Systematic review of school-based resilience interventions targeting adolescent tobacco, alcohol or illicit drug use: review protocol

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004718
Article Type:	Protocol
Date Submitted by the Author:	19-Dec-2013
Complete List of Authors:	Hodder, Rebecca; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle, Freund, Megan; Hunter New England Local Health District, Hunter New England Population Health; Hunter Medical Research Institute, Wolfenden, Luke; Hunter New England Local Health District, Hunter New England Population Health; Hunter Medical Research Institute, Bowman, Jenny; The University of Newcastle, Gillham, Karen; Hunter New England Local Health District, Hunter New England Population Health; Hunter Medical Research Institute, Dray, Julia; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle, Wiggers, John; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle,
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Smoking and tobacco, Public health, Addiction
Keywords:	MENTAL HEALTH, Substance misuse < PSYCHIATRY, RESILIENCE, ADOLESCENCE

TITLE: Systematic review of school-based resilience interventions targeting adolescent tobacco, alcohol or illicit drug use: review protocol

CORRESPONDING AUTHOR:
Rebecca Kate Hodder
Departments/Institutions: Hunter New England Population Health, Hunter New England Local Health District; The University of Newcastle; Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.
Email: Rebecca.hodder@hnehealth.nsw.gov.au;
Telephone: +61 2 4924 6499;
Fax: +61 2 4924 6215

CO-AUTHORS:
Megan Freund
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Luke Wolfenden
Departments/Institutions: Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Jenny Bowman
Departments/Institutions: The University of Newcastle
Address: The University of Newcastle, University Drive, Callaghan, NSW, 2308, Australia.

Karen Gillham
Departments/Institutions: Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Julia Dray
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

John Wiggers
Departments/Institutions: Hunter New England Population Health, Hunter Medical Research Institute, The University of Newcastle,
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Key words: smoking; alcohol drinking; marijuana smoking; resilience, psychological; schools

Word count: 2,006

ABSTRACT

Introduction: Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality. Despite evidence suggesting interventions designed to increase adolescent resilience may represent a means of reducing adolescent substance use, and schools providing a key opportunity to implement such interventions, existing systematic reviews assessing the effectiveness of such interventions targeting adolescent substance use have not examined this potential.

Methods and analysis: The aim of the systematic review is to determine whether interventions focused on enhancing the resilience of adolescents are effective in reducing adolescent substance use. Eligible studies will: include participants 18 years of age or under; report tobacco use, alcohol consumption or illicit drug use as outcomes; and implement a school-based intervention designed to promote internal (e.g. self-esteem) or external (e.g. school connectedness) resilience factors. Eligible study designs include randomised controlled trials, cluster randomised controlled trials, pre-post, quasi-randomised, stepped wedge, preference trials, quasi experimental, randomised encouragement trials, staggered enrolment trials, nonrandomised trials, time series trials, multiple baseline and regression discontinuity trials with a parallel control group. A search strategy including criteria for participants, study design, outcome, setting and intervention will be implemented in various electronic databases and information sources. Two reviewers will independently screen studies to assess eligibility, as well as extract data from, and assess risk of bias of, included studies. A third reviewer will resolve any discrepancies. Attempts will be made to quantify trial effects by meta-analysis. Binary outcomes will be pooled and effect size reported using odds ratios. For continuous data, effect size of trials will be reported using a mean difference where trial outcomes report the same outcome using a consistent measure, or standardised mean difference where trials report a comparable measure. Otherwise trial outcomes will be described narratively.

Dissemination: Review findings will be disseminated via peer-reviewed journals and conferences.

INTRODUCTION

Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality.[1, 2] School-based interventions have been recommended to be implemented to reduce this burden given initiation of such drug use typically occurs during adolescence,[3] and schools provide almost universal access to adolescents for prolonged periods. Given this, school-based interventions have been implemented by governments internationally in an attempt to reduce adolescent initiation to substance use.[4-6]

Despite widespread implementation, Cochrane reviews have found little evidence for the effectiveness of school-based drug prevention programs on adolescent substance use.[4-6] Of the multiple intervention approaches examined by such reviews, little or no evidence of effectiveness has been found for the most commonly implemented curricula or information-only interventions, whereas evidence has been found for interventions adopting a social competence, generic psychosocial or individual social skills approach.[4-6] A review by the World Health Organisation examining school-based drug prevention programs similarly concluded that programs that promote young people's mental wellbeing were most likely to be effective, suggesting that interventions incorporating a mental wellbeing approach may have the best chance of impacting on substance use.[7]

The concept of resilience and closely related research regarding protective factors provides one avenue for addressing mental wellbeing that is suggested to have an impact on adolescent substance use.[8-17] Both individual and environmental protective factors are thought to contribute to an individual's resilience, be critical for positive youth development, and protect adolescents from engaging in risk behaviours, such as substance use.[18-21] Individual, or internal resilience factors refer to the personal skills and traits of young people (including self-esteem, empathy, and self-awareness).[22] Environmental, or external resilience factors refer to the positive influences within a young person's social environment (including connectedness to family, school and community).[22] Various studies have reported such factors to be negatively associated with adolescent substance use, [12, 16, 23-35] for example higher self-esteem [16, 28, 31, 34] associated with a lower likelihood of tobacco, alcohol and illicit drug use.

Despite this associative evidence, and the systematic review evidence for conceptually overlapping intervention approaches such individual social skills, to the authors knowledge existing systematic reviews assessing the effectiveness of school-based substance use interventions have not examined this potential specifically.[4-6, 36] A systematic synthesis of studies defined as adopting an intervention approach that addresses the internal and external resilience factors in schools is required to determine whether such an approach is effective in reducing adolescent substance use.

Objective

To determine if school-based interventions designed to enhance resilience are effective relative to a comparison group in reducing the extent of adolescent tobacco, alcohol or illicit drug use.

METHODS

All methods employed in the review will be consistent with the Cochrane Handbook for Systematic Reviews of Interventions.[37]

Eligibility criteria

Study characteristics

Participants

Studies will be included if they report results of participants aged 18 years or under. Studies that select participants based on a diagnosis of a psychiatric or other mental illness, cognitive or developmental disability will be excluded from the study. There will be no exclusions on the basis of study country.

Study design

Studies with the following designs will be included: randomised controlled trials, cluster randomised controlled trials, pre-post, quasi-randomised, stepped wedge, preference trials, quasi experimental, randomised encouragement trials, staggered enrolment trials, nonrandomised trials, time series trials, multiple baseline and regression discontinuity trials. Trials with non-random assignment of groups will be

included given Medical Research Council recommendations that non-randomised designs may represent the most appropriate evaluation deign for some complex public health interventions,[38] and as an acknowledgment of the value of non-randomised designs in assessing intervention effects in public health interventions.[39] Studies with any length of follow-up will be included in the review. Studies will be excluded if they do not include a parallel comparison group.

Comparison group

The comparison group may have received no intervention, usual practice, attention only or an alternate intervention.

Primary outcomes

Studies will be included if they report one or more of the following outcomes:

- tobacco use (including ever smoked, tobacco use in last week, or current smoking status);
- alcohol consumption (including ever consumed an alcoholic drink, alcohol use in last week, frequency of alcohol consumption);
- illicit drug use (including ever use or frequency of use of cannabis, amphetamines, cocaine).

Substance use data collected via various methods will be included, for example data collected via observation; self-report via face to face or telephone, internet survey; secondary report by peers or parents; and biochemical measurement of substance use (such as carbon monoxide or cotinine detection).

Secondary outcomes

Any adverse outcomes reported in included studies will be described in the results.

Interventions

Studies will be included if they report interventions that address student resilience in some way, irrespective of whether substance use is the primary outcome measure of the study. A broad definition of resilience will be employed to identify eligible studies, with a study included if it reports an intervention based on resilience or any known internal or external resilience factor (including internal resilience factors: cooperation and

communication, self-efficacy, empathy, problem solving, self-awareness, goals and aspirations; and/or external resilience factors: school support, school meaningful participation, community support, community meaningful participation, home support, home meaningful participation, peer caring relationships, and pro-social peers).[40] Interventions described as strengths-based,[41] social and emotional learning/wellbeing, mental wellbeing, psycho-social wellbeing, and mental health will be included in the review if they address an internal or external resilience factor. Studies will be assessed to determine whether they are: entirely focused on resilience and address both internal and external resilience (comprehensive); entirely focused on one such type of factor (uni-dimensional); or a component of the intervention is focused on a small number of such factors (partial).

There will be no exclusion criteria regarding other intervention elements, the duration of intervention, the format of intervention delivery (for example curricula-based or internet-based), or the intervention administration (for example the intervention could be delivered by school-staff, research staff, community members or students).

Setting

Studies will be included if the intervention is implemented in a school.

Publication characteristics

Studies of any language will be included and translated using Google translate where required. Studies published in the last 20 years in peer reviewed journals will be eligible for inclusion.

Information sources

Electronic databases

The following electronic databases will be searched: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAH, PsycINFO, ERIC and the first 200 citations only of Google scholar.

Other sources

The following additional information sources will be searched or contacted for eligible studies:

- Hand searching of three relevant journals in the field (last 5 years) (Addiction, Journal of Adolescent Health, Journal of School Health);

- Reference lists of included studies;

- Reference lists of existing Cochrane reviews on school-based interventions targeting tobacco, alcohol and illicit substances;[4-6]

- Corresponding authors of included studies.

Search strategy

The search strategy will include terms for participants, setting, intervention, study design[42] and outcome (sourced from current Cochrane systematic reviews examining the effectiveness of tobacco, alcohol and illicit substance use interventions; see Web Only Appendix 1 for Medline search strategy).[4-6] The search strategy will be tailored as required for implementation in other information sources.

Study selection

Two reviewers will independently screen the titles and abstracts of all studies identified via the implementation of the above search strategy. The reviewers will not be blind to study authors. A standardised screening tool will be used to assess study eligibility with those titles and abstracts not meeting the criteria excluded from the review. The full texts of the remaining papers will be sourced and examined independently by the two reviewers to assess study eligibility. Any disagreement between the two reviewers regarding study eligibility, that cannot be resolved via consensus, will be assessed by a third reviewer. Corresponding authors will be contacted if there is not sufficient information to determine eligibility. If sufficient information remains unavailable, the study will be deemed ineligible. The details of ineligible studies for which the full text was sourced will be reported in the results section including the reason the study was ineligible.

Data extraction

The two study reviewers will independently extract data from the eligible studies using a standardised form. Reviewers will not be blind to study authors. Any unresolved discrepancies between reviewers regarding the

extracted data will be resolved by the third reviewer. Where there is insufficient data to make a judgement regarding eligibility, the corresponding authors will be contacted for clarification.

