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Evidence Check

Effectiveness of oral health promotion interventions

An Evidence Check rapid review brokered by the Sax Institute and commissioned by Dental Health Services Victoria for the Victorian Department of Health—September 2022

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This report was prepared by: Kritika Rana, Kanchana Ekanayake, Ritesh Chimoriya, Elizabeth Palu, Loc Do, Mihiri Silva, Santosh Tadakamadla, Sameer Bhole, Cheru Tesema Leshargie, Li Ming Wen, Diep Ha and Amit Arora

September 2022

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An Evidence Check rapid review brokered by the Sax Institute and commissioned by Dental Health Services Victoria for the Victorian Department of Health. September 2022.

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Key Messages

The aim of this Evidence Check rapid review—funded by the Victorian Department of Health and commissioned by the Dental Health Services Victoria—is to synthesise the evidence for the effectiveness of oral health promotion interventions in the Australian population. It contains 46 reviews published between 2012 and 2021 that included studies conducted in Australia and other countries and jurisdictions with comparable health systems to Victoria and Australia, i.e. the UK, New Zealand, Canada and the US.

Based on the Evidence Check's findings, some of the oral health promotion interventions that have been found to be effective and may be feasible in the Victorian and Australian settings are:

- **Children and adolescents:**
  - Use of fluoride toothpastes for preschool children
  - Motivational interviewing and community level dental health promotion
  - Multiple oral health education sessions, with either group activities or provision of leaflets
  - School-based education programs with multiple oral health education sessions
  - Use of fluoride varnish, fluoride gel and fluoride mouth rinse
- **Older people residing in a care facility:**
  - Workforce model of nurse-led training of aged care nurses and oral health professional-led training of aged care nurses with ongoing clinical support
  - Educational interventions (for caregivers, patients, staff or relatives)
- **Pregnant women and mothers with young infants:**
  - Interventions with educational components for improving skills and eliciting behaviour change
  - Postnatal oral health education with or without individualised counselling, provision of written oral health promotion materials, and community wide oral health initiatives
- **Mixed population groups (children, adults and older people)**
  - Oral health advice and education along with referral to general dental practitioners, dental specialists and dental emergency services when needed
  - Use of xylitol as an alternative sweetener among adults; use of xylitol and erythritol among children, adults and older people; use of fluoride toothpaste containing 10% xylitol (for 2.5–3 years) for children and adults
  - Use of sugar-free gums for children and adults
  - Water fluoridation
  - Use of fluoride toothpaste for young children and adults.

These interventions have been found to be effective in countries with comparable health systems to Australia's, yet require careful consideration based on the quality of evidence. Further research may be required to ascertain the feasibility and effectiveness of the interventions in Victoria and Australia.

Table 1—Oral health promotion interventions that may be replicable in the Victorian/Australian setting by Integrated Health Promotion categories

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
Children and adolescents ***Infants, toddlers and preschool children***			After-lunch brushing program and culturally sensitive oral health resources[1]		
		Working with the Closing the Gap Clinical Outreach teams for application of fluoride and with schools for toothbrushing program[1]			
		Oral health education session (baseline, six, 18, and 30 months)[1]			
				Use of fluoride toothpastes for preschool children[2]	
		Motivational interviewing and community level dental health promotion[3]			
		Motivational interviewing or counselling techniques for preventing caries[4]			
School-children		Multiple educational sessions (on tooth function, diet and teeth, toothbrushing instruction and dietary topics)[5]			

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
		Multiple oral health education sessions (with group activities or provision of leaflets)[6]			
	School-based dental screening followed by a referral card[7]				
***Children and adolescents**		Oral health education (e.g. lectures, leaflets, counselling); oral health instruction of toothbrushing; toothbrushing demonstration and supervised toothbrushing[8]			
	School-based dental health education; multiple sessions of oral health education[9]				
		School-based education program with multiple oral health education sessions (four lessons, one hour each) designed to fit in the national curriculum[10]			
					Fluoride varnish, fluoride gel and fluoride mouth rinse[11–13]

