

Evidence Check

Healthy lifestyle choices in children

An **Evidence Check** rapid review brokered by the Sax Institute for the NSW Ministry of Health.
May 2016.

This report was prepared by:

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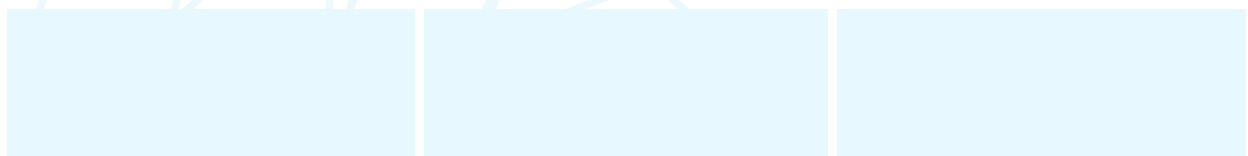
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1 Glossary

Systematic review (SR)	A systematic review is a literature review that uses a systematic process to identify, appraise, select and synthesize all high quality research in relation to a single question.
Meta-analysis (MA)	A meta-analysis combines the results of several studies that address a set of related research hypotheses. Analysing the results from a group of studies can allow more accurate data analysis.
Randomisation	Is the process by which a random population is selected
Randomised Control Trial (RCT)	A randomised controlled trial is a scientific procedure commonly used in Trial testing the effectiveness of psychological interventions. It is a trial that uses a randomised control.
Quasi-experimental	Quasi-experimental studies share many similarities with RCTs but they lack study randomised assignment to groups.
Risk factor	Risk factors are characteristics of school, community, and family environments, and characteristics of students and their peer groups that are known to independently predict increased likelihood of harmful drug use, crime, violent behaviours, school dropout and mental health problems among youth.
Protective factor	Protective factors exert a positive influence and buffer against the negative influence of risk, thus reducing the likelihood that children and young people will develop health and social problems.
Effect size	The measure of the strength of the relationship between two variables.
Pearson's r	A measure of effect size that varies in magnitude from -1 (perfect negative relationship) to 1 (perfect positive relationship) with 0 representing no relationship.
Cohen's d	A measure of effect size where commonly 0.2 is regarded a small effect, 0.5 a medium effect and 0.8 a large effect.
Hedge's g	A measure of effect size that takes into account sample size.
Odds ratio (OR)	A measure of effect size when both variables are binary. Measures the odds of an event occurring in one group as compared to it occurring in another group, i.e. the probability of an event occurring. An odds ratio of 1 indicates that the condition or event is equally likely in both groups.
PRISMA diagram	A flow diagram that depicts the flow of information through the different phases of a systematic review. It maps out the number of records identified, included and excluded and the reasons for exclusions.
Significant findings	A statistically significant difference that is unlikely to have occurred by chance.

Prosocial behaviour	Voluntary behaviour intended to benefit others. Meaningful participation in responsibilities and activities at home, in the classroom, and in the community, e.g. volunteering.
Resiliency	The process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress, and the capacity to "bounce back" from difficult experiences.

2 Executive summary

Obesity and substance misuse are both priority public health problems that have components that are preventable through interventions through the late primary and early secondary (middle) school years. This review synthesised the findings of previous high quality literature reviews to identify risk and protective factors that influence the development of obesity and substance misuse in the middle school years, and factors that promote resiliency (recovery from early problems) in order to inform effective prevention models through the middle school years. The review was completed by the Deakin University Centre for Social and Early Emotional Development (SEED) and commissioned as a Sax Institute Evidence Check for Drug & Alcohol Population & Community Programs, New South Wales Ministry of Health.

Search criteria identified high quality reviews and studies from Australia, UK, New Zealand, Canada and the USA, from the year 2000 onwards. Studies were also required to be English language and focused on school aged children in the middle school years. Separate searches were conducted for each question, and for each behavioural outcome (obesity and substance use). A total of six searches were conducted to identify evidence to address the specific questions listed below.

Question 1a: What is the evidence regarding the protective and risk factors that may influence healthy lifestyle choices and risk taking behaviour (i.e. substance misuse and obesity) in children?

A variety of risk factors were identified for substance misuse. A total of 17 individual risk factors, 8 family risk factors, 3 school risk factors, and 3 community risk factors were identified. A total of 10 protective factors were identified: 7 factors at the individual level, 2 factors at the family level, and 1 at the school level. These factors were grouped according to the following developmental process theories revealing evidence for interventions in the middle school years: cognitive behavioural theories, social development theories, self-regulation theories, and community environment theories. Risk and protective factors associated with stress and socioeconomic influence theories had very small effects.

The review of risk factors for obesity identified a total of seven individual risk factors and four family risk factors. Four protective factors were identified. No school or community risk factors were identified. These factors were associated with developmental process theories that included social development theories and self-regulation theories. Programs targeting these developmental processes in primary and early secondary school could contribute to preventing both substance misuse and obesity.

Question 1b: What is the role of resilience in the pathway to healthy lifestyle choices in children?

A definition of resiliency was used that emphasised both the process of adapting well in the face of adversity and significant stress, and the ability to “bounce back” or recover from early problems. Modifiable factors that encourage resiliency were identified in both social development and self-regulation theories. Low levels of self-regulation were indicated as risk factors for both substance misuse and obesity. Although outcome studies have not explicitly applied resiliency theories to prevent obesity, there is evidence that school-based programs can effectively prevent overweight and obesity, and assist overweight and obese youth to bounce back toward healthy weight status. There was evidence that resiliency theories had been successfully applied in programs to prevent substance misuse.

Question 2: What is the evidence regarding effective interventions and models to reduce risk taking behaviours (i.e. substance misuse and obesity) in children of primary and early secondary school age?

There is generally high quality evidence for the effectiveness of programs implemented in the middle school years to promote Social and Emotional Learning (SEL) and prevent substance misuse and obesity. The findings of twelve prior reviews relevant to substance misuse and ten reviews on obesity were synthesised. Overall effect sizes were small to moderate for substance misuse and small to very small for obesity. The intervention studies have examined these outcomes separately and the present report is one of few efforts to integrate the findings across substance misuse and obesity prevention.

Both substance misuse and obesity prevention programs are more effective in the middle school years when they: are based on a clear program design founded on behavioural and developmental theory, successfully manage implementation challenges, teach self-regulation skills such as resiliency and social-emotional learning, involve parents, and are extended across more than one year. There has been considerable incorporation of social development theories in substance misuse prevention programs (in effective components such as normative education), and more limited application in obesity prevention. Computer and on-line delivery is demonstrated as effective in substance misuse prevention and could be further explored in obesity prevention.

The evidence indicated that programs with longer duration tended to have larger effects. Substance misuse programs were more effective where they offered at least four and up to 12 lessons and included booster sessions (reinforcing lessons) in a subsequent year. Obesity programs had larger effects where they offered longer programs that ran for one to four years. Comprehensive school obesity programs were more effective where they did not rely simply on changes to school lesson content and included components that took time to organise, such as changes to the school food supply, activity facilities and active transport opportunities.

3 Background

Obesity and substance misuse are priority public health problems both in Australia and internationally. There is evidence that these problems have preventable components through the late primary and early secondary (middle) school years.¹ In order to prevent these problems, it is important to understand the factors that influence their development. The prevailing paradigms for understanding pathways to healthy and unhealthy child development are models of risk and protection. A risk factor has a consistent effect in statistically increasing the odds of a particular outcome for an individual child.² Protective factors ameliorate (that is, moderate and mediate) the effect of risk factors.² Risk and protective factors are known to operate at the individual, family, school and community level. The study of risk and protective factors has been informed by methodologically sound longitudinal and epidemiological studies. As described by Michael Rutter³, these studies allowed researchers to isolate a range of critical influences upon children's physical and psychosocial development, understand the magnitude of their influence, and begin to understand how they cluster and interact.

An important reason for studying risk and protective factors is to inform causal theories of factors that influence child development. Several seminal studies have contributed to present-day developmental theories. These studies include, for example, the research of John Bowlby⁴ and Mary Ainsworth⁵ that have informed social development theories.⁶ As relevant to the middle school years, social development theories explain pathways to obesity and substance misuse in terms of the influence of social relationships. Where they experience strong bonds the likelihood increases that children or adolescents will adopt the attitudes and behaviours modelled in social relationships.⁶

Self-regulation theories recognise that a key task in the middle school years is to learn to manage stressful life events to neutralise their potentially harmful effects on physical and neurological health.⁷ Self-regulation theories emphasise the role of SEL.

Cognitive behavioural development theories recognise that behaviours and skills are underpinned by neurological and physical development processes. These theories recognise that in the middle school period skills for healthy and unhealthy behaviours are shaping and developing such that early experiences with alcohol and drug use, unhealthy eating and sedentary behaviours are consistent predictors of the development of later behaviours.⁸

Bronfenbrenner's⁹ ecological systems theory emphasised the influence of nested environmental contexts. These theories have been emphasised in community environment theories that explain adolescent involvement in alcohol use, unhealthy eating and sedentary activities in terms of the marketing and availability of unhealthy products such as alcohol, fast foods, and sedentary online games.⁸

Evidence-based programs

A number of programs have been designed to prevent obesity and or substance misuse during the middle school developmental period. Effective programs target developmental processes to reduce the effect of risk factors and enhance protective factors. Evidence-based programs comprise: (i) a discrete course of intervention with a strong logic model informing the activities hypothesised to prevent obesity or substance misuse; (ii) a clearly specified target population; and (iii) a set of manuals or tools that clearly describe the developmental theories they are based on and the activities and training required to deliver them with fidelity.¹⁰ What makes these programs 'evidence-based' is a clear program design and a robust body of experimental evidence — randomised controlled trials or quasi-experimental designs — that

demonstrate a positive impact on child outcomes, over and above what would have changed without provision of the intervention.

Within school settings a group of interventions broadly referred to as SEL programs represent one promising type of resilience-promoting intervention. They are, arguably, the most scientifically advanced and empirically supported form of intervention to equip children with the skills and resources to effectively manage life tasks, stresses and challenges.^{11, 12}

Schools are the most typical setting for SEL, largely due to the captive audience of children in schools (making them an ideal candidate for universal preventative efforts) and the human capital available to implement and deliver the interventions, that is teachers with additional resources and training.¹¹ In addition, Australian schools are increasingly required or expected to teach children more than just academic skills, but also a range of non-cognitive skills promoting well-being in a broader sense and equipping children with the skills required for civic engagement and employment.⁸

Review questions

In light of the above, the Deakin University Centre for Social Emotional and Early Development (SEED) completed the review that follows. The review was commissioned as a Sax Institute Evidence Check for Drug & Alcohol Population & Community Programs, NSW Ministry of Health. A rapid review examined the following three questions.

Question 1a: What is the evidence regarding the protective and risk factors that may influence healthy lifestyle choices and risk taking behaviour in children, particularly substance use and obesity?

Question 1b: What is the role of resilience in the pathway to healthy lifestyle choices in children?

Question 2: What is the evidence regarding effective interventions and models to reduce risk taking behaviours, particularly substance use and obesity, in children of primary and early secondary school age?

4 Methodology

This evidence check was based on a rapid review methodology; it follows the same process as a systematic review, however it is conducted within a more limited time period. This review focused on identifying and synthesising findings from previously completed systematic reviews. The review set out to integrate the three research questions by focusing on the influence of risk, protective factors and resiliency, and to then use this information to evaluate interventions through the middle school years addressing these influences to prevent substance misuse and obesity.

Articles searched were from Australia, UK, New Zealand, Canada and the USA, from the year 2000 onwards, in the English language and focusing on school aged children in late primary school and early secondary school. Using the criteria outlined below, searches were conducted using the following search engines: EBSCO Host; PSYCHInfo; MEDLINE Complete; EMBASE Academic Search Complete; CINAHL Complete; and, ERIC. Peer-referred systematic reviews and meta-analyses were sourced from the Cochrane site and other search engines. Separate searches were conducted for each question (see the Appendices for search term tables and PRISMA diagrams for each review question).

Using similar search terms, a search for grey literature was also undertaken via the World Wide Web. A comprehensive review of the evidence for risk and protective factors for drug and alcohol use with children in primary school years was undertaken in 2004.¹³ This review was included as part of the grey literature review. Given the extremely broad scope of this review and the time limit for the review, qualitative studies were excluded.

The first analytic step was to rate the quality of the evidence. Using a standardised ranking method, the NHMRC Level of Evidence (see Table 1) two reviewers examined and rated each study. The criteria used to rank studies using this method are outlined in Table 1 below.

Table 1 NHMRC Level of Evidence Ranking System

Level of Evidence	Study Design
I	A systematic review of Level II studies.
II	A randomised controlled trial.
III-1	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method).
III-2	A comparative study with concurrent controls (i.e. non-randomised experimental trials, cohort studies, case-control studies, interrupted time series studies with a control group).
III-3	A comparative study without concurrent controls (i.e. historical control study, two or more single arm studies, interrupted time series studies without a parallel control group).
IV	Case series with either post-test or pre-test/post-test outcomes.