The following information will be extracted from eligible studies where available: authors, year of publication, year/s of study, country, study design, intervention (including resilience factor targeted, duration, intensity), comparison group type, substance use targeted, study participants' demographics (including age and gender), study results (including sample size, consent rate/s, participation rate/s, length of follow up, attrition, relevant outcome results and intra-class correlation), measurement tool characteristics, intervention fidelity (including any process measures) and information to determine any potential study bias (see below).

Assessment of risk of bias

Study bias of eligible studies will be assessed independently by the two reviewers against the Cochrane Handbook for Systematic Reviews of Interventions study characteristics including: sequence generation (selection bias), allocation sequence concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias) and other potential sources of bias.[37]

Included non-RCTs will be assessed for selection bias that may have resulted in confounding of the outcome of interest, and where possible statistical methods will adjust for such confounding. Any additional biases specific to individual study designs will be assessed by the reviewers and reported.[37]

The reviewers will not be blinded to the names of the authors, institutions, journal or results of studies. Any disagreement between the two reviewers regarding study bias that is not resolved via discussion will be resolved by a third reviewer.

Data analysis

Data synthesis and analysis

Attempts will be made to quantify trial effects by meta-analysis using data from intention to treat analyses. Where multiple measures (for example biochemical and self-reported smoking status) for the same outcome are reported, the most objective measure of outcome will be used. Similarly, where studies report data from multiple follow-up periods, data from final follow up periods will be extracted. Binary outcomes, (such as tobacco use) will be pooled and effect size reported using odds ratios. For continuous data, the effect size of trials will be reported using a mean difference where trial outcomes are reported using a consistent measure, or a standardised mean difference where outcomes across trials report the same outcome using comparable measures. Sensitivity analysis will be conducted excluding trials judged to be at high risk of bias. Meta-analyses will be performed using a random effects model, when there is little evidence of heterogeneity (I^2<50%) and only for randomised trials. Otherwise trial outcomes will be described narratively.

Assessment of study heterogeneity

Study heterogeneity will be assessed via examination of forest plots and calculation of I^2 statistic. If an I^2 score over 50% is found, the cause of the heterogeneity will be explored via the conduct of subgroup analyses.

Issues of clustering

If any included cluster randomised controlled trials have not accounted for clustering, intra-class correlations will be requested from authors or if not available, estimates from similar studies will be used to adjust for clustering.

Assessment of reporting bias

Possible reporting bias will be determined by examining funnel plots of the included studies and comparison with trial registers.

Additional analyses

If possible, additional analyses will be conducted by subgroup (e.g. gender), intervention intensity, intervention duration and length of follow up.

ETHICS AND DISSEMINATION

Given this is a systematic review, ethics approval is not required. Findings of this review will be disseminated via peer-reviewed journals and conference presentations.

DISCUSSION

This systematic review will be the first internationally to examine the effectiveness of school-based resilience interventions in reducing the prevalence of adolescent tobacco, alcohol and illicit drug use. Given the majority of adolescents attend school, population level implementation of an effective intervention approach has the potential to provide significant health gains by reducing adolescent substance use, and as a result will be of interest to researchers and policy makers.

AUTHORS' CONTRIBUTIONS

RH led the drafting of the protocol and will lead the review. All authors contributed to the refinement of the review protocol, approved the final manuscript and will be involved in the preparation of the review.

COMPETING INTERESTS STATEMENT

The authors are currently undertaking a randomised controlled trial of a school-based resilience intervention to decrease adolescent substance use. The authors have not received any benefit, in cash or in kind, any hospitality or any subsidy from the alcohol industry or any other source perceived to have an interest in the outcome of this review.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

REFERENCES

1. Begg S, Vos T, Barker B et al. The burden of disease and injury in Australia 2003. 2007. PHE 82, Canberra, AIHW.

2. Lopez AD. Global burden of disease and risk factors. 2006. Washington D.C., Oxford University Press.

3. Gilman SE, Abrams DB, Buka SL. Socioeconomic status over the life course and stages of cigarette use: initiation, regular use, and cessation. Journal of Epidemiology & Community Health 2003; **57**(10):802-808.

4. Faggiano F, Vigna-Taglianti FD, Versino E et al. School-based prevention for illicit drugs' use. Cochrane Database of Systematic Reviews 2005;(2):CD003020.

5. Foxcroft DR, Tsertsvadze A. Universal school-based prevention programs for alcohol misuse in young people. Cochrane Database of Systematic Reviews 2011; **5:CD009113**.

6. Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2013; **Issue 4**(Art. No.: CD001293. DOI: 10.1002/14651858.CD001293.pub3).

7. Stewart-Brown S. What is the evidence on school health promotion in improving health or preventing disease and, specifically, what is the effectiveness of the health promoting schools approach? 2006. Copenhagen, WHO Regional Office for Europe (Health Evidence Network report).

8. Resnick MD. Resilience and protective factors in the lives of adolescents. J Adolesc Health 2000; **27**(1):1-2.

9. Masten AS. Ordinary magic. Resilience processes in development. Am Psychol 2001; **56**(3):227-238.

10. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. Child Dev 2000; **71**(3):543-562.

11. Greenberg MT, Weissberg RP, O'Brien MU et al. Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. American Psychologist 58(6-7):466-74, 2003;-Jul.

12. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. Annu Rev Public Health 2005; **26**:399-419.

13. Harvey J, Delfabbro PH. Psychological resilience in disadvantaged youth: A critical overview. Australian Psychologist 2004; **39**(1):3-13.

14. Catalano RF, Berglund ML, Ryan JAM et al. Positive Youth Development in the United States: Research Findings on Evaluations of Positive Youth Development Programs. Ann Am Acad Pol Soc Sci 2004; **591**(97):124.

15. Greenberg MT. Promoting resilience in children and youth: preventive interventions and their interface with neuroscience. Ann N Y Acad Sci 2006; **1094**:139-150.

16. Resnick MD, Bearman PS, Blum RW et al. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. JAMA 1997; **278**(10):823-832.

17. Resnick MD. Protective factors, resiliency and healthy youth development. Adolescent Medicine: State of the Art Reviews 2000; **11**(1):157-164.

18. Benard B. Fostering Resiliency in Urban Schools. Closing the achievement gap: A vision for changing beliefs and practices. Virginia: Association for Supervision and Curriculum Development 1996.

19. Benard B. Protective factors in the family, school, and community. Portland, OR: Western Center for Drug-Free Schools and Communities 1991

20. Bernat DH, Resnick MD. Healthy youth development: science and strategies. Journal of Public Health Management & Practice 2006; **Suppl**:S10-S16.

21. Toumbourou JW. Drug Prevention Strategies: A Developmental Settings Approach Prevention Research Evaluation Report Number 2. 2002. Melbourne, Australian Drug Foundation.

22. MindMatters Evaluation Consortium. Report of the MindMatters (National Mental Health in Schools Project) Evaluation Project, vols. 1-4. 2000. Newcastle, Hunter Institute of Mental Health.

23. Bond L, Butler H, Thomas L et al. Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. J Adolesc Health 2007; **40**(4):357.e9-357.e18.

24. Carvajal SC, Granillo TM. A prospective test of distal and proximal determinants of smoking initiation in early adolescents. Addict Behav 2006; **31**(4):649-660.

25. Fang L, Barnes-Ceeney K, Schinke SP. Substance use behavior among early-adolescent Asian American girls: the impact of psychological and family factors. Women & Health 2011; **51**(7):623-642.

26. Haegerich TM, Tolan PH. Core competencies and the prevention of adolescent substance use. New Directions for Child & Adolescent Development 2008; **2008**(122):47-60.

27. Hiemstra M, Otten R, Engels RC. Smoking onset and the time-varying effects of self-efficacy, environmental smoking, and smoking-specific parenting by using discrete-time survival analysis. Journal of Behavioral Medicine 2012; **35**(2):240-251.

28. Kavas AB. Self-esteem and health-risk behaviors among Turkish late adolescents. Adolescence 2009; **44**(173):187-198.

29. McLellan L, Rissel C, Donnelly N et al. Health behaviour and the school environment in New South Wales, Australia. Social Science & Medicine 1999; **49**(5):611-619.

30. Neumark-Sztainer D, Story M, French SA et al. Psychosocial correlates of health compromising behaviors among adolescents. Health Educ Res 1997; **12**(1):37-52.

31. Patton GC, Bond L, Carlin JB et al. Promoting social inclusion in schools: a group-randomized trial of effects on student health risk behavior and well-being. Am J Public Health 2006; **96**(9):1582-1587.

32. Piko BF, Kovacs E. Do parents and school matter? Protective factors for adolescent substance use. Addict Behav 2010; **35**(1):53-56.

33. Vuille JC, Schenkel M. Social equalization in the health of youth. The role of the school. European Journal of Public Health 2001; **11**(3):287-293.

34. Wiefferink CH, Peters L, Hoekstra F et al. Clustering of health-related behaviors and their determinants: possible consequences for school health interventions. Prevention Science 2006; **7**(2):127-149.

35. Wright LL, Palfai TP. Life goal appraisal and marijuana use among college students. Addict Behav 2012; **37**(7):797-802.

36. Thomas R, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2006; **3**:CD001293.

37. Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. Higgins JPT, Green S, editors. The Cochrane Collaboration, 2011. 2011.

38. Craig P, Dieppe P, Macintrye S et al. Developing and evaluating complex interventions: new guidance. 2008. Medical Research Council.

39. Armstrong R, Waters E, Jackson N et al. Guidelines for systematic reviews of health promotion and public health interventions. [Version 2]. 2007. Australia, Melbourne University.

40. Hanson TL, Kim JO. Measuring resilience and youth development: the psychometric properties of the Healthy Kids Survey. 2007. Washington, DC, U.S. Department of Education, Institute of Education Sciences, National Centre for Education Evaluation and Regional Assistance, Regional Educational Laboratory West.

41. Brownlee K, Rawana J, Franks J et al. A systematic review of strengths and resilience outcome literature relevant to children and adolescents. Child & Adolescent Social Work Journal 2013;No.

42. Kingsland M, Wiggers J, Wolfenden L. Interventions in sports settings to reduce alcohol consumption and alcohol-related harm: a systematic review. BMJ Open 2[2], 1-6. 6-4-2012. United Kingdom, BMJ Group.

