experiencing financial problems and ethnic minority status were associated with reduced likelihood of service use. Each of these variables are associated with increased risk of suicide (90–93) and highlight the impact of cultural factors and social determinants of health on service use (94).

Decedents with a psychiatric diagnosis were more likely to have received services compared to those without a diagnosis, which likely reflects that acquiring a formal diagnosis necessarily requires contact with a professional. In contrast, suicide among people without diagnoses might be more likely to have been precipitated by acute stressors, rather than enduring mental health issues, providing little opportunity for intervention. Indeed, we found some, albeit mixed, evidence to suggest that those experiencing acute stressors, such as financial difficulties, prior to suicide were less likely to have received services compared to those not experiencing such stressors.

It is possible that there are distinct profiles among those not receiving mental health services. For instance, we found evidence that both younger and older age were associated with non-receipt of services, potentially reflecting different subgroups. Younger individuals are more likely to report financial concerns and fear of psychotherapy as barriers to help-seeking, whereas elderly people may be less likely to receive formal mental health services due to difficulties with transportation and/or a tendency to normalize distress (95). We also found some inconsistent evidence for the relationship between service use, and ethnicity and employment status, which might further indicate that people who die by suicide without having received services have diverse profiles. One limitation of the current review was that all included studies were conducted in high-income countries, meaning the findings may not apply to low and middle-income countries, where 75.5% of global suicides occur (96). Included studies also varied in the range of covariates accounted for, which may impact the significance and comparability of results. Furthermore, we assessed the reliability and validity, but not the comprehensiveness of the service utilization data. Studies varied in the breadth of healthcare utilization data that they captured, with many studies effectively capturing public but not private mental health service utilization. Although accessing data on all possible sources of mental health service use may not be practicable in many cases, mental health service use is likely to be underreported within databases, impacting the accuracy with which studies could determine service use. However, despite variation in the quality of included studies, key findings in relation to demographic, diagnostic, suicide-related, and service contact variables were

largely consistent across studies. Additionally, the use of coronial and similar data also limited the type of predictors that could be examined. Few studies examined such variables as sexual orientation and personality characteristics, while no studies examined the presence of adverse childhood experiences (ACEs), despite the well-established association between ACEs, and both suicidality and self-harm (97, 98). Further, given the current focus on individuals who died by suicide, we were unable to gain insight into service preferences and barriers to service use in this population. Future research should examine these characteristics among individuals at risk of suicide to help guide clinical practice and inform the development of alternative service pathways.

The current review was also unable to distinguish between people who chose not to seek help and people who attempted to access help without successfully receiving it. These subgroups are likely to have different needs and barriers to service access, highlighting an important avenue for future research. Moreover, this review only examined predictors of non-receipt of *formal* mental health services. These services may not always meet users' needs and may vary in quality (99). Receiving formal services also does not guarantee that individuals were recognized as suicidal or treated for suicidality. The quality of services received within the formal mental health system also varies considerably and may not always meet the individual needs of those within this system (99). Furthermore, those at risk of suicide—particularly those in younger age groups—also often rely on informal sources of support, such as support from family and friends, and crisis lines or internet forums. The latter sources remove additional barriers to help-seeking such as cost and confidentiality (100, 101). These informal supports may be helpful, or indeed sufficient, for some people at risk of suicide (102). For example, calls to suicide crisis lines are a form of help-seeking not captured in this review that may be effective in alleviating short-term distress for some people (102). Understanding the characteristics of suicidal individuals who do not receive either formal or informal sources of support is necessary to identify those least likely to receive any form of help.

Further work is needed to understand the trajectories and antecedents to suicide, and barriers to using mental health services to aid the development of appropriate interventions. Epidemiological studies provide broad data on risk factors. However, within-group patterns and individual trajectories may be more clearly elucidated through surveys of those “at risk” outside of services and qualitative interviews with people in our target group that have made a non-fatal attempt, as well as families and friends bereaved by suicide. By providing insight into the individual stories and needs of people at risk of suicide, these approaches will facilitate the development of tailored and preference-based service pathways (103).

