Review article

A systematic review of suicidal behaviour in men: A narrative synthesis of risk factors

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ABSTRACT

Rationale: Suicides by men outnumber those by women in every country of the world. To date, there has not been a comprehensive systematic review of risk factors for suicidal behaviour in men to better understand the excess deaths by suicide in men.
Objective: The present systematic review seeks to determine the nature and extent of the risk factors to predict suicidal behaviour in men over time.
Methods: A range of databases (CINAHL, PsycINFO, Web of Science Core Collection, Pubmed, Embase, and Psychology and Behavioural Sciences Collection) were searched from inception to January 2020 for eligible articles. The findings were collated through a narrative synthesis of the evidence.
Results: An initial 601 studies were identified. Following the inclusion and exclusion criteria, there were 105 eligible studies (62 prospective and 43 retrospective) identified. Overall, the risk factors with the strongest evidence predicting suicidal behaviour in men were alcohol and/or drug use/dependence; being unmarried, single, divorced, or widowed; and having a diagnosis of depression. In the prospective studies, the most consistent evidence was for sociodemographic factors (19 risk factors), mental health/psychiatric illness (16 risk factors), physical health/illness (13 risk factors), and negative life events/trauma (11 risk factors). There were a small number of psychological factors (6 factors) and characteristics of suicidal behaviour (3 factors) identified. The findings from the retrospective studies provided further evidence for the risk factors identified in the prospective studies.
Conclusions: This systematic review has highlighted the wide range of risk factors for suicidal behaviour in men, in this review alone 68 different risk factors were identified. Many factors can interact and change in relevance throughout an individual's life. This review has identified extensive gaps in our knowledge as well as suggestions for future research.

1. Introduction

Suicide is a major public health concern (Naghavi, 2019) and continues to be a significant risk for men. Suicides by men outnumber those by women in every country of the world (Naghavi, 2019). Although men are more likely to die by suicide, women are more likely to attempt suicide, a phenomenon for which Canetto and Sakinofsky (1998) coined the term *gender paradox*. Indeed, recent reviews (Franklin et al., 2017; O'Connor and Nock, 2014; Turecki and Brent, 2016; Turecki et al., 2019) have highlighted advances in our understanding of risk factors for suicide in men and women, yet our ability to predict suicide remains no better than chance.

Several theories of suicide have been proposed over the past 100 years including perspectives from sociology (Durkheim, 1897; Maris, 1981), biology (Oquendo et al., 2014), and psychology (Joiner, 2007; O'Connor and Kirtley, 2018). Yet, no theoretical explanation has accounted for male suicide specifically. The extant research has tended to outline the complex aetiology of suicide risk, highlighting a wide range of risk factors. We also know that individuals with and without diagnosable psychiatric disorders can be vulnerable to suicide, and for many, there are other predisposing or triggering risk factors (Fazel and Runeson, 2020).

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Potential explanations for the gender differences in suicidal behaviour include disparities in early life experiences, differences in emotions and emotional expression, social/cultural norms, coping, situational factors, differences in method selection, and biological factors (Chandler, 2019; Mościcki, 1994). As such, the risk factors are varied, and they can change in relevance throughout an individual's life.

In short, suicide in men is a complex issue encompassing a wide range of risk factors across the lifespan, from early childhood experiences to mental illness, masculinity, social context, and negative life events. Previous reviews have investigated suicide in male and female physicians (Duarte, El-Hagrassy, e Couto et al., 2020a, 2020b; Lindeman et al., 1996), gender differences in suicidal behaviour in adolescents and young people (Miranda-Mendizabal et al., 2019), risk factors for suicide in prisoners (Fazel et al., 2008), mental disorders, suicide and self-harm in lesbian, gay and bisexual people (King et al., 2008), signs of suicide in men (Hunt et al., 2017) and male depressive symptoms concerning violent suicides or suicide attempts (Sørensen et al., 2019). To our knowledge, there has not been a comprehensive systematic review of risk factors for suicidal behaviour in men. It is also known that the time taken to transition from thinking about suicide to acting on these suicidal thoughts can be shorter in men (Schrijvers et al., 2012), highlighting the need to further understand the factors that affect this transition. Therefore, we conducted such a review to determine the extent and nature of the risk factors that predicted suicidal behaviour in men over time.

2. Methods

2.1. Search strategy

A literature search was conducted using the following databases (all years): CINAHL, PsycINFO, Web of Science Core Collection, PubMed, Embase, and Psychology and Behavioural Sciences Collection. The search was originally conducted on March 26, 2019, with no date restriction. The search was then repeated on the January 8, 2020. Keyword searches including the terms Men or Male AND Suicid* AND risk* OR Risk Factor were employed (Supplementary appendix 1 for search strategy), which generated 26,307 records (22,143 after duplicates were eliminated; Fig. 1). Articles were refined by language (English). The study selection process involved screening titles in the first instance, followed by reading the abstracts. Finally, 602 full-text reports were screened for eligibility.

2.2. Eligibility criteria

The inclusion/exclusion criteria are as follows as per the protocol (CRD42019126304):
Inclusion criteria:

1. Contained primary-level research employing a retrospective or prospective research design.
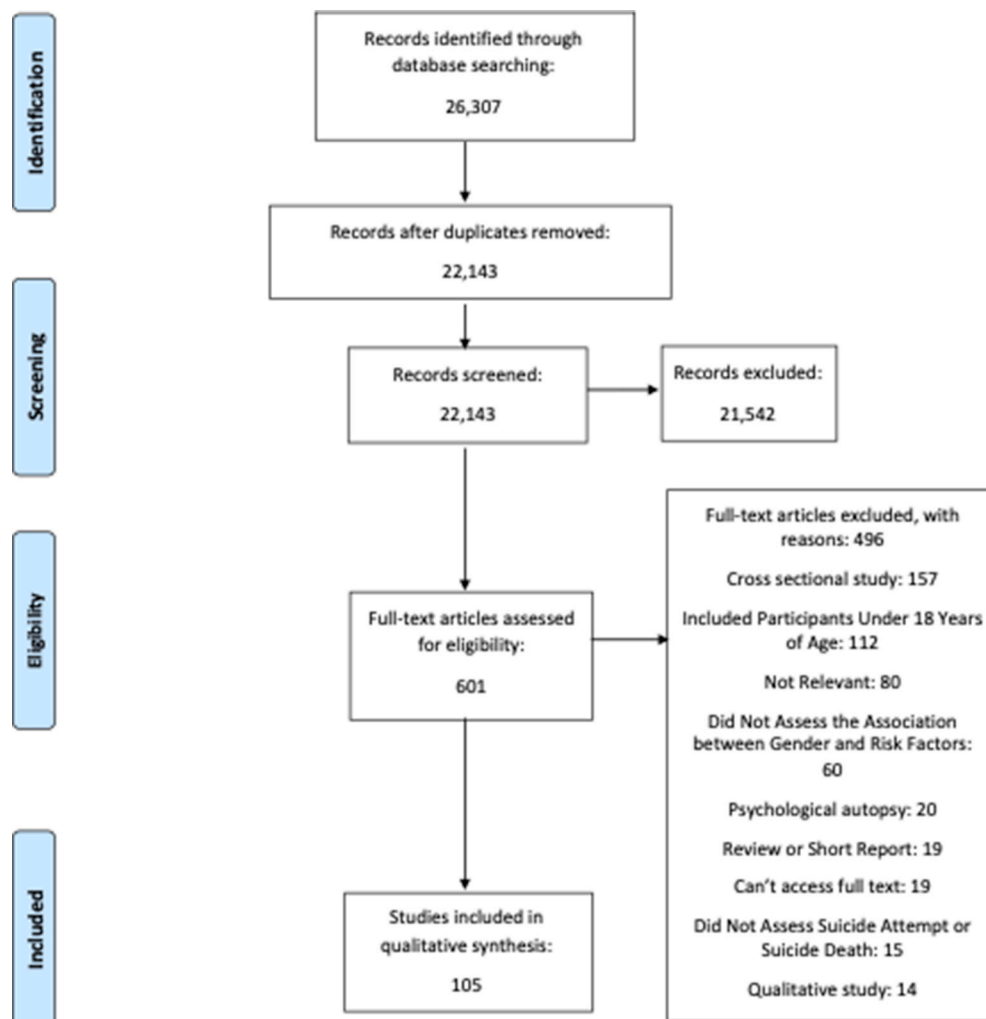2. Participants were aged over 18 years of age.