APPENDIX 1

Database: Ovid MEDLINE(R) 1946 to Present with Daily Update

Search Strategy:

---

1 (prevent* or stop* or quit* or abstin* or abstain* or reduc* or "tobacco use disorder" or ex-smoker or freedom from smoking or anti-smok*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (2949486)

2 exp smoking/ or smoking.mp. or smoking cessation.mp. or exp smoking cessation/ or smok*.mp. or noticine.mp. or tobacco.mp. or exp tobacco/ [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (244905)

3 1 and 2 (75169)

4 exp alcohols/ad, ae (75999)

5 exp alcohol drinking/ (50226)

6 exp alcohol abuse/ (66163)

7 exp alcohol, ethyl/ae (7478)

8 exp alcohol abuse/mo, pc, rh, th (18949)

9 alcohol*.ti,ab. (209848)

10 drink*.ti,ab. (87398)

11 drunk*.ti,ab. (3138)

12 intoxicat*.ti,ab. (34927)

13 or/4-12 (382204)

14 cannabis.mp. or exp Cannabis/ (11714)

15 exp Marijuana Smoking/ (2487)

16 marijuana.mp. (11285)

17 street drugs.mp. or exp Street Drugs/ (9005)

18 exp substance-related disorders/ (359827)

19 addict*.ab,ti. (37697)

20 (abus* or use*).ab,ti. (4111763)

21 morphine.ab,ti. (38748)

22 hashish.mp. (457)

23 heroin.ab,ti. (9943)

24 "heroin dependence".mp. (7920)

25 exp *n-methyl-3-4-methylenedioxyamphetamine/ or "ecstasy".mp. or "MDMA".mp. (4187)

26 exp *hallucinogens/ or "hallucinogens".mp. (16151)

27 exp *cocaine/ or exp *crack cocaine/ or "cocaine".mp. (33227)

28 exp *lysergic acid diethylamide/ or "lsd".mp. (4386)

29 or/14-28 (4402741)

30 risk-taking.mp. or exp Risk-Taking/ (23020)

31 risk behaviours.mp. (1383)

32 health risks.mp. (8865)

33 exp Health Behavior/ or health behaviours.mp. (94401)

34 or/30-33 (123513)

35 3 or 13 or 29 or 34 (4678307)

36 school.mp. or exp Schools/ (199868)

37 school health services.mp. or exp School Health Services/ (18410)

38 (school* adj3 (intervention* or program* or course* or polic* or practice* or curricul* or environment*)).mp. (15226)

39 or/36-38 (201010)

40 exp Child/ or child.mp. (1630031)

41 exp Adolescent/ or adolescent.mp. (1581151)

42 (adolescen* or student* or class*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (2503330)

43 (teenage* or youth).ti,ab. (43859)

44 (early adj2 adult*).ti,ab. (5053)

45 (young adj2 adult*).ti,ab. (56450)

46 exp students/ (77794)

47 (young people or youth).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (47625)

48 or/40-47 (3361720)

49 exp Resilience, Psychological/ (1218)

50 (resilience or resilienc*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (7080)

51 emotional intelligence.mp. or exp Emotional Intelligence/ (60696)

52 mental health.mp. or exp Mental Health/ (104258)

53 mental wellbeing.mp. (138)

54 communication/ or cooperative behavior/ or self efficacy/ or empathy/ or problem solving/ or self concept/ or goals/ or "aspirations (psychology)"/ or social environment/ (209017)

55 Adolescent Development/ or youth development.mp. or Child Development/ (35780)

56 (school* adj3 engage*).mp. (316)

57 (school* adj3 connect*).mp. (330)

58 (communit* adj3 support*).mp. (4200)

59 social participation/ or family/ or parent-child relations/ or family relations/ or peer group/ or social support/ or friends/ (144179)

60 pro-social peers.mp. (2)

61 (positive adj3 (peer* or friend*)).mp. (486)

62 life skill*.mp. (593)

63 social environment.mp. or exp Social Environment/ (89397)

64 interpersonal relations.mp. or exp Interpersonal Relations/ (251156)

65 emotional wellbeing.mp. (202)

66 or/49-65 (661242)

67 randomized controlled trial.pt. (367158)

68 controlled clinical trial.pt. (87691)

69 (randomised or randomized).ab. (318587)

70 clinical trials as topic.sh. (169978)

71 randomly.ab. (187790)

72 trial.ti. (115019)

73 doubleblind.ab. (151)

74 singleblind.ab. (9)

75 experiment*.mp. (1466450)

76 (pretest or pre test).mp. (9609)

77 (posttest or post test).mp. (9762)

78 (pre post or prepost).mp. (3758)

79 before after.mp. (2409)

80 (quasi-randomised or quasi-randomized or quazi-randomised or quazi-randomized).mp. (2369)

81 stepped wedge.mp. (67)

82 preference trial.mp. (41)

83 comprehensive cohort.mp. (49)

84 natural experiment.mp. (674)

85 (quasi experiment* or quazi experiment*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (4811)

86 (randomised encouragement trial or randomized encouragement trial).mp. (3)

87 staggered enrolment trial of staggered enrollment trial.mp. (0)

88 (nonrandomised or non randomised or nonrandomized or non randomized).mp. (13227)

89 interrupted time series.mp. (840)

90 (time series and trial).mp. (737)

91 multiple baseline.mp. (1262)

92 regression discontinuity.mp. (39)

93 or/67-92 (2256891)

94 35 and 39 and 48 and 66 and 93 (1936)

BMJ Open

Systematic review of universal school-based resilience interventions targeting adolescent tobacco, alcohol or illicit drug use: review protocol

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004718.R1
Article Type:	Protocol
Date Submitted by the Author:	23-Apr-2014
Complete List of Authors:	Hodder, Rebecca; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle, Freund, Megan; Hunter New England Local Health District, Hunter New England Population Health; Hunter Medical Research Institute, Wolfenden, Luke; Hunter Medical Research Institute, Bowman, Jenny; The University of Newcastle, Gillham, Karen; Hunter New England Local Health District, Hunter New England Population Health; Hunter Medical Research Institute, Dray, Julia; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle, Wiggers, John; Hunter New England Local Health District, Hunter New England Population Health; The University of Newcastle,
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Smoking and tobacco, Public health, Addiction
Keywords:	MENTAL HEALTH, Substance misuse < PSYCHIATRY, RESILIENCE, ADOLESCENCE

TITLE: Systematic review of universal school-based resilience interventions targeting adolescent tobacco, alcohol or illicit drug use: review protocol

CORRESPONDING AUTHOR:
Rebecca Kate Hodder
Departments/Institutions: Hunter New England Population Health, Hunter New England Local Health District; The University of Newcastle; Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.
Email: Rebecca.hodder@hnehealth.nsw.gov.au;
Telephone: +61 2 4924 6499;
Fax: +61 2 4924 6215

CO-AUTHORS:
Megan Freund
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Luke Wolfenden
Departments/Institutions: The University of Newcastle, Hunter Medical Research Institute
Address: C/-Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Jenny Bowman
Departments/Institutions: The University of Newcastle
Address: The University of Newcastle, University Drive, Callaghan, NSW, 2308, Australia.

Karen Gillham
Departments/Institutions: Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Julia Dray
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

John Wiggers
Departments/Institutions: School of Medicine and Public Health, University of Newcastle; Hunter New England Population Health, Hunter Medical Research Institute
Address: Locked Bag 10, Wallsend, NSW, 2287, Australia.

Key words: smoking; alcohol drinking; marijuana smoking; resilience, psychological; schools

Word count: 2,493

ABSTRACT

Introduction: Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality. Despite evidence suggesting interventions designed to increase adolescent resilience may represent a means of reducing adolescent substance use, and schools providing a key opportunity to implement such interventions, existing systematic reviews assessing the effectiveness of school-based interventions targeting adolescent substance use have not examined this potential.

Methods and analysis: The aim of the systematic review is to determine whether universal interventions focused on enhancing the resilience of adolescents are effective in reducing adolescent substance use. Eligible studies will: include participants 5-18 years of age; report tobacco use, alcohol consumption or illicit drug use as outcomes; and implement a school-based intervention designed to promote both internal (e.g. self-esteem) and external (e.g. school connectedness) resilience factors. Eligible study designs include randomised controlled trials, cluster randomised controlled trials, staggered enrolment trials, stepped wedged trials, quasi-randomised trials, quasi experimental trials, time series/interrupted time-series trials, preference trials, regression discontinuity trials and natural experiment studies with a parallel control group. A search strategy including criteria for participants, study design, outcome, setting and intervention will be implemented in various electronic databases and information sources. Two reviewers will independently screen studies to assess eligibility, as well as extract data from, and assess risk of bias of, included studies. A third reviewer will resolve any discrepancies. Attempts will be made to quantify trial effects by meta-analysis. Binary outcomes will be pooled and effect size reported using odds ratios. For continuous data, effect size of trials will be reported using a mean difference where trial outcomes report the same outcome using a consistent measure, or standardised mean difference where trials report a comparable measure. Otherwise trial outcomes will be described narratively.

Dissemination: Review findings will be disseminated via peer-reviewed journals and conferences.

INTRODUCTION

Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality.[1, 2] School-based interventions have been recommended to be implemented to reduce this burden given initiation of such drug use typically occurs during adolescence,[3] and schools provide almost universal access to adolescents for prolonged periods. Given this, school-based interventions have been implemented by governments internationally in an attempt to reduce adolescent initiation to substance use.[4-6]

Despite widespread implementation, Cochrane reviews have found little evidence for the effectiveness of school-based drug prevention programs on adolescent substance use, with such reviews focused on any or only universal intervention approaches.[4-6] Of the multiple intervention approaches examined by such reviews, little or no evidence of effectiveness has been found for the most commonly implemented curricula or information-only interventions. Some evidence however has been found for various psychosocial interventions, including those that adopt a social competence and social influence, generic psychosocial or individual social skills approach.[4-6] A review by the World Health Organisation examining school-based drug prevention programs similarly concluded that programs that promote young people's mental wellbeing were most likely to be effective, suggesting that interventions incorporating a mental wellbeing approach may have the best chance of impacting on substance use.[7]

The concept of resilience and closely related research regarding protective factors provides one avenue for addressing mental wellbeing that is suggested to have an impact on adolescent substance use.[8-17] Resilience has been variably defined as the process of, capacity for, or outcomes of successful adaptation in the context of risk or adversity.[9, 10, 12, 13, 18] Despite this variability, it is generally agreed that a range of both individual and environmental protective factors are thought to: contribute to an individual's resilience; be critical for positive youth development; and protect

adolescents from engaging in risk behaviours, such as substance use.[19-22] Individual, or internal resilience factors refer to the personal skills and traits of young people (including self-esteem, empathy, and self-awareness).[23] Environmental, or external resilience factors refer to the positive influences within a young person's social environment (including connectedness to family, school and community).[23] Various studies have separately reported such factors to be negatively associated with adolescent use of different types of substances, [12, 16, 24-36] for example higher self-esteem [16, 29, 32, 35] associated with a lower likelihood of tobacco and with lower likelihood of alcohol use.