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
					Fissure sealants in combination with water fluoridation[14]
	Oral health education, fluoride rinsing, introduction of reticulated fluoride water supply and daily brush-ins with fluoride application[15]				
Older people residing in a care facility	Nurse-led training of aged care nurses; oral health professional-led training of aged care nurses, with ongoing clinical support[16]				
		Educational interventions (designed for caregivers, patients, staff or relatives)[17]			
Pregnant women and mothers with young infants		Dental education sessions in prenatal period[18]			
	Oral health interventions with educational components for improving skills and eliciting behaviour change[19]				
		Postnatal oral health education with or without individualised counselling, provision of oral health promotion materials, and community wide oral health initiative[20]			

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
Mixed population groups (children, adults and older people)	Oral health advice/education; referral to dental practitioners, dental specialists and emergency services[21]				
				Use of xylitol as an alternative sweetener[22]; xylitol and erythritol use[23]; use of fluoride toothpaste containing 10% xylitol[24]	
					Use of sugar-free gums for children and adults[25]
					Water fluoridation[26]
				Use of fluoride toothpaste for children and adults[27]	

Legend:

Assessment of quality of evidence is as per NHMRC levels of evidence[28]:

Level I	Level II	Level III-**1**	Level III-**2**	Level III-**3**	Level IV

Note:

When choosing interventions, as well as choosing interventions based on the strength of evidence, consideration needs to be given to implementing a mix of interventions across the Health Promotion categories. An appropriate mix of interventions that balance both individual and population-wide interventions has the maximum impact.[29, 30]

* The included reviews focused on different age groups of children and adolescents. Overall, we identified three population subgroups: (1) Infants, toddlers and preschool children; (2) Schoolchildren; (3) Children and adolescents. As the results varied with the population, the results were also synthesised as per these subgroups.

Executive summary

Background

Oral health is multidimensional in nature and includes physical, psychological, emotional and social domains, which are integral to overall health and wellbeing.[31, 32] Despite being largely preventable, oral diseases are a major public health issue globally.[33, 34] They affect more than 3.5 billion individuals across the world, with untreated dental caries identified as the most prevalent health condition.[34] Oral disorders contribute to 2.4% of the total health burden in Australia[35], with dental caries being one of the most predominant conditions for both children and adults.[36, 37]

Oral disease has been identified as a key marker of social disadvantage, resulting in inequalities in oral health.[30, 38] The National Oral Health Plan 2015–2024 has identified a number of priority population groups who continue to experience poor oral health.[39] These include people who are socially disadvantaged or on low incomes, Aboriginal and Torres Strait Islander people, people living in regional and remote areas, and people with additional and/or specialised healthcare needs.[39]

Oral health promotion interventions are used to prevent oral diseases and improve oral health knowledge, literacy, attitudes and positive oral health practices.[40–42] These interventions focus on providing structural supports and information related to oral health in a wide range of clinical and non-clinical settings, including dental clinics, childcare and preschools, workplaces, residential care and community settings.[30, 42] However, it is essential to understand which oral health promotion interventions are effective and applicable to the Australian population.

The aim of this Evidence Check rapid review—funded by the Victorian Department of Health and commissioned by the Dental Health Services Victoria—is to synthesise the evidence of the effectiveness of oral health promotion interventions for the Australian population.

Evidence Check questions

This Evidence Check sought to answer the following questions:

Question 1: What are the most effective types of health promotion interventions to prevent oral disease in the Australian population?

Question 2: Based on the findings from Question 1, which best practice evidence-based oral health promotion interventions are most relevant for the Australian population?