*As per http://www.nhmrc.gov.au/files/nhmrc/file/guidelines/stage_2_consultation_levels_and_grades.pdf

Discrepancies amongst reviewers were discussed until agreement was reached. As Question 1a examined risk factors that are predictive of later behaviours, only longitudinal studies were examined. While randomised control trials are the gold standard for examining cause and effect, without a longitudinal follow-up they usually are not adequate to examine the relationship of factors over long time periods in the same way longitudinal studies are.¹⁴ A known strength of longitudinal studies is their capacity to examine child development across the life-course: how one factor (such as family conflict at age eight) precedes and predicts a second factor (for example alcohol use) further down the developmental timeline (for example age 12).

While, the National Health and Medical Research Council (NHMRC) Quality of Evidence matrix (outlined in Table 2 over the page) is best used to examine cause and effect evidence, it ranks longitudinal (cohort) studies as III-2 — quite low in the overall hierarchy (between B and D). Thus, to examine the quality of the longitudinal studies, we also used the Newcastle-Ottawa Scale (NOS) (see Table 17 in the Appendices). See the following for further information:

http://www.ohri.ca/programs/clinical_epidemiology/nos_manual.pdf

http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp

The NOS is an ideal instrument for assessing the quality of cohort studies, as examined in Question 1 of this review. The NOS uses a system where each study is judged on three broad perspectives: the selection of the study groups, the comparability of the groups, and the ascertainment of either the exposure or outcome of interest for case-control or cohort studies respectively. The full scale is included in Table 17 in the Appendices.

The quality of intervention evaluation evidence was rated according to the NHMRC Quality of Evidence matrix. As indicated below, the NHMRC evidence matrix is designed to allow for a mixture of components to guide recommendations. The body of intervention evaluation evidence was rated from a grade of A (excellent) to D (poor) for the five components listed below:

1. **Evidence base:** The level of evidence based on the quantity, level and quality of the included studies
2. **Consistency:** Assesses whether the findings are consistent across the included studies to establish whether the results are likely to be replicable (stable across methods and contexts)
3. **Clinical impact:** Evaluates the size of effects in the middle school population
4. **Generalisability:** Measures how well the populations and settings from the included studies can inform the prevention of obesity and substance misuse in the middle school age group
5. **Applicability:** Measures whether the evidence base is relevant to the Australian context.

Table 2 NHMRC Quality of Evidence matrix to summarise the evaluation of evidence in different areas

Component	A	B	C	D
	Excellent	Good	Satisfactory	Poor
Evidence base	several level I or II studies with low risk of bias	one or two level II studies with low risk of bias or a systematic review or multiple level III studies with low risk of bias	level III studies with low risk of bias, or level I or II studies with moderate risk of bias	level IV studies, or level I to III studies with high risk of bias
Consistency	all studies consistent	most studies consistent and inconsistency may be explained	some inconsistency reflecting genuine uncertainty around clinical question	evidence is inconsistent
Clinical impact	very large	substantial	moderate	slight or restricted
Generalisability	population/s studied in body of evidence are the same as the target population in question	population/s studied in the body of evidence are similar to the target population in question	population/s studied in body of evidence differ to target population in question, but it is clinically sensible to apply this evidence to target population	population/s studied in body of evidence differ to target population and hard to judge whether it is sensible to generalise to target population
Applicability	directly applicable to Australian context	applicable to Australian context with few caveats	probably applicable to Australian context with some caveats	not applicable to Australian context

An intervention process analysis was completed as a final methodological step. This analysis synthesised the major intervention models and processes identified as effective within the high-quality literature reviews. This analysis enabled the identification of potential gaps by contrasting information on risk, protective and resiliency influences against the intervention processes currently targeted in the evaluation literature.

5 Results

Question 1a: What is the evidence regarding the protective and risk factors that may influence healthy lifestyle choices and risk taking behaviour in children?

Obesity and Substance misuse

The search terms used to identify evidence for Question 1a are listed in Table 14 in the Appendices. As this question addressed risk and protective factors as predictors for health behaviours, evidence was restricted to temporal, that is longitudinal studies. Longitudinal studies examine whether a factor precedes in time, and is predictive of, a health behaviour(s) at later time points. The PRISMA diagram for the studies identified for Question 1a is presented in Figure 1 in the Appendices. As indicated in the PRISMA diagram, after the initial search, 373 records were screened, based on their abstract. After abstract inspection, 291 studies were excluded; the remaining 82 studies were selected to be read in entirety and screened for suitability. A total of 11 studies were retained for the review; 6 focusing on substance use and 5 focusing on obesity. No systematic reviews and meta-analyses summarising findings from longitudinal studies were identified through this process.

Substance misuse

Six longitudinal studies examining predictors of substance misuse were identified. The NOS rankings and NHMRC quality of evidence for these studies are outlined in Table 18 in the Appendices. A summary of the evidence across these six studies is presented below. Information is evaluated using the following categories: Evidence base, Consistency, Clinical Impact, Generalisability, and Applicability.

Evidence base

Using the NHMRC evidence matrix, the evidence base for the six longitudinal studies examining risk factors predicting substance use was rated C or satisfactory. The low rating was due to a lack of replication in risk factors across the six studies; each study tended to examine different risk factors. However, using the NOS scale, all six studies were given a score of 7 out of a possible 9. This score indicated that the study samples were representative, utilised appropriate analytic techniques and had sufficient follow up periods. See Appendices for greater information pertaining to the NOS scale.

Consistency

Consistency evaluates the extent that findings show heterogeneity or commonality across different study methods and samples. In general, the included studies could be evaluated to have a poor (D) score for consistency as few studies evaluated similar risk or protective factors. Across the six studies a variety of risk factors were identified in the individual, family, school and community domains. In total 17 individual risk factors were identified; 8 family risk factors; 3 school risk factors; and 3 community risk factors. These are listed in Table 3 (risk factors) and Table 4 (protective factors) below. The findings for the six longitudinal studies are detailed in Table 18 in the Appendices. Risk factors that showed similar effects when measured in two or more studies are as follows: "Friends' use of drugs";¹⁵ "Family history of antisocial behaviour";^{16, 17} and "Low school commitment".

Table 3 Summary of risk factors for substance use

Risk factors							
Individual/Peer	Effect size	Family	Effect size	School	Effect size	Community	Effect size
1. Friends' use of drugs	OR 4.91 & OR 2.72	1. Poor family management	OR 4.37	1. Low school commitment	OR 1.64 & OR 1.79	1. Perceived availability	OR 1.99
2. Rebelliousness	OR 1.68	2. Family history of antisocial behaviour (including drug and alcohol use)	OR 2.12 & OR 2.06	2. Lower expectations for academic achievement	Alcohol OR 0.899	2. Community enforcement of laws	OR 1.33
3. Sensation seeking	OR 1.39	3. Having a large family size	Cigarettes ($r=0.07$) Marijuana ($r=0.05$)	3. Less positive attitudes towards school	Alcohol OR 0.850	3. Acceptability, and normality of drug and alcohol use	OR 1.60
4. Stress intensity	Alcohol ($r=0.06$) Alcohol ($\beta=0.005$)	4. Feeling that family and friends do not care about them	Cigarettes ($r=-0.09$) Alcohol ($r=-0.09$) Marijuana ($r=-0.06$)				
5. Lower initial levels of behavioural control in early childhood	Age of onset of drinking (OR 0.552) Age of first drunkenness (OR 0.58)	5. Having an alcoholic parent	Drinking by 14 (OR 3.080) Drunkenness by 17 (OR 4.572) Alcohol problem (OR 0.336) Age of onset of				

Risk factors

Individual/Peer	Effect size	Family	Effect size	School	Effect size	Community	Effect size
			drinking (OR 1.791) Age of first drunkenness (OR 2.004)				
6. Slower rates of increase in behavioural control	Age of onset of drinking (OR 0.441) Age of first drunkenness (OR 0.387)	6. Family conflict	Alcohol OR 1.031				
7. To have used drugs other than alcohol	Cigarettes (r=0.43) Marijuana (r=0.54)	7. Less parental control	Alcohol OR 0.939				
8. Conduct problems @ 7-9 yrs	Tobacco ($\beta=0.15$) Cannabis ($\beta=0.13$) Other illicit drugs ($\beta=0.16$)	8. Higher perceived parental approval of child drinking	Alcohol OR 1.117				
9. Attentional problems @ 7-9 yrs	Alcohol ($\beta=-0.27$)						

10. Conduct problems @ 14-16 yrs	Tobacco ($\beta=0.25$); Alcohol ($\beta=0.48$); Cannabis ($\beta=0.37$); Other illicit drugs ($\beta=0.36$)						
11. Less intolerance of deviance	Alcohol OR 0.882						
12. Greater approval of drinking	Alcohol OR 1.210						
13. Lower religiosity	Alcohol OR 0.905						
14. More frequent deviant behaviour	Alcohol OR 1.082						
15. Friends' approve drinking	Alcohol OR 1.174						
16. Friends' approve drug use	Alcohol OR 1.228						
17. Sipped alcohol by aged 10	Alcohol OR 1.883						

NOTE: All findings included in the Table are significant. Findings in bold show large to very large effects. For links to specific study findings see Appendices, Table 18

Table 4 Summary of protective factors for substance use

Protective factors							
Individual/Peer	Effect size	Family	Effect size	School	Effect strength	Community	Effect size
1. Self-esteem	OR 0.52	1. Knowing others cared about them (social connectedness)	Cigarettes ($r=-0.06$) Marijuana ($r=-0.06$) Alcohol ($r=-0.09$)	1. Scholastic competence	Alcohol ($r=-0.06$)	Nil found	
2. Peer rewards for prosocial behaviour	OR 0.77	2. Mother's education – high education levels	Alcohol ($r=-0.07$) Alcohol ($\beta=-0.009$)				
3. Engaging in healthy behaviours	Cigarettes ($r=0.08$) Marijuana ($r=-0.07$) Alcohol ($r=-0.09$)						
4. Having a sense of behavioural competence	Cigarettes ($r=-0.05$) Marijuana ($r=-0.08$) Alcohol ($r=-0.06$)						
5. Global self-worth	Marijuana ($r=-0.05$) Alcohol ($r=-0.07$)						

Protective factors

Individual/Peer	Effect size	Family	Effect size	School	Effect strength	Community	Effect size
6. Temperament - task persistence	Cigarettes ($r=-0.05$)						
7. Initial levels of resiliency	Age of onset of first drinking (OR 0.787) Age of onset of first drunkenness (OR 0.710)						

Clinical impact

Rated A to B, or excellent to good. The largest effect sizes for risk factors in Table 3 and for protective factors in Table 4 are listed in bold. The risk factor “having a friend(s) who used drugs” had odds ratios between 2.72 and 4.91 and can be interpreted as increasing the risk of substance misuse at a later point by between 172% and 391%. Having sipped alcohol by the age of 10 increased a child’s risk of using alcohol in adolescence by approximately 88%.

The risk factor “having an alcoholic parent” increased a child’s risk of alcohol use at age 14 by 308% (OR 3.08). “Poor family management” increased the risk of subsequent substance misuse by 337% (OR 4.37). “Low commitment to school” increased the risk of substance use between 64% and 79% (OR 1.64 – 1.79). Coming from a family with a history of antisocial behaviour was associated with an increase in risk of between 106% and 112% (OR 2.06 - 2.12).

At the community level, high perception of availability of substances was associated with a 99% increase in substance misuse (OR 1.99). The remaining risk factors were evaluated to have moderate to large effects with odds ratios between 1.40 and 1.68 (correlations [r] or standardised regression coefficients β between 0.4 and 0.7) and small to very small effects with odds ratios below 1.40 (r or $\beta < 0.4$)

In respect to clinical impact for protective factors these could be considered moderate to strong (see Table 4). High levels of “self-esteem” reduced the risk of substance use by 48% (OR=.52), “peer rewards for prosocial behaviour” reduced the risk of substance use by 23% (OR=.77), and “initial levels of resiliency” was associated with a reduction in risk by above 20% (OR=.79 & .71). Effect sizes for other protective factors were small, with protective effects of approximately 10%.

Generalisability

Rated B. Using the NHMRC ranking, five studies were ranked B, and one study was ranked A for generalisability. Rankings of A and B indicate that the evidence in these studies could be generalisable to the population of school aged children from late primary school to early secondary school.

Applicability

Rated B. The six studies could be considered applicable to the Australian context. Four of the studies were undertaken with US children, one with Australian children and one with children from New Zealand. Using the NHMRC ranking, five studies were ranked B, and one study was ranked A for applicability. As the studies undertaken were with participants in OECD and developed in western countries, the findings from the six substance use studies can be applied to the Australian context.

Please note that risk and protective factors for substance use that also overlap with risk and protective factors for obesity are presented after the review of the evidence for obesity.