Fig. 1. Flow chart of the selection process.

3. The sample included participants who experienced suicidal behaviour (suicide attempts or death by suicide).
4. Either male and female results (reported separately) or male-only results regarding suicide risk and behaviour.
5. Included the association between gender and risk factors, does not solely state male gender as a risk factor.

Exclusion criteria:

1. Participants were under 18 years of age.
2. Cross-sectional study design or studies investigating treatment efficacy.

2.3. Data extraction

A data extraction sheet was completed for each article that included information such as article identification, methodological aspects, main results, and authors' interpretation of their data.

2.4. Quality assessment

After data extraction, all selected studies were assessed for methodological quality using a 9-item index based on a quality assessment tool used by O'Connor, Ferguson, Green, O'Carroll, and O'Connor (2016). Quality assessment was completed by the first author and another member of the research team cross-checked 20% (21) of the papers for inter-rater reliability, with 100% concordance after discussion.

The quality assessment tool was modified to account for both prospective and retrospective studies. Total scores were calculated ranging from 0 to 13, with a lower score indicative of a higher probability of methodological bias. Classifications of quality were set as follows: 0–2 very low quality; 3–4 low quality, 5–7 reasonable/medium quality; 8–10 good quality; and 11–13 excellent/very good quality. The full quality-assessment tool can be found in supplementary appendix 2. The Preferred Reporting Items for Systematic reviews and Meta-Analyses for Protocols 2015 (Moher et al., 2015) was completed (Supplementary Appendix 3).

2.5. Data analysis and synthesis

A narrative synthesis was conducted consistent with best practice (Campbell et al., 2020; Johnson and Hennessy, 2019) on reporting a systematic review synthesis (without meta-analysis). The studies were grouped by study design, with prospective and retrospective studies

being assessed separately, as prospective studies tend to be regarded as being higher quality (Euser et al., 2009). Prospective and retrospective studies also have distinct strengths and weaknesses and can be affected by risk of bias differentially (Euser et al., 2009) so will be considered separately in this review. To facilitate the narrative synthesis, the emergent risk factors were clustered into sociodemographic characteristics, physical health/illness, mental health problems/psychiatric illness, psychological factors, negative life events/trauma, characteristics of suicidal behaviour, and other factors (Fig. 2). The studies were numbered according to the table numbers in Table 1 (also see Supplementary Appendices 4 and 5) and the paragraphs are structured in order of the number of supporting studies, starting with the most. The correlation coefficient effect size (Cohen, 2013) was calculated for 40/62 prospective studies and 36/43 retrospective studies due to availability of data (in addition to the effect sizes calculated by the study authors) and were interpreted as $r = 0.10$ to 0.30: small effect; $r = 0.30$ to 0.50: intermediate effect; $r = 0.50$ and higher: strong effect (supplementary appendices 4 and 5). Effect sizes were then described in the text of the results for factors that had five or more calculated r values. Male only and gender differences r values were calculated, depending on the availability of the data, using two effect size calculators (Lenhard and Lenhard, 2016; Wilson, 2001). These analyses were to gain a deeper understanding of the magnitude of effects associated with each risk factor across studies. The results were detailed in terms of whether a risk factor demonstrated a stronger effect in men or women. This is displayed in full in Supplementary Appendices 4 and 5, alongside the effect sizes calculated by the original study authors.

3. Results

3.1. Data extraction and methodological quality

A keyword search of the databases (outlined above) was conducted, yielding 26,307 records. Following duplicate removal and screening, 105 articles were quality assessed, and included in the final systematic review (Fig. 1). The individual quality assessment scores are displayed in supplementary appendices 5 and 6. The maximum obtainable score was 13. For the 62 prospective studies, the mean score was 7.19 ± 1.19 (range: 5 to 10). In the 43 retrospective studies, the mean score was 7.67 ± 1.64 (range: 5 to 11).

3.2. Study characteristics

In total, 105 studies met the inclusion criteria (Fig. 1). There were 62 prospective studies (Supplementary Appendix 4) and 43 retrospective

Legend:
- Sociodemographics
- Physical Health/Illness
- Other
- Mental Health Problems/Psychiatric Illness
- Psychological Factors
- Negative Life Events/Trauma
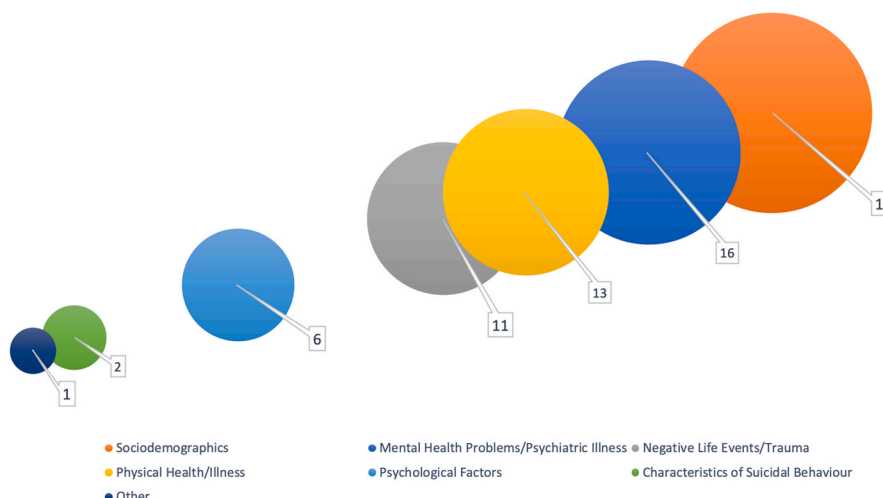- Characteristics of Suicidal Behaviour

Fig. 2. Bubble chart of number and type of risk factors identified across prospective and retrospective studies.

Table 1
Study numbers for prospective and retrospective studies.