Summary of methods

The Evidence Check authors conducted a rapid review of systematic reviews of oral health promotion interventions undertaken in non-clinical or community settings. Studies were limited to those conducted in Australia and countries and jurisdictions with comparable health systems to Victoria and Australia, i.e. the UK, New Zealand, Canada and the US. We systematically searched both peer-reviewed and grey literature for English-language studies published between 2012 and 2021, including studies accepted for publication until December 2021. We used MEDLINE (Ovid), Embase, Web of Science and ERIC to find peer-reviewed literature. We conducted an extensive grey literature search of relevant websites and other evidence sources noted in the project brief, and manual searches of studies eligible for inclusion. After screening titles and abstracts, we reviewed full-text reports and extracted data. Studies included in the Evidence Check were assessed using the National Health and Medical Research Council (NHMRC) criteria to determine the level of evidence.[28]

Key findings

We included 46 reviews in the Evidence Check, of which 38 were sourced from the databases and eight from the manual search. Each review focused on a certain population group: children and adolescents (n=28), older people residing in a care facility (n=6), pregnant women and mothers with young infants (n=3), and mixed population groups of children, adults and older people (n=9). Twenty-five reviews included only randomised controlled trials and were of NHMRC level I evidence.

Question 1: What are the most effective types of health promotion interventions to prevent oral disease in the Australian population?

The oral health promotion interventions differed widely across population groups. The interventions identified for each population group are summarised as follows:

- **Children and adolescents:**

The included reviews focused on different age groups of children and adolescents, and we identified three population subgroups, as noted below. As the results varied according to the population, the results were also synthesised as per these subgroups.

  - Interventions for *infants, toddlers and preschool children* included:
    Supervised toothbrushing; use of fluoride toothpaste and fluoride varnish among preschool children; motivational interviewing or counselling
  - Interventions for *schoolchildren* included:
    Education programs with oral health instructions; school screening with referrals; oral hygiene intervention with toothbrushing
  - Interventions for *children and adolescents* included:
    Theory-guided interventions; education programs with oral health instructions; interventions focused on toothbrushing; fluoride varnish, fluoride gel and fluoride mouth rinse; interventions specifically for priority population groups.

- **Older people residing in a care facility:**
  - *Interventions for caregivers and nursing home staff* included workforce models addressing oral care needs; oral health education/training of nurses; oral health education for caregivers
  - *Combination of interventions for caregivers/nursing home staff and elderly* included educational interventions (designed for caregivers, patients, staff or relatives) and various interventions designed to improve or maintain oral health (e.g. oral healthcare training).
- **Pregnant women and mothers with young infants:**
  - *Multicomponent interventions during the prenatal period* included oral health education and skills development in prenatal clinics
  - *Multicomponent interventions during prenatal, postnatal and early parenthood* included oral health interventions with educational components; prenatal/postnatal oral health education.
- **Mixed population groups (children, adults and older people)**
  - Various interventions were identified including oral health education; xylitol and other alternative sweeteners; tobacco cessation; water fluoridation; use of fluoride toothpaste.

Question 2: Based on the findings from Question 1, which best practice evidence-based oral health promotion interventions are most relevant for the Australian population?

Following the identification of effective interventions to answer Question 1, we conducted an analysis of their applicability in the Victorian and Australian context. Some of the oral health promotion interventions that have been found to be effective in countries with comparable health systems to Australia and may be feasible in Victorian/Australian settings are summarised as follows:

- **Children and adolescents:**
  - Use of fluoride toothpastes for preschool children
  - Motivational interviewing and community level dental health promotion
  - Multiple oral health education sessions, with either group activities or provision of leaflets
  - School-based education program with multiple oral health education sessions
  - Use of fluoride varnish, fluoride gel and fluoride mouth rinse.
- **Older people residing in a care facility:**
  - Workforce model of nurse-led training of aged care nurses and oral health professional-led training of aged-care nurses, with ongoing clinical support
  - Educational interventions (for caregivers, patients, staff or relatives).
- **Pregnant women and mothers with young infants:**
  - Interventions with educational components for improving skills and eliciting behaviour change
  - Postnatal oral health education with or without individualised counselling, provision of written oral health promotion materials, and community wide oral health initiatives.
- **Mixed population groups (children, adults and older people)**
  - Oral health advice and education along with referral to general dental practitioners, dental specialists and dental emergency services when needed

- Use of xylitol as an alternative sweetener among adults; use of xylitol and erythritol among children, adults and older people; use of fluoride toothpaste containing 10% xylitol (for 2.5–3 years) for children and adults
- Use of sugar-free gums for children and adults
- Water fluoridation
- Use of fluoride toothpaste for young children and adults.

