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## Primary prevention of suicide and suicidal behaviour for adolescents in school settings (Protocol)

Macleod E, Nada-Raja S, Beautrais A, Shave R, Jordan V

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[Intervention Protocol]

# Primary prevention of suicide and suicidal behaviour for adolescents in school settings

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## ABSTRACT

This is the protocol for a review and there is no abstract. The objectives are as follows:

To assess the effects of the range of school-based psychological or educational prevention programmes that are available to prevent suicide and suicidal behaviour in adolescents.

## BACKGROUND

### Description of the condition

Worldwide, suicide is amongst the top three causes of death for adolescents, accounting for an estimated 9.1% of all youth deaths (Patton 2009; Wasserman 2005). Best estimates suggest that out of every 100,000 adolescents, 7.4 die due to suicide (Wasserman 2005), and a further 13,000 engage in non-fatal intentional self harm behaviour (Silverman 2007b; WHO 2010), which increases the risk of eventual suicide (Garland 1993; Hawton 1998; Wasserman 2005). Between 1965 and 1999, suicide rates for male adolescents in particular increased dramatically, and these rates have generally only slightly declined since 1999 (Fleming 2007; Patton 2009; Wasserman 2005, but see Windfuhr 2013). Although male adolescents are more likely to die by suicide, fe-

male adolescents are most likely to engage in non-fatal suicidal behaviours (Fleming 2007; Patton 2009; Wasserman 2005).

Both adolescent suicide and suicidal behaviour (fatal or non-fatal intentional self harm behaviour, e.g., suicide or suicide attempts; Silverman 2007b) are associated with a consistent but wide-ranging series of risk factors (Beautrais 2000; Bridge 2006; Borowsky 2001; Evans 2004; Gould 2003; Haw 2013; Hawton 2012). Sociodemographic risk factors include social disadvantage (including current financial stressors), gender (males are more at risk for suicide, females for suicidal behaviour), and minority sexual orientation. There is also evidence for genetic and biological vulnerabilities to suicide. Psychological risk factors include prior suicidal behaviour, suicidal ideation, the presence of any psychiatric disorder (but particularly disorders of mood, substance misuse, disruptive/antisocial behaviour, and eating disorders), and aggressive-impulsive behaviour (e.g., in association with personality disorders). Psychosocial risk factors include disconnection to school

or work, problems with health, life stressors involving legal problems or relationships (e.g., relationship losses, family discord, bullying), experiences of physical and/or sexual abuse, and exposure to suicidal behaviour (e.g., familial, peer, media). Access to means also increases vulnerability to suicide. Compared with adults, adolescents represent the most at-risk group for contagion suicides (when individuals become aware of, and imitate, real or fictional suicidal behaviour (Gould 2003b)), or suicide clusters (a group of suicides and/or suicidal behaviour occurring at a similar time, in a similar location CDC 1994), and school settings in particular represent an environmental risk factor for contagion suicides (Larkin 2012). Emotional well-being and family connectedness protect against suicidal behaviour. Specific risk factors vary by sex, ethnicity, and age (Andrews 1992; Borowsky 2001; Fennig 2005; La Vecchia 1994)

### Description of the intervention

Given that the majority of adolescents (up to the age of 18 years) receive, or are entitled to, formal education, many suicide prevention programmes have been implemented in secondary schools, to target this convenience sample. In general, suicide prevention programmes can occur at one of three levels: universal programmes target all adolescents within a population; selective programmes target subgroups who possess one or more risk factors for suicidal behaviours; and indicated programmes target specific individuals who are known to be at-risk for suicidal behaviour (Institute of Medicine 1994; Kalafat 2003).

In general, school-based prevention programmes are usually either universal or selective. Common universal suicide prevention programmes include gatekeeper training programmes (brief training in a one or two workshop format, designed to teach adults who work with adolescents, such as teachers and counsellors, to recognise students who are at-risk, and provide, or refer them for, support), peer support programmes (brief training designed to place students in leadership roles, and then teach them to recognise, support, and refer at-risk peers), suicide awareness education programmes (short-term classroom-based teaching, designed to provide information to students about suicide, how to identify risk in oneself or peers, and how to seek help), and skills development programmes (classroom-based teaching over a medium-term period (i.e., less than a term), designed to teach students specific skills as protective factors, such as coping skills, problem solving, and cognitive skills) (Gould 2003; Katz 2013; Lake 2011). Universal programmes are either administered by qualified external personnel, or by teachers who are known to the students and who are trained as administrators.

The most common selective suicide prevention programmes are screening programmes, in which trained school staff or external personnel administer self report questionnaires or interviews to identify at-risk students (e.g., students displaying suicidal ideation, substance use problems, or depression), and then these students are

referred for mental health treatment, or to take part in a prevention programme (e.g., skills development) (Bursztein 2011; Eckert 2009; Eggert 1995; Guo 2002; Silbert 1991; Thompson 2000; Thompson 2001).

Indicated suicide prevention programmes would target students who had engaged in suicidal behaviour, or had indicated suicidal behavioural intent (e.g., cognitive behavioural therapy for individuals who were known to have experienced suicidal ideation, or suicidal behaviour, e.g., Spirito 2011; Tarrier 2008, or dialectical behavioural therapy for individuals with a history of suicidal behaviour, Rathus 2002). Given that the aim of prevention programmes is usually to intervene prior to suicidal behaviour, across either an at-risk (selected) or population level group (universal), individual, indicated programmes are less likely to be the focus of suicidal prevention efforts.

### How the intervention might work

School-based suicide prevention programmes are designed to either reduce suicide risk and/or to increase protective factors. The rationale and specific goals associated with each programme vary and include providing adolescents with information about suicide, increasing awareness of suicide, reducing stigmatised attitudes to suicide, reducing suicide risk factors, increasing protective factors, improving coping skills, increasing identification of suicide risk, and increasing self- and peer-related help-seeking behaviour (Guo 2002).

For example, amongst universal programmes, suicide awareness education programmes are based on the rationale that adolescents are more likely to disclose information to their peers than to adults, but that peers will not always facilitate appropriate support. If students are trained to identify risk in themselves or their peers, however, they might be more likely to seek or receive help prior to engaging in suicidal behaviour (Kalafat 2003). Gatekeeper training programmes are designed to help the adults who work with adolescents to identify when other students are at-risk, understand how to facilitate help, and take action to support students so that there is a reduced opportunity, and perceived need, for suicidal behaviour (Guo 2002; Kalafat 2003). Peer support programmes are expected to work in the same way as gatekeeper training programmes, but with peers as the gatekeepers, rather than school staff. Alternatively, skills development programmes are devised to improve assumed adolescent deficits in abilities such as decision making, coping, and cognitive skills, which are associated with suicidal behaviour. Such programmes can be based on psychological theories such as Social Learning Theory (Bandura 1977), or Cognitive Behavioural Theory (Beck 1975); by improving deficits, it is assumed that students will gain skills that will help them to resist engaging in suicidal behaviour (Bursztein 2011). Overall, reviews of universal school-based suicide prevention programmes have shown positive outcomes (e.g., improvements in knowledge, attitudes, and peer support (Bursztein 2011; Cusimano 2011;

Gould 2003), but also some evidence of harm (e.g., negative student attitudes toward suicide, reduced likelihood of peer referral, and, for those at-risk, reduced likelihood of seeking help (Cho 2005; Eckert 2009; Gould 2003).

