Suicide prevention interventions targeting Indigenous peoples in Australia, New Zealand, the United States and Canada: a rapid review

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An **Evidence Check** review brokered by the Sax Institute for the NSW Ministry of Health

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This rapid review was brokered by the Sax Institute for the NSW Ministry of Health.

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1 EXECUTIVE SUMMARY

1.1 Scope of review

This report presents the results of a systematic search of the peer reviewed and grey literature, aimed at identifying studies that describe or evaluate suicide prevention interventions, including early intervention, prevention and postvention strategies, targeting Indigenous peoples in Australia, New Zealand (NZ), Canada or the United States (US), for the period 1981 to 2012 (May) (inclusive). It critiques the methodology of evaluations of suicide prevention interventions and describes their key characteristics. The likely causes of suicide among Aboriginal and Torres Strait Islander Australians most commonly articulated in the descriptive literature are also identified. The implications of overall findings for suicide prevention programs and policies targeting Aboriginal communities in NSW are discussed.

1.2 Methods

A qualified librarian systematically searched 17 electronic databases and 13 websites for scientific and grey literature publications relating to suicide among Indigenous peoples of Australia, NZ, Canada or the US, identifying 945 publications. Examination of the abstracts of these 945 publications identified 38 intervention studies. Of these 38 intervention studies, 29 (76%) described a suicide prevention intervention program or policy and 9 (24%) evaluated a suicide prevention intervention program of policy.

1.3 Key results

The nine studies evaluating a suicide prevention intervention targeted Indigenous peoples in the United States (n=5 studies), Australia (n=3 studies), and Canada (n=1 study). No intervention evaluation targeted Indigenous peoples in NZ. The main intervention strategies evaluated by studies included community prevention (n=4 studies), gatekeeper training (n=3 studies) and education (n=2 studies).

Community prevention interventions targeted specific Indigenous groups and communities at high risk of suicide. Two of the four community prevention interventions employed multiple strategies to reduce risk factors of suicide and/or suicidal behaviours among Indigenous young people. Broadly, these included educational programs, social and cultural activities, and mental health service delivery. One community prevention intervention employing multiple strategies reported reductions in rates of suicidal behaviours. Two community prevention interventions each employed one main strategy: one an empowerment program and the other, community level alcohol restrictions. Alcohol restrictions reduced suicide rates, with less restrictive measures more effective at reducing suicide rates than more restrictive measures.

Gatekeeper training involves teaching specific groups of people in the community how to identify and support individuals at high risk of suicide. The three studies evaluating Gatekeeper training reported post-training increases in participants' knowledge of suicidal risk behaviours, and confidence and/or willingness to assist individuals at risk of suicide. One study measuring the long term effects of gatekeeper training found improvements in knowledge and confidence were diminished at two years follow-up. No study evaluating gatekeeper training measured changes in suicide or suicidal behaviour.

For education interventions, one was integrated into the school curriculum and delivered to Indigenous teenagers at school, while the other was delivered via multi-media technology to Indigenous peoples across varying age groups and from different social backgrounds. The school-based intervention achieved significant reductions in psychological risk factors of suicide among Indigenous teenagers receiving the intervention versus those that did not. The multi-media education intervention resulted in modest improvements in participants' knowledge of suicide risk factors. Again, neither education evaluation measured changes in suicide or suicidal behaviour.

1.4 Key findings

In summary, there are four key findings of this review. Firstly, there is a lack of evidence from published studies on the most effective intervention strategies for preventing suicide in Indigenous populations, but community prevention programs currently have the most evidence for reducing actual rates of suicide or suicide behaviours among Indigenous populations (two out of four community prevention evaluations showed a significant effect). Secondly, tailoring suicide prevention intervention strategies, in collaboration with targeted Indigenous communities, to address the needs and preferences of high risk Indigenous groups (e.g. young people) is likely to be crucial for optimising acceptability and feasibility of program delivery. Thirdly, the most common risk-factors for suicide reported in data-based, analytical descriptive studies specific to Aboriginal and Torres Strait Islander populations were mental illness, alcohol abuse and a prior history of self-harm. Other risk factors for suicide in the Aboriginal and Torres Strait Islander population reported in non data-based descriptive studies included low levels of access to mental health services, low levels of help seeking behaviours, imprisonment, social powerlessness and high levels of exposure to trauma and violence. Fourthly, evidence from systematic reviews (see Appendix 1) of community suicide prevention programs show that multi-faceted approaches combining one or more individual strategies, tailored to specific communities, and targeting common risk factors for suicide (mental health disorders, alcohol abuse and a prior history of self-harm), offer considerable promise for reducing rates of suicide and suicidal behaviour. Promising individual strategies that can be combined into a coherent community prevention program, as opposed to being independently implemented, include:

- Training general practitioners (GPs) to recognise and treat suicidal behaviour
- Improving access to timely and appropriate mental health care for at-risk individuals (e.g. those with a history of self-harm) and groups (e.g. young people)
- Teaching specific groups of people in the community how to identify individuals at high risk of suicide and refer them for treatment (gatekeeper training)
- Cognitive behavioural approaches to assist individuals displaying suicidal behaviours (e.g. feelings of hopelessness and depression), and/or engaging in high risk behaviours for suicide (e.g. alcohol abuse), to make changes in their lives to reduce their risk of suicide
- Restricting access to means of suicide among high-risk groups and individuals.

1.5 Implications

There is currently insufficient evidence from published evaluations of suicide prevention interventions targeting Indigenous peoples to confidently allow prescriptive determination of suicide prevention, early intervention and postvention policies or programs for Aboriginal people in NSW. This has two major implications. Firstly, an evidence-informed policy would take into account the main findings from this systematic review of the literature. Specifically, policies and

programs are most likely to be effective if they comprise multiple components, (e.g. GP and gatekeeper training, cognitive behavioural therapy and greater restrictions on access to potential means of suicide), especially evidence-based components targeting mental health disorders, alcohol abuse and a prior history of self-harm, and are tailored to specific communities (as opposed to being generic for all communities). The methodologically strongest study in this review effectively tailored alcohol restrictions to reduce suicide in Indigenous communities, demonstrating this process is possible. Second, there is an urgent need to evaluate policies or programs, especially in terms of their costs given there have been no economic evaluations. Such evaluations can be designed with researchers with relevant skills and need not be expensive if they occur simultaneously with the development and implementation of a policy or program. The Centre for Aboriginal Health at the NSW Ministry of Health is pioneering this combined implementation and evaluation approach to improve cultural competence in hospitals in NSW and to improve chronic care services delivered in Aboriginal Community Controlled Health Services.