Our conclusion from this review is that people who die by suicide without receiving formal mental health services are likely to have diverse characteristics. It is likely that a multi-faceted approach may increase engagement. Clearly, services that are currently on offer do not attract or reach this group. New pathways, such as alternatives to the ED (e.g.,

BOX 1 | Implications of research findings.

Reaching people who are “under the radar” before they die by suicide may require:

- Reducing inequity of access to existing services including financial and locational barriers
- Trialing outreach approaches and interventions that are designed to reach people in the short interval between experiencing a life stressor (e.g., financial adversity) and suicide
- Providing alternative pathways into services including capitalizing on existing government service touchpoints (e.g., income support, social housing, transition periods)
- Implementing and evaluating alternative forms of support including safe havens, respite services, and the peer support workforce
- Offering and evaluating online support and referral services for suicidality

peer support services, safe havens), and outreach activities, potentially integrated in non-health settings such as workplaces, welfare and housing agencies, and educational institutions, are needed (see **Box 1** for research implications). Online interventions, which have been shown to reduce suicidal ideation and reduce barriers such as high out-of-pocket expenses, physical distance and stigma, may also offer a route into services (104). However, we do not know whether the above avenues will work, and more investigation is needed. Furthermore, significant reform is likely needed to provide timely support to those experiencing an acute stressor given that existing services are subject to long waitlists, and ED responses are often perceived as unsatisfactory (105). Further, people experiencing suicidal distress may not recognize the role of mental health support in managing acute distress. Our findings on the relationship between social determinants of mental health and mental health service use among people who die by suicide suggest that equity issues and broader policy reform in relation to such issues as social welfare, employment, education, and housing should be considered.

Due to diversity among people who die by suicide without receiving services, there are likely several avenues for increasing the service use for those experiencing suicidality, including improving access, quality, and delivery of existing services and the development of new support pathways. Further research exploring reasons underlying non-use of existing services is critical to better meet the needs of people at risk of suicide.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

ST, NR, PB, AC, GC, AM, and HC designed the study. ST and NR conducted the literature search, screened titles, abstracts, and full-texts for eligibility for inclusion into the review, and extracted

data from the manuscripts. ST and AA performed quality assessments. AM translated non-English articles to English. ST, NR, and AA wrote the first draft of the manuscript. All authors contributed to the interpretation and subsequent edits of the manuscript.

FUNDING

Funding for this research was provided by the Medical Research Future Fund, Australia (grant number: 1200195). PB, AC, and HC are supported by National Health and Medical Research Council Fellowships 1158707, 1173146, and 1155614.