The rationale behind selective programmes is that there are a number of specific risk factors associated with suicidal behaviour, but that these are usually not well identified; identifying and treating adolescents who demonstrate these risk factors will therefore decrease their suicide risk. The specific goals of selective prevention programmes include reduction of suicidal behaviour, depression symptoms, hopelessness, and substance use. For example, screening programmes are expected to identify the proportion of students who are more likely to engage in suicidal behaviour (e.g., students with depression), and to provide the appropriate treatment (e.g., cognitive behavioural therapy), so that the students have support and develop new skills, enabling them to resist suicidal behaviour. For adolescents, research suggests that screening and indicated intervention help to reduce suicidal behaviour (AACAP 2001; Brent 2009). Other researchers have cautioned, however, that screening may stigmatise students, and needs to be repeated because suicide risk changes over time (Bursztein 2011; Gould 2003).

The rationale behind indicated programmes would vary depending on the theoretical model underlying the programme. For example, cognitive behavioural therapy for suicidal behaviour is designed to identify, challenge, and modify the dysfunctional thoughts and behaviours that, in the face of stress, can lead to suicidal behaviour (Spirito 2011). Dialectical behavioural therapy focuses on reducing behaviours that are life-threatening, or that interfere with therapy or quality of life (Rathus 2002).

### Why it is important to do this review

Despite the fact that a wide range of programmes are currently employed to prevent adolescent suicide, there are few systematic reviews of these programmes (for examples, see Brent 2009; Bursztein 2011; Eckert 2009; Gould 2003; Guo 2002; Ploeg 1999). Even fewer reviews exist that are specific to school settings, despite widespread public and political belief that schools are the most logical and appropriate place for youth suicide prevention efforts. The existing systematic reviews of suicide prevention programmes in schools are limited for many reasons, including that they are out of date (Guo 2002), selective (e.g., literature search limited to one database (Katz 2013)), they are narrative or use limited statistical methodology (Cusimano 2011; Kalafat 2003; Robinson 2013), or the reviews are non-peer-reviewed government documents (Appelhoff 2013; Leitner 2008).

There is a need to provide a comprehensive, exhaustive systematic review of suicide prevention programmes that are specific to school settings. There is also a need to identify discrete components or subgroups for which effective suicide prevention programmes exist (e.g., alternative education), and also to identify limitations of the current research and areas for future research.

A protocol for a review covering suicide prevention in adolescents was originally published in 2008 (Stevens 2008). Following from the Stevens et al protocol, the present review will form part of a suite of reviews covering suicide prevention in adolescence and suicide postvention.

## OBJECTIVES

To assess the effects of the range of school-based psychological or educational prevention programmes that are available to prevent suicide and suicidal behaviour in adolescents.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

We will include randomised controlled trials (RCTs) and cluster-randomised trials. Given the high likelihood of few RCTs and cluster-RCTs, we will also include quasi-randomised trials and cross-over studies in the review. We will include non-English studies, and both published and unpublished studies.

#### Types of participants

#### Participant characteristics

Our review will include studies directly involving any adolescents who are attending secondary school (10 to 18 years of age; in the US, including studies based in middle school and high school, likely to encompass grades 6 or 7 through to 12), and studies focusing on helping the adults who work in secondary school settings to prevent adolescent suicide. Participants from both mainstream and alternative education will be included.

School-based suicide intervention studies often target participants who are at-risk for suicidal behaviour. Such at-risk participants include those with sociodemographic risk factors (social disadvantage, being female, and minority sexual orientation), genetic and biological vulnerabilities to suicide (e.g., prior suicidal behaviour, suicidal ideation, the presence of psychiatric disorder, and aggressive-impulsive behaviour), or psychosocial risk factors (e.g., disconnection to school or work, problems with health, life stressors involving legal problems or relationships, experiences of physical and/or sexual abuse, and exposure to suicidal behaviour). Adolescents with access to means also have an increased vulnerability to suicide.

## Diagnosis

Participants are not required to have a diagnosis to be included in the review. We will exclude intervention programmes aimed specifically at adolescents who have already made a suicide attempt, or adolescents who self harm without suicide intent (for an existing review of effective treatments for self harm, see [Hawton 1998b](#); [Hawton 1999](#)).

## Co-morbidities

Participants with intellectual disability, borderline personality disorder, or autistic spectrum disorder will be excluded from the review. It is unlikely that participants will meet the criteria for a diagnosis of borderline personality disorder (i.e., most will be under the age of 18), but if participants do meet the criteria for this diagnosis, they will be excluded. Participants with any other comorbid psychiatric or physical health diagnoses will be eligible for inclusion in the review.

## Setting

We will review suicide prevention studies in which interventions take place in secondary schools.

## Subset data

In the case of studies in which only a subset of data is relevant, if the data for the subset can be isolated (including means, standard errors, participant details such as age, number), we will independently extract these data and exclude the remaining data from the review. For example, in a study that includes participants beyond the age of 18, we would aim to extract data from the subset of participants up to 18 years old, and exclude data for participants over the age of 18. In the case where data for the relevant subset of participants cannot be isolated and extracted independently, we will include the data for the whole study as long as the participant criteria are met for more than 50% of the participants.

## Types of interventions

### Experimental interventions

We will review intervention studies that aim to prevent suicide and/or suicidal behaviour. The review will include universal, selective, and indicated (if any studies meet the criteria) suicide prevention programmes, such as suicide education, gatekeeper training, peer training, skills-based programmes, and screening and referral programmes.

It is often difficult to differentiate behaviours that are associated with the intent to die (e.g., cutting with suicidal intent), from those that are not associated with the intent to die (e.g., habitual

self cutting without suicidal intent, sometimes described as non-suicidal self injury (NSSI)). Although people who engage in suicidal and non-suicidal self harm share a number of similarities and risk factors, they also represent heterogeneous groups, and a small fraction of those who engage in NSSI go on to make suicide attempts ([Nock 2006](#)). For this review, we will exclude research that focuses solely on intentional self injury without suicidal intent, or research that focuses on repeat suicidal behaviour. All other studies involving intentional self harm, in which suicidal intent is possible, will be eligible for inclusion. These wide inclusion criteria ensure that all potential suicidal behaviour is considered in the review, but we acknowledge that we are also likely to capture some non-suicidal self harm behaviour.

We will exclude pharmacological interventions. We will also exclude postvention programmes from this review (the present authors are currently completing a proposal for a separate review of postvention programmes).