1.6 Key recommendations

Based on the findings of this systematic review of the current evidence base, it is recommended that:

A. Suicide prevention, early intervention and postvention policies or programs for Aboriginal people in NSW reflect the need to develop and implement multiple strategies coordinated across, and tailored to, defined communities. At a minimum, a list of best-evidence strategies could be provided from which Aboriginal communities can choose those that are most feasible to implement in their community, depending on their own specific needs and circumstance

B. Given the current lack of evidence, NSW Health extends its pioneering approach of facilitating partnerships between communities/clinicians and researchers with skills and expertise in evaluation design to Aboriginal suicide prevention, early intervention and postvention programs. At least one evaluation could be designed and implemented to measure the impact and economic costs of a best-evidence community program, the results of which would improve the effectiveness of future policies and programs for reducing rates of Aboriginal suicide.

2 Introduction

Indigenous peoples of Australia, NZ, Canada and the US have rates of suicide that are two to three times higher than in their country's general population.[1–5] Suicide was the sixth leading cause of death among Aboriginal and Torres Strait Islander Australians in 2010, accounting for 4% of all deaths.[1] This compares with 1.6% of all deaths attributable to suicide in the general Australian population.[1] The actual rates of suicide among Aboriginal and Torres Strait Islander Australians are most likely higher, with evidence of underreporting of Indigenous suicides due to factors such as misclassification of Indigenous status on death certificates and differences between jurisdictions in procedures for reporting deaths, and the limitations of legal criteria for determining the cause of death.[2]

The overall rates of suicide among Canadian First Nations people are at least two times that of Canada's general population[3]. In the US the rate of suicide among the American Indian population is approximately 1.5 times that of the general US population.[4] In NZ, Maori and non-Maori suicide rates were similar to 1987, after which a significant increase in the Maori suicide rate was reported, particularly for young males.[5,6]

Epidemiological data show variations in rates and patterns of suicide deaths across Indigenous communities.[7] For example, suicide clusters – a series of suicides approximated in time and geographical place, and etiologically linked[8] – have been reported in remote Aboriginal communities in Australia[9,10] and on American Indian reservations.[11] Suicide rates in Indigenous populations are also disproportionately higher among younger, relative to older, people[7], and among non-Indigenous people of the same age.[9] For instance, in Australia, almost half of the health gap between Aboriginal and non-Aboriginal Australians due to injury is attributable to suicide in young Aboriginal males[12], and in NZ, suicide rates in Māori youth are more than double that of non-Māori youth.[6]

In addition to being younger, the main risk factors for suicide are mental health disorders, stressful life events and substance abuse.[13,14] All these risk factors occur at disproportionately higher rates in Indigenous populations, placing them at significantly higher risk of suicide than the general population.[15,16] For instance, Indigenous peoples are more likely than the general population to use alcohol and other drugs at levels that increase their risk of mental health disorders[16], and their higher levels of social disadvantage increases their exposure to stressful life events, such as unemployment, homelessness, incarceration and family problems[15] that, in turn, have been shown to increase risk of suicide.[14] Indigenous peoples of Australia, NZ, Canada and the US are also at an increased risk of suicidal behaviour due to factors embedded in their historical experiences, including loss of land and culture, trans-generational trauma and grief, racism and social exclusion.[17-22] Indigenous peoples' continued exposure to multiple risk factors for suicide underscores their urgent need for suicide prevention interventions.

There is evidence from systematic reviews for the effectiveness of different suicide prevention interventions.[13,23,24] This evidence, however, largely derives from evaluations of suicide prevention interventions targeting the general population. Although there are published reviews of suicide interventions specifically targeting Indigenous populations[25–28], a systematic review of published evaluations of suicide prevention interventions targeting Indigenous populations is timely for at least two reasons. Firstly, with the exception of one review on approaches for reducing suicide among Indigenous youth[28], there have been no published evaluations of systematic reviews of suicide prevention interventions targeting the Indigenous peoples of Australia, NZ, Canada or the US. Outcomes of suicide prevention interventions targeting an Indigenous population in one of these countries may be applicable to Indigenous populations in the other countries, in so far as they have similar risk factors, such as historical experiences, levels