Gaps in the evidence base

This Evidence Check found there has been substantial research into the effectiveness of oral health promotion interventions over the past decade (2012–2021), identifying 46 relevant reviews. It is essential to note that while each review targeted a specific population group, only four population groups were identified for this Evidence Check and studies among specific priority groups (e.g. pregnant women) were scarce. None of the identified systematic reviews focused specifically on diverse populations, including people with disabilities or complex medical conditions. This demonstrates a significant research gap in relation to the priority populations outlined in the National Oral Health Plan 2015–2024.[39] Future research is required focusing on people who are socially disadvantaged or on low incomes; Aboriginal and Torres Strait Islander people; people living in regional and remote areas; and people with additional and/or specialised healthcare needs. Research needs to be conducted with a focus on interventions delivered in non-clinical/community settings, with further clarity on what interventions could be effective in childcare/preschool settings, school settings, workplace settings, community settings and residential care settings.

Studies included in this Evidence Check varied in terms of NHMRC levels of evidence, with just over 50% having NHMRC level I evidence. Therefore, all the interventions that we found to be effective require careful consideration based on their levels of evidence. While the included studies were conducted in countries with comparable health systems to Victoria and Australia, studies in an Australian setting were scarce, which limits our ability to draw robust conclusions as to the applicability of the interventions in Victoria and Australia. For instance, evidence as to the effectiveness of fluoride toothpastes was mostly generated from populations with low or no coverage of water fluoridation. While the health systems of the UK and Australia are comparable, there is a major difference in water fluoridation rates, which is about 10% in the UK but 90% in Australia.[43] Rigorous research is required to ascertain the feasibility and effectiveness of the interventions in the Victorian/Australian setting.

Conclusion

This Evidence Check has synthesised evidence as to the effectiveness of oral health interventions for varied population groups, along with an analysis of their applicability for the Victorian/Australian setting. We identified significant research gaps in the evidence base, with the most essential being the limited studies conducted in Australia, which limits our ability to draw robust conclusions as to the applicability of the interventions in the Victorian/Australian setting. There is a need for rigorous future research in diverse priority population groups across Australia, including people who are socially

disadvantaged or on low incomes, Aboriginal and Torres Strait Islander people, people living in regional and remote areas and people with additional and/or specialised healthcare needs, to ensure the improvement of oral health for all Australian populations.

Background

The burden of oral diseases

Oral health is defined as “a standard of health of the oral and related tissues that enables an individual to eat, speak and socialise without active disease, discomfort or embarrassment, and that contributes to general wellbeing”.[44] Oral health is multidimensional in nature and includes physical, psychological, emotional and social domains, which are integral to overall health and wellbeing.[31, 32] Oral health not only affects the quality of life of an individual, but also their families, communities and the society as a whole.[34, 45]

Oral diseases encompass a wide range of conditions and diseases that affect the teeth and mouth, including dental caries (tooth decay), gingival and periodontal disease (gum disease) and oral cancers.[34, 46] Despite being largely preventable, oral diseases are a major public health issue globally.[33, 34] Oral diseases affect more than 3.5 billion individuals across the world, with untreated dental caries identified as the most prevalent health condition globally.[34]