REFERENCES

1. Australian Bureau of Statistics. *Causes of Death, Australia* (2020).
2. Stene-Larsen K, Reneflot A. Contact with primary and mental health care prior to suicide: a systematic review of the literature from 2000 to 2017. *Scand J Public Health*. (2019) 47:9–17. doi: 10.1177/1403494817746274
3. Hawton K, Casañas I, Comabella C, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. *J Affect Disord*. (2013) 147:17–28. doi: 10.1016/j.jad.2013.01.004
4. Hofstra E, van Nieuwenhuizen C, Bakker M, Özgül D, Elfeddali I, de Jong SJ, et al. Effectiveness of suicide prevention interventions: a systematic review and meta-analysis. *Gen Hosp Psychiatry*. (2020) 63:127–40. doi: 10.1016/j.genhosppsych.2019.04.011
5. May AM, Klonsky ED. What distinguishes suicide attempters from suicide ideators? A meta-analysis of potential factors. *Clin Psychol Sci Pract*. (2016) 23:5–20. doi: 10.1037/h0101735
6. Magaard JL, Seeralan T, Schulz H, Brütt AL. Factors associated with help-seeking behaviour among individuals with major depression: a systematic review. *PLoS ONE*. (2017) 12:e0176730. doi: 10.1371/journal.pone.0176730
7. Roberts T, Esponda GM, Krupchanka D, Shidhaye R, Patel V, Rathod S. Factors associated with health service utilisation for common mental disorders: a systematic review. *BMC Psychiatry*. (2018) 18:1–19. doi: 10.1186/s12888-018-1837-1
8. Han J, Batterham PJ, Calear AL, Randall R. Factors influencing professional help-seeking for suicidality. *Crisis*. (2017) 39:175–96. doi: 10.1027/0227-5910/a000485
9. Hom MA, Stanley IH, Joiner TE Jr. Evaluating factors and interventions that influence help-seeking and mental health service utilization among suicidal individuals: a review of the literature. *Clin Psychol Rev*. (2015) 40:28–39. doi: 10.1016/j.cpr.2015.05.006
10. Hjelmeland H, Dierserud G, Dyregrov K, Knizek BL, Leenaars AA. Psychological autopsy studies as diagnostic tools: are they methodologically flawed? *Death Stud*. (2012) 36:605–26. doi: 10.1080/07481187.2011.584015
11. Moher D, Liberati A, Tetzlaff J, Altman DG, Group TP. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. (2009) 6:e1000097. doi: 10.1371/journal.pmed.1000097
12. Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, et al. Chapter 7: Systematic reviews of etiology and risk. In: Aromataris E, Munn Z, editors. *JBIM Manual for Evidence Synthesis*. JBI. (2020). doi: 10.46658/JBIMES-20-08
13. Ahmedani BK, Simon GE, Stewart C, Beck A, Waitzfelder BE, Rossom R, et al. Health care contacts in the year before suicide death. *J Gen Intern Med*. (2014) 29:870–7. doi: 10.1007/s11606-014-2767-3
14. Ali B, Rockett IRH, Miller TR, Leonardo JB. Racial/ethnic differences in preceding circumstances of suicide and potential suicide misclassification among US adolescents. *J Racial Ethn Health Disparities*. (2021). doi: 10.1007/s40615-020-00957-7 [Epub ahead of print].
15. Chang C-M, Liao S-C, Chiang H-C, Chen Y-Y, Tseng K-C, Chau Y-L, et al. Gender differences in healthcare service utilisation 1 year before suicide: national record linkage study. *Brit J Psychiatry*. (2009) 195:459–60. doi: 10.1192/bjp.bp.108.053728