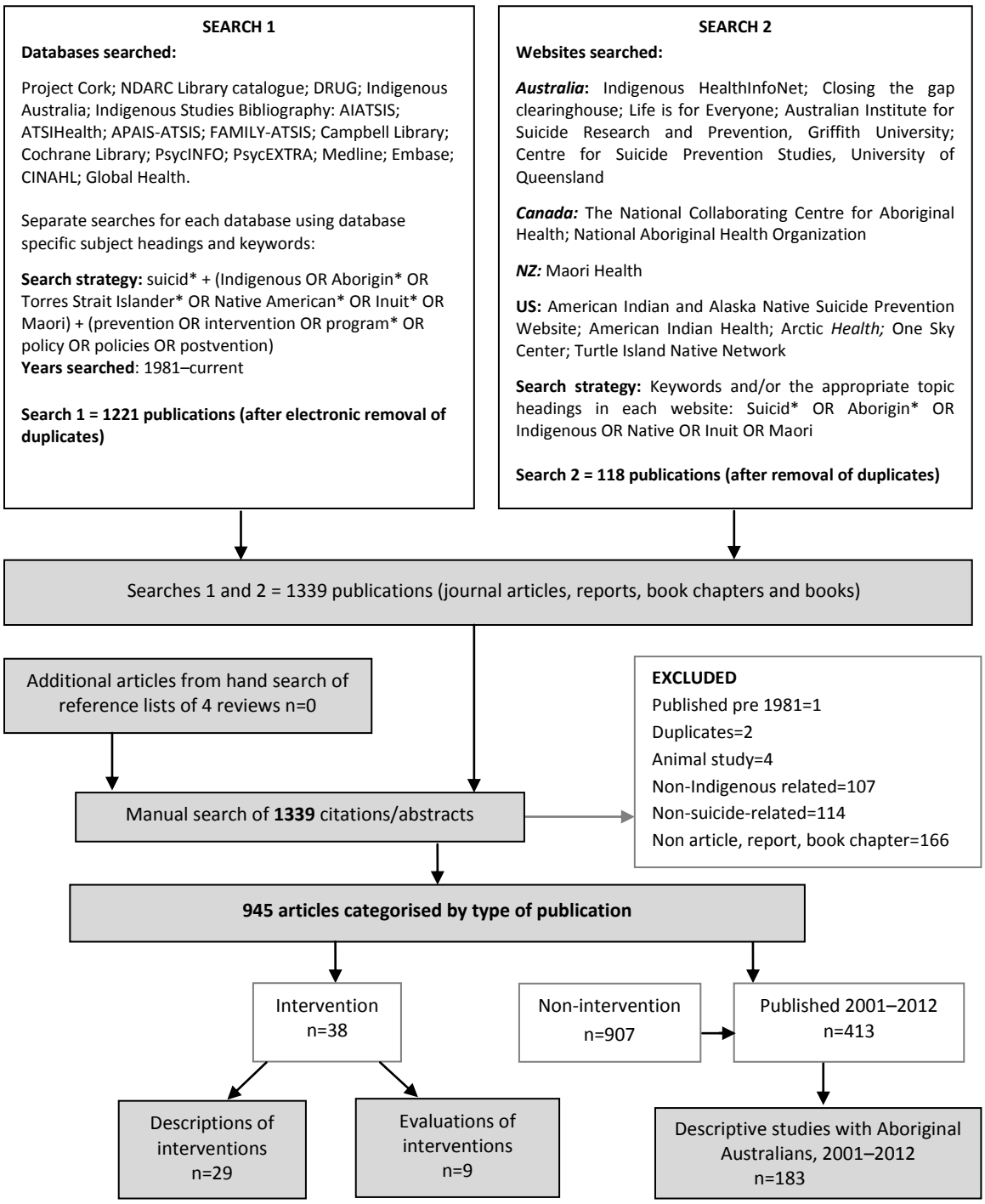
of socioeconomic disadvantage and burden of ill health and disease.[15,16] Secondly, existing systematic reviews of suicide prevention interventions targeting Indigenous populations focus on describing the interventions, rather than examining the methodological quality of their evaluation designs.[25–27] Therefore, this systematic review aims to: firstly, identify evaluations of suicide prevention interventions targeting Indigenous peoples in Australia, NZ, Canada and the US published in the scientific and grey literature; secondly, critique their methodological quality using a standardised assessment tool and describe their key characteristics; thirdly, identify the causes of suicide among Aboriginal and Torres Strait Islander Australians most frequently articulated in published descriptive studies and discussion papers; and finally, discuss the overall implications of findings for preventing suicide among Aboriginal communities in NSW, Australia.

3 Methods

3.1 Search strategy

Figure 1 summaries the databases searched, the search terms used, the exclusion criteria, and classification of included studies.

Figure 1. Flowchart of search strategy



Consistent with methods detailed in the Cochrane Collaboration Handbook on Systematic Reviews of Health Promotion and Public Health Interventions[29], and with previous systematic reviews[30-31], the search strategy comprised three steps.

First, consultation with a qualified librarian identified 17 relevant electronic databases to search: Project Cork; NDARC Library catalogue; DRUG; Indigenous Australia; Indigenous Studies Bibliography: AIATSIS; ATSIHealth; APAIS-ATSIS; FAMILY-ATSIS; Campbell Library; Cochrane Library; PsycINFO; PsycEXTRA; Medline; Embase; CINAHL; Global Health. The terms suicid* and Aborigin* OR Indigenous OR Torres Strait Islander* OR Native American* OR Inuit OR Maori were searched using keywords and MESH terms in each database. The combined searches of the 17 databases (excluding duplicates) identified 1221 references that were imported into Endnote.

Second, to maximise search coverage of the grey literature, 13 websites and clearinghouses related to Indigenous peoples of Australia, NZ, Canada and/or the US were also searched (See Figure 1, Search 2). 118 studies not identified in the electronic database search were identified.

Third, reference lists of four reviews of suicide prevention interventions targeting Indigenous peoples of Australia, Unites States, Canada and/or NZ[25–28], identified by the electronic database search, were hand-searched for relevant studies not yet identified. No additional studies were identified.

In total, 1339 references were identified for classification.

3.2 Classification of studies

The titles and abstracts of the 1339 identified references were classified in a three-step process.

Step 1: Identification of studies for exclusion.
Papers were excluded if they: (a) were duplicates (n=2); (b) did not focus on suicide, or if the outcomes or predictor variables did not include or specifically relate to suicide (n=114); (c) did not focus on Indigenous people in Australia, NZ, US or Canada (n=107); (d) were not journal articles, reports or book chapters (n=166); (e) were an animal study (n=4); and (f) were published pre-1981 (n=1). Step 1 excluded 394 papers, leaving 945 references.

Step 2: Classification of studies.
The abstracts of remaining studies (*n*=945) were examined to identify studies that were: (i) *Intervention evaluations*, defined as those that evaluated a suicide prevention, early interventions or postvention program or policy (n=9); (ii) *Intervention descriptions,* defined as those that described the development, implementation and/or components of a suicide prevention, early interventions or postvention program or policy, but did not undertake an evaluation (n=29); (iii) *Reviews*, defined as literature reviews of suicide prevention interventions, (n=4); and *Other*, defined as studies that were not intervention-related or reviews (n=904). Ten percent (*n*=95) of studies were re-classified by an individual blinded to the results of the initial classification, to cross-check classifications performed by the first author (AC). Agreement was 83 per cent. The articles excluded in Step 1 were not cross-checked because they were not relevant to the review.

Step 2 identified 9 intervention evaluations[32–41] (See Appendix 2), 29 intervention descriptions[42–65] (See Appendix 3) and 4 literature reviews[25–28] (See Appendix 1).

Step 3: Identification of causes of suicide relating to Aboriginal and Torres Strait Islander peoples.
Abstracts of studies classified as 'other' were manually searched to identify those relating to Indigenous Australians. Given the large number of studies (n=907), only the abstracts of studies published in the previous 10 years (2001–2012) were searched (n=413). 183 studies relating to

Indigenous Australians were identified. The abstracts of these 183 studies were further examined to identify causes of suicide among Indigenous Australians most commonly articulated in the descriptive-based literature.