Study Number	Author(s)
1	Aaltonen et al. (2019)
2	Allebeck and Allgulander (1990a)
3	Allebeck and Allgulander (1990b)
4	Allebeck et al. (1988)
5	Allebeck et al. (1987)
6	Almeida et al. (2016)
7	Anderson, P.Allebeck, Gustafsson, and Gunnell (2008)
8	Batty et al. (2012)
9	Batty et al. (2010)
10	Bjorkenstam et al. (2016)
11	Brenner et al. (2015)
12	Burrows et al. (2011)
13	Crump et al. (2014)
14	Denney et al. (2009)
15	Elovainio et al. (2009)
16	Erlangsen et al. (2004)
17	Fairweather-Schmidt et al. (2010)
18	Fukuchi et al. (2013)
19	Garcy and Vågerö (2013)
20	Geoffroy et al. (2014)
21	Gravseth et al. (2010)
22	Gunnell et al. (2005)
23	Gunnell et al. (2002)
24	Hansson et al. (2019)
25	Hedna et al. (2018)
26	Ilgen et al. (2010)
27	Jee et al. (2011)
28	Jiang et al. (1999)
29	Johansson et al. (1997)
30	Mukamal, Kawachi, Miller, and Rimm (2007a)
31	Kaplan et al. (2007)
32	Mukamal, Kawachi, Miller, and Rimm (2007b)
33	Kikuchi et al. (2009)
34	Kosidou et al. (2014)
35	Kosik et al. (2017)
36	Lorant et al. (2005)
37	Magnusson et al. (2006)
38	Miller et al. (2000)
39	Monnin et al. (2012)
40	Oquendo et al. (2007)
41	Paffenbarger et al. (1994)
42	Peters et al. (2018)
43	Poudel-Tandukar et al. (2011)
44	Quevedo et al. (2011)
45	Rojas and Stenberg (2010)
46	Rossow et al. (1999)
47	Rostila et al. (2013)
48	Sadeh and McNiel (2013)
49	Shalit et al. (2016)
50	Skogman et al. (2004)
51	Smith et al. (2018)
52	Stenbacka and Jokinen (2015)
53	Stenbacka et al. (2014)
54	Strand and Kunst (2006)
55	Sun et al. (2012)
56	Tidemalm et al. (2014)
57	Tidemalm et al. (2008)
58	Tsutsumi et al. (2007)
59	von Borczyskowski et al. (2010)
60	Weiser et al. (2016)
61	Yi and Hong (2015)
63	Yousaf et al. (2005)
63	Agerbo (2005)
64	Agerbo et al. (2011)
65	Altınöz et al. (2019)
66	Andrés et al. (2009)
67	Bae et al. (2015)
68	Bálint et al. (2016)
69	Blakely et al. (2003)
70	Canu et al. (2019)
71	Castelpietra et al. (2019)
72	Cibis et al. (2012)
73	Conner et al. (2001)
74	Conner et al. (2013)

Table 1 (*continued*)

Study Number	Author(s)
75	Dalca et al. (2013)
76	Dulskas et al. (2019)
77	Erlangsen et al. (2012)
78	Forsman et al. (2019)
79	Fountoulakis et al. (2014)
80	Gao et al. (2013)
81	Haglund et al. (2019)
82	Hempstead et al. (2013)
83	Henson et al. (2019)
84	Horwitz et al. (2019)
85	Ishii et al. (2013)
86	Kimerling et al. (2016)
87	Kittel et al. (2019)
88	Kochanski-Ruscio et al. (2014)
89	Li (1995)
90	Lundin et al. (2012)
91	Mahar et al. (2019)
92	Mathy et al. (2011)
93	O'Donnell et al. (2019)
94	Park et al. (2018)
95	Patasius et al. (2019)
96	Phillips and Hempstead (2017)
97	Robinson et al. (2009)
98	Salib and Green (2003)
99	SALIB, EL-NIMR, HABEEB, and THEOPHANOUS (2004)
100	Stickley et al. (2016)
101	Ursano et al. (2018)
102	Vasiliadis et al. (2017)
103	Waern (2003)
104	Windsor-Shellard and Gunnell (2019)
105	Yang et al. (2019)

studies identified (Supplementary Appendix 5). The prospective studies were conducted in a range of countries (full details in Supplementary Appendix 4); Sweden had the largest number of studies (26 studies), followed by the USA (11 studies), UK (4 studies), and Japan (4 studies). The average follow-up time for the prospective studies was 15 years, ranging from 60 days to 50 years. Most of the retrospective studies (Supplementary Appendix 5) were conducted in the USA (12 studies), UK (6 studies), and Denmark (5 studies). For the retrospective studies, the average study period was eight years (range: 1–21 years). The participants were from a variety of settings (from general population samples to psychiatric inpatients, see Supplementary Appendices 4 and 5). The majority of studies were conducted in high-income countries, more information can be found in supplementary appendices 6 and 7). The number and type of risk factors identified across the prospective and retrospective studies are displayed in Fig. 2.

4. Risk factors – prospective studies

4.1. Sociodemographic characteristics

Across eight studies there was evidence that being unmarried, divorced, widowed, separated, or single was associated with a significantly increased risk of suicide death (12, 13, 14, 16, 18, 25, 29, 51) and attempts (25) relative to those who were married. This was evident in general population samples, individuals on anti-depressant medication, individuals with prostate cancer, and across the lifespan (from 18 to 90+). Two studies found that being in a same-sex married relationship was associated with an increased risk of suicide mortality in men (10, 12) in Sweden and Canada, respectively. Male-only effect sizes were calculated for one study (51) and a small effect size was calculated for men who were single, divorced, widowed, or separated. Gender differences effect sizes were calculated for five studies (12, 13, 16, 18, 29). Five studies found more of an effect in females who were separated/ divorced/widowed/never married, although this was small. A small effect size was found for men who were separated/divorced/widowed/ never married in five studies, demonstrating more of an effect of marital

status in females. Two studies demonstrated more of an effect (small) in men who were never married or unmarried.

Suicide risk was also higher among men with lower levels of education with regards to suicide death (12, 13, 14, 21, 36, 61) and suicide attempts (35). This pattern was evident across a variety of samples (general population, veterans, and individuals followed up since birth). Four large general population studies found that being unemployed was associated with an increased risk of suicidal death (12, 13, 14) as well as attempts (17). Two studies of Norwegian participants reported a link between low household income as a child and later suicide mortality in men (54, 59). Three studies uncovered a relationship between social and material deprivation and suicidal death (12, 36, 42), such that suicidal behaviours were more common among those living in more deprived areas. Two studies examined large general population samples (12, 42) whilst study 36 examined data from ten European countries.

Living alone was associated with increased suicide death in four studies (1, 12, 24, 43) including a follow-up study of patients first hospitalised for depressive disorder (1), a large sample of Canadian adults (12), individuals with bipolar disorder (24) and Japanese adults aged 40–69 (43). Studies 1, 12, and 24 assessed living arrangements via census data while study 43 obtained this information via self-report. Two studies highlighted an association between having a small circle of friends and the risk of suicide in young Swedish male conscripts (3, 4).

Short stature among men may also be a risk factor for suicidal death (27) and suicide attempts (28) evidenced by two different samples, study 27 focused on Korean men and women whereas study 28 reported on a sample of young male Swedish conscripts. Short stature was a risk factor for suicide mortality in women, but to a lesser extent (27).

Ethnicity and suicide mortality were related in two studies (29, 31). For male veterans, White race was associated with suicide risk (31). Study 29 studied a Swedish population and found an association between ethnicity (defined as being born abroad) and death by suicide in all age groups studied (20–29, 30–49, and 50+).

Eleven Ten sociodemographic factors were identified from single studies. One study found that homosexuality (defined as "sexual deviations") was significantly associated with the risk of death by suicide, in young Swedish men (2). However, it was difficult to ascertain associations from this study as there were only sixteen participants (0.03% of the sample) who identified as LGBTQ+. Study 54 highlighted an association between low parental education (father and mother) and suicide mortality. Low income was associated with an increased risk of suicidal death in one Canadian census mortality follow-up study (12). Living in a small town or rural location was linked to a modest increase in suicide mortality, only in men (13). The highest risk was for men aged 20–29, yet risk was higher for females in all age groups. Overcrowding was related to suicide mortality in men of all age groups with the highest risk being in men aged 50+ (29). Renting accommodation was only linked to increased risk of suicide death in men aged 30–49 (29). Male veterans with a high level of education (12 years or over) were significantly more likely to die by suicide than those with less than twelve years of education (31). One study demonstrated a link between high income and suicide death in a sample of men and women first hospitalised for depression and followed up for 24 years (1). Men whose income was in the highest third were more likely than men in the lowest third to die by suicide during the follow-up period, but this risk was marginally larger in women. Study 21 found that receiving disability pension due to schizophrenia was linked to increased risk of suicide death in men yet this risk was higher in females. One study found an association between complicating social factors (defined as related to family, work, or economy) and suicidal behaviours (attempts and mortality) in men with bipolar disorder (56).