Obesity

Evidence base

Rated D or poor, due to a lack of longitudinal studies. Five longitudinal studies examining risk factors for obesity were identified. The NOS rankings and NHMRC quality of evidence for these studies are outlined in Table 19 in the Appendices. The NOS scores indicate the quality of studies was varied. NOS scores ranged from 5 to 8, indicating moderate (5) to strongly (8) designed longitudinal studies. One study was rated 5, two studies were rated 7, and two studies were rated 8. Studies with a rating of 5 indicated that they were of a reasonable standard but had some limitations in respect to sample representativeness. Studies rating a 7 or 8 were of a high standard. Thus, overall the longitudinal studies reported in this review were mostly high in standard.

Across the five studies a variety of risk factors were identified. Seven risk factors at the individual level and four risk factors at the family level were identified. No school or community risk factors were identified. Table 5 and 6 below summarises the risk and protective factors identified.

Consistency

Rated D or poor. In respect to overall consistency of the findings, only one risk factor was identified in more than one study — this was “short sleep duration” — and there were no overlapping protective factors found in the five studies. Thus, the existing research was evaluated as weak in being unable to inform the consistency of findings for risk or protective factors.

Table 5 Summary of risk factors for obesity

Risk factors							
Individual/Peer	Effect size	Family	Effect size	School	Effect size	Community	Effect size
1. Short sleep duration	SSD @ 4.75 yrs (OR 2.04) SSD @ 5.75 yrs (OR 1.64) Early onset (OR 1.66-1.68)	1. Parental overweight 2. Two parents overweight 3. One parent overweight	Early onset (OR 7.29) Late onset (OR 5.01) Early onset (OR 2.22), Late onset (OR 1.51)	Nil found		Nil found	
2. Conduct problems @ 5 yrs	Obesity @ 30 yrs (OR 1.5)	4. Overprotective parenting	Early onset (OR 1.12)				
3. Hyperactivity @ 5 yrs	Obesity @ 30 yrs (OR 1.4)						
4. Emotional problems @ 5 yrs	Obesity @ 10 yrs (OR 0.6)						
5. Behavioural problems (Rutter's parent score) @ 5 yrs	Obesity @ 30 yrs (OR 1.5) Obesity @ 34 yrs (OR 1.3)						

Risk factors

Individual/Peer	Effect size	Family	Effect size	School	Effect size	Community	Effect size
6. Behavioural problems (Rutter's parent score) @ 10 yrs Social development score	Obesity @ 34 yrs (OR 1.3) Obesity @ 30 & 34 yrs (OR 1.4)						
7. Attention deficit @ 10 yrs	Obesity @ 34 yrs (OR 1.3)						

NOTE: All findings included in the Table are significant. Findings in bold show large to very large effects. For links to specific study findings see Appendices, Table 19.

Table 6 Summary of protective factors for obesity

Protective factors							
Individual/Peer	Effect size	Family	Effect size	School	Effect size	Community	Effect size
1. Social-emotional well-being: Teacher reports - internalising behaviour	OR 1.02	1. Maternal efficacy for preventing their child from engaging in sedentary behaviours	$\beta=-0.03$	Nil found		Nil found	
2. Child self-report - anger/distractibility	OR 1.02	2. Rules to limit sedentary behaviours	OR 1.14				
		3. Family structure (one or two parent household)	OR 1.03				

NOTE: All findings included in the table are significant. No large or very large effects were identified. For links to specific study findings see Appendices, Table 19.

Clinical impact

Rated C or Satisfactory. In respect to the strongest risk factors identified in the five studies, the effect sizes could be considered strong to very strong. "Short sleep duration" was associated with an increase of up to 104% (OR=2.04) in risk of being obese, indicating a strong effect size. Having parents who were overweight was associated with up to a 629% (OR=7.29) increase in risk of obesity, indicating a very strong effect size.

The effect sizes for the other risk factors could be considered small to moderate, with effect sizes ranging from increases in risk between 12% and 50%. The effect sizes for the other protective factors could be considered small to very small, with protective effects reducing risk by approximately 2%.

Generalisability

Rated B or Good: the generalisability for the studies was of a good standard. All studies were rated either A or B. The A ranking suggested that the population studied was the same as the target population, and the B ranking indicated that the population was close to the target middle school aged population.

Applicability

Rated B or Good. A rated studies were completed in Australia and the B rated studies included a mix of ethnic groups. As Australia is considered to have a broad multicultural mix the studies were deemed generally applicable to the Australian context.

Table 7 Common self-regulation risk and protective factors for substance use and obesity

Risk factor	Effect size	Outcome
Conduct problems @ 5 yrs	Obesity @ 30 yrs (OR 1.5)	Obesity
Conduct problems @ 7-9 yrs	Tobacco ($\beta=0.15$) Cannabis ($\beta=0.13$) Other illicit drugs ($\beta=0.16$)	Substance use
Conduct problems @ 14-16 yrs	Tobacco ($\beta=0.25$) Alcohol ($\beta=0.48$) Cannabis ($\beta =0.37$) Other illicit drugs ($\beta=0.36$)	Substance use
Attention deficit @ 10 yrs	Obesity @ 34 yrs (OR 1.3)	Obesity
Attentional problems @ 7-9 yrs	Alcohol ($\beta=-0.27$)	Substance use
Protective factor	Effect size	Outcome
Social-emotional well-being	Teacher reports -internalising behaviour (OR 1.02) Child self-report - anger/distractibility (OR 1.02)	Obesity
Initial levels of resiliency	Age of onset of first drinking (OR 0.787) Age of onset of first drunkenness (OR 0.710)	Substance use
Global self-worth	Marijuana ($r = -0.05$) Alcohol ($r = -0.07$)	Substance use
Self-esteem	Grade 6 initiation - OR 0.52	Substance use

Implications for common risk process theories

The risk factors summarised above suggested that both substance misuse and obesity were predicted by common social development and self-regulation risk process theories. Social development theories were evident in very strong social risk factors for obesity (for example overweight parents) and for substance misuse (for example alcohol using friends and parents). Above, Table 7 summarises the risk and protective factors associated with self-regulation theories that were common for both obesity and substance misuse. Self-regulation theories were indicated in risk factors that included conduct problems and attention deficit, and in protective factors relating to social and emotional control: resiliency, emotional well-being, and self-worth.

Question 1b: What is the role of resilience in the pathway to healthy lifestyle choices in children?

According to the American Psychological Association, resilience is defined as “the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress, and the capacity to “bounce back” from difficult experiences”¹ Studies were identified to help understand the role of resiliency in the

overall development of children's obesity and substance misuse. The studies identified below used a variety of definitions for resilience; however, all were judged to be consistent with the essence of the above APA definition.

The search terms used to identify evidence for Question 1b are listed in Table 15 in the Appendices. As this question investigated the role of resilience, we investigated evidence based programs that either enhanced resilience or used resilience to reduce risky behaviour. The PRISMA diagram outlining the search strategy is presented in Figure 2 in the Appendices. As indicated in the PRISMA diagram, after the initial search screening practices, 47 records were screened based on their abstract. After abstract inspection, 26 studies were excluded; the remaining 21 studies were selected to be read in entirety and screened for suitability. A total of six studies were retained for the current review: three focusing on resilience as an outcome, two focusing on substance misuse and one focusing on obesity. Four systematic reviews and two longitudinal studies were identified. Of the four reviews, two reviews systematically summarised evidence and incorporated a meta-analysis; the other systematic reviews did not include a meta-analysis. Table 20 in the Appendices summarises the key findings of these six studies.

Studies on effective interventions for resilience were also identified through a search of the grey and unpublished literature. We also made contact with our academic collaborators in New South Wales, who have recently completed a systematic review (currently unpublished, 2016; see study 4 in Table 20 in the Appendices) examining resiliency in primary school and secondary school children, in respect to drug and alcohol use. We used this document to assist with identifying relevant studies for this review question.

Evidence base

The reviews summarised resiliency programs and their impact on a variety of behaviours across approximately 317 studies. The evidence for the review studies were ranked as Level I (using the NHMRC Level of Evidence ranking) as they were systematic reviews of randomised control trials, and the fifth study, which was a randomised control trial was ranked Level II. This suggested the evidence base was excellent. A summary of the key features of these studies is outlined in Table 8 below.

Consistency

Although specific literature reviews find high heterogeneity (for example, Durlak et al.^{11, 12}), consistency was evaluated as A (excellent) when comparing the included reviews. There was consistent evidence that resiliency programs had significant effects on social and academic outcomes. This is presented in the tables below. Table 8 indicates that three reviews found that resiliency programs had an impact on social skills, attitudes and positive behaviours. Resiliency was also found to impact on academic achievement in two reviews, and was not assessed in another. Overall the evidence for social and school behaviours is consistent across the reviewed studies.

Table 9 summarises resiliency program effects on substance misuse behaviours. In respect to substance misuse, one review by Hodder et al. identified that resiliency programs had an impact on illicit drug use, but not on alcohol and tobacco use.¹⁸ Effective substance use programs were school and universal based programs. There was one Australian longitudinal and randomised control study¹⁹ that demonstrated that social relationship curricula combined with family intervention components were associated with lower rates of alcohol use. The second longitudinal study found that teachers reported internalising behaviours more often with children whose weight changed between grade 5 and grade 8, compared to children whose weight did not change over this period, although the effect was small (see table 20).²⁰

Table 8 Effectiveness of programs that enhance resilience

Study	NHMRC Level of evidence	Social skills	Attitudes	Positive Behaviours	Academic achievement
Durlak et al. ¹¹	I	•	•	•	•
Durlak et al. ¹²	I	•	•	•	•
Wells et al. ²¹	I	•	•	•	•

• Social skills • No effect • Attitudes • No effect • Behaviours • No effect • Academic performance • No effect • Did not evaluate

Table 9 Effectiveness of resilience programs targeting substance misuse behaviours

Study	NHMRC Level of evidence	Effect	Risk behaviours
Hodder et al. ¹⁸	I	Tobacco use: No overall effect Alcohol use: No overall effect Illicit drug use: Significant intervention effect (OR 0.78)	Tobacco use, alcohol use and illicit drug use
Toumbourou et al. ¹⁹	II	Significant intervention effect on reductions in lifetime alcohol use and reduced progression to frequent and heavy alcohol use.	Alcohol use

Clinical impact

Rated B. Only the two meta-analyses reported effect sizes^{11, 12}; Hedge's g was the effect size measure used. It is generally accepted that an effect size of 0.5 is a medium effect, and an effect size of 0.8 is a large effect. Overall, small to medium effect sizes were reported in the meta-analyses.

Programs yielded significant positive effects on:

- Targeted social-emotional skills (mean ES=0.57)
- Attitudes about self, others, and school (mean ES=0.23)
- Positive social behaviours (mean ES=0.24)
- Conduct problems (mean ES=0.22)
- Emotional distress (mean ES=0.24)
- Academic performance (mean ES=0.27).¹¹

Effects remained statistically significant for a minimum of 6 months after the intervention.

Participants demonstrated significant increases in:

- Their self-perceptions (ES=0.34)
- Bonding to school (ES=0.12)

- Positive social behaviours
- School grades and levels of academic achievement
- Significant reductions in problem behaviours.¹²

Programs that were defined as: sequenced (clear and coordinated program logic), active (includes active learning components), focused (at least one component developing personal or social skills), and explicit (to SEL skills rather than general skills or positive development) showed larger effects (mean weighted ES = 0.31, 95% CI 0.24-0.38).

Generalisability

Rated A or Excellent. The evidence for the reviews is relevant to classroom interventions; the populations are similar to the middle school target population for this rapid review. Thus the generalisability for these studies can be reported as excellent.

Applicability

Applicability was rated as C or Satisfactory. The large Durlak et al. reviews^{11, 12} examined only US populations, Wells et al.²¹ included Australian populations, and Toumbourou et al.¹⁹ is an Australian study.

Question 2: What is the evidence regarding effective interventions and models to reduce risk taking behaviours in children of primary early secondary school age?

Studies that were identified evaluate the effectiveness of interventions in reducing drug and alcohol use and obesity in children. The search strategy is listed in Table 16 in the Appendices. The PRISMA diagram outlining the search strategy is presented in Figure 3 in the Appendices. As indicated in the PRISMA diagram, after the initial title screening practices, 146 records were screened based on their abstract. Based on abstract inspection, 66 studies were excluded; the remaining 80 studies were selected to be read in entirety and screened for suitability. A total of 22 studies were retained in the review, with 12 studies targeting substance use and 10 studies targeting obesity.

Studies on effective interventions for substance misuse were identified through a search of the grey literature. Similar to work being done with resiliency we made contact with our academic collaborators at Melbourne University, who have recently completed a systematic review (currently unpublished) examining resiliency programs and substance use with primary school and secondary school children. We used this document to assist with identifying relevant studies that have been shown to be related to effective resiliency programs for substance use. A detailed overview of the studies and NHMRC quality of evidence for these studies are outlined in the Table 18 (substance use) and Table 19 (obesity) in the Appendices.