3.3 Search of the self harm literature for intervention studies

Given the small number of evaluations of suicide prevention interventions identified (n=9), the initial search of the electronic database (Page 11) was replicated replacing the term 'suicid*' with 'self harm' in an effort to identify additional intervention evaluations. This search identified 282 additional publications. A manual search of the abstracts of these publications did not identify any additional intervention evaluations.

3.4 Data extraction from intervention studies

Criteria for data extraction from studies were adapted from the Cochrane Collaboration Handbook for Systematic Reviews of Health Promotion and Public Health Interventions.[19] The criteria, shown in Table 1, relate to the intervention/s, the sample (including eligibility, size, age range and percent male), the outcomes measured, effects and the cost calculations performed.

3.5 Methodological critique of intervention studies

Methodological quality was assessed using the Dictionary for the Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies.[25] Sections A to F (A. selection bias; B. allocation bias; C. confounders; D. blinding; E. data collection methods; and F. withdrawal and drop-outs) were coded weak, moderate or strong, consistent with the component rating scale of the Dictionary.[25] For Sections G (analysis) and H (intervention integrity) descriptive information was recorded, in line with the Dictionary recommendations.

3.6 Data extraction from abstracts of descriptive studies

The causes of Indigenous suicide reported in the abstracts of descriptive studies published between 2001 and 2012, and relating to Aboriginal and Torres Strait Islander Australians, were identified and grouped into broad themes.

4 Results

Table 1 summarises the characteristics of intervention evaluations.

Table 1. Characteristics of evaluations of suicide prevention interventions

1st Author Year	Publi-cation type	Country, location	Main inter-vention type	Intervention component/s (number of sessions)	Target age, sample (*n*)	Design	Data collection methods	Outcomes	Effects	Follow-up	Cost
LaFromboise 1995[39]	Journal article	US, rural New Mexico	Education	Culturally tailored school-based life skills curriculum, including manual and teacher training. (3 sessions/week x 30 weeks)	Native Americans 14–19 yrs (n=128); mean age=15.9 yrs; 36% male	Controlled pre–post study, (2 control groups)	– Self-report survey – Observational methods	Suicide vulnerability: hopelessness, depression, self-efficacy	Intervention v control: less hopelessness (P<0.05); less suicidal (P<0.07); not less depressed	8 months	NR
Berman 1999[40]	Journal article	US, rural Alaska	Community prevention	Alcohol restrictions	Experimental: 29,000 Control: 21,000	Interrupted time series with control group	Alaska Bureau of Vital Statistics	Death rates: Accidents, suicides, homicides	Significant reductions (P<0.05) in homicide for high-level restrictions, and in suicide for low-level restrictions 0.21 reduction in injury deaths overall	1–13 yrs	NR
Tsey 2000[41]	Journal article	Austalia, remote Qld	Community prevention	Four-stage empowerment program (1 x 4-hr session per week for 10 weeks per each stage)	Aboriginal community members (n=31); age range 20s –50s; median age=early 40s; 10% male	Pre–post, no control	– Self-report survey – Participant observation – Narrative interviews	Changes in indiviudal and community levels of empowerment	NR	10, 20, 30, and 40 weeks	
May 2005[37]	Journal article	US, rural New Mexico	Community prevention	– Train youth as natural helpers – Drug and suicide education – Family outreach post-suicide – Suicide-risk screening – Community cultural events – Reorientation of mental health services	Native Americans 10–19 yrs; and 20–24 yrs 5 yrs into project (n=approx 800)	Interrupted time series, no control	Self-report by health professionals and police and medical records	Suicide attempts, gestures and completions	Significant reductions (P<0.05) in rates of sucidial gestures and attempts. No change in suicidal completions	13 yrs	NR
Deane 2006[33,34]	Journal article	Australia, regional NSW	Gatekeeper training	Suicide awarenes and skills gatekeeper training (8 x 1-day workshops)	48 Aboriginal Australian community members, 19–55 yrs; mean age=36 yrs; 9% male	Pre–post, no control	– Self-report survey – Interviews	Knowlegde and intentions to help suicidal indiviudal and refer to mental health service	– Significant increases pre–post training in knowledge, intentions, confidence – Non-signifcant changes post training to 2 years' follow-up	2 yrs	NR

1st Author Year	Publi-cation type	Country, location	Main inter-vention type	Intervention component/s (number of sessions)	Target age, sample (*n*)	Design	Data collection methods	Outcomes	Effects	Follow-up	Cost
Haggarty 2006 [32]	Journal article	Canada, rural	Education	Multi-media education (1 x 30-minute session)	Healthcare providers, teachers, students and elders (24)	Pre–post, no control	Self-report survey	Knowledge	Significant increases in knowledge	NR	NR
Westerman 2007[36]	Grey report	Australia, rural and remote WA	Gatekeeper training	Training and information workshops	Aboriginal youth 15–25 yrs and community members (769)	Pre–post, no control	Self-report survey Interviews	Knowledge, confidence, intentions	Medium to large improvements in knowledge and confidence	NR	NR
Muelenkamp 2009[35]	Journal article	US, Native American	Gatekeeper training	Gatekeeper training, education workshops, social activities, individual counselling and education seminars, student support team, social networking, spirtitual ceremonies	Native American college students (n=90)	Pre–post, no control	Self-report survey	Knowldge, attitudes and skills after gatekeeper training and workshops	Significant improvements in problem solving ability, and marginal improvements in communication skills and knowledge	NR	NR
Allen 2009[38]	Journal article	US, remote Alaska	Community prevention	Community module: 26 prevention activities (7 targeting community) in 32 sessions. Additional activities: increased alcohol control, suicide crisis response team and prayer walks (32 sessions over 12 months)	Alaskan Indigenous youth 12–17 yrs (n=61) mean age= 14 yrs; 30% male. Adults of youth?(n=47); mean age=48 yrs; 42% male Community informants (n=5)	Pre–post, no control	Self-report survey	– Community readiness – Youth and adult protective behaviours	Increase in community readiness and number of protective behaviours in youth and adults	NR	NR

Note. NR=Not reported. Yrs=Years.