Oral disorders are highly prevalent in the Australian community, contributing to 2.4% of the total health burden, which includes the burden of dental caries and pulpitis, periodontal disease and severe tooth loss with fewer than 10 teeth.[35] Dental caries constitute one of the most prevalent health conditions among both children and adults in Australia.[36, 37] The National Child Oral Health Survey 2012–2014 found almost 25% of children aged 5–10 years had untreated caries in primary (baby) teeth, while one in 10 children aged 6–14 years had untreated caries in the permanent dentition.[36] The National Study of Adult Oral Health 2017–18 reported that while most Australian adults aged 15 years and over have had some experience of dental decay, about one in three adults (32%) had at least one tooth with untreated dental decay.[37] As a result, more than 63,000 Australians are hospitalised every year for preventable dental conditions, which has been noted as the third most common reason for acute preventable hospital admissions.[47]

Oral disease has been identified as a key marker of social disadvantage, resulting in inequalities in oral health that are directly influenced by wider determinants of health.[30, 38] The National Oral Health Plan 2015–2024 has identified a number of priority populations who continue to experience poor oral health at higher rates than the general population.[39] These include people who are socially disadvantaged or on low incomes, Aboriginal and Torres Strait Islander people, those living in regional and remote areas and people with additional and/or specialised healthcare needs.[39]

Oral health promotion interventions

Health promotion is defined as “the process of enabling people to increase control over, and to improve, their health” in the Ottawa Charter.[48] Health promotion encompasses combinations of educational, political and organisational support for behavioural and environmental changes that are

conducive to health.[49] Oral health promotion interventions have been used for prevention of oral disease and improvement of oral health knowledge, literacy, attitudes and positive practices.[40–42]

Oral health promotion interventions generally focus on providing structural support and information related to oral health in a wide range of clinical and non-clinical settings, including dental clinics, childcare and preschools, workplaces, residential care and community settings.[30, 42] Rather than prioritising the treatment of oral diseases in clinical settings, oral health promotion interventions focused on prevention of oral disease in a non-clinical or community-based setting may be particularly useful when the interventions consider the influence of contextual factors.[50] Resources, socioeconomic status, access to healthcare, and the social, cultural and political environment are some of the contextual factors that influence oral health, and oral health promotion seeks to target the contextual risk factors to terminate the progression of oral diseases.[38, 42, 51] However, it is also essential to understand which oral health promotion interventions are effective and applicable to the Australian population, and how best to implement a number of targeted interventions.

Building on the Ottawa Charter philosophy of health promotion[48], the Victorian government in Australia has undertaken an integrated health promotion approach.[29, 30] Five categories of health promotion interventions are identified within the Victorian Integrated Health Promotion framework. These include screening and individual risk assessment; health education and skills development; social marketing and health information; community action; settings and supportive environments.[29, 30] The five categories of interventions ensure the delivery of a quality integrated health promotion program through implementation of a mix of interventions that balance both individual and population-wide interventions.[29] The five categories of health promotion interventions have also been used previously in the context of oral health promotion.[30]

Purpose of the Evidence Check

The “evidence-based oral health promotion resource” is internationally recognised as a best practice summary for policy development and program implementation to prevent oral disease and promote oral health in community settings.[30] The resource has been used extensively in Victoria and nationally to inform oral health prevention policy. The resource was produced by the Department of Health in 2011 and covered the literature to June 2010.[30] In 2013, Dental Health Services Victoria was commissioned by the Commonwealth Department of Health to update the resource to December 2012. This Evidence Check was commissioned by Dental Health Services Victoria to update the evidence base by covering literature from 2012–2021.

The Evidence Check sought to synthesise the evidence as to the effectiveness of oral health promotion interventions for the Victorian and Australian population. The review will be used to update and develop a new evidence-based oral health promotion resource that recognises as best practice the most effective health promotion strategies for prevention of oral disease across Victoria and Australia. It will inform the development of relevant oral health policies, influence policy and practice, and support funding for the prevention of oral disease. The main audiences for this Evidence Check are the Government, ministerial committees, Department of Health, Dental Health Services Victoria, community health agencies, the rural health workforce, policy makers, health promotion agencies, and staff working in local government areas.

Evidence Check questions

This Evidence Check sought to answer the following questions:

Question 1: What are the most effective types of health promotion interventions to prevent oral disease in the Australian population?