Despite this associative evidence, to the authors knowledge existing systematic reviews assessing the effectiveness of school-based substance use interventions have not reported the effectiveness of universal resilience-based interventions on adolescent use of multiple substances.[4-6, 37] Three existing Cochrane reviews have individually examined the efficacy of school-based tobacco, alcohol and illicit drug use programs.[4-6] Such reviews have not reported outcomes for universal resilience-based interventions specifically, but have included such interventions in broader categories of intervention type for subgroup analysis. As a consequence, a systematic review of the efficacy of universal resilience-based interventions specifically remains unreported. For example a tobacco-focused review which included any intervention type, classified interventions with a component of resilience content into different subgroups such as social competence or social influence interventions, finding evidence for both broad intervention approaches.[6] For the alcohol-focused review, only universal interventions were included with such interventions grouped according to whether they targeted alcohol alone or targeted multiple substance types.[5] Whilst meta-analysis was not conducted due to the heterogeneity of studies, the review concluded that some psychosocial and developmental prevention programs were effective. Given such inability to draw conclusions with respect to universal resilience interventions and studies suggest an association exists between resilience and substance use, there is a need to examine whether more specifically defined universal resilience interventions are efficacious in reducing substance use by adolescents. Such a review would

also provide an update to the existing Cochrane reviews which do not represent the current state of knowledge as searches are between two and ten years old.

Objective

To determine if universal school-based interventions designed to enhance resilience are efficacious relative to a comparison group in reducing the extent of adolescent tobacco, alcohol or illicit drug use.

METHODS

All methods employed in the review will be consistent with the Cochrane Handbook for Systematic Reviews of Interventions.[38]

Eligibility criteria

Study characteristics

Participants

Studies will be included if they report results of participants aged 5 to 18 years. Studies that select participants based on a diagnosis of a psychiatric or other mental illness, cognitive or developmental disability will be excluded from the study. There will be no exclusions on the basis of study country.

Study design

Studies with the following designs will be included: randomised controlled trials including cluster randomised controlled trials; staggered enrolment trials [39] or stepped wedged trials [40]; quasi-randomised trials where group allocation is not purely random [41, 42]; quasi experimental trials including, non-randomised pre-post [43], time series/interrupted time-series trials including multiple baseline trials with independent control groups [39, 43], preference trials [40] and regression discontinuity trials [39]; and natural experiment studies.[44] Trials with non-random assignment of groups will be included given Medical Research Council recommendations that non-randomised designs may represent the most appropriate evaluation deign for some complex public health

interventions,[45] and as an acknowledgment of the value of non-randomised designs in assessing intervention effects in public health interventions.[46] Studies with a length of follow-up of at least 6 months post intervention commencement will be included in the review. Studies will be excluded if they do not include a parallel comparison group.

Comparison group

The comparison group may have received no intervention, usual practice, attention only or an alternate intervention.

Primary outcomes

Studies will be included if they report one or more of the following outcomes:

- tobacco use (including but not limited to proportion ever smoked, frequency of smoking, number of cigarettes smoked, tobacco use in last week, current smoking status, or established tobacco use);
- alcohol consumption (including but not limited to proportion ever consumed an alcoholic drink, alcohol use in last week, frequency of alcohol consumption, binge drinking, or established alcohol use);
- illicit drug use (including but not limited to ever use or frequency of use of any illicit drug or a specific drug for example cannabis, amphetamines, or cocaine).

Substance use data collected via various methods will be included, for example data collected via observation; self-report via face to face or telephone, internet survey; secondary report by peers or parents; and biochemical measurement of substance use (such as carbon monoxide or cotinine detection).

Secondary outcomes

Any adverse outcomes reported in included studies will be described in the results.

Interventions

A study will be included if it reports a universal intervention that specifically aims to improve at least one internal and at least one external resilience factor. A universal intervention is defined as an intervention delivered to an entire school population. As the internal and external factors that comprise resilience are not consistently reported, numerous bodies of work were reviewed to identify an inclusive list of internal and external resilience factors.[9, 10, 12, 13, 18] Internal resilience factors will include: cooperation and communication, self-efficacy, self-esteem, empathy, problem solving, decision-making skills, autonomy, self-awareness, goals and aspirations, social and emotional skills or competence, and self-control or self-regulation [9, 10, 12, 13, 18, 47-49] . External resilience factors will include: meaningful participation, high adult expectations, caring relationships and support within home, school and community environments; peer caring relationships and pro-social peers.[9, 10, 12, 18, 47-49]

Given the theoretical and componentry cross over between resilience and other intervention approaches (such as strengths-based, social competence, social influence, skills focused, affective focused, social and emotional learning/wellbeing, mental wellbeing, and psycho-social [50-53]), a study will be included irrespective of the stated overall intervention approach if it specifically aims to address at least one internal and one external resilience factor as defined above. Studies will be included irrespective of whether substance use is the primary outcome measure.

There will be no exclusion criteria regarding other intervention elements, the duration of intervention, the format of intervention delivery (for example curricula-based or internet-based), or the intervention administration (for example the intervention could be delivered by school-staff, research staff, community members or students).

Setting

Studies will be included if the intervention is implemented across a whole school.

Publication characteristics

Studies of any language will be included and translated using Google translate where required. Studies published in the last 20 years in peer reviewed journals will be eligible for inclusion.

Information sources

Electronic databases

The following electronic databases will be searched: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsycINFO, ERIC and the first 200 citations only of Google scholar.

Other sources

The following additional information sources will be searched or contacted for eligible studies:

- Hand searching of three relevant journals in the field (last 5 years) (Addiction, Journal of Adolescent Health, Journal of School Health);
- Reference lists of included studies;
- Reference lists of existing Cochrane reviews on school-based interventions targeting tobacco, alcohol and illicit substances;[4-6]
- Corresponding authors of included studies;
- PubMed single citation searcher.

Search strategy

The search strategy will include terms for participants, setting, intervention, study design[54] and outcome (sourced from current Cochrane systematic reviews examining the effectiveness of tobacco, alcohol and illicit substance use interventions; see Web Only Appendix 1 for Medline search strategy).[4-6] The search strategy will be tailored as required for implementation in other information sources.

Study selection

Two reviewers will independently screen the titles and abstracts of all studies identified via the implementation of the above search strategy. The reviewers will not be blind to study authors. A standardised screening tool will be used to assess study eligibility with those titles and abstracts not meeting the criteria excluded from the review (see Web Only Appendix 2). The full texts of the remaining papers will be sourced and examined independently by the two reviewers to assess study eligibility. Any disagreement between the two reviewers regarding study eligibility, that cannot be resolved via consensus, will be assessed by a third reviewer. Corresponding authors will be contacted if there is not sufficient information to determine eligibility. If sufficient information remains unavailable, the study will be deemed ineligible. The details of ineligible studies for which the full text was sourced will be reported in the results section including the reason the study was ineligible.

Data extraction

The two study reviewers will independently extract data from the eligible studies using a standardised form. Reviewers will not be blind to study authors. Any unresolved discrepancies between reviewers regarding the extracted data will be resolved by the third reviewer. Where there is insufficient data to make a judgement regarding eligibility, the corresponding authors will be contacted for clarification.

The following information will be extracted from eligible studies where available: authors, year of publication, year/s of study, country, study design, intervention (including resilience factors targeted, duration, intensity), comparison group type, substance use targeted, measurement tool characteristics, study participants' demographics (including age and gender), study results (including sample size, consent rate/s, participation rate/s, length of follow up, attrition, relevant outcome results and intra-class correlation), intervention fidelity (including any process measures) and information to determine any potential study bias (see below).

Assessment of risk of bias

Study bias of eligible studies will be assessed independently by the two reviewers against the Cochrane Handbook for Systematic Reviews of Interventions study characteristics including:

sequence generation (selection bias), allocation sequence concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias) and other potential sources of bias.[38]

Included non-RCTs will be assessed for selection bias that may have resulted in confounding of the outcome of interest using the Newcastle-Ottawa Scale,[38] and where possible statistical methods will adjust for such confounding. Any additional biases specific to individual study designs will be assessed by the reviewers and reported.[38]

The reviewers will not be blinded to the names of the authors, institutions, journal or results of studies. Any disagreement between the two reviewers regarding study bias that is not resolved via discussion will be resolved by a third reviewer.

Data analysis

Data synthesis and analysis

Attempts will be made to quantify trial effects from randomised controlled trials by meta-analysis using data from intention to treat analyses. Where multiple measures (for example biochemical and self-reported smoking status) for the same outcome are reported, the most objective measure of outcome will be used. Similarly, where studies report data from multiple follow-up periods, data from final follow up periods will be extracted. Binary outcomes, (such as tobacco use) will be pooled and effect size reported using odds ratios. For continuous data, the effect size of trials will be reported using a mean difference where trial outcomes are reported using a consistent measure, or a standardised mean difference where outcomes across trials report the same outcome using comparable measures. Sensitivity analysis will be conducted excluding trials judged to be at high risk of bias. Meta-analyses will be performed using a random effects model, when there is little evidence of heterogeneity (I^2<50%) and only for randomised trials. Otherwise trial outcomes, including those from non-randomised trials, will be described narratively.

Assessment of study heterogeneity

Study heterogeneity will be assessed via examination of forest plots and calculation of I^2 statistic. If an I^2 score over 50% is found, the cause of the heterogeneity will be explored via the conduct of subgroup analyses and sensitivity analysis via meta-regression.

Issues of clustering

If any included cluster randomised controlled trials have not accounted for clustering, intra-class correlations will be requested from authors or if not available, estimates from similar studies (defined as those with similar school and student characteristics including gender and scholastic year proportions) will be used to adjust for clustering.

Dealing with missing data

Authors of included studies will be contacted to provide any missing data (for example missing participant data due to drop out or missing statistics such as standard deviations). If not available, attempts will be made to compute them, including an intention-to-treat analysis where appropriate.

Assessment of reporting bias

Possible reporting bias will be determined by examining funnel plots of the included studies and comparison with trial registers.

Additional analyses

If possible, additional analyses will be conducted by subgroup (e.g. gender), intervention intensity, intervention duration and length of follow up. Further subgroup analysis is planned based on whether included interventions focused solely on resilience (resilience interventions) versus interventions that focused on resilience as well as other determinants of substance use (multi-dimensional interventions).

ETHICS AND DISSEMINATION

Given this is a systematic review, ethics approval is not required. Findings of this review will be disseminated via peer-reviewed journals and conference presentations.

DISCUSSION

This systematic review will be the first internationally to examine the effectiveness of universal school-based resilience interventions in reducing the prevalence of adolescent tobacco, alcohol and illicit drug use. Given the majority of adolescents attend school, population level implementation of an effective intervention approach has the potential to provide significant health gains by reducing adolescent substance use, and as a result will be of interest to researchers and policy makers.