Table 1. Characteristics of evaluations of suicide prevention interventions

4.1 Indigenous population and sample

Five intervention evaluations targeted Native Americans[35,37–40]; three targeted Aboriginal Australians[33,34,36,41] and one First Nation Canadians (Inuit).[32] No interventions targeted the Maori of NZ. The sample population reported by studies included both Indigenous young people and general community members[36,38]; young people only[35,37,39]; defined adult sub-populations within communities[33,41]; and whole communities.[40] Six studies reported age of participants, as ranging in age from 10 to 55 years.[33,36–39,41] Four studies reported the percentage of male participants: 9%[33]; 10%[41]; 36%[39]; and 30% (youth) and 42% (adults).[38]

4.2 Intervention strategies

The main intervention strategies employed by the nine intervention studies included: community prevention[37,38,40,41]; gatekeeper training[33–36]; and education programs.[32,39]

Community prevention

Four intervention studies employed community prevention strategies targeting Indigenous groups and communities at high risk of suicide.[37,38,40,41] Two studies evaluated one main strategy: one evaluated alcohol restrictions in multiple Native Alaskan communities[40], and the other an empowerment program in an Aboriginal community in Australia.[41] The former study was a natural experiment of the impact of Alaska's local law option, which allows community control over the local supply of alcohol, on rates of suicide among Native Alaskans. The effects of different levels of community-initiated alcohol control on rates of suicide were examined[40], with less restrictive measures more effective at reducing suicide rates than more restrictive measures. The latter study implemented an Aboriginal-specific family and wellbeing program in response to high rates of youth suicide in a remote Aboriginal community in Australia.[41] The program comprised four distinct stages designed to build empowerment in targeted individuals and the broader community. Individual level changes in personal and psychological empowerment as expressed through participants' narratives were reported.[41]

The other two community prevention studies employed multiple strategies to reduce risk factors of suicide and/or suicidal behaviours among Indigenous young people.[37,38] One community prevention program, the 'Adolescent Suicide Prevention Project', was initiated by the Indian Health Service (IHS – Federal Health Program for American Indians and Native Alaskans) in response to high rates of suicides among Native American young people living in a defined rural location.[37] The intervention strategies of the Project were selected following extensive community consultations with Indigenous community elders, youth, parents and individuals and groups working with young people. A key finding of community consultations was that community members' perceptions and experiences of suicide were that it had underlying causes of alcohol abuse, violence, childhood abuse and trauma, and unemployment. The Project, therefore, included multiple intervention strategies integrated within a public health framework, including: training youth as natural helpers; drug and suicide education; family outreach post-suicide; suicide-risk screening; community social and cultural events; and the reorientation and expansion of mental health service delivery.[37] The Project achieved reductions in rates of suicidal risk behaviours. The other community prevention program employing multiple strategies, the *Elluam Tungiinun* prevention program, was developed by local community members and researchers in response to the findings of community-based suicide research undertaken with young people in the community.[38] Strategies designed to develop protective behaviours and resilience were integrated into a cultural framework and delivered to youth and the broader community with the aim of preventing suicide and alcohol abuse among youth. Additional strategies implemented by the community included increased control over the sale of alcohol and regular meetings of a suicide response team.[38]

Gatekeeper training

Gatekeeper training involves teaching specific groups of people in the community how to identify and support individuals at high risk of suicide. Three studies evaluated the effectiveness of gatekeeper training[33–36], all of which reported that gatekeeper training programs were developed in consultation with targeted groups and communities.[33–36] Two studies evaluated the effectiveness of gatekeeper training only[33,34,36], and one evaluated gatekeeper training complemented with additional strategies, including individual counselling, education and support, and group-based social and cultural activities.[35] Two gatekeeper training interventions appeared to be delivered in a defined number of sessions over a short time period[33,35], while one was delivered in three stages over 18 months 'to enable participants and their communities to develop their knowledge and skills over time'.[36] Overall, gatekeeper training interventions resulted in significant short-term increases in participants' knowledge and confidence in how to identify individuals at risk of suicide, and their intention to help those at risk of suicide.[33,35,36]

Education

Two studies employed an education intervention: one to reduce suicidal behaviours[39] and the other to improve knowledge of suicide.[32] The education intervention targeting reductions in suicidal behaviours integrated culturally tailored life skills training (e.g. communication and problem-solving) into the high school curriculum for delivery to Native American teenagers.[39] The program was delivered three times a week for 30 weeks. There were significant reductions in psychological risk factors for suicide among Native American teenagers receiving the intervention versus those that did not.[39]

The education intervention targeting improvements in knowledge of suicide was delivered as a one-off 30-minute intervention to interested community members via interactive self-learning multi-media technology.[32] Modest improvements in participants' knowledge of suicide risk factors were reported.

Education and training were prominent intervention strategies, with seven of the nine intervention studies (three gatekeeper training, two education and two community prevention interventions) using these approaches.[32–37,39,41] Six of these studies reported developing a new education resource,[32,33,36] or adapting an existing education resource package for delivery. [35,39,41] Two also reported training intervention deliverers.[35,39] Three reported the number of intervention sessions delivered over a time period: 8[33], 32[38]; 40[41]; and 90[39] sessions delivered over 8 weeks[33], 12 months[38]; 40 weeks[41] and 30 weeks[39] respectively. The main components of multi-component community prevention interventions were education workshops, social and cultural activities and/or mental health service delivery.[37,38]

4.3 Data collection methods and outcomes

Seven studies used self-report measures only: three used self-complete surveys only[32,35,38]; two used self-complete surveys and interviews[33,36]; one self-complete survey and observation[39]; and one self-complete surveys, interviews, and observation.[41] Two studies used routinely collected data[37,40], one of which complemented this with self-report interviews.[37] Only two studies measured suicide-specific outcomes, including suicide attempts[37,40], gestures[37] and completions.[37,40] Four studies measured changes in knowledge, confidence and/or intentions to identify and assist individuals at risk of suicide.[32,33,35,36] One study measured psychological risk factors for suicide, including depression, vulnerability and feelings of hopelessness.[39] One study reported targeting the whole community but only measured individual level outcomes[38], while another reported positive changes among intervention participants but did not indicate measures used.[41]

4.4 Methodological adequacy

Table 2 summarises the methodological adequacy of the nine studies.