Question 2: Based on the findings from Question 1, which best practice evidence-based oral health promotion interventions are most relevant for the Australian population?

Methods

Criteria for selecting studies

Based on the scope of the Evidence Check, the review team developed the inclusion criteria using the Population, Interventions, Comparators and Outcomes (PICO) framework[52]; these are outlined in Table 2.

Table 2—Inclusion criteria for selection of studies

Parameter		Criteria
P	**Population and setting**	Types of participants: • Antenatal and early childhood (preschool) • School-aged children and adolescents • Older people • Aboriginal and Torres Strait Islanders • Culturally and Linguistically Diverse (CALD) communities • People living in regional and remote areas • People with special needs (mental illness; disabilities; complex medical conditions—obesity, diabetes, cardiovascular diseases, stroke) • Low income and socially disadvantaged groups Settings: Australia and countries and jurisdictions that have comparable health systems to the Victorian and Australian jurisdictions, i.e. the UK, New Zealand, Canada and the US
I	**Intervention**	Types of interventions: • Screening and individual risk assessment • Health education and skills development • Social marketing and health information • Community action • Settings and supportive environments

		The five categories of health promotion interventions listed above are as per the Victorian Integrated Health Promotion framework[29, 30] Intervention settings: non-clinical or community settings • Childcare and preschool • School • Workplace • Community • Residential care
C	**Comparison**	None or group without intervention
O	**Outcome**	Outcome measures: • Oral health knowledge • Oral health attitudes • Oral health behaviour • Oral health literacy • Oral health status

This Evidence Check only included reviews (rather than other types of studies), with preference given to systematic reviews of the effectiveness of oral health promotion interventions. Systematic reviews of interventions that promoted oral health as part of a broader chronic disease prevention intervention were included if the oral health intervention component met the inclusion criteria. Systematic reviews that evaluated an in-scope intervention in population-based/community settings were also considered for inclusion.

Information sources and search strategy

We conducted systematic searches of both peer-reviewed and grey literature for English-language studies published from 2012–2021, including studies accepted for publication until December 2021.

Peer-reviewed literature

The search strategy for peer-reviewed literature was developed in consultation with an expert medicine and health sciences librarian from the University of Sydney. The following electronic databases were searched for relevant peer-reviewed literature on 30 July 2022:

- MEDLINE (Ovid)
- Embase
- Web of Science
- ERIC

The search strategies used for all four databases are presented in Appendix 1.

Grey literature

We conducted an extensive grey literature search, which included relevant websites, other evidence sources noted in the project brief, and manual searching of studies eligible for inclusion.

Relevant websites:

- Public Health Association of Australia (PHAA): https://www.phaa.net.au/
- International Association for Dental Research (IADR): https://www.iadr.org/
- National Oral Health Promotion Clearinghouse: https://www.adelaide.edu.au/arcpoh/oral-health-promotion/

Other evidence sources:

- Evidence based oral promotion resource https://www.vgls.vic.gov.au/client/en_AU/search/asset/1269258/0
- Victorian Action Plan to Prevent Oral Disease 2020–30 https://www.health.vic.gov.au/sites/default/files/migrated/files/collections/research-and-reports/o/victorian-action-plan-to-prevent-oral-disease-2020.pdf
- Australia's National Oral Health Plan 2015–2024 https://www.health.gov.au/sites/default/files/documents/2022/04/healthy-mouths-healthy-lives-australia-s-national-oral-health-plan-2015-2024-australia-s-national-oral-health-plan-2015-2024.pdf

Manual search:

We adopted a number of strategies for manual searching, including searching in Google and Google Scholar and checking reference lists of relevant peer-reviewed and grey literature.

Screening and study selection

All records identified from the databases were collated into EndNote 20 reference management software and exported to the Covidence systematic review management software. Once duplicates were removed, two reviewers independently screened the titles and abstracts of the identified studies according to the inclusion criteria. Studies that appeared to meet the inclusion criteria, as well as those studies that required further assessment, were retrieved in full text. Two reviewers independently assessed full-text reports for eligibility and noted the reasons for exclusion of any studies. Any disagreements were resolved through discussions with a third reviewer.