4.2. Physical health/illness

Being underweight was linked to suicidal attempts (28) and suicide mortality (9, 21, 27, 30, 37), and this was evident across a variety of study populations, from young male Swedish conscripts (9, 28, 37) to large general population samples (21, 27, 30). Two studies (15, 27) also uncovered a link between obesity and higher suicide mortality, in men aged between 40 and 69 (15) and a general population cohort of men and women (27).

Smoking was a risk factor for suicide death (27, 38, 41, 42) as well as attempts (17), across a range of populations including men in their sixties (17), in the general population (27, 42), among university alumni (41) and US army personnel (38). Suicide mortality among cancer patients was investigated in three studies (13, 51, 62). The year after receiving a cancer diagnosis was a significant risk period for cancer patients, as evidenced by two studies (51, 62). Poor cancer prognosis was also a significant risk factor (62). Two large cohort studies identified a relationship between diabetes and increased risk for suicide (8, 13).

There were nine physical health/illness factors identified from single studies. Any form of pain (very mild, mild, moderate, or severe) was significantly related to an increased risk of death by suicide in Japanese men aged 40- to 79-years old (33). Having three to four health conditions (defined using ICD codes such as diseases of the respiratory system, diseases of the digestive system) was associated with increased odds of suicide mortality in older Australian men (aged 65–85) (6). Study 61 found that there was a significant link between poor self-rated health and death by suicide. High blood pressure increased the risk of suicide mortality among men in one study (27). Study 11 found that men with multiple sclerosis were at increased risk of both suicide attempts and suicide mortality, compared to those without a diagnosis of MS. Somatic disorders, such as cancer, diabetes, heart disease, stroke, COPD, asthma, and spine disorders, were found to increased suicide mortality (13). Study 13 found that, compared to women, suicide risk was higher in men with diabetes, heart disease, and among those who had had a stroke. Having activity limitations was a significant risk factor for suicide death in male veterans in one study (31). Unexplained weight loss was linked to an increased risk of suicide mortality in one study of men aged 40–69 years old (15).

4.3. Mental health problems/psychiatric illness

Fifteen studies demonstrated an association between alcohol and/or drug use/dependence and suicidal behaviour among men (1, 2, 3, 5, 6, 13, 24, 26, 27, 39, 46, 49, 52, 57, 61). Many studies were conducted with Swedish samples (9 studies), followed by the USA (2 studies), Australia (1 study), Finland (1 study), Korea (1 study), and France (1 study). The majority of studies investigated suicide death whilst one study examined suicide attempts (49), and two studies (46 and 52) investigated both suicide mortality and attempted suicide. The assessment of alcohol and drug use/dependence differed across studies. One study examined current alcohol/drug abuse or dependence (39) whereas most studies focused on data from health records of having alcohol or drug dependence (1, 2, 5, 13, 24, 26, 46, 57). Studies 3 and 27 examined weekly or daily alcohol consumption, and study 3 also examined lifetime use of narcotics. Study 49 focused on cannabis use and study 52 used the terms problem drinking and drug use. Effect sizes for men were calculated for seven studies (3, 5, 6, 46, 49, 52, 61). A small effect in men was found for alcohol dependence in three studies, and one study found a medium effect. In addition, a small effect for drug dependence in men was found in two studies, and two studies found a medium effect in men. A history of alcohol abuse in men had a small effect in two studies. Cannabis in men use had a small effect and daily cannabis use had a medium effect in one study. Gender differences were calculated for five studies (5, 13, 24, 27, 57). Alcohol use in men has a small effect in two studies and a strong effect in one study. History of alcohol abuse in men had a small effect in one study. Substance use in men had a small effect in two studies and a stronger (small) effect in females in one study. All but one study demonstrated more of an effect in males, compared to females.

Men with depression were at increased risk of suicidal behaviours in

twelve studies (1, 6, 13, 17, 24, 26, 44, 50, 55, 56, 57, 61). Five studies used Swedish samples followed by Australia (2 studies), USA (1 study), Finland (1 study), Korea (1 study), Brazil (1 study), and China (1 study). Many studies examined suicide mortality whilst three studies focused on risk factors for suicide attempts (17, 44, 56). Four studies (6, 13, 15) focused solely on depression diagnosis, two studies used psychological scales (44, 55, 61), and study one assessed both severe depression and psychotic depression. Study 24 assessed depressive episodes in the previous year. Study 49 focused on major depression and depression not otherwise specified, study 56 assessed lifetime depressive episodes, and study 57 used the terms bipolar or unipolar disorder and other depressive disorder. Effect sizes for men were calculated for five studies (6, 17, 44, 55, 61). A small effect was found in three studies. A strong effect was found in one study and a small effect was found in one study. Gender differences effect sizes were calculated for four studies (13, 24, 50, 55). A small effect was found in two studies in men and a small effect was found in two studies in women. These findings are inconclusive whether this is more of an effect in males or females.

Nine studies demonstrated an association between any diagnosis of a psychiatric disorder or possible mental illness and increased risk of suicide mortality (3, 13, 21, 23, 24, 26, 46, 52, 60) and attempts (46, 52). This was reported from a range of different study samples, predominantly from young male Swedish conscripts (3, 46, and 52).

Diagnosis of a personality disorder was linked to increased risk of suicide death in five studies (2, 3, 4, 13, 57), the majority of which were from studies of young male Swedish conscripts (2, 3, and 4). Whilst the other two studies investigated a general population sample (13) and individuals who have been hospitalised following a suicide attempt (57).

Five studies highlighted an association between anxiety and suicide death (13, 26, 56, 57) and attempts (17, 56). Two studies examined general population samples (13, 17) whilst the other studies investigated veterans (26), patients with bipolar disorder (56), and individuals hospitalised following a suicide attempt (57).

Five studies demonstrated a link between schizophrenia and suicide death (2, 3, 13, 26, 57) and this was from a range of samples, with the majority from young male Swedish conscripts (2, 3).

Four studies linked bipolar disorder to increased risk of suicide mortality (6, 13, 26, 57). All studies examined different populations, elderly men (6), general population (13), veterans (26), and individuals admitted to hospital following a suicide attempt (57).

Two large studies of young Swedish men found that having a neurotic disorder was associated with an increased risk of suicide mortality (2, 4). Two studies (24, 56) reported that affective episodes in the previous year represented an enhanced risk of suicide mortality (24, 56) and suicide attempts (56) in male bipolar patients, compared to female patients. Studies 24 and 56 highlighted that having psychiatric inpatient care, particularly involuntary care, was linked to increased odds of attempting suicide and suicide mortality during follow-up in male bipolar patients.