AUTHORS' CONTRIBUTIONS

RH led the drafting of the protocol and will lead the review. All authors contributed to the refinement of the review protocol, approved the final manuscript and will be involved in the preparation of the review.

COMPETING INTERESTS STATEMENT

The authors are currently undertaking a randomised controlled trial of a school-based resilience intervention to decrease adolescent substance use. The authors have not received any benefit, in cash or in kind, any hospitality or any subsidy from the alcohol industry or any other source perceived to have an interest in the outcome of this review.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

REFERENCES

1. Begg S, Vos T, Barker B et al. The burden of disease and injury in Australia 2003. 2007. PHE 82, Canberra, AIHW.

2. Lopez AD. Global burden of disease and risk factors. 2006. Washington D.C., Oxford University Press.

3. Gilman SE, Abrams DB, Buka SL. Socioeconomic status over the life course and stages of cigarette use: initiation, regular use, and cessation. Journal of Epidemiology & Community Health 2003; **57**(10):802-808.

4. Faggiano F, Vigna-Taglianti FD, Versino E et al. School-based prevention for illicit drugs' use. Cochrane Database of Systematic Reviews 2005;(2):CD003020.

5. Foxcroft DR, Tsertsvadze A. Universal school-based prevention programs for alcohol misuse in young people. Cochrane Database of Systematic Reviews 2011; **5:CD009113**.

6. Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2013; **Issue 4**(Art. No.: CD001293. DOI: 10.1002/14651858.CD001293.pub3).

7. Stewart-Brown S. What is the evidence on school health promotion in improving health or preventing disease and, specifically, what is the effectiveness of the health promoting schools approach? 2006. Copenhagen, WHO Regional Office for Europe (Health Evidence Network report).

8. Resnick MD. Resilience and protective factors in the lives of adolescents. J Adolesc Health 2000; **27**(1):1-2.

9. Masten AS. Ordinary magic. Resilience processes in development. Am Psychol 2001; **56**(3):227-238.

10. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. Child Dev 2000; **71**(3):543-562.

11. Greenberg MT, Weissberg RP, O'Brien MU et al. Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. American Psychologist 58(6-7):466-74, 2003;-Jul.

12. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. Annu Rev Public Health 2005; **26**:399-419.

13. Harvey J, Delfabbro PH. Psychological resilience in disadvantaged youth: A critical overview. Australian Psychologist 2004; **39**(1):3-13.

14. Catalano RF, Berglund ML, Ryan JAM et al. Positive Youth Development in the United States: Research Findings on Evaluations of Positive Youth Development Programs. Ann Am Acad Pol Soc Sci 2004; **591**(97):124.

15. Greenberg MT. Promoting resilience in children and youth: preventive interventions and their interface with neuroscience. Ann N Y Acad Sci 2006; **1094**:139-150.

16. Resnick MD, Bearman PS, Blum RW et al. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. JAMA 1997; **278**(10):823-832.

17. Resnick MD. Protective factors, resiliency and healthy youth development. Adolescent Medicine: State of the Art Reviews 2000; **11**(1):157-164.

18. Lee TY, Cheung CK, Kwong WM. Resilience as a positive youth development construct: a conceptual review. Thescientificworldjournal 2012; **2012**:390450.

19. Benard B. Fostering Resiliency in Urban Schools. Closing the achievement gap: A vision for changing beliefs and practices. Virginia: Association for Supervision and Curriculum Development 1996.

20. Benard B. Protective factors in the family, school, and community. Portland, OR: Western Center for Drug-Free Schools and Communities 1991

21. Bernat DH, Resnick MD. Healthy youth development: science and strategies. Journal of Public Health Management & Practice 2006; **Suppl**:S10-S16.

22. Toumbourou JW. Drug Prevention Strategies: A Developmental Settings Approach Prevention Research Evaluation Report Number 2. 2002. Melbourne, Australian Drug Foundation.

23. MindMatters Evaluation Consortium. Report of the MindMatters (National Mental Health in Schools Project) Evaluation Project, vols. 1-4. 2000. Newcastle, Hunter Institute of Mental Health.

24. Bond L, Butler H, Thomas L et al. Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. J Adolesc Health 2007; **40**(4):357.e9-357.e18.

25. Carvajal SC, Granillo TM. A prospective test of distal and proximal determinants of smoking initiation in early adolescents. Addict Behav 2006; **31**(4):649-660.

26. Fang L, Barnes-Ceeney K, Schinke SP. Substance use behavior among early-adolescent Asian American girls: the impact of psychological and family factors. Women & Health 2011; **51**(7):623-642.

27. Haegerich TM, Tolan PH. Core competencies and the prevention of adolescent substance use. New Directions for Child & Adolescent Development 2008; **2008**(122):47-60.

28. Hiemstra M, Otten R, Engels RC. Smoking onset and the time-varying effects of self-efficacy, environmental smoking, and smoking-specific parenting by using discrete-time survival analysis. Journal of Behavioral Medicine 2012; **35**(2):240-251.

29. Kavas AB. Self-esteem and health-risk behaviors among Turkish late adolescents. Adolescence 2009; **44**(173):187-198.

30. McLellan L, Rissel C, Donnelly N et al. Health behaviour and the school environment in New South Wales, Australia. Social Science & Medicine 1999; **49**(5):611-619.

31. Neumark-Sztainer D, Story M, French SA et al. Psychosocial correlates of health compromising behaviors among adolescents. Health Educ Res 1997; **12**(1):37-52.

32. Patton GC, Bond L, Carlin JB et al. Promoting social inclusion in schools: a group-randomized trial of effects on student health risk behavior and well-being. Am J Public Health 2006; **96**(9):1582-1587.

33. Piko BF, Kovacs E. Do parents and school matter? Protective factors for adolescent substance use. Addict Behav 2010; **35**(1):53-56.

34. Vuille JC, Schenkel M. Social equalization in the health of youth. The role of the school. European Journal of Public Health 2001; **11**(3):287-293.

35. Wiefferink CH, Peters L, Hoekstra F et al. Clustering of health-related behaviors and their determinants: possible consequences for school health interventions. Prevention Science 2006; **7**(2):127-149.

36. Wright LL, Palfai TP. Life goal appraisal and marijuana use among college students. Addict Behav 2012; **37**(7):797-802.

37. Thomas R, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2006; **3**:CD001293.

38. Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. Higgins JPT, Green S, editors. The Cochrane Collaboration, 2011. 2011.

39. Mercer SL, DeVinney BJ, Fine LJ et al. Study designs for effectiveness and translation research :identifying trade-offs. Am J Prev Med 2007; **33**(2):139-154.

40. Medical Research Council. Developing and evaluating complex interventions: new guidance. 2008.

41. Battaglia MP, Link MW, Frankel MR et al. An evaluation of respondent selection methods of respondent mail surveys. Public Opinion Quarterly 2008; **72**(3):459-469.

42. Oldendick RW, Bishop GF, Sorenson SB et al. A comparison of the Kish and last birthday methods of respondent selection in telephone surveys. Journal of Official Statistics 1988; **4**(4):307-318.

43. Nutbeam D, Bauman A. Evaluation in a Nutshell: A practice guide to the evaluation of health promotion programs. North Ryde, Australia: McGraw-Hill 2006

44. Sadish W, Cook T, Campbell D. Experimental and quasi-experimental designs for generalized causal inference. New York: Houghton Mifflin Company 2002

45. Craig P, Dieppe P, Macintrye S et al. Developing and evaluating complex interventions: new guidance. 2008. Medical Research Council.

46. Armstrong R, Waters E, Jackson N et al. Guidelines for systematic reviews of health promotion and public health interventions. [Version 2]. 2007. Australia, Melbourne University.

47. Measuring protective factors and resilience traits in youth: The healthy kids resilience assessment. Seventh Annual Meeting of the Society for Prevention Research; California: School and Community Health Research Group; 1999.

48. Hanson TL, Kim JO. Measuring resilience and youth development: the psychometric properties of the Healthy Kids Survey. 2007. Washington, DC, U.S. Department of Education, Institute of

Education Sciences, National Centre for Education Evaluation and Regional Assistance, Regional Educational Laboratory West.

49. Masten AS. Resilience in developing systems: Progress and promise as the fourth wave rises. Development and Psychopathology 2007;(3):921-930.

50. Brownlee K, Rawana J, Franks J et al. A systematic review of strengths and resilience outcome literature relevant to children and adolescents. Child & Adolescent Social Work Journal 2013;No.

51. Griffin KW, Botvin GJ. Evidence-based interventions for preventing substance use disorders in adolescents. Child & Adolescent Psychiatric Clinics of North America 2010; **19**(3):505-526.

52. Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. Psychol Bull 1992; **112**(1):64-105.

53. Petraitis J, Flay BR, Miller TQ. Reviewing theories of adolescent substance use: organizing pieces in the puzzle. Psychol Bull 1995; **117**(1):67-86.

54. Kingsland M, Wiggers J, Wolfenden L. Interventions in sports settings to reduce alcohol consumption and alcohol-related harm: a systematic review. BMJ Open 2[2], 1-6. 6-4-2012. United Kingdom, BMJ Group.

TITLE: Systematic review of universal school-based resilience interventions targeting adolescent tobacco, alcohol or illicit drug use: review protocol

CORRESPONDING AUTHOR:
Rebecca Kate Hodder
Departments/Institutions: Hunter New England Population Health, Hunter New England Local Health District; The University of Newcastle; Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.
Email: Rebecca.hodder@hnehealth.nsw.gov.au;
Telephone: +61 2 4924 6499;
Fax: +61 2 4924 6215

CO-AUTHORS:
Megan Freund
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Luke Wolfenden
Departments/Institutions: The University of Newcastle, Hunter Medical Research Institute
Address: C/-Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Jenny Bowman
Departments/Institutions: The University of Newcastle
Address: The University of Newcastle, University Drive, Callaghan, NSW, 2308, Australia.

Karen Gillham
Departments/Institutions: Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

Julia Dray
Departments/Institutions: The University of Newcastle, Hunter New England Population Health, Hunter Medical Research Institute
Address: Hunter New England Population Health, Hunter New England Local Health District, Locked Bag 10, Wallsend, NSW, 2287, Australia.

John Wiggers
Departments/Institutions: School of Medicine and Public Health, University of Newcastle; Hunter New England Population Health, Hunter Medical Research Institute
Address: Locked Bag 10, Wallsend, NSW, 2287, Australia.