Table 2. Methodological adequacy of evaluations of suicide prevention interventions

1st Author year	Selection bias (A)	Allocation bias (B)	Con-founders (C)	Blinding (D)	Data collection methods (E)	Withdrawal & dropouts (F)	Analysis (G)	Intervention integrity (H)
LaFromboise 1995[39]	Weak	Moderate	Moderate	Moderate	Moderate	Moderate	– Citation for formula used in the analysis – High response rate	– No consent rate reported, 76% follow-up rate – Number of intervention sessions received by partcipants not reported – Manual used with teacher training – Random observations of intervention delivery by intervention coordinator
Berman 1999[40]	Strong	Strong	Strong	N/A	Strong	N/A	Citations to justify analysis but no citations for analysis method	Communities level of exposure to alcohol control reported and considered in analysis
Tsey 2000[41]	Weak	Weak	Weak	N/A	Weak	Moderate	Citation to justify theory but not analysis	– No consent rate reported and follow-up rate only partially reported – Adaptation of exisiting Aboriginal-specific program – Components of each stage described
May 2005[37]	Moderate	Weak	Weak	N/A	Strong	N/A	No citation for formula used in the analysis	– Number and type of prevention activities recorded but reported elswhere – Staff growth for program delivery reported
Deane 2006[34]	Moderate	Weak	Weak	N/A	Moderate	Strong	– Citations to justify analysis but no citations for analysis method – High response rate reported	– 93% consent rate and 91% and 100% follow-up reported – Manual for tailored delivery, dependent on group's needs
Haggarty 2006[32]	Weak	Weak	Weak	N/A	Weak	Moderate	No citation for analyis method	
Westerman 2007[36]	Weak	Weak	Weak	N/A	Moderate	Moderate	No description of analysis or citation	– Consent rate not reported and 77% follow-up – Intervention delivered by Indigenous Psychological services
Muelenkamp 2009[35]	Weak	Weak	Weak	N/A	Moderate	Weak	No citation for analyis method	– No consent rate reported and follow-up rate diffiuclt to determine – Some report of intervention exposure – Adaptation of existing intervention
Allen 2009[38]	Moderate	Weak	Strong	N/A	Moderate	Strong	– Citation for formula used in the analysis – Low to moderate response rates	– Intervention toolkit for tailoring to local needs – Intervention exposure (number and type of activities) measured and considered in analysis

Note. Measured by the *Dictionary for the Effective Public Health Practice Project Quality Assessment tool for Quantitative Studies*.[25]

4.5 Methodological adequacy

Seven studies used a pre-post study design[32,33,35–36,38,39,41]; six did not employ a control group[32,33,35–36,38,41], making it difficult to attribute outcomes reported to the intervention. Two studies employed a time series design, one with[40] and the other without a control group.[37] No study employed randomisation, increasing the risk of selection bias. Seven of the nine studies reported using previously tested measures and provided a citation to justify its selection[33–39,40], but no study reported the validity and reliability of measures used. Of the six studies in which it was appropriate to report consent rates, four did not[35,36,39,41] and two reported consent rates of 93%[33] and 61%[38] respectively. Follow-up rates were fully reported by two of the six relevant studies and ranged from 76 per cent[39] to 100 per cent.[38]

Six studies reported tailoring the intervention prior to its implementation to improve its acceptability to Indigenous peoples. Methods of tailoring included Indigenous community input and/or feedback[33–39,41], piloting intervention materials[36,38,39], integration of Indigenous culture into intervention content[33,36,38,39,41] and researching suicide in the target population.[36] The intervention study evaluating the impact of alcohol restrictions on suicide reported that the restrictions were community initiated.[40]

Methods to optimise consistency in intervention delivery were described in four studies and included training intervention deliverers[39], intervention manuals or packages[33,36,38,39,41] and/or self-report or observation.[39,41] One intervention was developed by an Indigenous-specific psychological service[36] and another by survivors of the stolen generation in Australia.[41]

Seven studies recorded participant attendance at intervention activities to measure their level of exposure to the intervention[32,36–39,41], one of which also reviewed participant's clinical records.[37] The study evaluating the impact of alcohol restrictions measured the level of, and period of exposure to, restrictions in each intervention community.[40]

4.6 Effectiveness of interventions

Due to the methodological deficiencies of included studies, and the variability in outcomes reported, effect sizes could not be combined in a meta-analysis and summarised for comparison.

4.7 Likely causes of suicide articulated in the descriptive literature

Examination of the abstracts of descriptive studies targeting Aboriginal and Torres Strait Islander Australians and published from 2001–2012, identified several commonly reported risk factors for suicide. The common risk-factors for suicide reported in the abstracts of data based, analytical descriptive studies (e.g. epidemiological studies) specific to Aboriginal and Torres Strait Islander populations were mental illness, alcohol abuse and a prior history of self-harm. Other risk factors for suicide in the Aboriginal and Torres Strait Islander population reported in the abstracts of non-data-based studies (e.g. discussion and commentary) included low levels of access to mental health services, low levels of help seeking behaviours, imprisonment, social powerlessness and high levels of exposure to trauma and violence.

5 Discussion

This systematic review of published evaluations of suicide prevention interventions targeting Indigenous peoples of Australia, Canada, the US and NZ identified four community prevention interventions[37,38,40,41], three gatekeeper training interventions[33–36] and two education interventions.[32,39] Community prevention interventions typically employed multiple strategies and two of the three gatekeeper training interventions complemented training with additional strategies. Interventions primarily targeted suicide in Indigenous young people[35–39,41] and were developed and/or tailored in collaboration with Indigenous community members to optimise acceptability and feasibility of their delivery.

5.1 Methodological adequacy of intervention evaluations

The methodological adequacy of included intervention studies varied considerably and none had consistently strong methodology across the majority of criteria. Weak ratings were commonly recorded for selection bias, allocation bias and confounding. Data collection methods were generally moderate to strong, with five studies using measures with some published evidence of their reliability and/or validity. The reporting of consent and dropout rates varied, with only three of five studies reporting the former and two of five the latter. Statistical analysis used was rarely supported by a citation of source. Interventions were tailored to optimise their acceptability, manuals developed to standardise their delivery and five studies made efforts to measure participants' levels of intervention exposure. Overall, interventions targeting whole communities[37,38,40] were generally consistently methodologically stronger than those targeting individuals.[32–35,41]

5.2 Strengths and limitations of intervention evaluations

Five of the nine intervention evaluations were conducted in the US, three in Australia, one in Canada and none in NZ. Although outcomes of suicide prevention interventions targeting an Indigenous population in one of these countries can provide valuable evidence and lessons applicable to Indigenous populations in the other countries, as has been previously suggested, between country differences in Indigenous peoples' rates and patterns of suicide, population distribution, and systems of healthcare[16] warrant that more rigorous evaluations of suicide prevention interventions targeting Indigenous populations other than in the US are required.