16. Cho J, Kang DR, Moon KT, Suh M, Ha KH, Kim C, et al. Age and gender differences in medical care utilization prior to suicide. *J Affect Disord*. (2013) 146:181–8. doi: 10.1016/j.jad.2012.09.001
17. King K, Schlichthorst M, Millar C, Sutherland G, Too LS. Understanding the context of suicides by older men compared with younger old men and women. *Crisis*. (2020) 2020:1–5. doi: 10.1027/0227-5910/a000747
18. Lee H-C, Lin H-C, Liu T-C, Lin S-Y. Contact of mental and nonmental health care providers prior to suicide in Taiwan: a population-based study. *Canad J Psychiatry*. (2008) 53:377–83. doi: 10.1177/070674370805300607
19. Malchy B, Enns MW, Young TK, Cox BJ. Suicide among Manitoba's aboriginal people, 1988 to 1994. *Can Med Assoc J*. (1997) 156:1133–8.
20. Niederkrotenthaler T, Logan JE, Karch DL, Crosby A. Characteristics of US suicide decedents in 2005–2010 who had received mental health treatment. *Psychiatric Services*. (2014) 65:387–90. doi: 10.1176/appi.ps.201300124
21. Persons JE, Hefti MM, Nashelsky MB. Epidemiology of suicide in an Iowa cohort. *Public Health*. (2019) 177:128–34. doi: 10.1016/j.puhe.2019.08.005
22. Pitkälä K, Isometsä ET, Henriksson MM, Lönnqvist JK. Elderly suicide in Finland. *International Psychogeriatrics*. (2000) 12:209–20. doi: 10.1017/S1041610200006335
23. Rodway C, Tham S-G, Ibrahim S, Turnbull P, Kapur N, Appleby L. Children and young people who die by suicide: childhood-related antecedents, gender differences and service contact. *BJPsych Open*. (2020) 6:e49. doi: 10.1192/bjo.2020.33
24. Ryan AT, Ghahramanlou-Holloway M, Wilcox HC, Umhau JC, Deuster PA. Mental health care utilization and psychiatric diagnoses in a sample of military suicide decedents and living matched controls. *J Nerv Ment Dis*. (2020) 208:646–53. doi: 10.1097/NMD.0000000000001192
25. Salib E, Green L. Gender in elderly suicide: analysis of coroners inquests of 200 cases of elderly suicide in Cheshire 1989–2001. *Int J Geriatr Psychiatry*. (2003) 18:1082–7. doi: 10.1002/gps.1012
26. Schaffer A, Sinyor M, Kurdyak P, Vigod S, Sareen J, Reis C, et al. Population-based analysis of health care contacts among suicide decedents: identifying opportunities for more targeted suicide prevention strategies. *World Psychiatry*. (2016) 15:135–45. doi: 10.1002/wps.20321
27. Searles VB, Valley MA, Hedegaard H, Betz ME. Suicides in urban and rural counties in the United States, 2006–2008. *Crisis*. (2014) 35:18–26. doi: 10.1027/0227-5910/a000224
28. Vassilas CA, Morgan HG. Suicide in avon: life stress, alcohol misuse and use of services. *Brit J Psychiatry*. (1997) 170:453–5. doi: 10.1192/bjp.170.5.453
29. Windfuhr K, While D, Hunt I, Turnbull P, Lowe R, Burns J, et al. Suicide in juveniles and adolescents in the United Kingdom. *J Child Psychol Psychiatry*. (2008) 49:1155–65. doi: 10.1111/j.1469-7610.2008.01938.x
30. Wong YJ, Wang L, Li S, Liu H. Circumstances preceding the suicide of Asian Pacific Islander Americans and White Americans. *Death Stud*. (2017) 41:311–7. doi: 10.1080/07481187.2016.1275888