## Control conditions

Control conditions will include no intervention, usual care, waiting list groups (inactive control), or non-pharmacological educational health interventions that are not designed or used for suicide prevention (suicide prevention is not directly addressed, active control). The latter condition would provide an attention control. Educational health interventions could be educational physical health interventions (e.g., exercise, healthy eating), or educational mental health interventions (e.g., mental well-being, peer support). An example of a non-pharmacological control condition is provided in a study of an intervention to reduce adolescent depression (text messages to access a mobile website on cognitive behavioural therapy). The attention control condition comprised text messages about healthy eating, sustainability of the environment, and safe practices for using the internet and mobile phone (cyber safety) ([Whittaker 2012](#)). A further example of an educational control is provided in a study of the use of self monitoring via mobile phones to increase awareness of early depression signs. Whereas adolescents in the treatment group self monitored their mood, stress levels, and daily activities, adolescents in the attention control group monitored only their daily activities ([Kauer 2012](#)). An example of an educational mental health control is provided in a study of the use of cognitive behavioural and social skills training to address symptoms of depression in group settings with adolescents. In this study, adolescents in the control group met in groups to discuss topics that were relevant to mental health, to control for adult and peer attention, and for group cohesion effects ([Gillham 2007](#)).

## Types of outcome measures

We will include studies that meet the above inclusion criteria regardless of whether they report on the following outcomes.

## Primary outcomes

1. Rates of suicide among adolescents (measured by coronial records or a medical examiner).

2. Rates of non-fatal suicidal behaviour (measured by self report, significant-other report, and health records).

Researchers and suicide experts currently use multiple terms to describe suicidal behaviour (e.g., suicide, attempted suicide, self harm, parasuicide; see [Silverman 2007a](#)). For the proposed review, we will define suicidal behaviour as fatal or non-fatal intentional self harm behaviour ([Silverman 2007b](#); [WHO 2010](#)). Our definition of suicidal behaviour includes suicide, attempted suicide, and intentional self harm ([Silverman 2007b](#)). Our definition excludes self injurious behaviour that is associated with intellectual disability ([Posner 2011](#); [Silverman 2007b](#)).

Given the relative rarity of suicide, in many intervention studies, it may be impossible to use suicide rates as an outcome measure. For studies in which only suicidal behaviour is measured, an intervention may reduce non-fatal suicidal behaviour, but this does not guarantee that it would also definitely reduce rates of suicide. Given that risk factors for suicide and suicidal behaviour are highly consistent, however, it is likely that any reduction in suicidal behaviour would also impact suicide, and thus non-fatal suicide behaviour is the best available proxy measure for suicide.

## Secondary outcomes

3. Rates of self report of suicidal ideation, intent, or plans (measured by adolescent self report and significant-other report).

4. Rates of changes in protective behaviours such as help-seeking behaviour (measured by adolescent self report and significant-other report).

5. Rates of correct and incorrect (specificity and sensitivity) identification of at-risk individuals by specified categories of gatekeepers (measured by gatekeeper self report).

6. Rates of changes in adolescents' knowledge, attitudes, intentions, and self- or peer-referral behaviours related to their own and their peers' suicidal behaviour (measured by adolescent self report).

7. Rates of changes in adults' knowledge, attitudes, intentions, and referral behaviours related to youth who engage in suicidal behaviour (measured by adult self report).

8. Acceptability (rates of dropout).

9. Measures of major modifiable suicide risk factors, including:

- mental health disorders (including depression, substance disorders, disruptive disorders, eating disorders, and personality disorders) as measured by a clinical diagnosis (meeting the criteria for a diagnosis as defined by a version of the Diagnostic and Statistical Manual of Mental Disorders, or the International Classification of Diseases), or a diagnosis obtained by using valid adolescent self report scales, parent- or teacher-report scales, or observational scales;

- other psychological outcomes (e.g., perceived stress, coping, interpersonal problems, antisocial behaviour, global functioning, and modifiable personality traits, including impulsive aggression, as measured by valid adolescent self report, parent- or teacher-report, observational scales, or official documentation such as court reports or healthcare records);

- school connectedness (e.g., adolescent self reported perceived connectedness, and truancy/attendance records);

- peer suicidal behaviour/exposure to suicide;

- experience of interpersonal violence (including bullying), and;

- access to available means as measured by adolescent self report, or parent- or teacher-report.

We will exclude outcomes of modifiable suicide risk factors from the review if the outcomes are measured by non-validated or unofficial measures. We will assume validity if authors report that a scale is valid and provide references to support the validity statement, or if literature supporting the validity of a measure is accessible by the review team.

Here, known suicide risk factors are defined as factors that have been shown empirically to be associated with both suicide and non-fatal suicidal behaviour (see background; [Beautrais 2000](#); [Bridge 2006](#); [Gould 2003](#); [Hawton 2012](#)). For the proposed review, we aim to investigate the effect of interventions on major, proximal suicide risk factors that are amenable to change by a relatively brief intervention strategy (outcomes listed above). Suicidal ideation, intent, and plans are not included as a primary outcome measure because although such behaviours increase the risk for suicide, thoughts about suicide are far more common than actions related to suicide, and although they share common risk factors, there are distinct differences in risk factors for thoughts about suicide and suicidal behaviours ([Bridge 2006](#); [Klonsky 2014](#)).

## Timing of outcome assessment

We are interested in three time points following the intervention. First, we are primarily interested in whether any changes have occurred in the short-term period following the intervention (one to three months), compared to baseline. We are also interested in whether these changes are maintained medium-term (three to 12 months following the intervention), compared to baseline. For each study, where available, we will extract one set of data to represent each of the two time-frames (short-term and medium-term). For studies in which there are several measurements within a particular time-frame, we will use the measurement closest to the midpoint (for short-term measurements, two months; for medium-term measurements, 7.5 months). We will note if any studies report changes that are maintained long-term (one year or more), compared to baseline.

## Hierarchy of outcome measures

For studies in which there are multiple measures of the same construct (e.g., multiple measures of depression), we will select the primary outcome measure as designated by the study authors. If the primary measure is unclear, we will prioritise the measure for which the outcomes are most strongly associated with suicidal behaviour (using evidence from the literature). If data on association with suicidal behaviour is lacking, we will prioritise the most robust measure (reliable, valid, widely used).

Where multiple measures employ different definitions of a similar construct (e.g., suicidal behaviour versus self harm), and the psychometric properties of the measures are similar, we will give priority to the measure that encompasses the definition closest to that specified in our inclusion criteria.

We will document any cases of prioritising outcomes and, where relevant, we will provide a written caveat in association with prioritised data.

## Search methods for identification of studies

### Specialised Register of the Cochrane Common Mental Disorders Group

The Cochrane Common Mental Disorders Group maintains a specialised register of randomized controlled trials, the CCMD-CTR. This register contains over 39,000 reference records (reports of RCTs) for depression, anxiety, bipolar disorder, eating disorders, self-harm and other mental health conditions within the scope of this Group. The CCMD-CTR is a partially studies based register with >50% of reference records tagged to c12,500 individually PICO coded study records. Reports of trials for inclusion in the register are collated from (weekly), generic searches of MEDLINE, EMBASE and PsycINFO, quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL) and review specific searches of additional databases. Reports of trials are also sourced from international trial registries, drug companies, the hand-searching of key journals, conference proceedings and other (non-Cochrane) systematic reviews and meta-analyses. Details of [CCMD's core search strategies](#) (used to identify RCTs) can be found on the Group's website.