Six of the nine interventions were implemented to address suicide in Indigenous young people. This finding is encouraging as it indicates that suicide-related interventions implemented in Indigenous communities are targeting high-risk groups. Less encouraging was the finding that only one intervention study targeting Indigenous young people measured the impact of an intervention on suicide-specific outcomes (i.e. suicide gestures, attempts and suicide). While the remaining five studies reported reductions in feelings of hopelessness and depression and improvements in problem-solving and coping with stress among Indigenous young people, the impact of these changes on suicidal behaviour was not evaluated.

Intervention strategies were generally evidence-based, although the number and combination of intervention strategies employed were less than optimal. For example, three interventions

employed gatekeeper training[33,35,36], but only one of these targeted healthcare professionals and employed additional strategies.[35] A systematic review of gatekeeper training found it is more likely to be effective for preventing suicide and suicidal behaviour when implemented as a component of a multi-faceted intervention and delivered by healthcare professionals.[24] Two studies employed school-based strategies aimed at Indigenous young people.[35,39] Although school-based programs offer great potential to reach large numbers of young people[30] and have been shown to increase knowledge and improve attitudes to mental illness, there is no evidence they reduce suicidal behaviour in the absence of other strategies.[13] Additionally, it is highly questionable whether or not school-based programs are likely to reach Indigenous young people most at risk of suicide, given evidence that high-risk young people typically attend school irregularly or not at all.[9,28]

No study considered costs. Economic analysis of the cost-effectiveness of suicide prevention interventions is important for costing and valuing reductions in suicide, as well as providing a benchmark to evaluate potential savings associated with individuals and communities.[66] Although the economic costs of suicide in Indigenous populations has not been measured, the profound negative impact of suicide on the social and emotional wellbeing and psychological functioning of affected Indigenous individuals, families and communities[5,7,14] strongly suggests they are likely to be high and accumulate over a lifetime.

5.3 Potential limitations of the review

Although a rigorous and thorough search strategy was used, there is a possibility that the review did not locate all relevant studies. Relevant intervention evaluations may have been misclassified, however, a high level of agreement between blinded coders suggests not. Additionally, a separate database search, replacing the key word 'suicide*' with 'self harm' did not yield any additional studies relevant to the review. Finally, since evaluations with statistically significant findings are more likely to be published, it is possible that the published evaluations reviewed over-estimate the true intervention effectiveness.[67]

6 Key findings, implications and key recommendations

6.1 Key findings

In summary, there are four key findings of this review. Firstly, there is a lack of evidence from published studies on the most effective intervention strategies for preventing suicide in Indigenous populations, but community prevention programs currently have the most evidence for reducing actual rates of suicide or suicide behaviours among Indigenous populations (two out of four community prevention evaluations showed a significant effect). Secondly, tailoring suicide prevention intervention strategies, in collaboration with targeted Indigenous communities, to address the needs and preferences of high-risk Indigenous groups (e.g. young people) is likely to be crucial for optimising acceptability and feasibility of program delivery.[64] Thirdly, the most common risk factors for suicide reported in the epidemiological studies specific to Aboriginal and Torres Strait Islander populations were mental illness, alcohol abuse and a prior history of self-harm. Other risk factors for suicide in the Aboriginal and Torres Strait Islander population reported in the abstracts of non-epidemiological-based studies included low levels of access to mental health services, low levels of help-seeking behaviours, imprisonment, social powerlessness and high levels of exposure to trauma and violence. Fourthly, evidence from reviews (see Appendix 1 and references 13, 23 and 24) of community suicide prevention programs show that multi-faceted approaches combining one or more individual strategies, tailored to specific communities, and targeting common risk factors for suicide (mental health disorders, alcohol abuse and a prior history of self-harm), offer considerable promise for reducing rates of suicide and suicidal behaviour.[23] Promising individual strategies that can be combined into a coherent community prevention program, as opposed to being independently implemented, include[13,23]:

- Training general practitioners (GPs) to recognise and treat suicidal behaviour
- Improving access to timely and appropriate mental health care for at-risk individuals (e.g. those with a history of self-harm) and groups (e.g. young people)
- Teaching specific groups of people in the community how to identify individuals at high risk of suicide and refer them for treatment (gatekeeper training)[24]
- Cognitive behavioural approaches to assist individuals displaying suicidal behaviours (e.g. feelings of hopelessness and depression), and/or engaging in high-risk behaviours for suicide (e.g. alcohol abuse), to make changes in their lives to reduce their risk of suicide
- Restricting access to means of suicide among high-risk groups and individuals.

6.2 Implications

There is currently insufficient evidence from published evaluations of suicide prevention interventions targeting Indigenous peoples to confidently allow prescriptive determination of suicide prevention, early intervention and postvention policies or programs for Aboriginal people in NSW. This has two major implications. Firstly, an evidence-informed policy would take into account the main findings from this systematic review of the literature. Specifically, policies and programs are most likely to be effective if they comprise multiple components[13,23] (e.g. GP and gatekeeper training, cognitive behavioural therapy and greater restrictions on access to potential means of suicide), especially evidence-based components targeting mental health disorders, alcohol abuse and a prior history of self-harm, and are tailored to specific communities

(as opposed to being generic for all communities). The methodologically strongest study in this review effectively tailored alcohol restrictions to reduce suicide in Indigenous communities, demonstrating this process is possible. Second, there is an urgent need to evaluate policies or programs, especially in terms of their costs given there have been no economic evaluations. Such evaluations can be designed with researchers with relevant skills and need not be expensive if they occur simultaneously with the development and implementation of a policy or program. The Centre for Aboriginal Health at the NSW Ministry of Health is pioneering this combined implementation and evaluation approach to improve cultural competence in hospitals in NSW and to improve chronic care services delivered in Aboriginal Community Controlled Health Services.

6.3 Key recommendations

Based on the findings of this systematic review of the current evidence base, it is recommended that:

A. Suicide prevention, early intervention and postvention policies or programs for Aboriginal people in NSW reflect the need to develop and implement multiple strategies coordinated across, and tailored to, defined communities. At a minimum, a list of best-evidence strategies could be provided from which Aboriginal communities can choose those that are most feasible to implement in their community, depending on their own specific needs and circumstances

B. Given the current lack of evidence, NSW Health extends its pioneering approach of facilitating partnerships between communities/clinicians and researchers with skills and expertise in evaluation design to Aboriginal suicide prevention, early intervention and postvention programs. At least one evaluation could be designed and implemented to measure the impact and economic costs of a best-evidence community program, the results of which would improve the effectiveness of future policies and programs for reducing rates of Aboriginal suicide.