We retrieved the full texts of any grey literature records identified in our search that appeared to meet the eligibility criteria. Two reviewers independently assessed the full-text reports for eligibility and noted the reasons for any exclusions. Any disagreements were resolved through discussions with a third reviewer.

Data extraction

We created two detailed data extraction templates, which we used to extract the data from each included study. The major areas of extraction across the two templates were:

1. Characteristics and summary of included studies: First author (year); study type (search duration); number of studies; type of participants; country of studies; type of intervention; intervention setting; outcome and effectiveness; level of evidence.
2. Detailed summary of findings from the included studies: First author (year); intervention description and delivery; outcome(s); summary of findings; authors' conclusions; reviewers' comments.

Four reviewers independently extracted the data from included studies. Cross validation of the data extraction was conducted independently by a second reviewer. Disagreements were discussed and resolved by consensus among reviewers.

Assessment of quality of evidence

The included studies were evaluated according to the National Health and Medical Research Council (NHMRC) criteria to determine the level of evidence[28], as outlined in Table 3. A systematic review was only assigned a level of evidence as high as the studies it contained, except where those studies were of level II evidence.[28]

Table 3—NHMRC levels of evidence

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

Integrated Health Promotion framework

We categorised the oral health promotion interventions identified in this Evidence Check according to the Victorian Integrated Health Promotion framework.[29, 30] The five categories of health promotion interventions identified within the framework are: screening and individual risk assessment; health education and skills development; social marketing and health information; community action; settings and supportive environments.

Case studies

Additionally, we have included five case studies in this Evidence Check to inform the development of a new evidence-based oral health promotion resource. The selection of the case studies is based on: (1) the success of the program—interventions that have been found to be effective in improving oral health outcome(s) (i.e. oral health knowledge, attitudes, behaviour, literacy, status); and (2) successful adoption or possible applicability of the intervention in Victoria and Australia.

Each case study was based on one of the included studies in the systematic reviews presented in this Evidence Check. These individual studies were conducted either in Australia or in countries with comparable health systems (US and UK). Where possible, the five case studies aimed to present different interventions for the diverse population groups identified in this Evidence Check.