Substance Use

Evidence base

Twelve systematic reviews were identified with seven of these also incorporating a meta-analysis. Five studies were given a ranking of I (according to the NHMRC Level of Evidence ranking), as they summarised randomised control trials and were considered to be the highest quality evidence. Seven studies were given a second ranking (for instance III-3), and were considered to be moderate to strong evidence. This ranking was given as they were reviews that included non-randomised studies. The full details of these rankings can be found in the table below. Overall there were 804 studies on substance use included in these reviews. Substance behaviours examined included alcohol, tobacco and general substance misuse. Overall the evidence base for the studies could be considered excellent. A summary of the evidence for these twelve studies is presented below.

Consistency

Rated B or Good. The included reviews described high heterogeneity between studies. However, as a group the evidence presented in Table 10 suggested that programs that target alcohol, tobacco and substance misuse in the primary schools and early secondary school years are effective. However, there was one meta-analysis reviewing 94 studies²² that suggested that drug and alcohol programs did not have an effect on alcohol use or substance misuse.

Clinical impact

Rated B or Good. It is generally accepted that an effect size of 0.5 is a medium effect, and an effect size of 0.8 is a large effect. However, not all studies reported results in a consistent format (e.g. Cohen's d or Hedges' g). Where standardised measures are reported, it seems generally small effect sizes were identified.

Generalisability

The evidence reported in this review pertains to classroom interventions, and the populations are similar to the target population for this rapid review. Thus the generalisability for the twelve reviews findings can be considered to be A or excellent.







Applicability










Rated B or Good. The populations in the studies included children in OECD countries and Australia. The review by Teesson et al.²³ was based on Australian students.

Table 10 Effectiveness of substance misuse prevention programs

Study	Number of studies	Type of study	Primary (Y1-5)	Early adolescence (Y6&7)	Middle adolescence (Y8&9)	Late adolescence (Y10-12)
Onrust et al. ²⁴	288	SR MA	● ● ●	● ● ●	● ● ●	● ● ●
Champion et al. ²⁵	10	SR	● ● ●	● ● ●	● ● ●	● ● ●
Teesson et al. ²³	7	SR	● ● ●	● ● ●	● ● ●	● ● ●
Foxcroft et al. ²⁶	53	SR		● ● ●		
Lemstra et al. ²⁷	6	SR	● ● ●	● ● ●	● ● ●	● ● ●
Porath-Waller et al. ²⁸	15	SR MA	● ● ●	● ● ●	● ● ●	● ● ●
Faggiano et al. ²⁹	29	SR MA		● ● ●		
Soole et al. ³⁰	58	SR MA (12)		● ● ●		
Skara & Sussman ³¹	25	SR	● ● ●	● ● ●	● ● ●	● ● ●
Gottfredson & Wilson ²²	94	MA	● ● ●	● ● ●	● ● ●	● ● ●

Continued over page

Study	Number of studies	Type of study	Primary (Y1-5)	Early adolescence (Y6&7)	Middle adolescence (Y8&9)	Late adolescence (Y10-12)
Cuijpers ³²	12	SR MA				
Tobler et al. ³³	207	MA				

-  Tobacco use
-  Tobacco no effect
-  Tobacco not evaluated
-  Alcohol use
-  Alcohol no effect
-  Alcohol not evaluated
-  Substance use
-  Substance use no effect
-  Substance use not evaluated

**Refer to Table 21 in the Appendices for detail on the effect size for the above studies.

Obesity

Evidence base

Rated B. Ten articles are included in this review, eight are systematic reviews (total of 350 studies), one is an integrative research review and the final article is a narrative review. As not all reviews examined RCTs, five studies were given a ranking of I; and five studies were given a second ranking (such as III-3). The full details of these rankings can be found in Table 22 in the Appendices.

Consistency

Rated B to C, or Good to Satisfactory. The evidence suggests that obesity interventions that target obesity outcomes are consistently effective. However, the type of outcomes (for example physical activity and diet/nutrition) and interventions vary between programs (for example school, parent and community programs, or school and parent programs).

Clinical impact

Rated C or Satisfactory. Effect sizes were not reported in most studies. However, one meta-analysis pooling two studies with approximately 52,000 participants identified a very small effect size of 0.076. As mentioned above, it is generally accepted that an effect size of 0.5 is a medium effect, and an effect size of 0.8 is a large effect.

Generalisability

Rated A or Excellent. The findings of the reviews can be considered generalisable to the middle school aged populations. However, it should be noted that each review examined a variety of interventions and a variety of outcomes. Thus, each review needs to be interpreted within this context.

Applicability

Rated C or Satisfactory. The populations reflect children in OECD countries. Thus, the findings can be applied to the Australian context.

Table 11 Effectiveness of obesity program

Study	Number of studies	Type of study	Physical activity	Diet/nutrition	Combined diet & physical activity	Population	Other Components
Wang et al. ³⁴	139	SR MA	●	●	●	2-18 years	
Shirley et al. ³⁵	12	SR	○	○	●	6-12 years	Duration ●
Hung et al. ³⁶	27	SR MA	○	○	○	6-18 years	Duration ○
Guerra et al. ³⁷	38	SR MA	○	●	○	6-18 years	
Sbruzzi et al. ³⁸	26	SR MA	○	○	○	6-12 years	
Sobol-Goldberg et al. ³⁹	32	SR MA	●	●	●	Children	Duration ●
			●	●	○	Adolescents	
Waters et al. ⁴⁰	55	SR	●	●	●	6-12 years	
			○	○	○	13-18 years	
Kropski et al. ⁴¹	14	SR	○	●	○	4-12 years	
			●	●	● girls	10-14 years	
Thomas ⁴²	57	Literature review	●	●	●	School age	Facilitator
Cole et al. ⁴³	10	Integrative research review	●	●	●	4-14 years	Facilitator

- School only intervention effect
- School and parental intervention with effect
- School, parental and community intervention with effect
- Did not evaluate
- No effect

** Refer to Table 22 in the Appendices for detail on the above studies.

Models of effective programs

Given that the evidence summarising effective programs were based on meta-analyses and systematic reviews — of 804 studies in substance misuse and 350 studies in obesity — it was beyond the scope of this project to systematically identify the names of effective programs. However, an analysis was completed (see Tables 21 & 22 in the Appendices) to identify the main features of the effective interventions described within the included literature reviews. Tables 12 and 13 provide a summary of the developmental processes targeted by the effective interventions and the learnings relevant to the implementation of prevention programs in the middle school context.

Table 12 Summary of substance misuse prevention and SEL findings relevant to intervention process models identified in the included literature reviews published after 2010.

Study	Developmental Processes Targeted and Intervention Components
Champion et al. ²⁵ Teesson, et al. ²³	Computers or the internet offer an effective platform for school-based alcohol and other drug prevention programs with outcomes evident from 6 months to 34 months. The effective models are based on social development and cognitive behavioural risk process theories. Effective intervention components include normative education, peer resistance skills training, reducing positive expectancies, parenting components, interactive education and the standardisation of implementation . Longer programs were the most effective at between 4 and 12 lessons . The three programs that included booster lessons all showed significant effects.
Durlak et al. ^{11, 12}	SEL interventions have measurably higher effects where they avoid implementation problems and conform to quality design features described by the acronym SAFE: Sequenced (clear and coordinated program logic); Active (includes active learning components); Focused (at least one component developing personal or social skills); and Explicit (to SEL skills rather than general skills or positive development). Programs delivered by classroom teachers have more consistent effects compared to those delivered by non-school personnel. Multicomponent programs (e.g. whole of school programs) are not superior to single-component programs , due partly to the simpler implementation challenge for the latter.
Onrust et al. ²⁴	Substance misuse prevention processes have differential effects at different stages in adolescent development. For primary school students , universal programs that teach SEL skills, self-control and problem solving and healthy behaviours are the most beneficial. Teaching students about specific substances can be counter-productive as they may attract higher risk students to explore these substances. In early secondary school (early adolescence) SEL skills, social norm strategies and parent programs are effective, while preparing students to refuse peer pressure is not.

Table 13 Summary of obesity prevention findings relevant to intervention process models identified in the included literature reviews published after 2010.

Study	Developmental Processes Targeted and Intervention Components
Guerra et al. ³⁷ Sbruzzi et al. ³⁸	There is evidence for resiliency effects in obesity in that combined physical activity and nutrition education Interventions produced better results among overweight and obese children (Guerra et al. 2014). Behavioural modification, nutrition and physical activity educational interventions were more effective as treatment than prevention (Sbruzzi et al. 2013).
Shirley et al. ³⁵ Wang et al. ³⁴	School-based interventions had significant obesity prevention effects. Interventions implemented in schools with home involvement had the highest proportion of studies with favourable results (Wang et al). A greater proportion of multi-setting interventions demonstrated significant and beneficial results compared with single-setting interventions. The strength of evidence was highest for physical activity only interventions delivered in schools with home involvement and combined diet and physical activity interventions delivered in schools with both home and community components . There was a more moderate strength of evidence for school only interventions targeting either diet or physical activity alone, for combined diet and physical activity in school-based interventions with home or community components, and for combined diet and physical activity in community-based interventions with a school component.
Sobol-Goldberg et al. ³⁹	A range of programs effective in preventing obesity, effects greater at ages 5 to 12 years compared to 13 to 18 years. Largest effects were in longer programs one year or longer (1-4 years) in duration, with the following comprehensive intervention components : provide information on nutrition (diet) and physical activity, change attitudes, monitor behaviour, modify environments (e.g. increase access to healthy food and activity opportunities), involve parents, behaviour change to increase physical activity and healthy food intake and decrease unhealthy food and in fewer studies sedentary behaviour.
Waters et al. ⁴⁰	Child and adolescent programs for preventing obesity are effective. While effects are largest in the pre-school age period (0 to 5 years), there are larger effects for school-aged children (aged 6-12 years) compared to older adolescents (13-18 years), although these age differences were not statistically significant. Programs with diet or physical activity interventions had similar effect sizes, while programs that combined diet and physical activity intervention components had slightly larger effects; however, these program content differences were not statistically significant. Effects are slightly (not significantly) larger for programs that run for 12 months or longer .

6 Discussion

This review synthesised the findings of previous high quality literature reviews to identify risk and protective factors that influence the development of obesity and substance misuse in the middle school years, factors that promote resiliency (recovery from early problems) and effective prevention models that may hold relevance to New South Wales schools. This rapid review was guided by three research questions outlined below.

Question 1a: What is the evidence regarding the protective and risk factors that may influence healthy lifestyle choices and risk taking behaviour in children?

In respect to substance misuse, 17 individual risk factors, 8 family risk factors, 3 school risk factors and 3 community risk factors were identified. A total of 10 protective factors were identified related to substance misuse: 7 factors at the individual level, 2 factors at the family level; and 1 factor at the school level (Tables 3 and 4). These factors were categorised into developmental process theories that are relevant to children through the middle school years. Support was found for theories that included: cognitive behaviour development theories (whereby early age behaviour and attitudes to alcohol use predict later behaviours); social development theories (that explain how the development of substance misuse are predicted by perceived behaviours of peer and adult role models, poor family management, and low school engagement); self-regulation theories (explaining the influence of behavioural dysregulation indicated by conduct and attention problems) and community environments (alcohol availability). Risk and protective factors associated with stress and socioeconomic influence theories showed very small effects.

In respect to obesity, a total of seven individual risk factors, and four family risk factors were identified (see Table 5). Four protective factors were identified (Table 6). No school or community risk factors were identified. The identified risk and protective factors were associated with developmental theories that included: social development theories (the very strong predictive effect of overweight parents); and self-regulation theories (such as the predictive effects of sleep problems and behavioural dysregulation). The above had some similarities to the developmental process theories for substance misuse. Programs that target these developmental processes in primary and early secondary school could contribute to preventing both substance misuse and obesity.

Question 1b: What is the role of resilience in the pathway to healthy lifestyle choices in children?

Resiliency was defined in terms of both the process of adapting well in the face of adversity and significant stress, and the ability to “bounce back” or recover from early problems.¹ Modifiable factors that encourage resiliency have been described in both social development (healthy social bonding)⁶ and self-regulation theories.¹¹ Low levels of self-regulation were indicated in the review of risk factors for both substance misuse and obesity (see results for Q1a). Although outcome studies have not explicitly applied resiliency theories to prevent obesity, there was evidence that school-based programs can effectively assist overweight and obese children to bounce back toward healthy weight.^{37, 38} There was evidence that resiliency theories had been successfully applied in programs to prevent substance misuse in Australia.¹⁹

Question 2: What is the evidence regarding effective interventions and models to reduce risk taking behaviours in children of primary and early secondary school age?

There was generally high quality evidence for the effectiveness of programs implemented in the middle school years to increase SEL skills, and to prevent substance misuse and obesity. We synthesised the findings of twelve prior reviews relevant to substance misuse (Table 21, Appendices) and ten prior reviews on obesity (Table 22, Appendices). Overall effect sizes were small to moderate for substance misuse and small to very small for obesity. The intervention studies have examined these outcomes separately and the present report is one of few efforts to integrate the findings across substance misuse and obesity prevention. Table 12 presents a summary of the implications of the current review for the design and implementation of SEL and substance misuse prevention programs; Table 13 similarly presents implications relevant to obesity prevention.