7 Conclusions

The urgent need to reduce the disproportionately high rates of suicide in Indigenous peoples of Australia, NZ, Canada and the US has been widely acknowledged. In order for this to occur, an increase in the number of evaluations of preventive interventions targeting reductions in Indigenous suicide using methodologically rigorous study designs across geographically and culturally diverse Indigenous population groups is required. While evaluations of suicide prevention interventions in discrete Indigenous communities using non-experimental designs may be easier and cheaper to implement, they are unlikely to provide strong evidence applicable to other Indigenous populations. Without this evidence there is a greater likelihood that ineffective interventions will be implemented to prevent suicide in Indigenous peoples of Australia, NZ, Canada and the US, reducing the likelihood of achieving reductions in rates of suicide in these populations. There is an opportunity in NSW to work with real world, complex intervention research specialists to design, and simultaneously implement and evaluate, suicide prevention, early intervention and postvention suicide policies or programs which would both improve outcomes for Aboriginal Australians and significantly strengthen the currently weak evidence base, identifying cost-effective strategies for other Indigenous communities in Australia and internationally to replicate.

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7 Glossary

Allocation bias	Differences in the process of allocating participants to the intervention or control group
Attrition	Loss of participants during the course of a study
Attrition bias	Withdrawals or exclusions of people entered into a study
Bias	A systematic error or deviation in results or inferences from the truth
Blinding	The process of preventing those involved in a controlled trial from knowing individual participants' group allocation
Causal effect	The association between two characteristics that is demonstrated when a change in one characteristic causes a change in another
CDSR	Cochrane Database of Systematic Reviews — a database in The Cochrane Library that combines Cochrane Reviews and Protocols for Cochrane Reviews
Contamination	Unintentional exposure of an intervention being evaluated to people in the control group, and/or failure to expose people in the intervention group to an intervention
Context	The conditions and circumstances under which an intervention was provided
Confounder	A factor that is associated with both an intervention and the outcome of interest. Randomisation is used to minimise confounding variables between experimental and control groups. Confounding is a major issue in non-randomised studies
Consent rate	The number of study participants divided by the number of potential study participants
Controlled pre–post-study	A non-randomised study design where a control group of similar characteristics as the intervention group is identified. Data are collected before and after the intervention in both the control and intervention groups
Control group [In a controlled trial]	The group that acts as a comparison for an alternative group receiving an intervention (i.e. experimental group)
Cost-effectiveness	An economic analysis that measures effects in terms of costs for some additional health gain (e.g. cost per each suicide prevented)
Critical appraisal	The process of assessing and interpreting evidence by systematically considering its validity, results and relevance
Descriptive study	A study that describes characteristics of a sample of individuals. Unlike an experimental study, the investigators do not actively intervene to test a hypothesis, but merely describe the health status or characteristics of a sample from a defined population
Dropouts	Participants lost during the course of a study
Economic analysis	Analyses of the relationship between costs and outcomes of alternative healthcare interventions
Effects	Changes resulting from an intervention
Effectiveness	The degree to which an intervention works as intended under normal conditions

Efficacy	The degree to which an intervention produces a beneficial result under ideal conditions
Embase	Excerpta Medica database — a major European database of medical and health research
Epidemiology	The study of the health of populations and communities as opposed to specific individuals
Follow-up	The observation over a period of time of study/trial participants to measure outcomes under investigation
Grey literature	Research reports that are not published in peer-reviewed journals. For example, government and community reports
Intention to treat analysis	Participants are included in the group to which they were allocated for analysis, regardless of whether or not they received (or completed) the intervention given to that group
Inter-rater reliability	The level of agreement between independent raters under identical conditions
Interrupted time series	A study design that collects data at multiple time points before and after an intervention (interruption)
Intervention	The process of intervening on people, groups, entities or objects in an experimental study
Intervention exposure	The frequency and type of participant contact with an intervention and its components
Intervention group	A group of participants in a study receiving an intervention
Intervention integrity	The extent to which an intervention was implemented and delivered in the manner it was intended to be
Key words	A string of words attached to an article that are used to index or code the article in a database
MEDLINE	An electronic database produced by the United States National Library of Medicine that indexes millions of articles in selected journals
MeSH headings	Medical Subject Headings—terms used by the United States National Library of Medicine to index articles in Index Medicus and MEDLINE
Meta-analysis	The use of statistical techniques in a systematic review to synthesise the results of included studies
Methodological quality	The quality of a study design and rigour of its implementation
Outcome measure	A variable used to assess the effectiveness of an intervention (see also primary outcome, secondary outcome)
Peer review	A refereeing process for assessing the quality of reports of research and selecting research reports for publication
Pre–post-study	A non-randomised study design with no control group. Data are collected before and after only in a group receiving an intervention
Primary outcome	The outcome considered to be most important
Publication bias	Publication of only a subset of all relevant studies. For example, studies in which an intervention is not found to be effective are sometimes not published
Random allocation	A method that uses chance to assign participants to comparison groups in a trial

Randomisation	The process of randomly allocating participants into one of the groups in a controlled trial
Randomised controlled trial (RCT)	An experiment in which two or more interventions, possibly including a control intervention or no intervention, are compared by being randomly allocated to participants
Reliability	The degree to which results obtained by a measurement procedure can be replicated
Search strategy	The methods used to identify publications within the scope of a systematic review
Secondary outcome	An outcome deemed less important than primary outcomes that is used to evaluate the effects of an intervention
Selection bias	Systematic differences in the characteristics of participants who are selected for study and those who are not
Self-report	A type of questionnaire, survey, or interview in which respondents select a response or provide an answer without researcher interference
Statistically significant	A result that is unlikely to have happened by chance
Study design	The procedure under which a study is carried out
Systematic review	A review of published studies that uses systematic and explicit methods to identify, select, and critically appraise relevant studies, and to collect and analyse data from studies to answer a question/s
Treatment	Intervening with individuals to enhance their health and wellbeing
Withdrawal	Participants who drop out of a study

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