### Electronic searches

1. We will search the **CCMD-CTR-Studies Register** using the following controlled vocabulary terms:

Condition = (parasuicide or suicide or suicidality) AND Age Group = (child or adolescent)

We will manually screen records for prevention studies.

2. We will search the **CCMD-CTR-References Register** using a more sensitive set of terms to identify additional untagged/uncoded reports of RCTs:

((suicid\* or parasuicid\*) and ((child\* or boy\* or girl\* or juvenil\* or minors or paediatric\* or pediatric\* or adolesc\* or preadolesc\* or "pre adolesc\*" or pubert\* or pubescen\* or prepube\* or "pre pube\*" or teen\* or young or youth\*) or (school\* or "high school" or curriculum or classroom\* or college\* or campus\* or undergrad\* or student\* or pupil\* or educat\* or teacher\* or gatekeeper\* or peer or peers))):ti,ab,kw,ky,emt,mh,mc

[Key to field tags. *ti*:title; *ab*:abstract; *kw*:keywords; *ky*:other keywords; *mh*:MeSH headings; *mc*:MeSH check words; *emt*:EMTREE headings]

We will manually screen records for reports of prevention studies in children and adolescents.

3. We will conduct complementary searches in the following bibliographic databases using keywords, subject headings, and search syntax appropriate to each resource:

- CENTRAL (all years) ([Appendix 1](#))
- PubMed (all years) ([Appendix 2](#))
- EMBASE (1980 to present) ([Appendix 3](#))
- PsycINFO (1806 to present) ([Appendix 4](#))
- CINAHL (1982 to present) ([Appendix 5](#))
- Web of Science (Science and Social Sciences Citation Index) (all years)
  - ASSIA (1987 to present)
  - ERIC (1966 to present)
  - Index to theses (1986 to present)
  - Dissertation Abstracts International (1980 to present)
  - LILACS (1982 to present)
  - Australian Education Index (AEI)
  - British Education Index (BEI)
  - Educational Research Abstracts (ERA)

Note. Relevant RCT records from CENTRAL, EMBASE and PsycINFO are already indexed in the CCMD-CTR. These additional searches will employ a more sensitive search strategy to ensure no studies have been missed in the development of CCMD's specialised register.

4. We will also search international trial registries via the World Health Organization's trials portal ([ICTRP](#)) and [ClinicalTrials.gov](#) to identify unpublished and ongoing studies.

### Searching other resources

#### Reference lists

We will check the reference lists of all included studies and key reviews in this area to identify additional studies.

#### Correspondence

We will attempt to obtain further information on published and unpublished trials by contacting lead researchers in the field of

suicide, and also organisations associated with suicide prevention. We will report any personal communication.

### Grey literature

We will attempt to obtain further randomised studies from government documents, conference proceedings, theses, and dissertations by searching Google, Google Scholar, the Networked Digital Library of Theses and Dissertations (NDLTD), PsycEXTRA, and OpenSIGLE.

### Handsearching

We will handsearch the proceedings of suicide group conferences, including conferences of the European Symposium on Suicide and Suicidal Behaviour (ESSSB), the International Association for Suicide Prevention (IASP), the American Association of Suicidology (AAS), and the International Academy for Suicide Research (IASR).

## Data collection and analysis

### Selection of studies

Following the literature searches, we will assess each study for eligibility for inclusion in the review by using the pre-determined criteria (above). Two members of the review team will filter potential studies by viewing titles and abstracts. To determine final eligibility, the two members will view all potentially relevant studies independently, in full. If necessary, a third member of the review team will be consulted to resolve disagreements. To maximise reliability, we will pilot the process for assessing eligibility. We will classify studies by design as (1) RCT, (2) quasi-RCT, or (3) other. Based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Liberati 2009), we will use a PRISMA flow diagram to illustrate the study search and selection process.

### Data extraction and management

Two members of the review team will independently use standardised forms to extract data from each eligible study. The review authors will pilot the data extraction form with the first few studies, and adjust the form as necessary until they reach agreement that the form provides complete and reliable data extraction. If necessary, a third team member will be consulted to resolve disagreements. We will aim to extract data regarding the study source, participants, methods, outcomes, results, and other relevant information (see Appendix 6 for further specific data extraction details).

### Main planned comparisons

The main comparison will be suicide prevention interventions compared to control conditions (no intervention, usual care, waiting list groups, and/or educational physical health interventions that are not designed or used for suicide prevention). We will compare the interventions to control groups at each level of intervention (universal, selective, or indicated), for each type of suicide prevention programme (e.g., at the universal level: gatekeeper training programmes versus control, skills-based programmes versus control, at the selective level: screening programmes versus control). The main expected comparisons are as follows:

### Universal interventions

1. Gatekeeper training programmes versus control
2. Peer support programmes versus control
3. Skills-based programmes versus control
4. Suicide awareness education programmes versus control

### Selective interventions

5. Screening programmes versus control

### Indicated interventions

6. If relevant: individual indicated interventions versus control (e.g., CBT versus control; DBT versus control)

Within each programme type, if considerable heterogeneity is present between individual programmes, we will make the main comparisons within individual/specific programmes. We will separately analyse non-active controls from active controls.

We also plan to conduct comparisons stratified by level of intervention (i.e., gatekeeper, peer support, etc.) if there are sufficient studies, as follows:

1. Universal versus no intervention/usual/care/WL
2. Universal versus educational health interventions
3. Universal versus educational mental health interventions
4. Selective versus no intervention/usual/care/WL
5. Selective versus educational health interventions
6. Selective versus educational mental health interventions
7. Indicated versus no intervention/usual/care/WL
8. Indicated versus educational health interventions
9. Indicated versus educational mental health interventions

However, we recognise the possibility that this analysis plan may be an aspirational goal, and that, pragmatically, there may be an insufficient number of studies, with adequate heterogeneity, to warrant comparisons by intervention level. We will, however, use commentary to report each intervention type within each intervention level.

## Assessment of risk of bias in included studies

We will evaluate the risk of bias associated with each study based on The Cochrane Collaboration 'Risk of bias' tool (EPOC 2015; Higgins 2011), including recommendations for assessing risk of bias for cluster-randomised controlled trials and cross-over trials (Higgins 2011, Section 16.3 and 16.4). This tool assesses risk of bias in the following domains:

1. Sequence generation: Was the allocation sequence adequately generated? For cluster-randomised trials, we will specifically consider recruitment bias.
2. Allocation concealment: Was allocation adequately concealed? We will check whether baseline outcome measurements and participant characteristics are similar, suggesting that randomisation had been effective in RCTs and that groups were sufficiently comparable in quasi-randomised trials. For cluster-randomised trials, we specifically consider baseline imbalance. For quasi-randomised trials, we will record whether or not major confounders were examined in each trial and accounted for in the analysis and interpretation of the findings. Known major confounders that we will record data regarding include: mental disorders, especially affective and substance misuse disorders, exposure to self harm or suicidal behaviours, prior self harm or suicidal behaviour, victimisation or abuse, cognitive factors such as hopelessness, cognitive rigidity, and family dysfunction.
3. Blinding of a) participants and personnel, and b) outcome assessment, for each main outcome or class of outcomes: Was knowledge of the allocated intervention adequately prevented during the study for a) and b)?
4. Incomplete outcome data for each main outcome or class of outcomes: Were incomplete outcome data adequately addressed? For cluster-randomised trials, we specifically consider loss of clusters.
5. Selective outcome reporting: Are reports of the study free of suggestion of selective outcome reporting? For cluster-randomised trials, we will specifically consider incorrect analyses, where clustering was not taken into account.
6. Other sources of bias: Was the study apparently free of other problems that could put it at a high risk of bias? For cluster-randomised trials, we will specifically consider comparability with individually randomised trials. We will provide a description of what was reported to have happened in each study, and make a judgement on the risk of bias for each outcome (across domains) within studies and across studies, if appropriate, based on the following three categories: low; unclear; high (as described by Higgins 2011). For each study, for each outcome, two review authors will independently judge the risk of bias associated with each risk domain, and will then make an overall judgement of risk of bias for each study outcome, across domains. We will classify a study as having a low risk of bias if all of the domains of the study outcome are associated with low risk, or if the majority of the domains are as-

sociated with low risk and the remaining domains are associated with unclear risk that is unlikely to seriously alter the results. We will classify a study as having unclear risk of bias if there is plausible bias that raises questions about the results in one or more domains, and the remainder of the domains are associated with low risk. We will classify a study as having high risk of bias if there is plausible bias that seriously weakens confidence in the results for one or more domain. If necessary, a third team member will be consulted to resolve disagreements. To maximise inter-rater reliability, the two review members will each determine then compare 'Risk of bias' judgements for initial studies before assessing the remaining studies.

The main concerns over risk of bias in cross-over trials are: (i) whether the cross-over design is suitable; (ii) whether there is a carry-over effect; (iii) whether only first period data are available; (iv) incorrect analysis; and (v) comparability of results with those from parallel-group trials. We will reduce these concerns by only using data from the first period of the trial.

## Measures of treatment effect

### Binary data

For binary outcomes, we will present risk ratios (RRs) along with 95% confidence intervals. Where odds ratios (ORs) or prevalences are provided, these will be converted to RRs. We will convert ORs to RRs using the recommended formula (Section 12.5.4.4, Higgins 2011).

We will analyse time-to-event data (HRs) using the generic inverse variance method (Higgins 2011). If there are a mixture of studies using analyses of dichotomised and time-to-event data, and log-rank estimates are reported, we will use Peto's method, subject to the required criteria being satisfied (Section 9.4.4.2, Higgins 2011).

### Continuous data

We will analyse continuous data if means and standard deviations/standard errors are available. By preference we will include change scores, but if these are not available we will include post-intervention means. Where possible, we will present relative change from baseline in the intervention group (intervention group change - control group change), along with 95% confidence intervals for the between-group difference. We will analyse continuous variables that are measured on different scales in different studies as standardised mean differences (SMD) with 95% confidence intervals.

### Unit of analysis issues

### Cluster-randomised trials

We will identify any cluster-randomised trials in the review.

We will report the methods used to analyse cluster-randomised trials, and whether the risk of unit of analysis error was dealt with appropriately. Where the analysis was carried out appropriately, we will consider the studies for meta-analysis and use the reported effect sizes and standard errors. Where the analysis was inappropriate, if the necessary information can be extracted, we may perform approximately correct analyses (Higgins 2011). The approach used here will be to adjust standard errors accordingly where a reliable estimate of the intracluster correlation coefficient (ICC) can be obtained, or, in the cases where a reliable estimate of the ICC cannot be obtained, we will use a summary measures approach and perform the analysis at the cluster level (for example, using the proportion of those in each cluster experiencing the event of interest).

### Multiple treatment groups

For studies that involve multiple treatment groups, if the treatment groups are similar in rationale and nature (e.g., cognitive behavioural therapy delivered via the internet and cognitive behavioural therapy delivered via telephone, with a control condition of treatment as usual) we will combine treatment groups to use a single pair-wise comparison for a meta-analysis (cognitive behavioural therapy delivered via the internet/telephone versus the control condition of treatment as usual). If treatment groups are dissimilar, and only one of the treatment groups is of interest (e.g., psychological therapy, drug therapy, treatment as usual), we will exclude the group that is not of interest (e.g., drug therapy), to use a single pair-wise comparison for the meta-analysis (in this case, psychological therapy versus treatment as usual). If there are a small number of studies in which more than one treatment group is of interest (e.g., education, psychological therapy, control), we will use the shared intervention groups approach outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

### Cross-over studies

It is not likely that we will find any eligible cross-over trials. If we do, we will only analyse cross-over trials at the first phase of the trial, to avoid unit of analysis issues (e.g., issues associated with the inability of those who die by suicide during one treatment to cross over to another treatment). When assessing risk of bias for any cross-over trials, we will only consider the first phase of the trial, due to issues associated with the a) suitability of the design (e.g., prevention of suicidal behaviour does not approximate treatment of a chronic condition), and b) carry-over effects (e.g., the high likelihood that phase one interventions will have lasting effects). If outcomes are only available from the first period of the trial, however, we will consider the outcomes to be at risk of bias.

### Dealing with missing data

We will deal with missing data as recommended in Higgins 2011 (Section 16.1.2) and Dziura 2013. We will first contact study authors to request data or reanalysis so that multiple imputation (MI) can be used where data are regarded as missing completely at random (MCAR, which is unlikely to be the case here) or missing at random (MAR, which may be plausible in some cases, depending on appropriate covariates being available at the very least) and use the results following MI in place of those originally reported for a sensitivity analysis.

We will assess missing data and dropouts for each study. In the review we will report the number of participants included in each study's final analysis as a proportion of all participants in the study. Where missing data are substantial (> 5%) and NMAR is a more reasonable assumption, we will perform additional sensitivity analyses assuming the worst outcome for missing data and re-running the analyses to see how results are affected. We will discuss the results of any such sensitivity analyses as recommended in Higgins 2011 (Section 16.1.2). Further, we will provide rates of missing data and comparisons between those providing full data and those missing whenever available for each study.

If it is unclear how participants with more than one instance of suicidal behaviour are treated in the same study, we will contact the study authors to determine this.

### Assessment of heterogeneity

To assess heterogeneity, based on the recommendations in Higgins 2011, we will initially visually inspect the meta-analysis and then use the  $I^2$  statistic, with a 95% confidence interval ( $I^2$  values of 0% to 40%: might not be important; 30% to 60%: may represent moderate heterogeneity; 50% to 90%: may represent substantial heterogeneity; 75% to 100%: may represent considerable heterogeneity). In addition to the  $I^2$  value (Higgins 2011), we will present the  $\text{Chi}^2$  test and its P value and consider the direction and magnitude of the treatment effects. For meta-analyses with few studies, the  $\text{Chi}^2$  test is underpowered to detect heterogeneity should it exist, so we will use a P value of 0.10 as a threshold of statistical significance.