In broad overview, SEL and substance misuse and obesity prevention programs are more effective in the middle school years where they: are guided by a clear program design based on behavioural and developmental theory;^{12, 19, 34, 35} are targeted to the developmental changes that occur in the middle school developmental period;²⁴ use evidence-based strategies to manage implementation challenges;^{11, 25} explicitly teach self-regulation skills such as social-emotional learning;^{11, 12, 24} involve parents;^{19, 24, 34, 35} and are extended across one or more years using strategies such as booster sessions in substance misuse prevention²⁵ and integration of obesity prevention components across years.³⁹

The evidence summarised in the present review provides some insights into how prevention programs should be scheduled and organised in the middle school context to enable the longer durations that are associated with the largest effects. Substance misuse programs were found to be more effective where they offered at least four and up to 12 lessons and included booster sessions (one or two reinforcing lessons) in a subsequent year.^{23, 25} Obesity programs had larger effects where they offered longer programs that ran for one to four years.^{39, 40} School obesity prevention programs were more effective where they were more comprehensive and did not rely simply on changes to school lesson content, but included components that take multiple years to organise, such as changes to the school: food supply, such as healthy food in the school canteen; facilities to encourage physical activity; and active transport opportunities.^{34, 35, 39, 40}

The available evidence points to some areas that should be carefully considered in designing and implementing prevention programs. Programs that use external experts rather than classroom teachers are controversial as there is some evidence for them being less successful in social-emotional learning.¹¹ Programs of this type can be effective, but should be carefully evaluated. Teaching students about specific substances in primary school can be counter-productive for substance misuse prevention, as this may attract higher risk students to explore these substances.²⁴

Given that both substance misuse and obesity are influenced by community environment factors, for example marketing and availability of alcohol and unhealthy food, there is attraction in designing prevention programs that include community components.^{34, 35} However, multi-component programs introduce complexity and this can result in trade-offs in reducing effectiveness due to increased implementation challenges.¹¹

A variety of developmental theories are shown in the present review to offer a valid basis for designing effective intervention models that link to evidence of risk and protective factors. Social development theories (positing social processes whereby peer and adult role models are large risk factors for substance misuse [Table 3] and obesity [Table 5]) have been successfully used in middle school prevention programs

(Table 12). Effective components that are based on these theories in substance misuse prevention include: normative education, peer resistance skills training^{23, 25} and parent components.^{19, 24} There has been more limited application of social development theories in obesity prevention.

Self-regulation theories (behavioural dysregulation and lack of skills for managing life challenges and stress lead to unhealthy behaviours) were evident in the identification of risk and protective factors for both substance misuse and obesity prevention (Table 7). There is evidence that the promotion and development of self-regulation through SEL skills can prevent illicit drug use in the primary and early secondary school years²⁴ and that resiliency programs can reduce alcohol use in Australian populations.¹⁹

Cognitive behaviour development theories were evident in the identification of risk factors for substance misuse, for example, early age alcohol use as a predictor of later problems (see Table 3). These theories have been prominent in the design of SEL programs,^{11, 12} substance misuse prevention, for example reducing positive expectancies,^{23, 25} and obesity prevention, for example changing attitudes and monitoring behaviour.³⁹

Computer and on-line delivery is demonstrated as effective in SEL promotion and substance misuse prevention²⁵ and should be further explored in obesity prevention. Computer and on-line delivery offers the potential to offer interactive educational experiences and to ensure standardised program implementation.

It is important to bear in mind the limitations of the current report. Firstly, the review is limited by the quality of previous systematic reviews and their application to school systems in Australia. To address this limitation, the current report has sought to offer transparent evaluations of the quality of evidence in each section. Secondly, the present review is limited in the available techniques for integrating the diverse study designs for producing evidence for risk, protection and resiliency to inform prevention program design. The current report has used developmental theory as a common bridge between these discrete research areas. Thirdly, the available evidence is not well designed to inform the most effective intervention models and components. To make confident conclusions regarding different intervention components, research studies would need to be designed that randomly assigned participants into programs with differing components. In general, this type of design is rare and literature reviews have relied on meta-analysis to compare interventions with varying models and components.

7 Appendices

Search strategy for Question 1a

What is the evidence regarding the protective and risk factors that may influence healthy lifestyle choices and risk taking behaviour in children?

Obesity and Substance use

The search terms used to identify evidence for Question 1a are listed in the table below. As this question addressed risk and protective factors as predictors for health behaviours, evidence was restricted to temporal (i.e. longitudinal) studies. Longitudinal studies examine whether a factor proceeds in time, and is predictive, of a health behaviour(s) at later time points.

Table 14 Search terms for Question 1a (as in body of report)

Outcome	Search terms
Obesity	"Risk factor*" OR "protective factor"
AND	Obes* OR overweight
AND	child* OR adolescen* OR teenage* OR youth*
AND	longitudinal
Substance Use	"Risk factor*" OR "protective factor"
AND	"Substance use" OR "alcohol use" OR "drug use"
AND	child* OR adolescen* OR teenage* OR youth*
AND	longitudinal

The PRISMA diagram for the studies identified for Question 1a is presented below.

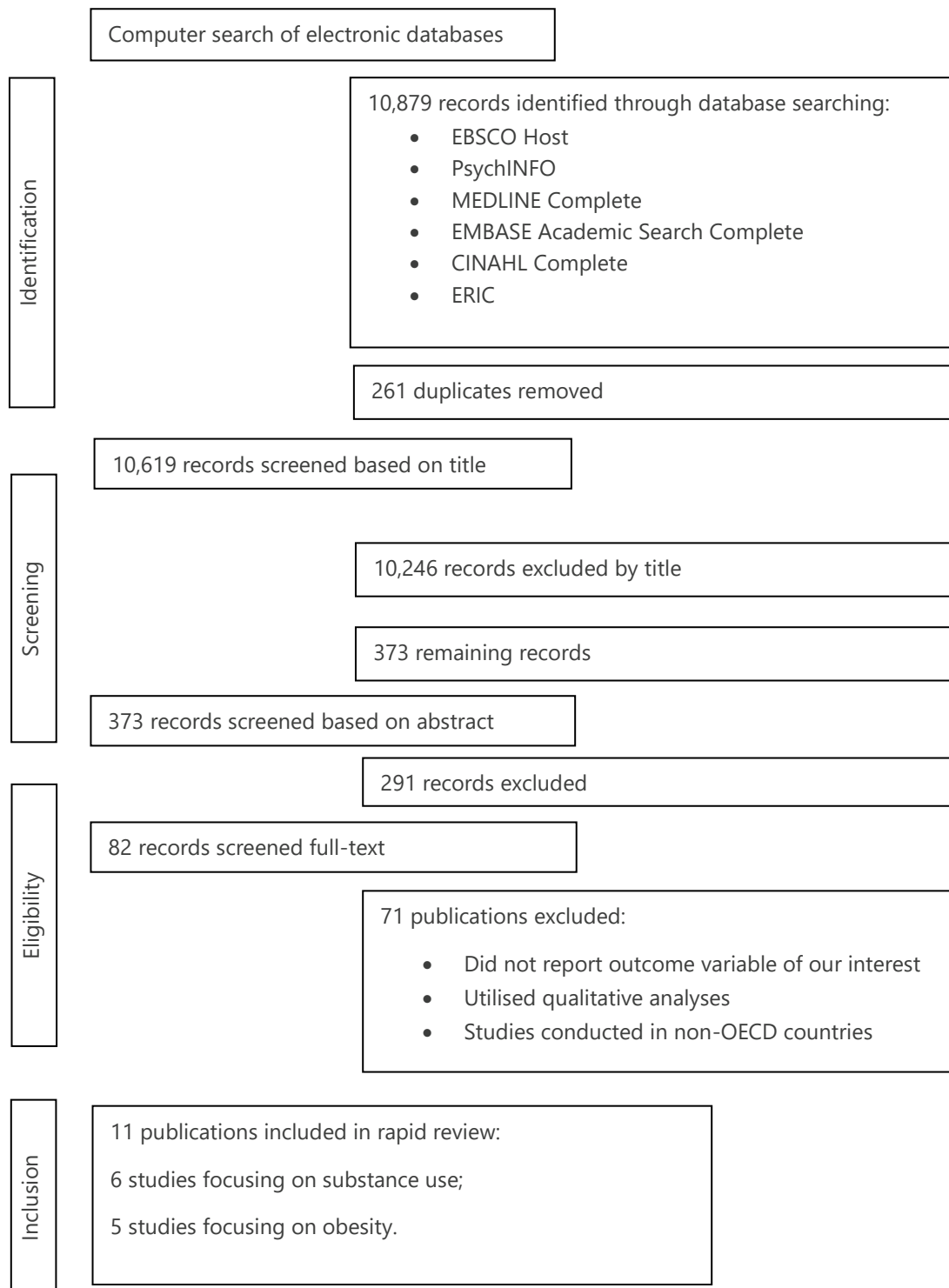


Figure 1 PRISMA diagram for flow of information in search process for Question 1a

Search strategy for Question 1b

What is the role of resilience in the pathway to healthy lifestyle choices in children?

The search terms used to identify evidence for Question 1b are listed in the table below. As this question investigated the role of resilience we investigated evidence based programs that either enhanced resilience or used resilience to reduce risky behaviour.

Role in Obesity and Substance misuse

Table 15 Search terms for Question 1b (as in body of report)

Outcome	Search terms
Substance Use	Interven* OR program* OR model*
AND	"Substance use" OR alcohol* OR drug*
AND	child*
AND	Resilien* OR "social emotional dev**"
Obesity	Interven* OR program* OR model*
AND	obes* OR nutriti* OR "health* eat*" OR "health* choice*" OR "health* behav*" OR overweight
AND	child*
AND	Resilien* OR "social emotional dev**"

Studies on effective interventions for resilience were also identified through a search of the grey and unpublished literature. We also made contact with our academic collaborators at New South Wales, who have recently completed a systematic review (currently unpublished, 2016) examining resiliency with primary school and secondary school children. We used this document to assist with identifying relevant studies for this review question.

The PRISMA diagram outlining the search strategy for Question 1b is presented below.

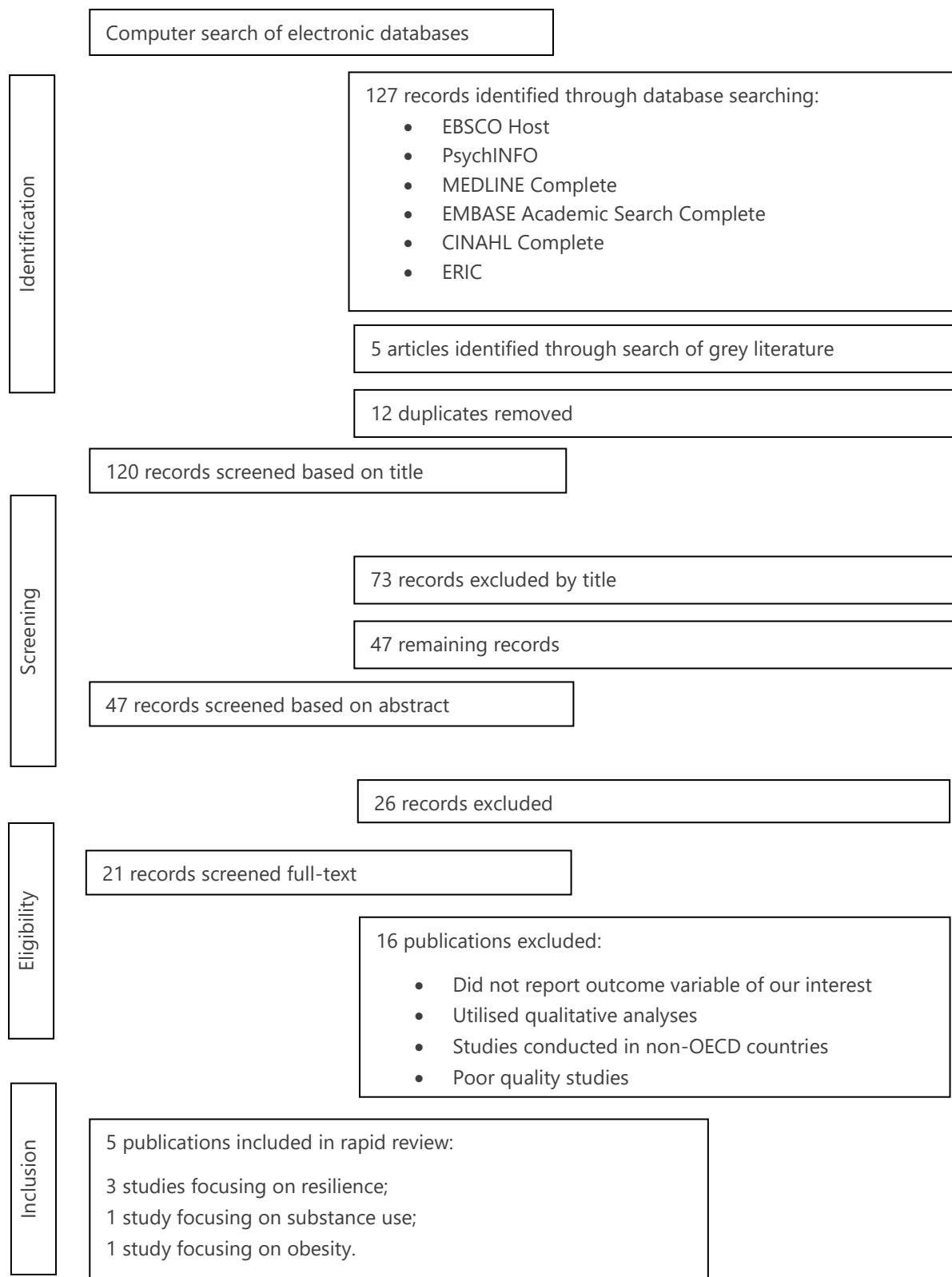


Figure 2 PRISMA diagram for flow of information in search process for Question 1b

Search strategy for Question 2

What is the evidence regarding effective interventions and models to reduce risk taking behaviours in children of primary and early secondary school age?