Six mental health/psychiatric illness factors were identified from single studies. In men who had recently had a baby (30–60 days postpartum), all mood disorders were associated with an increased risk of suicide attempts (44). The risk was highest for mixed disorders followed by depression. One study of US veterans found that post-traumatic stress disorder was a risk factor for suicide death in men, but this risk was higher in women (26). One study of young male Swedish conscripts reported that being on medication for psychiatric problems was a risk factor for both violent and non-violent suicide attempts (52). Alcohol-related and substance-related mental illness increased odds of death by suicide in a sample of men aged between 65 and 85 (6). Men with bipolar disorder and a comorbid eating disorder were five times more likely to attempt suicide during the follow-up period (56). Study 39 found evidence for the association between current recurrent psychotic syndrome and re-attempts in the two years following a suicide attempt.

4.4. Psychological factors – personality and individual differences

Five studies demonstrated a significant association between low IQ and risk of suicide mortality (7, 21, 22, 52) and suicide attempts (28, 52). Most of the evidence was from young male Swedish conscripts (21, 22, 28, 52), where intelligence was measured at conscription (aged 18 or 19 years old). Two studies (7, 34) linked intelligence to suicide mortality (7) and attempts (34). Study 7 reported that low IQ scores at age 13 were associated with an increased risk of suicide mortality in adulthood. On the other hand, study 34 uncovered (in their study of 6146 individuals followed up for 5 years) that school performance and risk of suicide did not differ between genders.

Poor emotional control was also associated with an increased risk of suicidal mortality (3, 4, 52) and attempts (52) in three studies of Swedish men conscripted for military service (3, 4, and 52).

Four psychological factors were identified from single studies. One longitudinal study that followed up individuals for 50 years, starting at birth, found that externalising problems (rated by mothers at age 7) were associated with an increased risk of death by suicide in adulthood for men but not women (20). A study of male Swedish conscripts found that poor psychological function capability and poor psychological capability were significant risk factors for later suicide attempts (28). In men discharged from a psychiatric inpatient facility (Study 48), greater inclination towards angry behaviour was linked to an increased likelihood of suicide attempts in the year following discharge from the hospital. This pattern appeared to be particularly relevant for men who had been affected by childhood sexual victimisation. One study of young male Swedish conscripts uncovered a significant link between paranoid states and suicide death during the follow-up period (2).

4.5. Negative life events/trauma

Adverse childhood experiences were associated with suicide death (3, 4, 21, 52) and suicide attempts (17, 52) in five studies with many of the studies investigating young male Swedish conscripts (3, 4, 51).

Across two studies a relationship between bereavement and suicide mortality emerged (16, 47). The highest risk across age and gender was for men aged 80+ in the first year of widowhood (16). The death of a sibling was associated with an increased risk of suicide in a large sample of Swedish men and women (47). Bereavement by suicide, of a parent or sibling, was also associated with an increased risk of suicide mortality (16, 47).

Two studies of male Swedish conscripts found an association between involvement in criminal activity and suicidal death (52, 53) and attempts (52).

Nine negative life events/trauma factors were identified from single studies. One study of Japanese men reported an association between low control at work and risk of suicide, the same effect was not found for high demand at work (58). Men with bipolar disorder who endorsed expressing violent behaviour were at increased risk of suicidal mortality and suicide attempts (56). This association was not evident in women. Study 59 found that men affected by parental psychotic or affective disorder were at risk of suicide mortality, although this risk was higher in women in this study. Stressful life events in the past six months were associated with an increased risk of suicide attempts at follow-up, in all age groups (20s, 40s, and 60s) (17). The highest risk was for men in their sixties. One study found an association between childhood sexual victimisation and suicide attempts, in a sample of recently discharged psychiatric inpatients (48). Aggressive behaviour when angry increased the odds of a suicide attempt particularly in men with a history of sexual abuse or assault (48). Having conduct problems in school was linked to suicide attempts and mortality in young Swedish male conscripts (52), particularly regarding violent suicide attempts. This factor was also added risk for non-violent suicide attempts. Social isolation as a child (age 12–13) remained a significant risk factor for suicide death in men across the adjusted analyses (45). Childhood poverty was linked to

suicide mortality in Swedish men in one study (45).

4.6. Characteristics of suicidal behaviour

A history of previous suicide attempts increased the risk of suicide mortality in six studies (1, 5, 24, 50, 56, 60) and suicide attempts in two studies (39, 56). Two studies followed up patients who had been hospitalised following a suicide attempt (39, 50) and three studies examined patients with a diagnosed mental illness (schizophrenia and bipolar disorder respectively) (5, 24, 56). Study 1 investigated suicide risk after first-lifetime psychiatric hospitalisation for depression. A previous suicide attempt, particularly using violent methods, was a risk factor for suicide death (50). One study (60) found that young Israeli men assessed for military service with a psychiatric diagnosis who reported suicidal ideation (without a history of suicide attempts) were at risk of suicide mortality. Male only effect sizes were calculated for three studies (50, 56, 60). An intermediate effect size was found in two studies and a small effect was found in one study. Gender differences were calculated for three studies (24, 39, 50) and a small effect was found in two studies, indicating more of an effect in females. A small effect was found in one study, demonstrating more of an effect in males.

4.7. Other

One study of young male Swedish conscripts reported a significant relationship between fortuitous psychic disorders and death by suicide during the follow-up period (2).

5. Risk factors - retrospective studies

Overall, the 43 retrospective studies displayed a similar pattern of risk factors to the prospective studies. The section below displays a narrative synthesis of these findings (also see appendix 5 for the summary table of studies).

5.1. Sociodemographic characteristics

Fourteen studies reported a link between marital status and suicide risk, specifically being unmarried, single, divorced, or widowed was associated with increased risk of suicidal mortality (63, 64, 66, 68, 69, 85, 87, 89, 92, 94, 98, 99) and attempts (93, 105). Two studies with male-only samples reported being married was a risk factor for suicide mortality (82, 93). Married men were more likely to die by firearm suicide than those who were single (82). Young male veterans who were married did display heightened suicide risk, but this was less than those who were divorced or widowed (93). Male-only effect sizes were calculated for seven studies (63, 69, 87, 92, 93, 94, 105). The majority of studies demonstrated a small effect for being unmarried, single, divorced, or widowed. An intermediate effect was found for widowed men in one study (93) and never married or divorced men in study 94. Gender differences were calculated for seven studies (63, 66, 68, 89, 92, 98, 99). Four studies demonstrated a small effect for people who have been widowed and two studies demonstrated a small effect for divorced people, indicating a greater effect in females. There is a small effect for those who have never been married/unmarried in three studies, demonstrating a greater effect in men. Study 66 also showed a small effect for single people, indicative of a greater effect in females.

Five studies demonstrated a relationship between having a low level of education and suicide mortality (68, 69, 87, 94, 96) in general population samples. A link between unemployment and increased risk of suicide mortality (66, 69, 70, 85) and suicide attempts (79) was reported in five large studies assessing nationwide suicide rates or rates across several countries.

Twelve sociodemographic factors were found from single studies. In male patients with genital system cancer, being white was associated with an increased risk of suicide mortality (105). Study 93 reported that, in young male veterans, being black, Hispanic or "other" was linked to an increased risk of suicide attempts compared to those who were white. Having one or no household car access was associated with a small increase in the risk of suicide mortality (69). Not being married but living with a partner was associated with an increased risk of suicide death in men that was higher than the risk for women (63). Being in a same-sex partnership was associated with increased suicide mortality in men that was substantially higher than the risk for women (92). Study 85 based in Japan reported that the male standardised mortality rate (SMR) of suicide was significantly and negatively associated with annual postal savings per person. Men with a low income were more likely to die by suicide than those in the highest income quartile and this risk was higher than in women (66). Study 85 reported that the male standardised mortality rate (SMR) of suicide was significantly and positively associated with the elderly population rate. Men with low socioeconomic position (defined as an unskilled worker) were more likely to die by suicide than those at a higher level (90), although this risk was slightly higher in women compared to men. One study (100) examined the risk of suicide mortality close to the individual's birthday. In men, the five-day period before their birthday was associated with significantly increased odds of death by suicide, with the highest risk being on their birthday. Study 90 found that the risk of suicide in men increased as their sickness absence from work increased, with men being off work for over sixty-two days, 2.70 times more likely to die by suicide than those with 0–15 days off. This was also higher than the risk found in women. Study 104 reported that men in low skilled occupations were slightly more likely to die by suicide than those in skilled or highly skilled jobs.