ACKNOWLEDGMENTS

We acknowledge the Under the Radar Core Codesign Team (Bani Aadam, Katherine Boyde, Philippa Butt, Bridget Betzold, Brian Draper, Emma Elder, Jin Han, Bruce McMillan, Maddison O'Grady-Lee, Fiona Shand) for their feedback on this review.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.736948/full#supplementary-material>

31. King EA. The Wessex suicide audit 1988-1993: a study of 1457 suicides with and without a recent psychiatric contact. *Int J Psychiatry Clin Pract.* (2001) 5:111–8. doi: 10.1080/136515001300374849
32. Svetcic J, Milner A, De Leo D. Contacts with mental health services before suicide: a comparison of Indigenous with non-Indigenous Australians. *Gen Hosp Psychiatry.* (2012) 34:185–91. doi: 10.1016/j.genhosppsych.2011.10.009
33. Chang HJ, Lai YL, Chang CM, Kao CC, Shyu ML, Lee MB. Gender and age differences among youth, in utilization of mental health services in the year preceding suicide in Taiwan. *Community Ment Health J.* (2012) 48:771–80. doi: 10.1007/s10597-011-9470-1
34. Renaud J, Berlim MT, Séguin M, McGirr A, Tousignant M, Turecki G. Recent and lifetime utilization of health care services by children and adolescent suicide victims: a case-control study. *J Affect Disord.* (2009) 117:168–73. doi: 10.1016/j.jad.2009.01.004
35. Ribeiro JD, Gutierrez PM, Joiner TE, Kessler RC, Petukhova MV, Sampson NA, et al. Health care contact and suicide risk documentation prior to suicide death: results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *J Consult Clin Psychol.* (2017) 85:403–8. doi: 10.1037/ccp0000178
36. Jung S, Lee D, Park S, Lee K, Kweon Y-S, Lee E-J, et al. Gender differences in Korean adolescents who died by suicide based on teacher reports. *Child Adolesc Psychiatry Ment Health.* (2019) 13:12. doi: 10.1186/s13034-019-0274-3
37. Runeson BS. Youth suicides unknown to psychiatric care providers. *Suicide Life Threat Behav.* (1992) 22:494–503.
38. Choi NG, DiNitto DM, Marti CN. Suicide decedents in correctional settings: mental health treatment for suicidal ideation, plans, and/or attempts. *J Correct Health Care.* (2019) 25:70–83. doi: 10.1177/1078345818819500
39. Frei A, Bucher T, Walter M, Ajdacic-Gross V. Suicides in the Canton of Lucerne over 5 years: subjects with and without psychiatric history and diagnosis. *Swiss Med Wkly.* (2013) 143:w13779. doi: 10.4414/sm.w.2013.13779
40. Haaland V, Bjørkhold M, Freuchen A, Ness E, Walby F. Selvmord, psykisk helsevern og tverrfaglig spesialisert rusbehandling i Agder 2004-13. *Tidsskriftet Norske Legefor.* (2017) 137:18. doi: 10.4045/tidsskr.16.0503
41. McLone SG, Kouvelis A, Mason M, Sheehan K. Factors associated with suicide among adolescents and young adults not in mental health treatment at time of death. *J Trauma Acute Care Surg.* (2016) 81:S25–9. doi: 10.1097/TA.0000000000001175
42. Loh C, Tai B-C, Ng W-Y, Chia A, Chia B-H. Suicide in young Singaporeans aged 10–24 years between 2000 to 2004. *Arch Suic Res.* (2012) 16:174–82. doi: 10.1080/13811118.2012.667335
43. Foster T, Gillespie K, McClelland R. Mental disorders and suicide in Northern Ireland. *Brit J Psychiatry.* (1997) 170:447. doi: 10.1192/bjp.170.5.447
44. Sweeney HA, Fontanella CA, Steelesmith DL, Quinn C. Suicide in older adults in Ohio: characteristics, precipitants, and mental health service utilization. *Community Ment Health J.* (2020) 56:1549–56. doi: 10.1007/s10597-020-00606-7
45. Giupponi G, Pycha R, Innamorati M, Lamis DA, Schmidt E, Conca A, et al. The association between suicide and the utilization of mental health services in South Tirol, Italy: a psychological autopsy study. *Int J Soc Psychiatry.* (2014) 60:30–9. doi: 10.1177/0020764012461209
46. Hamdi E, Price S, Qassem T, Amin Y, Jones D. Suicides not in contact with mental health services: risk indicators and determinants of referral. *J Ment Health.* (2008) 17:398–409. doi: 10.1080/09638230701506234
47. Law YW, Wong PWC, Yip PSF. Suicide with psychiatric diagnosis and without utilization of psychiatric service. *BMC Public Health.* (2010) 10:431. doi: 10.1186/1471-2458-10-431
48. McPhedran S, De Leo D. Miseries suffered, unvoiced, unknown? Communication of suicidal intent by men in “rural” Queensland, Australia. *Suic Life Threat Behav.* (2013) 43:589–97. doi: 10.1111/sltb.12041
49. Stark C, Huc S, O'Neill N. Service contacts prior to death in people dying by suicide in the Scottish Highlands. *Rural Remote Health.* (2012) 12:1–11. doi: 10.22605/RRH1876