The following search terms were used to identify evidence for obesity or substance misuse related interventions for the above question. The PRISMA diagram outlining the search strategy is below.

Table 16 Search terms for Question 2 (as in body of report)

Outcome	Search terms
Obesity	interven*, model*, trial, program*
AND	review*, meta*, syst* review*
AND	obes*, nutriti*, health* eat*, health* choice*, health* behav*, overweight
AND	primary school, early secondary school, elementary school, school*
AND	child*
Substance use	interven*, model*, trial, program*
AND	review*, meta*, syst* review*
AND	"Substance use" OR alcohol* OR drug*
AND	primary school, early secondary school, elementary school, school*
AND	child*

Studies on effective interventions for substance use were identified through a search of the grey literature. Similar to work being done with resiliency we made contact with our academic collaborators at Melbourne University, who have recently completed a systematic review (currently unpublished, 2016) examining resiliency programs and substance use with primary school and secondary school children. We used this document to assist with identifying relevant studies that have been shown to be related to effective resiliency programs for substance misuse.

The PRISMA diagram outlining the search strategy for Question 2 is presented below.

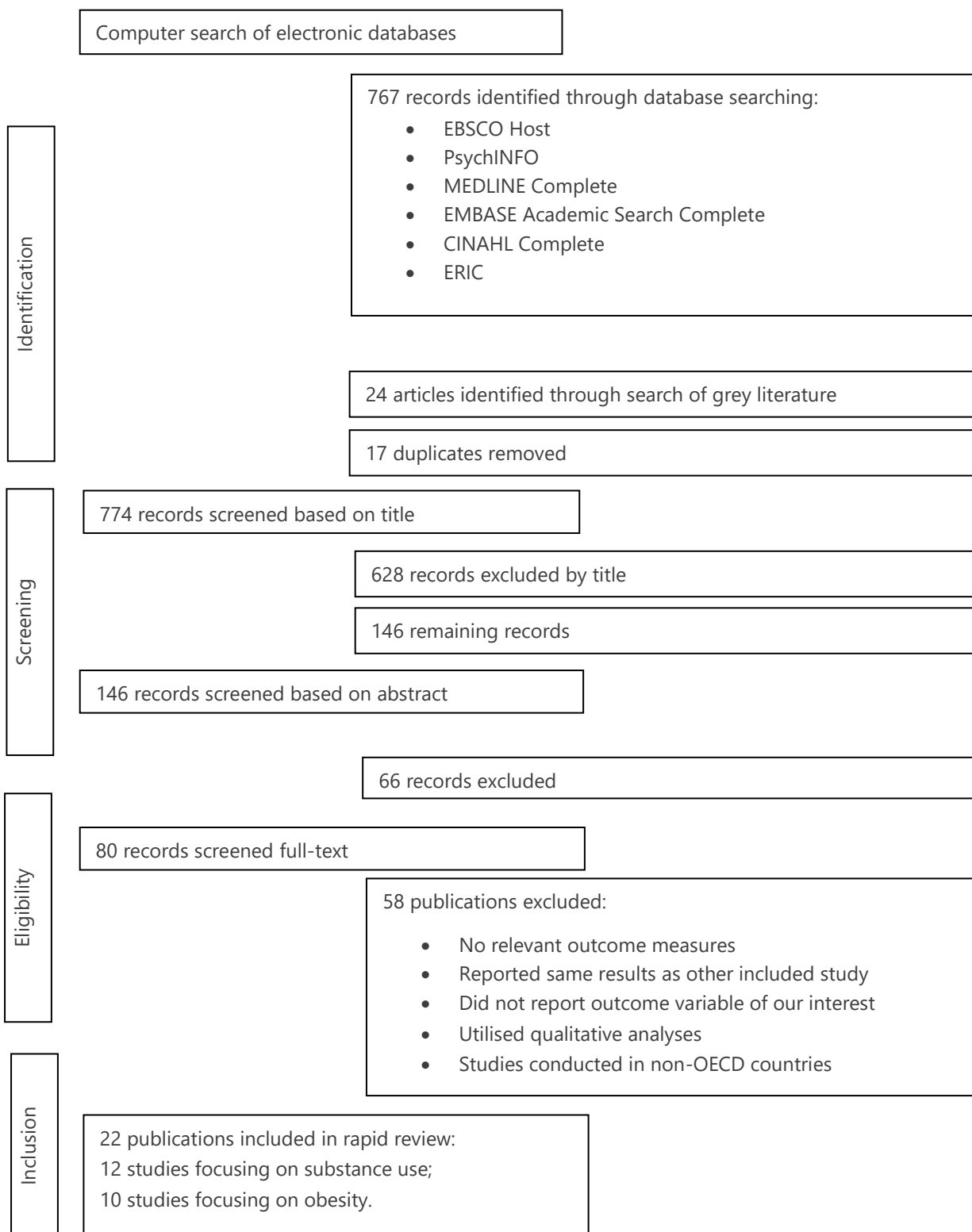


Figure 3 PRISMA diagram for flow of information in search process for Question 2

Table 17 NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE COHORT STUDIES

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability

Selection

1. Representativeness of the exposed cohort
 - a. truly representative of the average _____ (describe) in the community*
 - b. somewhat representative of the average _____ in the community*
 - c. selected group of users e.g. nurses, volunteers
 - d. no description of the derivation of the cohort.
2. Selection of the non-exposed cohort
 - a. drawn from the same community as the exposed cohort*
 - b. drawn from a different source
 - c. no description of the derivation of the non-exposed cohort.
3. Ascertainment of exposure
 - a. secure record (e.g. surgical records)*
 - b. structured interview*
 - c. written self report
 - d. no description.
4. Demonstration that outcome of interest was not present at start of study
 - a. Yes*
 - b. No.

Comparability

1. Comparability of cohorts on the basis of the design or analysis
 - a. study controls for _____ (select the most important factor)*
 - b. study controls for any additional factor (This criteria could be modified to indicate specific control for a second important factor.)*

Outcome

1. Assessment of outcome
 - a. independent blind assessment*
 - b. record linkage*
 - c. self-report
 - d. no description.
2. Was follow-up long enough for outcomes to occur
 - a. yes (select an adequate follow up period for outcome of interest)*

b. no.

3. Adequacy of follow up of cohorts

- a. complete follow up — all subjects accounted for*
- b. subjects lost to follow up unlikely to introduce bias - small number lost - > ___ % (select an adequate %) follow up, or description provided of those lost)*
- c. follow up rate < ___% (select an adequate %) and no description of those lost
- d. no statement.

Table 18 Summary of the evidence for risk and protective factors for substance use

Quality of Evidence		Study details	Study methods (design, sample size, particulars)	Outcome variables	Study findings	Effect range
Newcastle- Ottawa Scale	NHMRC Level of Evidence					
Selection: 3 Comparability: 2 Outcome: 2 Total: 7	Generalisability: A Applicability: A	Author: Scholes-Balog et al. Year: 2013 Country: Australia <i>Predicting Early Initiation of Alcohol Use: A Prospective Study of Australian Children</i>	Longitudinal 1-2 year duration N=927 Grade 5	Alcohol use	<i>Risk factors:</i> Peer/Individual – Friend’s use of drugs; sensation seeking Community – Perceived availability; acceptability, and normality of drug and alcohol use and increase risk of early alcohol use. Family – Poor family management; family history of antisocial behaviour (including drug and alcohol use) School – Low school commitment. <i>Protective factors:</i> Individual/peer – Peer rewards for prosocial behaviour; self-esteem may also play a protective role in childhood, but with less of an impact later in development.	Odds Ratio 1.33 – 4.91 (indicating a moderate to very strong effect)
Selection: 3 Comparability: 2 Outcome: 2 Total: 7	Generalisability: B Applicability: B	Author: Horner, Rew & Brown Year: 2012 Country: USA <i>Risk-taking Behaviors Engaged In By Early Adolescents While On School Property</i>	Longitudinal 1-3 year duration N=1460 Grades 4-6, follow-up in grade 7	Health risk behaviours in grade 7 (cigarette smoking, marijuana use, drinking alcohol, weapon carrying)	<i>Risk factors:</i> Tobacco & Marijuana: Having a large family size; expectation they would not complete school; feeling that family and friends do not care about them Marijuana & Alcohol: Less engagement in healthy actions in childhood; having more stressful life events; and lower global competence scores Alcohol: More likely to consider dropping out of school; having family and friends who were less caring of them; lower scholastic competence; and lower behavioural competence Tobacco use was significantly related to alcohol use and marijuana use. <i>Protective factors:</i>	r -0.05 – -0.09 (indicating weak effect)

Quality of Evidence		Study details	Study methods (design, sample size, particulars)	Outcome variables	Study findings	Effect range
Newcastle- Ottawa Scale	NHMRC Level of Evidence					
					Engaging in healthy behaviours, knowing others cared about them; having a sense of competence in middle childhood (Grades 4-6). Lack of these protective resources was found to be associated with engaging in health risk behaviours on school property.	
Selection: 3 Comparability: 2 Outcome: 2 Total: 7	Generalisability: B Applicability: B	Author: Donovan & Molina Year: 2011 Country: USA <i>Childhood risk factors for early-onset drinking</i>	Longitudinal 8.5 year duration N = 452 8 or 10 years old	Age of initiation of alcohol use	<i>Risk factors:</i> Lower expectations for academic achievement; less positive attitudes towards school; less intolerance of deviance; greater approval of drinking; lower religiosity; greater peer than parental influence; greater friends' approval of drinking and of other drug use; more conflict with parents; less parental control; higher perceived parental approval of child drinking; greater exposure to parental drinking; more frequent deviant behaviour; and less frequent religious behaviour.	Odds Ratio 0.899 – 1.883 (indicating a weak to strong effect)

Table 19 Summary of evidence for risk and protective factors for obesity

Quality of Evidence		Study details	Study methods (design, sample size, particulars)	Outcome variables	Study findings	Effect range
Newcastle- Ottawa Scale	NHMRC Level of Evidence					
Selection: 3 Comparability: 2 Outcome: 2 Total: 7	Generalisability: B Applicability: A	Author: Bonuck et al. Year: 2015 Country: USA <i>Sleep-Disordered Breathing, Sleep Duration, and Childhood Overweight: A Longitudinal Cohort Study</i>	Longitudinal 8 year duration N = 1899 7 year olds	Body mass index (BMI)	<i>Risk factors:</i> Sleep disordered breathing; short sleep duration associated with an increased chance of overweight.	Odds ratio 1.54-2.21 (indicating a moderate effect)
Selection: 2 Comparability: 2 Outcome: 1 Total: 5	Generalisability: B Applicability: A	Author: Crawford et al. Year: 2015 Country: Australia <i>Maternal efficacy and sedentary behaviour rules predict child obesity resilience</i>	Longitudinal 3 year duration N=200 5-12 year olds	Obesity/ weight gain	<i>Protective factors:</i> Maternal efficacy for preventing their child from engaging in sedentary behaviours; rules to limit sedentary behaviours was a predictor of being resilient to unhealthy weight gain	$\beta = -0.03$ & OR = 1.14
Selection: 3 Comparability: 2 Outcome: 2 Total: 7	Generalisability: B Applicability: A	Author: Pryor Year: 2015 Country: Canada <i>Early Risk Factors of Overweight Developmental Trajectories during Middle Childhood</i>	Longitudinal 6 year duration N = 2120 6 years old	Overweight	<i>Risk factors:</i> Maternal overprotection; short sleep duration; parental overweight	Odds ratio 1.22 – 7.29 (indicating a moderate to very strong effect for having both parents overweight)
Selection: 4 Comparability: 2 Outcome: 3 Total: 8	Generalisability: A Applicability: B	Author: Chang & Gable Year: 2013 Country: USA <i>Predicting Weight Status Stability and Change From Fifth Grade to Eighth Grade: The Significant Role of Adolescents' Social-Emotional</i>	Longitudinal 3 year duration N = 6220 5 th grade	Weight status	<i>Risk factors:</i> Levels of emotional functioning at grade 5 were associated with weight increase in adolescence: interpersonal skills; externalising; internalising.	Odds ratio 0.99-1.02