5.2. Physical health/illness

Five studies reported an association between cancer diagnosis and suicide mortality (76, 83, 95, 97) and suicide attempts (83, 105). Two studies focused on cancers specific to men (prostate and male genital cancer respectively; 95, 105) while studies 83 and 97 included a mixed sample of patients with various cancer diagnoses, and study 76 assessed colorectal patients. Men diagnosed with cancer with a poor prognosis were at increased risk of suicide mortality, compared to women (95, 97). Specifically, the first 6–12 months following diagnosis was a significant risk period for men (76, 105).

Three studies reported a link between physical health problems and suicide mortality (65, 82, 84). In all three studies, the samples were identified from death records. Study 65 examined elderly individuals, study 82 included men who died by suicide between 2003 and 2009 in New Jersey (USA), and study 84 compared veteran and civilian suicide decedents.

Two studies reported an association between current smoking and suicide death (80, 87) in general population samples.

Four physical health/illness factors were reported from single studies. In a large sample of British adults followed up for seven years (80), being underweight (BMI less than 18.5) was associated with a substantial increase in the incidence rate ratio of suicide mortality for men (without depression history) compared to women. Type 2 diabetes increased the incidence rates of suicide mortality in men that was higher than in women (80), but the same effect was not found for suicide attempts. One study of elderly individuals found that arthritis was linked to a moderately increased risk of suicide in men, the same effect was not found in women (102). Study 102 reported that men who had a cerebral vascular incident had increased odds of suicide mortality.

5.3. Mental health problems/psychiatric illness

Nine studies reported an association between alcohol or drug use/dependence and suicidal attempts (67, 93) and suicide mortality (75, 77, 81, 87, 88, 96, 103). This association was found across a range of populations including general population samples (67, 77, 87, 96), elderly individuals (103), soldiers/veterans (88, 93), patients discharged from a

psychiatric facility (81), and patients with major depressive disorder (75). Five studies (75, 81, 87, 88, 93) examined both alcohol and drug use disorders, one study assessed substance abuse (96) and one study measured alcohol use disorders (103). Study 67 evaluated the frequency of alcohol drinking, the quantity of alcohol per drinking session, and AUDIT (Alcohol Use Disorders Identification Test) scores. Gender differences effect sizes were calculated for five studies (67, 75, 77, 96, 103). Two studies demonstrated a small effect in females for alcohol use/dependence and one study showed a small effect in men. For substance use/dependence one study demonstrated a small effect in men whilst one study showed a small effect in females. The findings were mixed with three studies displaying a greater effect in females and two displaying a greater effect in males. Male only effect sizes were calculated for five studies (67, 87, 88, 93, 103). For alcohol use/dependence a small effect size was found in three studies and a strong effect was demonstrated in one study. A small effect size was found for substance use/dependence in three studies.

Seven studies reported an association between depression and suicide mortality (80, 81, 87, 102, 103) and attempts (88, 93). One study retrospectively analysed patients admitted to hospital following a suicide attempt (88), two studies were case-control studies of elderly individuals who died by suicide (102, 103), and studies 80 and 87 used general population samples. Study 81 assessed suicide mortality following discharge from a psychiatric facility and study 93 studied young male veterans.

Three studies reported an association between a psychiatric diagnosis and suicide death (71, 96, 102) in individuals prescribed antidepressants (less than three years before suicide death, 71), a general population sample (96), and older adults (102). Study 96 ascertained this information from the National Violent Death Reporting System (NVDRS) where "mental health problem" was listed under important risk factors for suicide whilst study 102 recorded information on anxio/depressive disorders and all other mental disorders from a longitudinal study on the health of the elderly for controls and information from health/death records for cases. Study 71 attained this information from a national database that records data on suicides, diagnoses, and antidepressant use. Current use of psychiatric medication was a significant risk factor for suicide by poisoning in two studies (71, 78).

Two studies found that mental health comorbidities were a risk factor for suicide death in men (74, 77), in a sample of male veterans (74), and in older adults (77). Suicide risk increased as the number of comorbidities increased (up to 6), and the highest risk was for bipolar disorder with comorbid anxiety (74). Study 77 reported that in men with schizophrenia, the presence of comorbidities was a risk factor for suicide, but this risk was lesser than those with a sole diagnosis of schizophrenia. Anxiety was also a risk factor for suicide mortality in two studies (81, 102) of patients discharged from a psychiatric facility (81) and older adults (102). Two studies reported an association between personality disorders and suicide death (77, 81). This was evidenced in adults aged 50+ (77) and patients discharged from a psychiatric inpatient facility (81). Schizophrenia was a risk factor for suicide death in two studies (77, 81).

Nine mental health/psychiatric diagnosis factors were identified from single studies. Psychotic disorders were a risk factor for suicide mortality in study 81. Men diagnosed with affective disorders were at risk of suicide mortality in one general population study (81). Men who had experienced bad mental health in the past thirty days were more likely to die by firearm suicide than those with good mental health (82). Being in treatment for a mental health problem was a risk factor for suicide in men, and to a lesser extent in women, aged over twenty-five years old (96). Depressed male suicide cases had a higher likelihood of being diagnosed with Cluster B Disorders compared to controls (living participants with major depressive disorder) (75). One study (77) reported, in a sample of older adults followed up for 16 years, that dementia was a risk factor for suicide mortality in men, but this risk was more than double in women. Comorbidity of schizophrenia and

dementia also conferred risk for males but was higher in females. Mental and physical health comorbidities were associated with suicide death in older adults (102), although it was slightly elevated in women. In adults aged 50+ with schizophrenia, a recent admission or discharge from hospital was a substantial risk factor for suicide in men (77).

5.4. Psychological factors – personality and individual differences

Two psychological factors were identified from single studies. Study 75 found that both impulsive aggression and non-impulsive aggression discriminated between male depressed suicide completers and controls. The same effect was not replicated in women. Study 75 also found that depressed male suicide cases had a higher likelihood of being characterised as "highly impulsive" compared to depressed living participants (controls).

5.5. Negative life events/trauma

Three studies found experiencing a recent crisis was a risk factor for suicide death in men recently discharged from psychiatric inpatient care (81), men who died by firearm suicide (82), and young male veterans (93).

Two studies reported that being bereaved by suicide was related to suicide mortality (63, 82). Study 63 reported that having a partner or cohabitee who died by suicide was a significant risk factor for suicide in men, but this was substantially higher than the risk in women. Study 82 found that experiencing a recent death or suicide of a friend or family member was associated with an increased risk of suicide by firearm. Two studies demonstrated a link between conflict with partner or spouse and suicide mortality (82, 96).