50. Sundqvist-Stensman U. Suicides among 523 persons in a Swedish county with and without contact with psychiatric care. *Acta Psychiatr Scand.* (1987) 76:8–14. doi: 10.1111/j.1600-0447.1987.tb02855.x
51. Suso-Ribera C, Mora-Marín R, Hernández-Gaspar C, Pardo-Guerra L, Pardo-Guerra M, Belda-Martínez A, et al. Suicide in Castellon, 2009–2015: do sociodemographic and psychiatric factors help understand urban–rural differences? *Rev Psiquiatr Sal Mental.* (2018) 11:4–11. doi: 10.1016/j.rpsmen.2018.02.004
52. Bakst S, Braun T, Hirshberg R, Zucker I, Shohat T. Characteristics of suicide completers with a psychiatric diagnosis before death: a postmortem study of 98 cases. *Psychiatry Res.* (2014) 220:556–63. doi: 10.1016/j.psychres.2014.07.025
53. De Leo D, Draper BM, Snowden J, Kölves K. Contacts with health professionals before suicide: missed opportunities for prevention? *Compr Psychiatry.* (2013) 54:1117–23. doi: 10.1016/j.comppsy.2013.05.007
54. Law YW, Wong PWC, Yip PSF. Health and psychosocial service use among suicides without psychiatric illness. *Soc Work.* (2015) 60:65–74. doi: 10.1093/sw/swu054
55. Schmutte TJ, Wilkinson ST. Suicide in older adults with and without known mental illness: results from the National Violent Death Reporting System, 2003–2016. *Am J Prev Med.* (2020) 58:584–90. doi: 10.1016/j.amepre.2019.11.001
56. Isometsa ET, Henriksson MM, Aro HM, Lonnqvist JK. Suicide in bipolar disorder in Finland. *Am J Psychiatry.* (1994) 151:1020–4. doi: 10.1176/ajp.151.7.1020
57. Schaffer A, Sinyor M, Reis C, Goldstein BI, Levitt AJ. Suicide in bipolar disorder: characteristics and subgroups. *Bipolar Disord.* (2014) 16:732–40. doi: 10.1111/bdi.12219
58. Zaheer J, Jacob B, de Oliveira C, Rudoler D, Juda A, Kurdyak P. Service utilization and suicide among people with schizophrenia spectrum disorders. *Schizophr Res.* (2018) 202:347–53. doi: 10.1016/j.schres.2018.06.025
59. Hayward L, Zubrick SR, Silburn S. Blood alcohol levels in suicide cases. *J Epidemiol Commun Health.* (1992) 46:256–60. doi: 10.1136/jech.46.3.256
60. Pennington ML, Ylitalo KR, Lanning BA, Dolan SL, Gulliver SB. An epidemiologic study of suicide among firefighters: findings from the National violent death reporting system, 2003–2017. *Psychiatry Res.* (2021) 295:113594. doi: 10.1016/j.psychres.2020.113594
61. Hintikka J, Lehtonen J, Viinamäki H. Hunting guns in homes and suicides in 15-24-year-old males in Eastern Finland. *Aust N Z J Psychiatry.* (1997) 31:858–61. doi: 10.3109/00048679709065512
62. Joe S, Marcus SC, Kaplan MS. Racial differences in the characteristics of firearm suicide decedents in the United States. *Amer J Orthopsychiatry.* (2007) 77:124–30. doi: 10.1037/0002-9432.77.1.124
63. Chen YY, Liao SC, Lee MB. Health care use by victims of charcoal-burning suicide in Taiwan. *Psychiatric Serv.* (2009) 60:126. doi: 10.1176/ps.2009.60.1.126
64. Shahpesandy H, Oakes M, van Heeswijk A. The Isle of Wight Suicide Study: a case study of suicide in a limited geographic area. *Ir J Psychol Med.* (2014) 31:133–41. doi: 10.1017/ipm.2014.10
65. Ho RCM, Ho ECL, Tai BC, Ng WY, Chia BH. Elderly suicide with and without a history of suicidal behavior: implications for suicide prevention and management. *Arch Suic Res.* (2014) 18:363–75. doi: 10.1080/13811118.2013.826153
66. Betz ME, Krzyzaniak SM, Hedegaard H, Lowenstein SR. Completed suicides in Colorado: differences between hispanics and non-hispanic whites. *Suic Life Threat Behav.* (2011) 41:445–52. doi: 10.1111/j.1943-278X.2011.00044.x
67. Choi NG, DiNitto DM, Marti CN, Kaplan MS. Older suicide decedents: intent disclosure, mental and physical health, and suicide means. *Am J Prev Med.* (2017) 53:772–80. doi: 10.1016/j.amepre.2017.07.021
68. Kameyama A, Matsumoto T, Katsumata Y, Akazawa M, Kitani M, Hirokawa S, et al. Psychosocial and psychiatric aspects of suicide completers with unmanageable debt: a psychological autopsy study. *Psychiatry Clin Neurosci.* (2011) 65:592–5. doi: 10.1111/j.1440-1819.2011.02266.x
69. Coope C, Donovan J, Wilson C, Barnes M, Metcalfe C, Hollingworth W, et al. Characteristics of people dying by suicide after job loss, financial difficulties and other economic stressors during a period of recession (2010–2011): a review of coroners' records. *J Affect Disord.* (2015) 183:98–105. doi: 10.1016/j.jad.2015.04.045
70. Cheung G, Douwes G, Sundram F. Late-life suicide in terminal cancer: a rational act or underdiagnosed depression? *J Pain Symptom Manage.* (2017) 54:835–42. doi: 10.1016/j.jpainsymman.2017.05.004