		<i>Wellbeing</i>				
Selection: 3 Comparability: 2 Outcome: 3 Total: 8	Generalisability: A Applicability: B	Author: White et al. Year: 2012 Country: England <i>Childhood psychological function and obesity risk across the lifecourse: findings from the 1970 British Cohort Study</i>	Longitudinal 19 years duration N=12,981 at 5yrs N=14,350* at 10 yrs. *children added to cohort	Obesity	<i>Risk factors:</i> General behavioural problems; inattention/hyperactivity; chronic conduct problems.	Odds ratio 1.0 – 1.5 (indicating a moderate effect)

Table 20 Analysis of six studies examining the role of resilience in healthy lifestyle choices in children

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Method of intervention	Outcome variables	Relevant findings and effects
I	Author: Durlak et al. Year: 2011 <i>The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions</i>	Systematic review and meta-analysis, 213 studies RCT & non-randomised controlled studies 1955-2007 Kindergarten to high school age N=270,034	Interventions to enhance social and emotional learning Curriculum interventions Skills training Environmental interventions Teacher led Non-school personnel led.	Social and emotional skills Attitudes towards self and others Positive social behaviour Conduct problems Emotional distress Academic performance.	Programs yielded significant positive effects on: <ul style="list-style-type: none"> • targeted social-emotional skills (mean ES=0.57), • attitudes about self, others, and school (mean ES=0.23) • Positive social behaviours (mean ES=0.24) • conduct problems (mean ES=0.22) • emotional distress (mean ES=0.24) • academic performance (mean ES=0.27). Effects remained statistically significant for a minimum of 6 months after the intervention Implemented by school teaching staff. Programs without implementation problems were more effective.
I	Author: Durlak et al. Year: 2010 <i>A Meta-Analysis of After-School Programs That Seek to Promote Personal and Social Skills in Children and Adolescents</i>	Systematic review and meta-analysis, 68 studies RCT & quasi-experimental study 1979-2008 5-18 years Not specified	Skills training After-school programs to promote personal and social skills	Self-esteem, self-concept, self-efficacy Bonding to school Positive social behaviours Problem behaviours Drug use School performance	Participants demonstrated significant increases in: <ul style="list-style-type: none"> • their self-perceptions (ES=0.34) • bonding to school (ES=0.12) • positive social behaviours • school grades and levels of academic achievement • significant reductions in problem behaviours. Programs defined as: sequenced, active, focused and explicit showed mean weighted ES = 0.31 (95% CI 0.24-0.38)
I	Author: Wells et al. Year: 2003 <i>A systematic review of universal approaches to mental health promotion in schools</i>	Systematic review, 17 studies RCT & controlled trials Universal approaches to mental health promotion in schools 1986-1999 Elementary to secondary	Teacher training Classroom activities Timetable changes Whole-school approach	Mental health Conduct problems Depression Suicidal ideation Behaviours Self-esteem	Improvements in: <ul style="list-style-type: none"> • self-concept • aggressive behaviour • negotiating and problem-solving. Positive evidence of effectiveness for programs that: <ul style="list-style-type: none"> • adopted a whole-school approach • were implemented continuously for more than a year

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Method of intervention	Outcome variables	Relevant findings and effects
		school N=13,672			<ul style="list-style-type: none"> were aimed at the promotion of mental health as opposed to the prevention of mental illness.
I	Author: Hodder et al. Year: 2017 <i>Systematic review of universal school-based 'resilience' interventions targeting adolescent tobacco, alcohol or illicit substance use: a meta-analysis</i>	Systematic review & meta-analysis, 19 studies RCTs & Cluster RCTs 1994-2015 5-18 yrs N=51,867	Resiliency intervention at individual and environmental (school) level	Tobacco use Alcohol consumption Illicit substance use	Illicit drug use reduction No effect for tobacco or alcohol use No adverse effects reported for any of the outcomes.
II	Author: Toumbourou et al. Year: 2013 Country: Australia <i>Reduction of adolescent alcohol use through family-school intervention: a randomized trial</i>	Longitudinal 2 year duration Randomised trial N = 2,354	Social relationship curriculum Parental involvement	Alcohol use	Relative to controls, intervention students showed significant reductions in any lifetime use (adjusted odds ratio [AOR], .78; 95% confidence interval [CI], .62e.97), and reduced progression to frequent (AOR, .69; CI, .56e.86) and heavy use (AOR, .75; CI, .60e.94).
III-2	Author: Chang & Gable Year: 2013 Country: USA <i>Predicting Weight Status Stability and Change From Fifth Grade to Eighth Grade: The Significant Role of Adolescents' Social-Emotional Well-Being</i>	Longitudinal 3 year duration N = 6220 5 th grade	Longitudinal study examining the role of s on weight change	Weight change	Teachers more likely to report internalising behaviour for children that were originally a healthy weight and changed to either overweight or obese, compared to children that remained with a health weight over the 3 year period.(Odds Ratio 1.02 (95 CI: 1-1.04). A small effect significant at p <0.05

Table 21 Analysis of the effectiveness of substance use interventions

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Method of intervention	Outcome variables	Relevant findings	Significant effect sizes
I	<p>Author: Onrust et al.</p> <p>Year: 2016</p> <p><i>School-based programmes to reduce and prevent substance use in different age groups: What works for whom? Systematic review and meta-regression analysis</i></p>	<p>Systematic review</p> <p>Meta-regression analysis</p> <p>288 programs</p> <p>Universal & targeted programs</p> <p>Experimental with control</p> <p>1966-2013</p> <p>Grades 1-12</p> <p>N = 436,180</p>	<p>Social influence theory</p> <p>Principles of cognitive behaviour therapy</p> <p>Trans-theoretical model of change.</p>	<p>Skills based</p> <p>Psychoeducation</p> <p>Social influence approach</p>	<p>Smoking</p> <p>Alcohol use</p> <p>Drug use</p>	<p><i>Smoking</i></p> <p>Elementary school: Generic programs that teach basic skills – social skills, self-control, problem-solving and healthy behaviours.</p> <p>Early adolescence: Social norm strategies; parental involvement; peer education; focusing on healthy alternatives; enhancement of basic skills, such as self-control, problem solving and decision making skills.</p> <p>Middle adolescence: No significant effects.</p> <p>Late adolescence: Self-control training; adjustment of the social norm; and peer education.</p> <p><i>Alcohol</i></p> <p>Elementary school: Self-control training, problem solving or decision making skills; applying techniques from cognitive behavioural therapy; and behavioural management by a parent or teacher.</p> <p>Early adolescence: Self-control training, problem solving or decision making skills training, focusing on healthy alternatives, applying techniques from cognitive behavioural therapy, behavioural management by a parent or teacher, and parental involvement.</p> <p>Middle adolescence: Significant adverse effects (see below).</p> <p>Late adolescence: Self-control training, problem solving or decision making skills training, health education on the interference of substance use with personal goals, refusal skills training, programs based on a social influence approach, applying techniques from cognitive behavioural therapy and involvement of parents in the program.</p> <p><i>Drug use</i></p> <p>Elementary: Self-control training</p> <p>Early adolescence: Social skills training, self-control training, problem solving or decision-making skills training, making a public commitment not to use substances, applying techniques from cognitive behavioural therapy, and</p>	<p>Measured using Cohen's <i>d</i>.</p> <p><i>Primary</i></p> <p>Smoking: $d = -.15$ (CI -.21 to -.08)</p> <p>Alcohol: $d = -.14$ (CI -.21 to -.08)</p> <p>Drug Use: $d = -.14$ (CI -.28 to -.01)</p> <p><i>Early adolescence</i></p> <p>Smoking: $d = -.14$ (CI -.20 to -.09)</p> <p>Alcohol: $d = -.10$ (CI -.15 to -.05)</p> <p>Drug Use: $d = -.14$ (CI -.20 to -.08)</p> <p><i>Middle adolescence</i></p> <p>Smoking: $d = -.09$ (CI -.13 to -.06)</p>

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Method of intervention	Outcome variables	Relevant findings	Significant effect sizes
						<p>mentoring.</p> <p>Middle adolescence: No significant effects.</p> <p>Late adolescence: Self-control training and adjustment of the social norm.</p> <p><i>Adverse effects for Alcohol:</i></p> <p>Early adolescence: Adverse effects found with refusal skills training and peer education.</p> <p>Middle adolescence: Adverse effects found with refusal skills training and making a public statement not to use substances.</p>	

Table 22 Analysis of the effectiveness of obesity interventions

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Focus of intervention	Outcome variables	Relevant findings
I/IV	Author: Wang et al. Year: 2015 <i>What childhood obesity prevention programmes work? A systematic review and meta-analysis</i>	Systematic review Meta-analysis 139 studies RCT, quasi-experimental & natural experiments 1985-2013 2-18 years N = 183,683	Not specified	Diet Physical activity Combined diet-physical activity	BMI Waist circumference Percent body fat Skin-fold thickness Prevalence of overweight or obesity	<i>High strength of evidence (SOE)</i> Physical activity (PA) only in schools with home involvement and combined PA/diet in schools with both home and community components. <i>Moderate strength of evidence</i> PA or diet only in schools and combined PA/diet in schools with home or community components. Moderate SOE to support effectiveness of school-based interventions. Multi-setting studies showed better results than single-setting interventions. SOE varied by intervention strategy and setting Cost-effectiveness was not studied.
I/III-3	Author: Shirley et al. Year: 2015 <i>Combinations of Obesity Prevention Strategies in US Elementary Schools: A Critical Review</i>	Systematic review Experimental & quasi-experimental with control 12 studies 2007-2012 6-12 years	Not specified	Physical activity Education Combined PA & nutrition Combined PA, nutrition & education	BMI Percent body fat Weight Level of PA (9)	Most studies with two or three components (i.e. physical activity plus nutrition, physical activity plus both education and nutrition) reported statistically significant improvements in objective obesity-related outcomes. Studies evaluating programs with community and parental involvement suggest that these components may increase effectiveness. Long-term implementation of programs is important for sustained gains, but longer interventions did not always produce better results.

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Focus of intervention	Outcome variables	Relevant findings
I	Author: Hung et al. Year: 2015 <i>A meta-analysis of school-based obesity prevention programs demonstrates limited efficacy of decreasing childhood obesity</i>	Meta-analysis 27 programs RCT & cohort interventions with control 1982-2010 6-18 N = 26,114	Social cognitive theory Social learning theory	Physical activity Nutrition Combined PA & nutrition	BMI Skinfold thickness	School-based interventions have not been effective for improving body mass index or skinfold thickness to curb childhood obesity; however, randomised controlled trials that focused on physical activity or nutrition appeared to produce promising results. RCTs with single component were more effective than multiple components The parental effect was unclear No effect found for longer duration programs.
I	Author: Guerra et al. Year: 2014 <i>School-based physical activity and nutritional education interventions on body mass index: A meta-analysis of randomised community trials — Project PANE</i>	Systematic review Meta-analysis 38 studies RCT ? – 2012 6-18 years N=28,870	Social cognitive theory (8)	Physical activity Nutrition education Combined PA & nutrition education	BMI	No statistically significant effect for combined PA & nutrition interventions. Interventions produced better results among overweight and obese children. High heterogeneity among studies Significant effect for nutrition education only interventions, based on one large study.
I	Author: Sbruzzi et al. Year: 2013 <i>Educational interventions in childhood obesity: A systematic review with meta-analysis of randomized clinical trials</i>	Systematic review Meta-analysis 26 studies RCT ?-2012 6-12 years N = 26,617	Not specified	Behavioural modification Nutrition Physical activity	Waist circumference BMI Blood pressure Lipid profile	There were no differences in outcomes assessed in prevention studies. Educational interventions are effective in treatment, but not prevention, of childhood obesity and its consequences.

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Focus of intervention	Outcome variables	Relevant findings
I	Author: Sobol-Goldberg et al. Year: 2012 <i>School-Based Obesity Prevention Programs: A Meta-Analysis of Randomized Controlled Trials</i>	Systematic review Meta-analysis 32 studies RCT 2006-2012 5-18 years N = 52,109	Not specified	Healthy lifestyle behaviours Physical activity Sedentary activities Nutrition	BMI	Overall programs were mildly effective (effect size=0.076) in reducing BMI. Studies of children had significant intervention effects. Largest effects in programs 1 year + in duration, with following elements: provide information on nutrition and PA, change attitudes, monitor behaviour, modify environment, involve parents, increase PA and improve diet. Long term, comprehensive interventions most effective. Parental involvement associated with greater success.
I/III-2	Author: Waters et al. Year: 2011 <i>Interventions for preventing obesity in children (Review)</i>	Cochrane review 55 studies Controlled trials (with or without randomisation) 1990-2011 0-18 years N=27,946	Social cognitive Family systems Social learning Learning through play Self-determination theory Settings based approach Socio-ecological Theory of Planned Behaviour Trans-theoretical model	Educational Health promotion Psychological/ family/behavioural therapy/ counselling/management strategies Diet Physical activity Combined diet & PA	Weight & height Per cent fat content BMI Ponderal index Skin-fold thickness Prevalence of overweight & obesity	Programs were effective at reducing adiposity Strong evidence to support beneficial effects of child obesity prevention programs on BMI, particularly for programs targeted to children aged six to 12 years Programs with diet or PA or combination Diet interventions for 13-18 yrs not effective.