Seven factors were identified from single studies. Engaging in violent behaviour in the past year was a significant risk factor for suicide mortality in men yet, this had a larger effect in women (73). Having a partner or cohabitee who was admitted to a psychiatric facility in the past two years increased the risk of suicide in men yet, this risk was also substantially elevated in women (63). One study (65) reported the association between financial difficulties and suicide death in older adults (aged 65+). Financial difficulties were the most common reason given for suicide in men in this study. Experiencing a job problem significantly increased the likelihood of death by firearm suicide (82). One study of veterans (86) stated that military sexual trauma was associated with increased risk of suicide mortality in men. This was also increased in women, and more women experienced military sexual trauma in this sample (21.2% of women compared to 1.1% of men). An argument preceding death was a significant risk factor for suicide death in men (96). This was also significant in women but to a lesser extent. One study (101) of US active-duty soldiers evidenced that having any history of family violence increased odds of a suicide attempt in men. Being a perpetrator was linked to the highest risk compared to being a victim. All measures of family violence conveyed greater risk to men, compared to women.

5.6. Characteristics of suicidal behaviour

Disclosing intent to harm themselves was also a risk factor for death by suicide in three studies, investigating general population samples (96), young male veterans (93), and a male-only sample of suicide decedents (82).

Three studies reported that men were more likely to choose lethal or high-risk methods (72, 84, 93), particularly male veterans (84, 93). Study 10 reported that men who died by suicide were more likely to choose high-risk methods compared to women (70% vs 30%). They were also less likely to choose low-risk methods compared to women (30% vs. 70%).

One study highlighted an association between previous suicide attempts and increased risk of later death by suicide (77). Having prior

attempts was only a risk factor for suicide by hanging in men, not the other methods of suicide studied (firearm or poisoning). In a sample of older adults, having previous suicide attempts was linked to a substantial risk for suicide mortality in men, particularly in those with a diagnosis of schizophrenia (77). Previous self-harm was also a risk factor for suicide mortality following discharge from a psychiatric facility (81).

6. Discussion

This systematic review has highlighted the complexity of assessing risk factors for suicidal behaviour in men; in this review alone, studies identified 68 different risk factors (see Fig. 2). Numerous factors were uncovered that can interact and change in relevance throughout an individual's life. While many risk factors can increase suicide risk regardless of gender, this review focused on those factors that are associated with suicidal behaviour in men.

6.1. Risk factors for suicidal behaviours in men

In the prospective studies (see supplementary appendix 4), the most consistent evidence was for sociodemographic factors (19 factors), followed by mental health/psychiatric illness (16 factors), physical health/illness (13 factors), and negative life events/trauma (11 factors). There were a small number of psychological factors (6 factors) and characteristics of suicidal behaviour (3 factors) identified. The paucity of psychological research may be a by-product of the types of studies included in this review. Most studies were large epidemiological designs and as such, they do not tend to routinely assess psychological factors and characteristics of suicidal behaviour. This major weakness needs to be addressed urgently.

For the most part, the findings from the retrospective studies (see supplementary appendix 5) provided further evidence for the risk factors identified in the prospective studies. However, there were 18 additional factors identified from single retrospective studies (with the exception of the partner's psychiatric illness, which was present in two studies) that require further investigation.

Across both prospective and retrospective studies, there were risk factors that had a substantial amount of supporting evidence. First, alcohol and drug use/dependence had the most extensive supporting evidence (24 studies) and this is consistent with previous research highlighting these as significant risk factors for suicidal behaviour in men (Holmstrand et al., 2015). What still needs to be understood, though, is whether alcohol/drug use are predisposing factors, coping strategies, or motivating/facilitating factors for suicidal behaviour. Being unmarried, divorced, widowed, or single was a risk factor evident in both the retrospective and prospective studies. Marital status seems to have a differential effect on men compared to women, with several researchers proposing potential explanations for this (Evans et al., 2016; Scourfield and Evans, 2015; Scourfield et al., 2012). Marriage is known to be protective for men, with their partner often being their only source of emotional support (Joiner, 2011). Yet, it is argued that once this support is removed, men may be less able to cope or reach out for help than women, possibly due to the differential nature of male and female friendships (Joiner, 2011). Relationship difficulties have been noted to increase suicide risk in physicians, with male physicians also exhibiting an overall increased risk of death by suicide compared to females (Duarte et al., 2020a, 2020b).

Consistent with previous research, depression was identified as a significant risk factor across both prospective and retrospective studies (Brownhill et al., 2005; Ross et al., 2017; ; Woodhead et al., 2014). Indeed, any diagnosis of mental illness was also a risk factor for men from prospective studies (Holmstrand et al., 2015). Having a low level of education was associated with increased suicidal behaviour across 12 studies, which demonstrates the potentially longer-term impact of childhood experiences. Previous suicide attempts were also a risk factor in eight studies for future suicide attempts and death by suicide, but the

small effect sizes of these studies demonstrate the need for further research to improve short-term prediction of suicide risk (Ribeiro et al., 2016). Various factors were identified from a single study or a small number of studies, which highlight important areas for future research.

Identifying risk factors for suicidal behaviour in men has important clinical and research implications. A comprehensive overview of risk factors is useful for suicide crisis helplines to identify imminent risk in men and build on established formulations (Gould et al., 2016). Previous research has identified that many patients attend emergency departments in the year before their death by suicide (43% in a study by Da Cruz et al. (2011)), with those who attend frequently being more likely to present for psychological reasons or self-harm than other attenders. This demonstrates the importance of suicide risk assessments in emergency settings but also in other services such as addiction services and services treating men who may be vulnerable (for example following a divorce). Also, risk assessments and greater awareness of the risk factors for suicide in men may have merit for those working in other settings, such as mental health charities. Yet, the limitations of suicide risk assessments need to be borne in mind (Zortea, Cleare, Melson, Wetherall and O'Connor, 2020), when used in isolation, particularly regarding their value compared to clinician judgement. Broadening these assessments to incorporate a more comprehensive understanding of risk factors within a theoretical framework (O'Connor and Kirtley, 2018) should guide clinical practice, improve clinician confidence in using the tools and improve identification of at-risk patients particularly for non-psychiatric care providers (Chunduri et al., 2019). Also, since the ability to identify those at risk of dying by suicide continues to be no better than chance (Franklin et al., 2017), this review provides a useful basis for future research by providing a comprehensive profile of risk factors and identifies important research gaps.

6.2. Knowledge gaps and directions for future research

In this review, it was evident how few studies in the male suicide literature had focused on psychological factors, such as personality and individual differences. This is surprising given the recognition that suicide is a behaviour governed, in large part, by psychological processes (O'Connor and Nock, 2014). Indeed, all of the recent theoretical models of suicide have been psychological in orientation (O'Connor and Kirtley, 2018; Van Orden et al., 2010; Williams and Pollock, 2001). Poor emotional control was identified as a risk factor for suicide in three studies of young male Swedish conscripts. Future research should investigate emotional control in more heterogeneous samples to determine whether its relationship with suicide extends to wider male populations. It would also be important to determine the extent to which emotion dysregulation contributes to suicide risk in men. Low IQ was also identified as a risk factor in five studies, however, given the heterogeneity of populations and measures of IQ, it is difficult to synthesise the findings and to understand the nature of the relationship between IQ and suicide. Also, more work needs to be done to understand the impact of early life circumstances such as poverty and reduced access to education on suicide risk in men. Periods of economic uncertainty have been linked to an increase in male suicidal behaviour (Vandoros et al., 2019), demonstrating the need to uncover the particular aspects contributing to this such as types of employment or personal circumstances (e.g. being the sole earner in a family).