### Assessment of reporting biases

If there are sufficient studies (10 or more), we will create funnel plots to investigate the relationship between study power and effect size. An asymmetric plot may indicate biases such as publication bias, location biases, poorer methodological quality of smaller studies, or a true difference related to smaller studies due, for instance, to differences in the delivery of the intervention to smaller samples. We will explore possible reasons for any asymmetry (Egger 1997).

## Data synthesis

We will aim to combine quasi-RCT and RCT data in the main analyses, and we will perform a sensitivity analysis to test the robustness of the findings regarding this decision.

In the first instance we will adopt a common sense approach to assess whether meta-analyses combining data from different studies are appropriate in terms of whether participants, interventions, and outcomes are sufficiently similar, and whether risk of bias is similar (Kristjansson 2007). If appropriate, we will use data to calculate mean differences. We will analyse continuous variables that are measured on different scales in different studies as standardised mean differences (SMD), with 95% confidence intervals reported. Where both continuous and binary outcomes are provided, we will convert ORs and RRs to SMD (as per Higgins 2011, Section 9.4.6).

We will use a random-effects model to estimate the intervention effects. We will use a fixed-effect model as a sensitivity analysis of the primary outcomes. It is possible that even if the types of intervention are diverse, a meta-analysis could usefully be carried out on studies of similar interventions, with similar research questions and similar outcomes, to provide an indication of the direction, but not the size, of any effect. If the heterogeneity of the available randomised studies prohibits a meta-analysis, we will conduct a narrative review.

## Subgroup analysis and investigation of heterogeneity

It is important to identify which intervention, for which individuals, in which context, is likely to prevent adolescent suicidal behaviour. If there are adequate numbers of a priori studies, with adequate sample sizes, power, and comparability of interventions, we will undertake subgroup analyses for the following groups.

1. Mainstream education and alternative education. Given that there are higher rates of suicide in alternative education settings (e.g., Kann 1998), it would be valuable to investigate whether the outcomes of interventions to prevent suicidal behaviour differ in alternative compared to mainstream educational settings. We will report separate effects for interventions in alternative education settings and mainstream education settings, and compare these.

2. Single sex male/female schools and mixed sex schools. Given that there are sex differences in the risk factors associated with suicidal behaviour (e.g., females are more likely to engage in suicidal behaviour, but males are more likely to die from suicidal behaviour, e.g., Wasserman 2005), it would be valuable to identify whether the outcome of an intervention would differ in a same sex environment, where the presence of sex effects may be more salient, compared to a mixed sex environment, where sex effects may be diluted. We will report separate effects for interventions in same sex education settings and mixed sex education settings, and compare these.

3. Indigenous/mainstream schools. Ethnicity is often a risk

factor for suicidal behaviour (e.g., New Zealand Mā ori have an elevated risk for suicide, McLean 2012); given this, it would be valuable to investigate whether the outcome of an intervention is likely to differ in a context in which high-risk adolescents belong to the minority, compared to the majority, ethnic group. We will report separate effects for interventions for each minority ethnicity education setting and compare these effects to those found in majority ethnicity education settings.

4. Type of intervention: curriculum-based suicide awareness programmes; skills-based programmes; screening with a view to further intervention for those considered at-risk; gatekeeper training; peer helper programmes; crisis intervention; help-seeking. It is important to identify whether there are interventions that are likely to have better outcomes, or fewer side effects, compared to others. If possible, therefore, we will try to compare the outcomes of interventions by intervention type, including the identification of common general successful or unsuccessful components of interventions. We will report effects for each intervention type. If the existing data are not sufficient to analyse appropriately, we will compare intervention types using a narrative.

5. Socioeconomic disadvantage. Given that socioeconomic disadvantage is a risk factor for suicidal behaviour, where possible we will try to investigate whether the outcome of an intervention is likely to differ when the intervention takes place in schools in areas with a high level of deprivation, compared to schools in areas with low levels of deprivation. We will report separate effects for interventions in schools in which students have a high level of socioeconomic advantage (e.g., using socioeconomic status (SES) measures, or proportions of students receiving a free lunch) compared to schools in which students are more advantaged.

Subgroup analyses are observational by nature (Higgins 2011). We will therefore interpret the results of these pre-specified analyses with caution. We will use any significant differences that are detected between studies to generate hypotheses for future potential research.

## Sensitivity analysis

We will conduct sensitivity analyses as outlined below to test the robustness of the decisions made in the review process. It has been shown that studies that have an inherent high risk of bias due to their study design are likely to distort the overall summary statistics by either underestimating or overestimating the treatment effect (Higgins 2011). Therefore, in the proposed review, we will conduct the following sensitivity analysis:

1. Using only studies of high quality (i.e., excluding those with high or unclear risk of bias).
2. Excluding quasi-RCT studies (as noted under 'Data synthesis' above).

3. For cluster-randomised trials, standard errors (SEs) will have been adjusted unless appropriate analyses were performed (see 'Unit of analysis issues' - cluster-randomised trials above) and we will use a range of plausible ICCs for this purpose to ensure conclusions are robust to values used.

4. (As outlined under 'Dealing with missing data' above.) For trials with missing data that have been ignored in the analysis, where we have been able to obtain the actual data or results from a reanalysis using multiple imputation (MI), we will use the results for primary outcomes obtained using MI in place of the original. Furthermore, where missing data on primary outcomes exceed 5% and are likely to be informative, we will assume worst-case outcomes for those with missing data and use the results from this in place of the original.

5. Using change scores instead of endpoints for primary outcomes where both are available.

6. Using a fixed-effect model (as noted under 'Data synthesis' above).

7. Using ORs rather than RRs for dichotomous primary outcomes.

For cross-over studies, given the implausibility of an appropriate 'wash-out' period for such interventions, we will only include the results from the first period in the analysis and so no further sensitivity analyses are required here.

### 'Summary of findings' table

We will create 'Summary of findings' tables as described in chapter 11 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We will create 'Summary of findings' tables separately for each of the main comparisons. That is, we will prepare 'Summary of findings' tables to compare suicide prevention interventions to control conditions for each level of suicide prevention (universal, selective, and indicated). If there is high heterogeneity within a level of suicide prevention, we will prepare further tables

by intervention type (e.g., gatekeeper training). We will indicate the quality of the evidence in the 'Summary of findings' table using the GRADE approach (GRADE 2004). Assumed risk of suicide, suicidal behaviour, suicidal intent, and mental illness will be based on the best available international population estimates (e.g., provided by the World Health Organization). Assumed risk of correct and false identification of risk will be based on control group averages. We will determine assumed risk for changes in protective behaviours, adolescent knowledge, and adult knowledge by converting continuous variables to a standardised dichotomous variable (> 20% change). We will use comments to highlight any deterioration occurring in treatment groups.