Key words: smoking; alcohol drinking; marijuana smoking; resilience, psychological; schools

Word count: ~~2,006~~2,493

ABSTRACT

Introduction: Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality. Despite evidence suggesting interventions designed to increase adolescent resilience may represent a means of reducing adolescent substance use, and schools providing a key opportunity to implement such interventions, existing systematic reviews assessing the effectiveness of school-based interventions targeting adolescent substance use have not examined this potential.

Methods and analysis: The aim of the systematic review is to determine whether universal interventions focused on enhancing the resilience of adolescents are effective in reducing adolescent substance use. Eligible studies will: include participants 5-18 years of age ~~or under~~; report tobacco use, alcohol consumption or illicit drug use as outcomes; and implement a school-based intervention designed to promote both internal (e.g. self-esteem) and external (e.g. school connectedness) resilience factors. Eligible study designs include randomised controlled trials, cluster randomised controlled trials, staggered enrolment trials, stepped wedged trials, quasi-randomised trials, quasi experimental trials, time series/interrupted time-series trials, preference trials, regression discontinuity trials and natural experiment studies with a parallel control group. A search strategy including criteria for participants, study design, outcome, setting and intervention will be implemented in various electronic databases and information sources. Two reviewers will independently screen studies to assess eligibility, as well as extract data from, and assess risk of bias of, included studies. A third reviewer will resolve any discrepancies. Attempts will be made to quantify trial effects by meta-analysis. Binary outcomes will be pooled and effect size reported using odds ratios. For continuous data, effect size of trials will be reported using a mean difference where trial outcomes report the same outcome using a consistent measure, or standardised mean difference where trials report a comparable measure. Otherwise trial outcomes will be described narratively.

Dissemination: Review findings will be disseminated via peer-reviewed journals and conferences.

INTRODUCTION

Tobacco, alcohol and illicit drug use contribute significantly to global rates of morbidity and mortality.[1, 2] School-based interventions have been recommended to be implemented to reduce this burden given initiation of such drug use typically occurs during adolescence,[3] and schools provide almost universal access to adolescents for prolonged periods. Given this, school-based interventions have been implemented by governments internationally in an attempt to reduce adolescent initiation to substance use.[4-6]

Despite widespread implementation, Cochrane reviews have found little evidence for the effectiveness of school-based drug prevention programs on adolescent substance use, with such reviews focused on any or only universal intervention approaches.[4-6] Of the multiple intervention approaches examined by such reviews, little or no evidence of effectiveness has been found for the most commonly implemented curricula or information-only interventions. Some evidence however has been found for various psychosocial interventions, including those that adopt a social competence and social influence, generic psychosocial or individual social skills approach.[4-6] A review by the World Health Organisation examining school-based drug prevention programs similarly concluded that programs that promote young people's mental wellbeing were most likely to be effective, suggesting that interventions incorporating a mental wellbeing approach may have the best chance of impacting on substance use.[7]

The concept of resilience and closely related research regarding protective factors provides one avenue for addressing mental wellbeing that is suggested to have an impact on adolescent substance use.[8-17] Resilience has been variably defined as the process of, capacity for, or outcomes of successful adaptation in the context of risk or adversity.[9, 10, 12, 13, 18] Despite this variability, it is generally agreed that a range of ~~B~~both individual and environmental protective factors are thought to: contribute to an individual's resilience;~~,~~ be critical for positive youth development;~~,~~ and protect

adolescents from engaging in risk behaviours, such as substance use.[19-22] Individual, or internal resilience factors refer to the personal skills and traits of young people (including self-esteem, empathy, and self-awareness).[23] Environmental, or external resilience factors refer to the positive influences within a young person's social environment (including connectedness to family, school and community).[23] Various studies have separately reported such factors to be negatively associated with adolescent use of different types of substances ~~use~~, [12, 16, 24-36] for example higher self-esteem [16, 29, 32, 35] associated with a lower likelihood of tobacco and with lower likelihood of alcohol use.

Despite this associative evidence, ~~and the systematic review evidence for conceptually overlapping intervention approaches such individual social skills,~~ to the authors knowledge existing systematic reviews assessing the effectiveness of school-based substance use interventions have not reported the effectiveness of universal resilience-based interventions on adolescent use of multiple substances. ~~is potential specifically.~~[4-6, 37] Three existing Cochrane reviews have individually examined the efficacy of school-based tobacco, alcohol and illicit drug use programs.[4-6] Such reviews have not reported outcomes for universal resilience-based interventions specifically, but have included such interventions in broader categories of intervention type for subgroup analysis. As a consequence, a systematic review of the efficacy of universal resilience-based interventions specifically remains unreported. For example a tobacco-focused review which included any intervention type, classified interventions with a component of resilience content —into different subgroups such as social competence or social influence interventions, finding evidence for both broad intervention approaches.[6] For the alcohol-focused review, only universal interventions were included with such interventions grouped according to whether they targeted alcohol alone or targeted multiple substance types.[5] Whilst meta-analysis was not conducted due to the heterogeneity of studies, the review concluded that some psychosocial and developmental prevention programs were effective. Given such inability to draw conclusions with respect to universal resilience interventions and studies suggest an association exists between resilience and substance use, there is a need to examine whether more

specifically defined universal resilience interventions are efficacious in reducing substance use by adolescents. Such a review would also provide an update to the existing Cochrane reviews which do not represent the current state of knowledge as searches are between two and ten years old.

Objective

To determine if universal school-based interventions designed to enhance resilience are ~~effective~~ efficacious relative to a comparison group in reducing the extent of adolescent tobacco, alcohol or illicit drug use.

METHODS

All methods employed in the review will be consistent with the Cochrane Handbook for Systematic Reviews of Interventions.[38]

Eligibility criteria

Study characteristics

Participants

Studies will be included if they report results of participants aged 5 to 18 years ~~or under~~. Studies that select participants based on a diagnosis of a psychiatric or other mental illness, cognitive or developmental disability will be excluded from the study. There will be no exclusions on the basis of study country.

Study design

Studies with the following designs will be included: randomised controlled trials including cluster randomised controlled trials; staggered enrolment trials [39] or stepped wedged trials [40]; quasi-randomised trials where group allocation is not purely random [41, 42]; quasi experimental trials including, non-randomised pre-post [43], time series/interrupted time-series trials including multiple baseline trials with independent control groups [39, 43], preference trials [40] and regression

discontinuity trials [39]; and natural experiment studies.[44] Trials with non-random assignment of groups will be included given Medical Research Council recommendations that non-randomised designs may represent the most appropriate evaluation deign for some complex public health interventions,[45] and as an acknowledgment of the value of non-randomised designs in assessing intervention effects in public health interventions.[46] Studies with a ~~ny~~ length of follow-up of at least 6 months post intervention commencement will be included in the review. Studies will be excluded if they do not include a parallel comparison group.

Comparison group

The comparison group may have received no intervention, usual practice, attention only or an alternate intervention.

Primary outcomes

Studies will be included if they report one or more of the following outcomes:

- tobacco use (including but not limited to proportion ever smoked, frequency of smoking, number of cigarettes smoked, tobacco use in last week, ~~or~~ current smoking status, or established tobacco use);
- alcohol consumption (including but not limited to proportion ever consumed an alcoholic drink, alcohol use in last week, frequency of alcohol consumption, binge drinking, or established alcohol use);
- illicit drug use (including but not limited to ever use or frequency of use of any illicit drug or a specific drug for example cannabis, amphetamines, or cocaine).

Substance use data collected via various methods will be included, for example data collected via observation; self-report via face to face or telephone, internet survey; secondary report by peers or parents; and biochemical measurement of substance use (such as carbon monoxide or cotinine detection).

Secondary outcomes

Any adverse outcomes reported in included studies will be described in the results.

Interventions

A study will be included if it reports a universal intervention that specifically aims to improve at least one internal and at least one external resilience factor. A universal intervention is defined as an intervention delivered to an entire school population. As the internal and external factors that comprise resilience are not consistently reported, numerous bodies of work were reviewed to identify an inclusive list of internal and external resilience factors.[9, 10, 12, 13, 18] Internal resilience factors will include: cooperation and communication, self-efficacy, self-esteem, empathy, problem solving, decision-making skills, autonomy, self-awareness, goals and aspirations, social and emotional skills or competence, and self-control or self-regulation [9, 10, 12, 13, 18, 47-49] . External resilience factors will include: meaningful participation, high adult expectations, caring relationships and support within home, school and community environments; peer caring relationships and pro-social peers.[9, 10, 12, 18, 47-49]

Given the theoretical and componentry cross over between resilience and other intervention approaches (such as strengths-based, social competence, social influence, skills focused, affective focused, social and emotional learning/wellbeing, mental wellbeing, and psycho-social [50-53]), a study will be included irrespective of the stated overall intervention approach if it specifically aims to address at least one internal and one external resilience factor as defined above. Studies will be included irrespective of whether substance use is the primary outcome measure.

~~Studies will be included if they report interventions that address student resilience in some way, irrespective of whether substance use is the primary outcome measure of the study. A broad definition of resilience will be employed to identify eligible studies, with a study included if it reports an intervention based on resilience or any known internal or external resilience factor (including internal resilience factors: cooperation and communication, self-efficacy, empathy, problem solving, self-awareness, goals and aspirations; and/or external resilience factors: school support, school meaningful~~

participation, community support, community meaningful participation, home support, home meaningful participation, peer caring relationships, and pro-social peers).[46] Interventions described as strengths based, social and emotional learning/wellbeing, mental wellbeing, psycho-social wellbeing, and mental health will be included in the review if they address an internal or external resilience factor. Studies will be assessed to determine whether they are: entirely focused on resilience and address both internal and external resilience (comprehensive); entirely focused on one such type of factor (uni-dimensional); or a component of the intervention is focused on a small number of such factors (partial).

There will be no exclusion criteria regarding other intervention elements, the duration of intervention, the format of intervention delivery (for example curricula-based or internet-based), or the intervention administration (for example the intervention could be delivered by school-staff, research staff, community members or students).

Setting

Studies will be included if the intervention is implemented in across a whole school.

Publication characteristics

Studies of any language will be included and translated using Google translate where required. Studies published in the last 20 years in peer reviewed journals will be eligible for inclusion.

Information sources

Electronic databases

The following electronic databases will be searched: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsycINFO, ERIC and the first 200 citations only of Google scholar.

Other sources

The following additional information sources will be searched or contacted for eligible studies:

- Hand searching of three relevant journals in the field (last 5 years) (Addiction, Journal of Adolescent Health, Journal of School Health);

- Reference lists of included studies;

- Reference lists of existing Cochrane reviews on school-based interventions targeting tobacco, alcohol and illicit substances;[4-6]

- Corresponding authors of included studies;

- PubMed single citation searcher.