71. Choi NG, DiNitto DM, Marti CN, Conwell Y. Physical health problems as a late-life suicide precipitant: examination of coroner/medical examiner and law enforcement reports. *Gerontologist*. (2019) 59:356–67. doi: 10.1093/geront/gnx143
72. Arnautovska U, McPhedran S, De Leo D. Differences in characteristics between suicide cases of farm managers compared to those of farm labourers in Queensland, Australia. *Rural Remote Health*. (2015) 15:51. doi: 10.22605/RRH3250
73. Booth N, Briscoe M, Powell RJ. Suicide in the farming community: methods used and contact with health services. *Occup Environ Med*. (2000) 57:642–4. doi: 10.1136/oem.57.9.642
74. Kavalidou K, McPhedran S, De Leo D. Farmers' contact with health care services prior to suicide: evidence for the role of general practitioners as an intervention point. *Aust J Prim Health*. (2015) 21:102–5. doi: 10.1071/PY13077
75. Roberts KA. Correlates of law enforcement suicide in the United States: a comparison with Army and Firefighter suicides using data from the National Violent Death Reporting System. *Pol Pract Res*. (2019) 20:64–76. doi: 10.1080/15614263.2018.1443269
76. Waitz-Kudla SN, Daruwala SE, Houtsma C, Anestis MD. Help-seeking behavior in socially conservative and Christian suicide decedents. *Suic Life Threat Behav*. (2019) 49:1513–22. doi: 10.1111/sltb.12535
77. Bertakis KD, Azari R, Helms LJ, Callahan EJ, Robbins JA. Gender differences in the utilization of health care services. *J Fam Pract*. (2000) 49:147–52.
78. Ng P, Chan K-F. Sex differences in opinion towards mental illness of secondary school students in Hong Kong. *Int J Soc Psychiatry*. (2000) 46:79–88. doi: 10.1177/002076400004600201
79. Mackenzie CS, Gekoski WL, Knox VJ. Age, gender, and the underutilization of mental health services: the influence of help-seeking attitudes. *Aging Ment Health*. (2006) 10:574–82. doi: 10.1080/13607860600641200
80. Chandra A, Minkovitz CS. Stigma starts early: gender differences in teen willingness to use mental health services. *J Adolesc Health*. (2006). 38:754.e1–8. doi: 10.1016/j.jadohealth.2005.08.011
81. Mackenzie CS, Visperas A, Ogrodniczuk JS, Oliffe JL, Nurmi MA. Age and sex differences in self-stigma and public stigma concerning depression and suicide in men. *Stigma and Health*. (2019) 4:233. doi: 10.1037/sah0000138
82. Cotton SM, Wright A, Harris MG, Jorm AF, McGorry PD. Influence of gender on mental health literacy in young Australians. *Aust N Z J Psychiatry*. (2006) 40:790–6. doi: 10.1080/j.1440-1614.2006.01885.x
83. Liddon L, Kingerlee R, Barry JA. Gender differences in preferences for psychological treatment, coping strategies, and triggers to help-seeking. *Brit J Clin Psychol*. (2018) 57:42–58. doi: 10.1111/bjc.12147
84. Crosby A, Han B, Ortega L, Parks SE, Gfroerer J. Suicidal thoughts and behaviors among adults aged > 18 Years - United States, 2008–2009. *MMWR*. (2011) 60:1–22.
85. Tsirigotis K, Gruszczynski W, Tsirigotis M. Gender differentiation in methods of suicide attempts. *Med Sci Monit*. (2011) 17:PH65–70. doi: 10.12659/MSM.881887
86. World Health Organization. *World Health Statistics 2020: Monitoring Health for the SDGs, Sustainable Development Goals*. Geneva: World Health Organization. (2020).
87. Hirsch JK, Cukrowicz KC. Suicide in rural areas: an updated review of the literature. *J Rural Ment Health*. (2014) 38:65. doi: 10.1037/rmh0000018
88. Fuller J, Edwards J, Procter N, Moss J. How definition of mental health problems can influence help seeking in rural and remote communities. *Aust J Rural Health*. (2000) 8:148–53. doi: 10.1046/j.1440-1584.2000.00303.x
89. Daghigh Yazd S, Wheeler SA, Zuo A. Key risk factors affecting farmers' mental health: a systematic review. *Int J Environ Res Public Health*. (2019) 16:4849. doi: 10.3390/ijerph16234849