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\* Indicates the major publication for the study

## APPENDICES

### Appendix 1. CENTRAL search strategy

The Cochrane Central register of Controlled Trials (CENTRAL) will be searched (all years) using the following strategy:

*[Condition]*

#1 MeSH descriptor: [Suicide] explode all trees

#2 MeSH descriptor: [Self-Injurious Behavior] this term only

#3 (suicid\* or parasuicid\*)

#4 (#1 or #2 or #3)

*[Prevention]*

#5 MeSH descriptor: [Suicide] explode all trees and with qualifiers: [Prevention & control - PC]

#6 ((prevent\* and suicid\*) or ((preventive or prevention) and (intervention\* or program\*)) or (prevention and control))

#7 (reduc\* and suicid\* and (attempt\* or behavi\* or ideation or thoughts or rate or rates or risk or risks))

#8 ("at risk" or "risk of" or "high risk" or "increased risk" or "suicide risk" or "risk factor" or "risk factor\*" or "risk taking" or "risk behaviour\*" or "risk behavior\*")

#9 MeSH descriptor: [Risk] explode all trees

#10 MeSH descriptor: [Risk Reduction Behavior] this term only

#11 MeSH descriptor: [Risk Factors] this term only

#12 MeSH descriptor: [Awareness] this term only

#13 ("suicide awareness" or (awareness and (training or program\*)))

#14 ("suicide attempt\*" or "attempted suicide" or "suicid\* ideation" or "potential\* suicid\*" or "suicid\* potential")

#15 suicidal\*

#16 ("no suicide" and (agreement\* OR contract\*))

#17 (#5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16)

*[Setting]*

#18 MeSH descriptor: [Education] explode all trees

#19 (school\* or college\* or campus\* or classroom\* or curriculum or teacher\* or student\* or pupil\* or educat\*)

#20 MeSH descriptor: [Peer Group] this term only

#21 ("peer group\*" or "peer relation\*" or "peer support\*" or "peer intervention\*" or "peer leader\*")

#22 gatekeeper\*

#23 (child\* or boy\* or girl\* or juvenil\* or minors or paediatric\* or pediatric\* or adolesc\* or preadolesc\* or pre-adolesc\* or pubert\* or pubescen\* or prepube\* or pre-pube\* or teen\* or young or youth\*)

#24 MeSH descriptor: [Child] this term only

#25 MeSH descriptor: [Adolescent] this term only

#26 (#18 or #19 or #20 or #21 or #22 or #23 or #24 or #25)

#27 (#4 and #17 and #26)

*[Syntax to remove duplicate CCMD-CTR records]*

#28 SR-DEPRESSN or HS-DEPRESSN

#29 #27 not #28

### Appendix 2. PubMed search strategy

PubMed will be searched (all years) using the following strategy:

*[Condition]*

#1 "Self-Injurious Behavior"[Mesh]

#2 (suicid\* OR parasuicid\*)

#3 (#1 OR #2)

*[Prevention]*

#4 "Suicide/prevention and control"[Mesh]

#5 ((prevent\* AND suicid\*) OR ((preventive OR prevention) AND (intervention\* OR program\*)) OR (prevention AND control))

#6 (reduc\* AND suicid\* AND (attempt\* OR behavi\* OR ideation OR thoughts OR rate OR rates OR risk OR risks))

#7 (“at risk” OR “risk of” OR “high risk” OR “increased risk” OR “suicide risk” OR “risk factor” OR “risk factors” OR “risk taking” OR “risk behaviours” OR “risk behaviors”)  
 #8 “Risk”[Mesh]  
 #9 “Risk Factors”[Mesh]  
 #10 “Risk Reduction Behavior”[Mesh]  
 #11 “Awareness”[Mesh]  
 #12 (“suicide awareness” OR (awareness AND (training OR program\*)))  
 #13 (“suicide attempt” OR “suicide attempts” OR “attempted suicide” OR “suicide ideation” OR “potential suicide” OR “suicide potential”)  
 #14 suicidal\*  
 #15 (“no suicide” AND (agreement\* OR contract\*))  
 #16 (#4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15)  
 [Setting]  
 #17 “Education”[Mesh]  
 #18 (school\* OR college\* OR campus\* OR classroom\* OR curriculum OR teacher\* OR student\* OR pupil\* OR educat\*)  
 #19 “Peer Group”[Mesh]  
 #20 (“peer group” OR “peer groups” OR “peer relation” OR “peer relations” OR “peer relationship” OR “peer relationships” OR “peer support” OR “peers support” OR “peer intervention” OR “peer interventions” OR “peer leaders”)  
 #21 gatekeeper\*  
 #22 (#17 OR #18 OR #19 OR #20 OR #21)  
 [Study Design: RCTs]  
 #23 randomized controlled trial[Publication Type]  
 #24 controlled clinical trial[Publication Type]  
 #25 (RCT OR randomly OR randomised OR randomized)  
 #26 (allocat\* OR assign\* OR volunteer\*)  
 #27 factorial\*  
 #28 (control\* AND (trial OR study OR group OR groups))  
 #29 (“wait list” OR “waiting list” OR “wait listed” OR waitlist OR “no intervention”)  
 #30 (#23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29)  
 #30 (#3 AND #16 AND #22 AND #30)

### Appendix 3. EMBASE search strategy

EMBASE will be searched on the OVID platform (1980 to present) using the following strategy:

1. exp suicidal behavior/
2. (suicid\* or parasuicid\*).tw.
3. or/1-2
4. “Prevention and Control”/
5. exp Prevention/
6. prevent\*.tw.
7. Preventive Medicine/
8. (reduc\* and suicid\* and (attempt\* or behavi\* or ideation or thoughts or rate or rates)).tw.
9. (suicide attempt\* or attempted suicide\* or suicid\* ideation or potential\* suicid\* or suicid\* potential).tw.
10. suicidal\*.tw.
11. exp Risk/
12. risk\*1.tw.
13. Awareness/
14. awareness.tw.
15. Suicide/pc [Prevention]
16. (“no suicide” adj (agreement\*1 or contract\*)).tw.
17. or/4-16
18. Adolescent Health/

19. Curriculum/
20. Education/
21. Health Program/
22. Health Education/
23. School Health Education/
24. exp School/
25. School Child/
26. School Health Nursing/
27. School Health Service/
28. Social Psychiatry/
29. Social Psychology/
30. Peer Group/
31. exp Student/
32. Teacher/
33. (school\* or college\* or campus\* or classroom\* or curriculum or teacher\* or student\* or pupil\* or educat\*).tw.
34. peer\*1.tw.
35. gatekeeper\*.tw.
36. or/18-35
37. Randomized Controlled Trial/
38. Randomization/
39. Placebo/
40. placebo.tw.
41. randomi#ed.tw.
42. randomly.ab.
43. (control\* adj3 (trial or study or group\*1)).tw.
44. (experimental group\*1).tw.
45. factorial\*.tw.
46. allocat\*.tw.
47. assign\*.tw.
48. volunteer\*.tw.
49. (crossover\* or cross over\*).tw.
50. (quasi adj2 (experimental or random\*)).tw.
51. (waitlist\* or (wait\* and list\* and (control\* or group))) .tw.
52. (treatment as usual or TAU).tw.
53. (usual care or care as usual).tw.
54. or/37-53
55. (3 and 17 and 36 and 54)

#### **Appendix 4. PsycINFO search strategy**

PsycINFO will be searched on the OVID platform (1806 to present) using the following strategy:

*[Condition]*

1. Attempted Suicide/
2. Suicide/
3. Suicidal Ideation/
4. Suicidology/
5. (suicid\* or parasuicid\*).ti,ab,id.
6. or/1-5