Impulsivity and impulsive aggression were also identified from one study in this systematic review, which is consistent with previous research that has shown that impulsivity can differentiate between those who think about suicide compared to those who attempt suicide in some samples (Gvion and Apter, 2011; Horesh et al., 1997; Klonsky & May 2010). Future research is needed to determine whether impulsivity and impulsive aggression are more strongly correlated with male versus female suicides. More research on psychological factors could aid in the identification of factors that predispose certain individuals to suicidal behaviour and crucially help to understand how other social or cultural

factors impact men differentially to increase risk. An issue with synthesising the findings from this review irrespective of risk factor was that the studies used many different measures and definitions of factors thereby rendering it difficult to compare studies (Franklin et al., 2018).

There is also a need to examine elements of the male social experience, such as masculinity, which may influence their suicide risk. To this end, self-reliance and shame could be useful avenues for future research as such feelings may prevent men from seeking help in a crisis and may be associated with maladaptive coping styles such as alcohol and drugs (Cleary, 2012; Oliffe et al., 2017). Social perfectionism, defined as a belief that others expect perfection from you, is an established suicide risk factor that may also be linked to the need to be self-reliant and to portray the outward experience of "doing well" (Wetherall, Robb and O'Connor, 2019). The extent to which this has a differential effect on men compared to women warrants further investigation. Help-seeking in men is also a useful avenue for further investigation, young men are less likely than young women to visit their general practitioner in general (Beautrais, 2002) and rigid coping styles may prevent men from recognising that they need help (Canetto, 2017). Disclosing emotional difficulties may pose a threat to the outward appearance of masculinity (Cleary, 2012), yet, the extent to which this relates to help seeking in men requires further investigation.

Method choice can differ between men and women, with death by self-inflicted gunshot and hanging more common in men. A "failed" suicide may be viewed as weak and a threat to masculinity whereas a "successful" suicide is viewed as brave and decisive (Canetto and Sakinofsky, 1998; Chandler, 2019). Despite differences in method choice, men and women may not differ in their intent to die (Denning et al., 2000), which demonstrates that the underlying mechanisms behind method choice require further investigation.

Defeat and entrapment are key features of predominant models of suicidal behaviour such as the Integrated Motivational-Volitional (IMV) model (O'Connor and Kirtley, 2018), yet it remains unclear whether men are differentially affected by such drivers for suicide than women. More generally, the extant male suicide literature is largely comprised of homogenous samples of white heterosexual men thereby demonstrating the need to investigate whether the risk factors identified herein are also important across different sexualities, ethnicities, and socio-economic status.

Alcohol and drug use/dependence were significant factors across both prospective and retrospective studies, yet, a useful avenue for further research would be to disentangle the nature of the relationship between alcohol/drug use and suicide risk. For example, it is unclear whether alcohol predisposes an individual to become suicidal or if it is used as a coping strategy. Alcohol use can lead to disinhibited thoughts, impaired judgment, and impulsivity; these can lead to suicidal thoughts and behaviours, but it can also be used as a way of alleviating the distress associated with being suicidal (Pompili et al., 2010). Alcohol myopia, which can have a narrowing effect on attention, may also affect men by leading to disinhibited behaviour such as aggression (Giancola et al., 2010). Aggression is an established feature of suicidal behaviour, and a suicide attempt may be a bid to direct this aggression on oneself (Martin et al., 2019). Also, by examining factors specific to the male experience, such as male depression (Sørensen et al., 2019), research can move towards understanding what it means to be a man and experience suicidal thoughts and behaviours. For example, men may express their emotions in ways different to women, which could lead to the under-reporting or under detection of male mental illness (Brownhill et al., 2005; McQueen and Henwood, 2002; Owens et al., 2011).

This review also highlights that more work is needed to understand the interactions between risk factors for male suicide and their relevance across the lifespan. Future research could also examine the factors that are relevant for each age group and how these change and evolve throughout their life. Naturalistic real-time monitoring via smartphones is an important new development (Kleiman and Nock, 2018; O'Connor and Portzky, 2018a, 2018b) and could be used to examine the shift from

thinking about suicide to suicidal behaviour in men. In addition, the majority of research identified in this review was conducted in high-income countries, which highlights an important gap in the literature because over 75% of suicides occur in low-middle income countries (Iemmi et al., 2016). Very few studies investigated the impact of culture on the risk of engaging in suicidal behaviour; this research gap is also important to be addressed.

6.3. Strengths and limitations

The strengths of this systematic review include a robust search strategy (see supplementary appendix 1), not limited by year, and adherence to best practice guidelines (Johnson and Hennessy, 2019). Checks and balances were included to reduce bias in the screening, extraction, and coding processes. The final included articles were screened by multiple reviewers to ensure they were thoroughly assessed. A wide range of risk factors were identified, from sociodemographics to mental illness, although many had relatively small effect sizes, which highlights the importance of the use of caution when interpreting the findings. The magnitude of the risk factor effect in males and females was also mixed, demonstrating important gaps to be addressed by future research. Both the prospective and retrospective studies (see supplementary appendices 4 and 5) included in this review were rated on average reasonable to good quality, with some studies scoring excellent, which demonstrates that the effect sizes were robust and not influenced by lower quality studies (Barker Bausell, Lee, Soeken, Li and Berman, 2004). The study quality was similar across prospective and retrospective studies, which was unexpected. Yet, this may have been because many studies were marked down if they did not conduct a power analysis. Indeed, the inclusion of a post-hoc power analysis may have been useful particularly as many studies had very large sample sizes (with low base rates of suicidal behaviour) and marginal effect sizes (Armstrong, 2019; Kim and Seo, 2013). Selection bias may have been an issue (Johnson and Hennessy, 2019), particularly in the case-control studies where the control group was comprised of individuals recruited from hospital samples or individuals with a diagnosed mental illness. The control participants may have had other confounding variables (or risk factors) present that the studies had not taken into consideration (Henderson and Page, 2007). In addition, several studies used data from conscription for military service and matched this factor to longitudinal general population data. Some factors were only assessed in the conscription sample (in males, not in females) which hindered the gender comparisons.

As we were interested in suicide over time, we focused on prospective and retrospective study designs only. This focus also addressed two of the key research challenges highlighted by O'Connor and Portzky (2018a, 2018b) regarding the need for more investigation into suicide deaths and novel risk factors. Similar to the limitations noted by Hunt et al. (2017), however, the investigation of gender differences was often not the sole purpose of the studies reviewed herein. Indeed, many of the studies solely focused on sociodemographic differences between men and women. There is a need for future research to investigate gender differences across a wide range of factors, particularly psychological factors that are under-researched. Also, we recognise that by excluding intervention studies other important research may be excluded and that retrospective studies may be subject to recall bias, particularly in case-control studies (Sedgwick, 2014). Nonetheless, given the similarity in findings between the prospective and retrospective studies, this bias may be minimal. A key aspect of the search strategy included the term "risk factor" as well as "suicide attempted" and "suicide", we recognise that important studies may have been missed. Although given the large number of studies identified initially, it was not deemed viable to broaden the search at this time.

7. Conclusions

This review is the largest synthesis of the research literature to date on risk factors for suicidal behaviours in men and the findings demonstrate the wide range of risk factors that are associated with male suicide. From predisposing factors, such as early life experiences and childhood education, to mental illness and health, the path towards suicide for men is complex and involves an interplay of factors. There were five risk factors with a particularly high proportion of supporting evidence in this review. Alcohol and drug use or dependence, marital status, depression, level of education, and previous suicide attempts were particularly notable risk factors, which may have a differential impact on suicide risk in men. Although many factors are relevant for all genders, identifying risk factors in men provides a step forward towards understanding why men are more likely to die by suicide than women.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2021.113831.

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