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Focus of intervention	Outcome variables	Relevant findings
			Behavioural determinants model			
I/III-2	Author: Kropski et al. Year: 2008 <i>School-based Obesity Prevention Programs: An Evidence-based Review</i>	Systematic review 14 studies Experimental Quasi-experimental 1990 – 2005 Elementary and secondary school N = 43,130	Not specified	Nutrition Physical activity Combined nutrition & PA Sedentary behaviour	BMI Measure of body fat or obesity/ overweight prevalence	Overall quality of evidence is weak 1 study strong evidence (girls only) Follow-up 6 mths + after baseline 1 study nutrition only 2 studies PA only 12 studies reported significant improvement in at least one measure Programs grounded in social learning may be more appropriate for girls Structural and environmental interventions enabling PA may be more effective for boys No effect found for parental involvement.
I	Author: Thomas Year: 2006 <i>Obesity prevention programs for children and youth: why are their results so modest?</i>	Literature review 57 studies RCT 1985 – 2003 Elementary and secondary school Not specified	Ecological systems theory Social Cognitive Theory Health belief model Social learning theory Behavioural choice theory Behavioural-	Nutrition education Physical activity education Healthy lifestyle education Combined physical activity & nutrition	Self-reported changes in fruit, veg, fat and salt intake BMI Skinfold thickness MVPA changes Changes in duration, frequency and intensity of PA	Results were modest and mixed. 33 studies reported statistically significant results in some outcomes but not others. 4 studies reported statistically and clinically significant results Few did post-test follow up – unclear if changes were maintained. In 4 significant studies, all were implemented by teachers who received specific training in the intervention. Specially trained teachers have greater effect.

NHMRC Level of Evidence	Study details	Study methods (design, sample size, particulars)	Theory	Focus of intervention	Outcome variables	Relevant findings
			epidemiologic al model of distal to proximal risk			
III-3	Author: Cole et al. Year: 2006 <i>An Integrative Research Review: Effective School-Based Childhood Overweight Interventions</i>	Integrative research review 10 studies Experimental (7), quasi-experimental (2) and non-experimental (1)	Social Cognitive Theory	Healthy lifestyle education Dietary habits Physical activity Combination PA & diet	BMI Weight	<p>The findings of this review support the fact that the majority of school-based interventions used multiple treatment modalities to address childhood overweight.</p> <p>This article only reviewed effective interventions.</p> <p>Teachers delivered healthy lifestyle education interventions and shared delivery with nutritionists in 3 studies.</p> <p>Inclusion of parents and peers in PA interventions and non-competitive, fun focus in curricula were present.</p> <p>Combination of all intervention approaches in 4 studies, healthy lifestyle education and PA treatment in 3 studies, healthy lifestyle education only in 2 studies and PA intervention only in 1 study.</p> <p>Incentives used to promote positive change in behaviours.</p>

8 References

1. (APA) APA. The Road to Resilience. 2016. [Access Date: December 9]. Available from: <http://www.apa.org/helpcenter/road-resilience.aspx>(Cole, Waldrop, D'Auria, & Garner, 2006)
2. Mrazek PJ, Haggerty RJ. Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research. Washington, DC, US: National Academy Press; 1994.
3. Rutter M. Environmentally Mediated Risks for Psychopathology: Research Strategies and Findings. *Journal Of The American Academy Of Child And Adolescent Psychiatry*. 2005;44(1):3-18.
4. Bowlby J. Attachment and Loss: London, Hogarth P.; Institute of Psycho-Analysis, 1969-1980.; 1969.
5. Ainsworth MDS, Bell SM. Attachment, Exploration, and Separation: Illustrated by the Behavior of One-Year-Olds in a Strange Situation. *Child Development*. 1970;41(1):49-67.
6. Catalano RF, Hawkins JD. Social Development Model: A Theory of Antisocial Behavior (from Delinquency & Crime: Current Theories, P 149-197, 1996, J. David Hawkins, Ed. -- See Ncj-161769). United States 1996
7. Anda RF, Felitti VJ, Bremner JD, Walker JD, Whitfield C, et al. The Enduring Effects of Abuse and Related Adverse Experiences in Childhood; a Convergence of Evidence from Neurobiology and Epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*. 2006(3)
8. Toumbourou JW, Olsson CA, Rowland B, Renati S, Hallam B. Health Psychology Intervention in Key Social Environments to Promote Adolescent Health. *Australian Psychologist*. 2014;49(2):66-74.
9. Bronfenbrenner U. *The Ecology of Human Development : Experiments by Nature and Design*: Cambridge, Mass. : Harvard University Press, 1979.; 1979.
10. Axford N. What's in a Service? *Child & Family Social Work*. 2010;15(4):473-82.
11. Durlak JA, Weissberg RP, Dymnicki AB, Taylor RD, Schellinger KB. The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*. 2011:405.
12. Durlak JA, Weissberg RP, Pachan M. A Meta-Analysis of after-School Programs That Seek to Promote Personal and Social Skills in Children and Adolescents. *American Journal of Community Psychology*. 2010;45(3/4):294-309.
13. Loxley W, Toumbourou JW, Stockwell T, Haines B, Scott K, et al. The Prevention of Substance Use, Risk and Harm in Australia: A Review of the Evidence. Canberra: The Australian Government Department of Health and Ageing; 2004. Available from: http://webarchive.nla.gov.au/gov/20140801053539/http://www.health.gov.au/internet/main/publishing.nsf/Content/health-publth-publicat-document-mono_prevention-cnt.htm
14. Shadish WR, Cook TD, Campbell DT. *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Boston, MA, US: Houghton, Mifflin and Company; 2002.
15. Donovan JE, Molina BSG. Childhood Risk Factors for Early-Onset Drinking. *Journal Of Studies On Alcohol And Drugs*. 2011;72(5):741-51.
16. Scholes-Balog KE, Hemphill S, Reid S, Patton G, Toumbourou J. Predicting Early Initiation of Alcohol Use: A Prospective Study Of Australian Children. *Substance Use & Misuse*. 2013;48(4):343-52.
17. Wong MMN, Joel T.; Zucker, Robert A.; Puttler, Leon I.; Fitzgerald, Hiram, E.; Jester, Jennifer M.; Glass, Jennifer M.; Adams, Kenneth. Behavioral Control and Resiliency in the Onset of Alcohol and Illicit Drug Use: A Prospective Study from Preschool to Adolescence. *Child Development*. 2006;77(4):1016-33.
18. Hodder RK, Freund M, Wolfenden L, Bowman J, Nepal S, et al. Systematic Review of Universal School-Based 'Resilience' Interventions Targeting Adolescent Tobacco, Alcohol or Illicit Substance Use: A Meta-Analysis. *Preventive Medicine*. 2017
19. Toumbourou JW, Gregg MED, Shortt AL, Hutchinson DM, Slaviero TM. Reduction of Adolescent Alcohol Use through Family-School Intervention: A Randomized Trial. *The Journal Of Adolescent Health: Official Publication Of The Society For Adolescent Medicine*. 2013;53(6):778-84.
20. Chang Y, Gable S. Predicting Weight Status Stability and Change from Fifth Grade to Eighth Grade: The Significant Role of Adolescents' Social-Emotional Well-Being. *Journal of Adolescent Health*. 2013;52(4):448-55.
21. Wells J, Barlow J, Stewart-Brown S. A Systematic Review of Universal Approaches to Mental Health Promotion in Schools. *Health Education*. 2003;103(4):197-220.

22. Gottfredson DC, Wilson DB. Characteristics of Effective School-Based Substance Abuse Prevention. *Prevention Science*. 2003;1(1):27.
23. Teesson M, Newton NC, Barrett EL. Australian School-Based Prevention Programs for Alcohol and Other Drugs: A Systematic Review. *Drug & Alcohol Review*. 2012;31(6):731-36.
24. Onrust SA, Otten R, Lammers J, Smit F. School-Based Programmes to Reduce and Prevent Substance Use in Different Age Groups: What Works for Whom? Systematic Review and Meta-Regression Analysis. *Clinical Psychology Review*. 2016;44:45-59.
25. Champion KE, Newton NC, Barrett EL, Teesson M. A Systematic Review of School-Based Alcohol and Other Drug Prevention Programs Facilitated by Computers or the Internet. *Drug and Alcohol Review*. 2013;32(2):115-23.
26. Foxcroft DR, Tsertsvadze A. Universal School-Based Prevention Programs for Alcohol Misuse in Young People. *Evidence-Based Child Health*. 2012;7(2):450-575.
27. Lemstra M, Bennett N, Nannapaneni U, Neudorf C, Warren L, et al. A Systematic Review of School-Based Marijuana and Alcohol Prevention Programs Targeting Adolescents Aged 10-15. *ADDICTION RESEARCH & THEORY*. 2010;18(1):84-96.
28. Porath-Waller AJ, Beasley E, Beirness DJ. A Meta-Analytic Review of School-Based Prevention for Cannabis Use. *HEALTH EDUCATION & BEHAVIOR*. 2010;37(5):709-23.
29. Faggiano F, Vigna-Taglianti FD, Versino E, Zambon A, Borraccino A, et al. Review: School-Based Prevention for Illicit Drugs Use: A Systematic Review. *Preventive Medicine*. 2008;46:385-96.
30. Soole DW, Mazerolle L, Rombouts S. School-Based Drug Prevention Programs: A Review of What Works. *AUSTRALIAN AND NEW ZEALAND JOURNAL OF CRIMINOLOGY*. 2008;41(2):259-86.
31. Skara S, Sussman S. Regular Article: A Review of 25 Long-Term Adolescent Tobacco and Other Drug Use Prevention Program Evaluations. *Preventive Medicine*. 2003;37:451-74.
32. Cuijpers P. Peer-Led and Adult-Led School Drug Prevention: A Meta-Analytic Comparison. *Journal of Drug Education*. 2002;32(2):107-19.
33. Tobler NSR, Michael R; Ochshorn, Peter; Marshall, Diana G; , Streke AVaS, Kimberly M School-Based Adolescent Drug Prevention Programs: 1998 Meta-Analysis. *The Journal of Primary Prevention*. 2000;20(4):275-336.
34. Wang Y, Cai L, Wu Y, Wilson RF, Weston C, et al. What Childhood Obesity Prevention Programmes Work? A Systematic Review and Meta-Analysis. *Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity*. 2015;16(7):547-65.
35. Shirley K, Rutfield R, Hall N, Fedor N, McCaughey VK, et al. Combinations of Obesity Prevention Strategies in Us Elementary Schools: A Critical Review. *The Journal Of Primary Prevention*. 2015;36(1):1-20.
36. Hung L-S, Tidwell DK, Hall ME, Lee ML, Briley CA, et al. A Meta-Analysis of School-Based Obesity Prevention Programs Demonstrates Limited Efficacy of Decreasing Childhood Obesity. *Nutrition Research*. 2015;35(3):229-40.
37. Guerra PH, Nobre MRC, da Silveira JAC, Taddei JAAC. School-Based Physical Activity and Nutritional Education Interventions on Body Mass Index: A Meta-Analysis of Randomised Community Trials - Project Pane. *Preventive Medicine*. 2014;61:81-89.
38. Sbruzzi G, Eibel B, Barbiero SM, Petkowicz RO, Ribeiro RA, et al. Educational Interventions in Childhood Obesity: A Systematic Review with Meta-Analysis of Randomized Clinical Trials. *Preventive Medicine*. 2013;56(5):254-64.
39. Sobol-Goldberg S, Rabinowitz J, Gross R. School-Based Obesity Prevention Programs: A Meta-Analysis of Randomized Controlled Trials. *Obesity (19307381)*. 2013;21(12):2422-28.
40. Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, et al. Interventions for Preventing Obesity in Children. *Cochrane Database of Systematic Reviews*. 2011:N.PAG-N.PAG.
41. Kropski JA, Keckley PH, Jensen GL. School-Based Obesity Prevention Programs: An Evidence-Based Review. *Obesity (19307381)*. 2008;16(5):1009-18.
42. Thomas H. Obesity Prevention Programs for Children and Youth: Why Are Their Results So Modest? *Health Education Research*. 2006;21(6):783-95.
43. Cole K, Waldrop J, D'Auria J, Garner H. An Integrative Research Review: Effective School-Based Childhood Overweight Interventions. *Journal for Specialists in Pediatric Nursing*. 2006;11(3):166-77.