Search strategy

The search strategy will include terms for participants, setting, intervention, study design[54] and outcome (sourced from current Cochrane systematic reviews examining the effectiveness of tobacco, alcohol and illicit substance use interventions; see Web Only Appendix 1 for Medline search strategy).[4-6] The search strategy will be tailored as required for implementation in other information sources.

Study selection

Two reviewers will independently screen the titles and abstracts of all studies identified via the implementation of the above search strategy. The reviewers will not be blind to study authors. A standardised screening tool will be used to assess study eligibility with those titles and abstracts not meeting the criteria excluded from the review (see Web Only Appendix 2). The full texts of the remaining papers will be sourced and examined independently by the two reviewers to assess study eligibility. Any disagreement between the two reviewers regarding study eligibility, that cannot be resolved via consensus, will be assessed by a third reviewer. Corresponding authors will be contacted if there is not sufficient information to determine eligibility. If sufficient information remains unavailable, the study will be deemed ineligible. The details of ineligible studies for which the full text was sourced will be reported in the results section including the reason the study was ineligible.

Data extraction

The two study reviewers will independently extract data from the eligible studies using a standardised form. Reviewers will not be blind to study authors. Any unresolved discrepancies between reviewers regarding the extracted data will be resolved by the third reviewer. Where there is insufficient data to make a judgement regarding eligibility, the corresponding authors will be contacted for clarification.

The following information will be extracted from eligible studies where available: authors, year of publication, year/s of study, country, study design, intervention (including resilience factors targeted, duration, intensity), comparison group type, substance use targeted, measurement tool characteristics, study participants' demographics (including age and gender), study results (including sample size, consent rate/s, participation rate/s, length of follow up, attrition, relevant outcome results and intra-class correlation), intervention fidelity (including any process measures) and information to determine any potential study bias (see below).

Assessment of risk of bias

Study bias of eligible studies will be assessed independently by the two reviewers against the Cochrane Handbook for Systematic Reviews of Interventions study characteristics including: sequence generation (selection bias), allocation sequence concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias) and other potential sources of bias.[38]

Included non-RCTs will be assessed for selection bias that may have resulted in confounding of the outcome of interest using the Newcastle-Ottawa Scale,[38] and where possible statistical methods will adjust for such confounding. Any additional biases specific to individual study designs will be assessed by the reviewers and reported.[38]

The reviewers will not be blinded to the names of the authors, institutions, journal or results of studies. Any disagreement between the two reviewers regarding study bias that is not resolved via discussion will be resolved by a third reviewer.

Data analysis

Data synthesis and analysis

Attempts will be made to quantify trial effects from randomised controlled trials by meta-analysis using data from intention to treat analyses. Where multiple measures (for example biochemical and self-reported smoking status) for the same outcome are reported, the most objective measure of outcome will be used. Similarly, where studies report data from multiple follow-up periods, data from final follow up periods will be extracted. Binary outcomes, (such as tobacco use) will be pooled and effect size reported using odds ratios. For continuous data, the effect size of trials will be reported using a mean difference where trial outcomes are reported using a consistent measure, or a standardised mean difference where outcomes across trials report the same outcome using comparable measures. Sensitivity analysis will be conducted excluding trials judged to be at high risk of bias. Meta-analyses will be performed using a random effects model, when there is little evidence of heterogeneity (I^2<50%) and only for randomised trials. Otherwise trial outcomes, including those from non-randomised trials, will be described narratively.

Assessment of study heterogeneity

Study heterogeneity will be assessed via examination of forest plots and calculation of I^2 statistic. If an I^2 score over 50% is found, the cause of the heterogeneity will be explored via the conduct of subgroup analyses and sensitivity analysis via meta-regression.

Issues of clustering

If any included cluster randomised controlled trials have not accounted for clustering, intra-class correlations will be requested from authors or if not available, estimates from similar studies (defined

as those with similar school and student characteristics including gender and scholastic year proportions) will be used to adjust for clustering.

Dealing with missing data

Authors of included studies will be contacted to provide any missing data (for example missing participant data due to drop out or missing statistics such as standard deviations). If not available, attempts will be made to compute them, including an intention-to-treat analysis where appropriate.

Assessment of reporting bias

Possible reporting bias will be determined by examining funnel plots of the included studies and comparison with trial registers.

Additional analyses

If possible, additional analyses will be conducted by subgroup (e.g. gender), intervention intensity, intervention duration and length of follow up. Further subgroup analysis is planned based on whether included interventions focused solely on resilience (resilience interventions) versus interventions that focused on resilience as well as other determinants of substance use (multi-dimensional interventions).

ETHICS AND DISSEMINATION

Given this is a systematic review, ethics approval is not required. Findings of this review will be disseminated via peer-reviewed journals and conference presentations.

DISCUSSION

This systematic review will be the first internationally to examine the effectiveness of universal school-based resilience interventions in reducing the prevalence of adolescent tobacco, alcohol and illicit drug use. Given the majority of adolescents attend school, population level implementation of

an effective intervention approach has the potential to provide significant health gains by reducing adolescent substance use, and as a result will be of interest to researchers and policy makers.

AUTHORS' CONTRIBUTIONS

RH led the drafting of the protocol and will lead the review. All authors contributed to the refinement of the review protocol, approved the final manuscript and will be involved in the preparation of the review.

COMPETING INTERESTS STATEMENT

The authors are currently undertaking a randomised controlled trial of a school-based resilience intervention to decrease adolescent substance use. The authors have not received any benefit, in cash or in kind, any hospitality or any subsidy from the alcohol industry or any other source perceived to have an interest in the outcome of this review.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

REFERENCES

1. Begg S, Vos T, Barker B et al. The burden of disease and injury in Australia 2003. 2007. PHE 82, Canberra, AIHW.

2. Lopez AD. Global burden of disease and risk factors. 2006. Washington D.C., Oxford University Press.

3. Gilman SE, Abrams DB, Buka SL. Socioeconomic status over the life course and stages of cigarette use: initiation, regular use, and cessation. Journal of Epidemiology & Community Health 2003; **57**(10):802-808.

4. Faggiano F, Vigna-Taglianti FD, Versino E et al. School-based prevention for illicit drugs' use. Cochrane Database of Systematic Reviews 2005;(2):CD003020.

5. Foxcroft DR, Tsertsvadze A. Universal school-based prevention programs for alcohol misuse in young people. Cochrane Database of Systematic Reviews 2011; **5:CD009113**.

6. Thomas RE, McLellan J, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2013; **Issue 4**(Art. No.: CD001293. DOI: 10.1002/14651858.CD001293.pub3).

7. Stewart-Brown S. What is the evidence on school health promotion in improving health or preventing disease and, specifically, what is the effectiveness of the health promoting schools approach? 2006. Copenhagen, WHO Regional Office for Europe (Health Evidence Network report).

8. Resnick MD. Resilience and protective factors in the lives of adolescents. J Adolesc Health 2000; **27**(1):1-2.

9. Masten AS. Ordinary magic. Resilience processes in development. Am Psychol 2001; **56**(3):227-238.

10. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. Child Dev 2000; **71**(3):543-562.

11. Greenberg MT, Weissberg RP, O'Brien MU et al. Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. American Psychologist 58(6-7):466-74, 2003;-Jul.

12. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. Annu Rev Public Health 2005; **26**:399-419.

13. Harvey J, Delfabbro PH. Psychological resilience in disadvantaged youth: A critical overview. Australian Psychologist 2004; **39**(1):3-13.

14. Catalano RF, Berglund ML, Ryan JAM et al. Positive Youth Development in the United States: Research Findings on Evaluations of Positive Youth Development Programs. Ann Am Acad Pol Soc Sci 2004; **591**(97):124.

15. Greenberg MT. Promoting resilience in children and youth: preventive interventions and their interface with neuroscience. Ann N Y Acad Sci 2006; **1094**:139-150.

16. Resnick MD, Bearman PS, Blum RW et al. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. JAMA 1997; **278**(10):823-832.

17. Resnick MD. Protective factors, resiliency and healthy youth development. Adolescent Medicine: State of the Art Reviews 2000; **11**(1):157-164.

18. Lee TY, Cheung CK, Kwong WM. Resilience as a positive youth development construct: a conceptual review. Thescientificworldjournal 2012; **2012**:390450.

19. Benard B. Fostering Resiliency in Urban Schools. Closing the achievement gap: A vision for changing beliefs and practices. Virginia: Association for Supervision and Curriculum Development 1996.

20. Benard B. Protective factors in the family, school, and community. Portland, OR: Western Center for Drug-Free Schools and Communities 1991

21. Bernat DH, Resnick MD. Healthy youth development: science and strategies. Journal of Public Health Management & Practice 2006; **Suppl**:S10-S16.

22. Toumbourou JW. Drug Prevention Strategies: A Developmental Settings Approach Prevention Research Evaluation Report Number 2. 2002. Melbourne, Australian Drug Foundation.

23. MindMatters Evaluation Consortium. Report of the MindMatters (National Mental Health in Schools Project) Evaluation Project, vols. 1-4. 2000. Newcastle, Hunter Institute of Mental Health.

24. Bond L, Butler H, Thomas L et al. Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. J Adolesc Health 2007; **40**(4):357.e9-357.e18.

25. Carvajal SC, Granillo TM. A prospective test of distal and proximal determinants of smoking initiation in early adolescents. Addict Behav 2006; **31**(4):649-660.

26. Fang L, Barnes-Ceeney K, Schinke SP. Substance use behavior among early-adolescent Asian American girls: the impact of psychological and family factors. Women & Health 2011; **51**(7):623-642.

27. Haegerich TM, Tolan PH. Core competencies and the prevention of adolescent substance use. New Directions for Child & Adolescent Development 2008; **2008**(122):47-60.

28. Hiemstra M, Otten R, Engels RC. Smoking onset and the time-varying effects of self-efficacy, environmental smoking, and smoking-specific parenting by using discrete-time survival analysis. Journal of Behavioral Medicine 2012; **35**(2):240-251.

29. Kavas AB. Self-esteem and health-risk behaviors among Turkish late adolescents. Adolescence 2009; **44**(173):187-198.

30. McLellan L, Rissel C, Donnelly N et al. Health behaviour and the school environment in New South Wales, Australia. Social Science & Medicine 1999; **49**(5):611-619.

31. Neumark-Sztainer D, Story M, French SA et al. Psychosocial correlates of health compromising behaviors among adolescents. Health Educ Res 1997; **12**(1):37-52.

32. Patton GC, Bond L, Carlin JB et al. Promoting social inclusion in schools: a group-randomized trial of effects on student health risk behavior and well-being. Am J Public Health 2006; **96**(9):1582-1587.