*[Prevention]*

7. Suicide Prevention/
8. Mental Health Programs/
9. Intervention/

10. prevent\*.ti,ab,id.
  11. (reduc\* and suicid\* and (attempt\* or behavi\* or ideation or thoughts or rate or rates)).ti,ab,id.
  12. risk\*1.ti,ab,id.
  13. awareness.ti,ab,id.
  14. (suicide attempt\* or attempted suicide\* or suicid\* ideation or potential\* suicid\* or suicid\* potential).ti,ab,id.
  15. suicidal\*.ti,ab,id.
  16. ("no suicide" adj (agreement\*1 or contract\*)).tw.
  17. or/7-16
- [Setting]*
18. (3580 or 3530 or 3500).cc.
  19. exp Education/
  20. exp Educational Personnel/
  21. Educational Programs/
  22. Program Development/
  23. exp Schools/
  24. School Based Intervention/
  25. School Principals/
  26. School Psychologists/
  27. Teaching/
  28. Peers/ or Peer Counseling/
  29. exp Students/
  30. school\*.ti,ab,id,sh.
  31. (school\* or college\* or campus\* or classroom\* or curriculum or teacher\* or student\* or pupil\* or educat\*).ti,ab,id.
  32. peer\*1.ti,ab,id.
  33. gatekeeper\*.ti,ab,id.
  34. or/18-33
- [Study Design: RCTs]*
35. Treatment Effectiveness Evaluation/
  36. Clinical Trials/
  37. Mental Health Program Evaluation/
  38. Placebo/
  39. placebo\*.ti,ab,id.
  40. randomly.ab.
  41. randomi#ed.ti,ab,id.
  42. (trial or study or program or intervention).ti.
  43. (control\* adj3 (trial\* or study or studies or group\*)).ti,ab,id.
  44. (experimental group\*1).tw.
  45. factorial\*.ti,ab.
  46. allocat\*.ti,ab.
  47. assign\*.ti,ab.
  48. volunteer\*.ti,ab.
  49. (crossover\* or cross over\*).ti,ab,id.
  50. (quasi adj2 (experimental or random\*)).ti,ab,id.
  51. "2000".md.
  52. (waitlist\* or ((wait\* and list\*) and (control\* or group))).ti,ab,id.
  53. (treatment as usual or TAU).ti,ab,id.
  54. (usual care or care as usual).ti,ab,id.
  55. or/35-54
  56. (6 and 17 and 34 and 55)

*Key:*

3580.cc.: *Educational/Vocational Counseling & Student Services (Concept Code)*

3530.cc.: *Curriculum & programs & Teaching Methods*

3500.cc.: *Educational Psychology*

## Appendix 5. CINAHL search strategy

CINAHL will be searched on EBSCOhost (1982 to present) using the following strategy:

S1 (MH "Suicide/PC")

S2 (MH "Adolescence") or (MH "Child")

S3 TX (child\* or boy\* or girl\* or juvenil\* or minors or paediatric\* or pediatric\* or adolesc\* or preadolesc\* or pre-adolesc\* or pubert\* or pubescen\* or prepube\* or pre-pube\* or teen\* or young or youth\*)

S4 (school\* or college\* or campus\* or classroom\* or curriculum or teacher\* or student\* or pupil\* or educat\* or peer or peers or gatekeeper\*)

S5 (S1 and (S2 or S3 or S4))

S6 (MH "Suicide ")

S7 (MH "Students+") or (MH "Schools+") or (MH "Teachers") or (MH "Curriculum+")

S8 S6 and S7

S9 TX prevent\* AND TX suicid\* AND TX (school\* or college\* or campus\* or classroom\* or curriculum or teacher\* or student\* or pupil\* or educat\* or peer or peers or gatekeeper\*)

S10 S5 or S8 or S9

S11 (MH "Randomized Controlled Trials")

S12 (MH "Random Assignment")

S13 TX (randomized or randomised)

S14 TX (random\* N3 (allocat\* or assign\*))

S15 TX ((experimental or intervention\* or program\*) and control\* and group\*)

S16 (S11 or S12 or S13 or S14 or S15)

S17 (S10 and S16)

## Appendix 6. Data extraction

Study source (e.g., study ID, report ID, citation and contact details)

### Participants

- a) Total number
- b) Overall study age range and/or age range of relevant subgroup(s)
- c) Sex
- d) Setting
- e) Country and location
- f) Ethnicity
- g) Socio-economic status
- h) Diagnosis
- i) Co-morbidity
- j) Other demographic information (e.g., diagnosis of depression, parents have substance abuse problems, juvenile offenders)
- k) Other information

### Methods

- a) Study design
- b) Study timing (date, duration, follow-up, time points for measurement of outcomes)
- c) Allocation concealment (where appropriate)
- d) Blinding (where appropriate)
- e) Sequence generation (where appropriate)
- f) Concerns about bias

### Intervention details

- a) Year of study
- b) Number of intervention groups
- c) Details of each intervention group (e.g., description, training, integrity, theoretical rationale, service provider)

**Outcomes**

a) Description of each relevant outcome (e.g., definition, timing, unit of measurement, direction of scale)

**Results**

a) Number of participants per intervention group for each intervention group and comparison group of interest

b) Number of participants who dropped out

c) Participant details for each outcome (sample size, missing participants)

d) Available data for each intervention group and/or subgroup (e.g., means or proportions, other effect sizes, SDs or SEs, confidence Intervals, P values)

**Other**

a) Key conclusions

b) Funding source

c) Other relevant information (e.g., comments from authors, correspondence needed)

d) For studies that seem relevant but are excluded, the reason for inclusion will be recorded

**WHAT'S NEW**

Date	Event	Description
18 November 2015	New citation required and major changes	Original protocol 'Prevention of suicide and suicidal behaviour in adolescents' (CD007322) was split into a suite of reviews by setting and methods updated

**CONTRIBUTIONS OF AUTHORS**

The protocol was written by Emily Macleod, with considerable advice, additions, and amendments from Annette Beautrais, Shyamala Nada-Raja, Roger Shave, and Vanessa Jordan.

**DECLARATIONS OF INTEREST**

Annette Beautrais has no declarations of interest to disclose.

Emily MacLeod has no declarations of interest to disclose.

Shyamala Nada-Raja has no declarations of interest to disclose.

Vanessa Jordan has no declarations of interest to disclose.

Roger Shave has no declarations of interest to disclose.

## SOURCES OF SUPPORT

### Internal sources

- No sources of support supplied

### External sources

- Health Research Council of New Zealand, New Zealand.

Funding was provided for a project on adolescent mental health and wellbeing to pilot online therapy programmes for depression and other mental health issues, including self harm (Principal Investigator: Nada-Raja S, and Co-Investigators: McGee R, Christensen H, Mackinnon A, 2010). One component of the project was to conduct a literature review of the relevant adolescent literature, which has been subsumed under the registered Cochrane title. Dr Emily Macleod (lead author on this Cochrane title) was recruited to work on this project, including leading the Cochrane relevant review. Therefore, her salary for this review was paid from the above described grant.