90. Forte A, Trobia F, Gualtieri F, Lamis DA, Cardamone G, Giallonardo V, et al. Suicide risk among immigrants and ethnic minorities: a literature overview. *Int J Environ Res Public Health*. (2018) 15:1438. doi: 10.3390/ijerph15071438
91. Ayano G, Tsegay L, Abraha M, Yohannes K. Suicidal ideation and attempt among homeless people: a systematic review and meta-analysis. *Psychiatric Quar*. (2019) 90:829–42. doi: 10.1007/s11126-019-09667-8
92. Bantjes J, Iemmi V, Coast E, Channer K, Leone T, McDauid D, et al. Poverty and suicide research in low- and middle-income countries: systematic mapping of literature published in English and a proposed research agenda. *Global Ment Health*. (2016) 3:e32. doi: 10.1017/gmh.2016.27
93. Knipe DW, Carroll R, Thomas KH, Pease A, Gunnell D, Metcalfe C. Association of socio-economic position and suicide/attempted suicide in low and middle income countries in South and South-East Asia: a systematic review. *BMC Public Health*. (2015) 15:1055. doi: 10.1186/s12889-015-2301-5
94. World Health Organization, Calouste Gulbenkian Foundation. *Social Determinants of Mental Health*. Geneva: World Health Organization. (2014).
95. Pepin R, Segal DL, Coolidge FL. Intrinsic and extrinsic barriers to mental health care among community-dwelling younger and older adults. *Aging Ment Health*. (2009) 13:769–77. doi: 10.1080/13607860902918231
96. World Health Organization. *Preventing Suicide: A Global Imperative*. Geneva: World Health Organization. (2014).
97. Fuller-Thomson E, Baird S, Dhrodia R, Brennenstuhl S. The association between adverse childhood experiences (ACEs) and suicide attempts in a population-based study. *Child Care Health Dev*. (2016) 42:725–34. doi: 10.1111/cch.12351
98. Serafini G, Canepa G, Adavastro G, Nebbia J, Belvederi Murri M, Erbuto D, et al. The relationship between childhood maltreatment and non-suicidal self-injury: a systematic review. *Front Psychiatry*. (2017) 8:149. doi: 10.3389/fpsyt.2017.00149
99. Flynn S, Graney J, Nyathi T, Raphael J, Abraham S, Singh-Dernevik S, et al. Clinical characteristics and care pathways of patients with personality disorder who died by suicide. *BJPsych Open*. (2020). 6:e29. doi: 10.1192/bjo.2020.11
100. Mok K, Chen N, Torok M, McGillivray L, Zbukvic I, Shand F. Factors associated with help-seeking for emotional or mental health problems in community members at risk of suicide. *Adv Ment Health*. (2020) 19:236–46. doi: 10.1080/18387357.2020.1770109
101. Arria AM, Winick ER, Garnier-Dykstra LM, Vincent KB, Caldeira KM, Wilcox HC, et al. Help seeking and mental health service utilization among college students with a history of suicide ideation. *Psychiatr Serv*. (2011) 62:1510–3. doi: 10.1176/appi.ps.005562010
102. Hoffberg AS, Stearns-Yoder KA, Brenner LA. The effectiveness of crisis line services: a systematic review. *Front Publ Health*. (2020) 7:399. doi: 10.3389/fpubh.2019.00399
103. Pretorius C, McCashin D, Kavanagh N, Coyle D, editors. Searching for mental health: a mixed-methods study of young people's online help-seeking. In: *Conference on Human Factors in Computing Systems*. Honolulu (2020). doi: 10.1145/3313831.3376328
104. Torok M, Han J, Baker S, Werner-Seidler A, Wong I, Larsen ME, et al. Suicide prevention using self-guided digital interventions: a systematic review and meta-analysis of randomised controlled trials. *Lancet*. (2020) 2:e25–36. doi: 10.1016/S2589-7500(19)30199-2
105. Mok K, Riley J, Rosebrock H, Gale N, Nicolopoulos A, Larsen M, et al. *The Lived Experience of Suicide: A Rapid Review*. Sydney, NSW: The Black Dog Institute (2020).

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2022 Tang, Reily, Arena, Batterham, Caele, Carter, Mackinnon and Christensen. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.