33. Piko BF, Kovacs E. Do parents and school matter? Protective factors for adolescent substance use. Addict Behav 2010; **35**(1):53-56.

34. Vuille JC, Schenkel M. Social equalization in the health of youth. The role of the school. European Journal of Public Health 2001; **11**(3):287-293.

35. Wiefferink CH, Peters L, Hoekstra F et al. Clustering of health-related behaviors and their determinants: possible consequences for school health interventions. Prevention Science 2006; **7**(2):127-149.

36. Wright LL, Palfai TP. Life goal appraisal and marijuana use among college students. Addict Behav 2012; **37**(7):797-802.

37. Thomas R, Perera R. School-based programmes for preventing smoking. Cochrane Database of Systematic Reviews 2006; **3**:CD001293.

38. Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. Higgins JPT, Green S, editors. The Cochrane Collaboration, 2011. 2011.

39. Mercer SL, DeVinney BJ, Fine LJ et al. Study designs for effectiveness and translation research :identifying trade-offs. Am J Prev Med 2007; **33**(2):139-154.

40. Medical Research Council. Developing and evaluating complex interventions: new guidance. 2008.

41. Battaglia MP, Link MW, Frankel MR et al. An evaluation of respondent selection methods of respondent mail surveys. Public Opinion Quarterly 2008; **72**(3):459-469.

42. Oldendick RW, Bishop GF, Sorenson SB et al. A comparison of the Kish and last birthday methods of respondent selection in telephone surveys. Journal of Official Statistics 1988; **4**(4):307-318.

43. Nutbeam D, Bauman A. Evaluation in a Nutshell: A practice guide to the evaluation of health promotion programs. North Ryde, Australia: McGraw-Hill 2006

44. Sadish W, Cook T, Campbell D. Experimental and quasi-experimental designs for generalized causal inference. New York: Houghton Mifflin Company 2002

45. Craig P, Dieppe P, Macintrye S et al. Developing and evaluating complex interventions: new guidance. 2008. Medical Research Council.

46. Armstrong R, Waters E, Jackson N et al. Guidelines for systematic reviews of health promotion and public health interventions. [Version 2]. 2007. Australia, Melbourne University.

47. Measuring protective factors and resilience traits in youth: The healthy kids resilience assessment. Seventh Annual Meeting of the Society for Prevention Research; California: School and Community Health Research Group; 1999.

48. Hanson TL, Kim JO. Measuring resilience and youth development: the psychometric properties of the Healthy Kids Survey. 2007. Washington, DC, U.S. Department of Education, Institute of

Education Sciences, National Centre for Education Evaluation and Regional Assistance, Regional Educational Laboratory West.

49. Masten AS. Resilience in developing systems: Progress and promise as the fourth wave rises. Development and Psychopathology 2007;(3):921-930.

50. Brownlee K, Rawana J, Franks J et al. A systematic review of strengths and resilience outcome literature relevant to children and adolescents. Child & Adolescent Social Work Journal 2013;No.

51. Griffin KW, Botvin GJ. Evidence-based interventions for preventing substance use disorders in adolescents. Child & Adolescent Psychiatric Clinics of North America 2010; **19**(3):505-526.

52. Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. Psychol Bull 1992; **112**(1):64-105.

53. Petraitis J, Flay BR, Miller TQ. Reviewing theories of adolescent substance use: organizing pieces in the puzzle. Psychol Bull 1995; **117**(1):67-86.

54. Kingsland M, Wiggers J, Wolfenden L. Interventions in sports settings to reduce alcohol consumption and alcohol-related harm: a systematic review. BMJ Open 2[2], 1-6. 6-4-2012. United Kingdom, BMJ Group.

APPENDIX 1

Database: Ovid MEDLINE(R) 1946 to Present with Daily Update

Search Strategy:

---

1 (prevent* or stop* or quit* or abstin* or abstain* or reduc* or "tobacco use disorder" or ex-smoker or freedom from smoking or anti-smok*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (2949486)

2 exp smoking/ or smoking.mp. or smoking cessation.mp. or exp smoking cessation/ or smok*.mp. or noticine.mp. or tobacco.mp. or exp tobacco/ [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (244905)

3 1 and 2 (75169)

4 exp alcohols/ad, ae (75999)

5 exp alcohol drinking/ (50226)

6 exp alcohol abuse/ (66163)

7 exp alcohol, ethyl/ae (7478)

8 exp alcohol abuse/mo, pc, rh, th (18949)

9 alcohol*.ti,ab. (209848)

10 drink*.ti,ab. (87398)

11 drunk*.ti,ab. (3138)

12 intoxicat*.ti,ab. (34927)

13 or/4-12 (382204)

14 cannabis.mp. or exp Cannabis/ (11714)

15 exp Marijuana Smoking/ (2487)

16 marijuana.mp. (11285)

17 street drugs.mp. or exp Street Drugs/ (9005)

18 exp substance-related disorders/ (359827)

19 addict*.ab,ti. (37697)

20 (abus* or use*).ab,ti. (4111763)

21 morphine.ab,ti. (38748)

22 hashish.mp. (457)

23 heroin.ab,ti. (9943)

24 "heroin dependence".mp. (7920)

25 exp *n-methyl-3-4-methylenedioxyamphetamine/ or "ecstasy".mp. or "MDMA".mp. (4187)

26 exp *hallucinogens/ or "hallucinogens".mp. (16151)

27 exp *cocaine/ or exp *crack cocaine/ or "cocaine".mp. (33227)

28 exp *lysergic acid diethylamide/ or "lsd".mp. (4386)

29 or/14-28 (4402741)

30 risk-taking.mp. or exp Risk-Taking/ (23020)

31 risk behaviours.mp. (1383)

32 health risks.mp. (8865)

33 exp Health Behavior/ or health behaviours.mp. (94401)

34 or/30-33 (123513)

35 3 or 13 or 29 or 34 (4678307)

36 school.mp. or exp Schools/ (199868)

37 school health services.mp. or exp School Health Services/ (18410)

38 (school* adj3 (intervention* or program* or course* or polic* or practice* or curricul* or environment*)).mp. (15226)

39 or/36-38 (201010)

40 exp Child/ or child.mp. (1630031)

41 exp Adolescent/ or adolescent.mp. (1581151)

42 (adolescen* or student* or class*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (2503330)

43 (teenage* or youth).ti,ab. (43859)

44 (early adj2 adult*).ti,ab. (5053)

45 (young adj2 adult*).ti,ab. (56450)

46 exp students/ (77794)

47 (young people or youth).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (47625)

48 or/40-47 (3361720)

49 exp Resilience, Psychological/ (1218)

50 (resilience or resilienc*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (7080)

51 emotional intelligence.mp. or exp Emotional Intelligence/ (60696)

52 mental health.mp. or exp Mental Health/ (104258)

53 mental wellbeing.mp. (138)

54 communication/ or cooperative behavior/ or self efficacy/ or empathy/ or problem solving/ or self concept/ or goals/ or "aspirations (psychology)"/ or social environment/ (209017)

55 Adolescent Development/ or youth development.mp. or Child Development/ (35780)

56 (school* adj3 engage*).mp. (316)

57 (school* adj3 connect*).mp. (330)

58 (communit* adj3 support*).mp. (4200)

59 social participation/ or family/ or parent-child relations/ or family relations/ or peer group/ or social support/ or friends/ (144179)

60 pro-social peers.mp. (2)

61 (positive adj3 (peer* or friend*)).mp. (486)

62 life skill*.mp. (593)

63 social environment.mp. or exp Social Environment/ (89397)

64 interpersonal relations.mp. or exp Interpersonal Relations/ (251156)

65 emotional wellbeing.mp. (202)

66 or/49-65 (661242)

67 randomized controlled trial.pt. (367158)

68 controlled clinical trial.pt. (87691)

69 (randomised or randomized).ab. (318587)

70 clinical trials as topic.sh. (169978)

71 randomly.ab. (187790)

72 trial.ti. (115019)

73 doubleblind.ab. (151)

74 singleblind.ab. (9)

75 experiment*.mp. (1466450)

76 (pretest or pre test).mp. (9609)

77 (posttest or post test).mp. (9762)

78 (pre post or prepost).mp. (3758)

79 before after.mp. (2409)

80 (quasi-randomised or quasi-randomized or quazi-randomised or quazi-randomized).mp. (2369)

81 stepped wedge.mp. (67)

82 preference trial.mp. (41)

83 comprehensive cohort.mp. (49)

84 natural experiment.mp. (674)

85 (quasi experiment* or quazi experiment*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (4811)

86 (randomised encouragement trial or randomized encouragement trial).mp. (3)

87 staggered enrolment trial of staggered enrollment trial.mp. (0)

88 (nonrandomised or non randomised or nonrandomized or non randomized).mp. (13227)

89 interrupted time series.mp. (840)

90 (time series and trial).mp. (737)

91 multiple baseline.mp. (1262)

92 regression discontinuity.mp. (39)

93 or/67-92 (2256891)

94 35 and 39 and 48 and 66 and 93 (1936)

Resilience interventions for reducing adolescent tobacco, alcohol and illicit drug use

Date: …… **Reviewer:** ……

Study Title: ……

Trial ID:	
First Author:	
Year of Publication:	
Country of Publication:	

Study eligibility & inclusion criteria

	INCLUDE	EXCLUDE	
	Yes	**No**	**Unclear**
Participants - Children aged 5 to 18 years			
Outcome - tobacco use (including proportion ever smoked, frequency of smoking, number of cigarettes smoked, tobacco use in last week, current smoking status or established tobacco use) - alcohol consumption (including proportion ever consumed an alcoholic drink, alcohol use in last week, frequency of alcohol consumption, binge drinking or established alcohol use) - illicit drug use (including ever use or frequency of use of any illicit drug or a specific drug for example cannabis, amphetamines, or cocaine)			
Comparator - no intervention, usual practice, attention only or an alternate intervention			
Study design - Randomised controlled trial, cluster randomised controlled trial; - Non-randomised trials (including staggered enrolment trials, stepped wedged trials; quasi-randomised trials where group allocation is not purely random; quasi experimental trials including, non-randomised pre-post, time series/interrupted time-series trials including multiple baseline trials with independent control groups, preference trials and regression discontinuity trials; natural experiment studies)			
Intervention universal intervention targeting at least one internal and one external resilience factor - included internal resilience factors: cooperation and communication, self-efficacy, self-esteem, empathy, problem solving, decision-making skills, autonomy, self-awareness, goals and aspirations, social and emotional skills or competence, and self-control or self-regulation - included external resilience factors: meaningful participation, high adult expectations, caring relationships and support within home, school and community environments; peer caring relationships and pro-social peers			

☐ Include ☐ Exclude ☐ Obtain full text of article