Findings

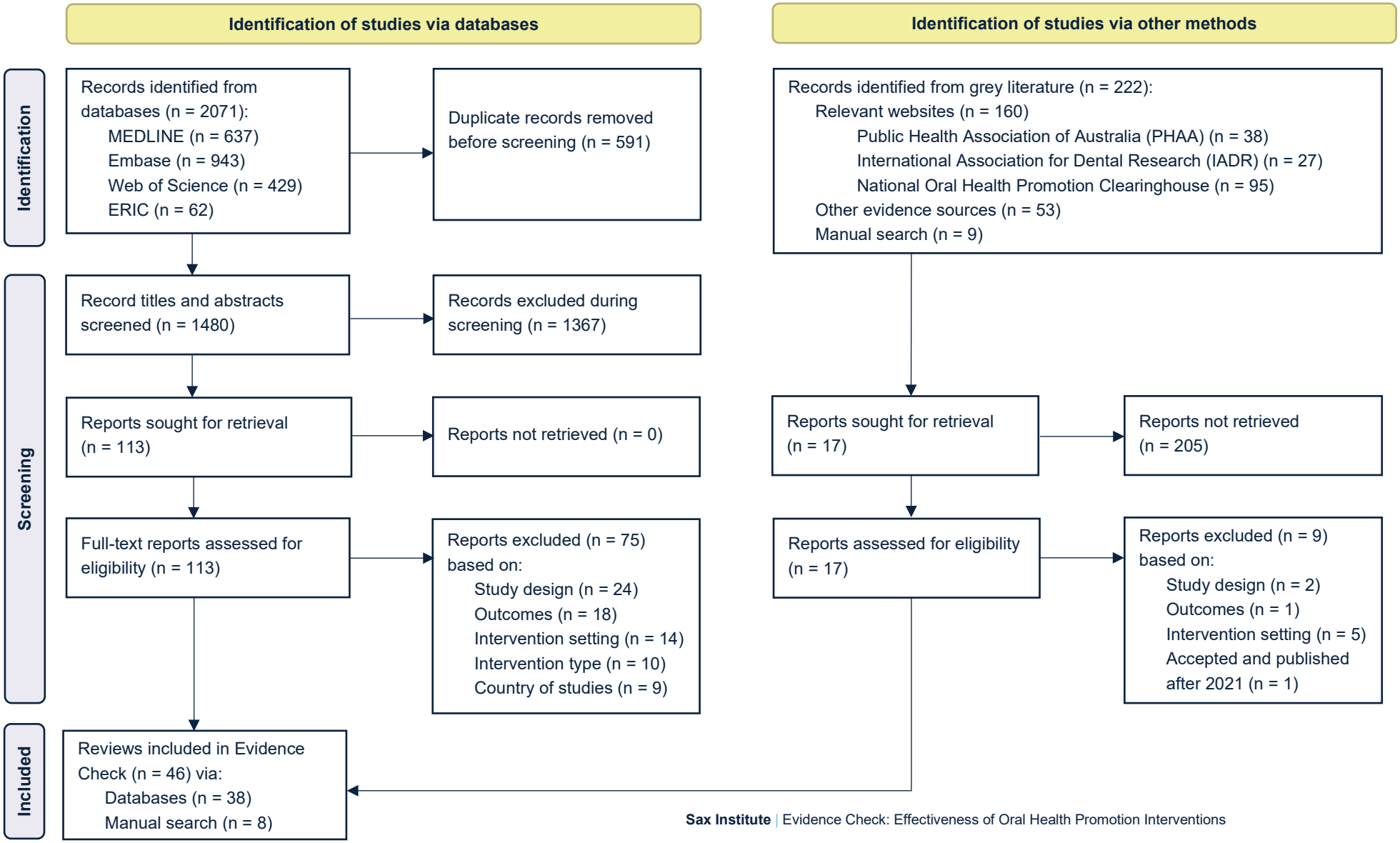
Search results

Of the 2071 records identified from the four databases searched, we removed 591 duplicates before screening. We screened the titles and abstracts of 1480 records, excluding 1367 records based on the eligibility criteria. We then assessed the full-text reports of 113 reviews, of which 75 were excluded based on study design, outcomes, intervention setting, intervention type and country of studies.

Further, 222 records were identified from the grey literature search, including those from relevant websites, other evidence sources and a manual search. We retrieved the full texts of 17 records that appeared to meet the eligibility criteria and assessed them for inclusion. Nine reports were excluded based on study design, outcomes, intervention setting, or because the review had been accepted and published after 2021.

A total of 38 reviews were included from the databases and eight from the manual search, giving 46 reviews for the Evidence Check. The search results are outlined in the format of a Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) flow diagram[53], presented in Figure 1.

Figure 1—PRISMA flow chart describing the study selection process



Approach to answering Evidence Check questions

Identification of population groups

An overview of the 46 reviews included in this Evidence Check showed that each review reported on the effectiveness of oral health promotion interventions for a certain population group (e.g. children, older people, pregnant women). Therefore, the oral health promotion interventions reported by each review were specific to the targeted populations and there were separate results for different population groups. Based on the target population of each review, we have derived four population groups and categorised the reviews into these groups accordingly:

I. Children and adolescents
II. Older people residing in a care facility
III. Pregnant women and mothers with young infants
IV. Mixed population groups (children, adults and older people).

Of the 46 reviews, most (n=28) focused on children and adolescents, with only six studies among older people residing in a care facility, three studies among pregnant women and mothers with young infants and nine among mixed population groups of children, adults and older people.

Therefore, the findings of this Evidence Check in relation to Questions 1 and 2 are presented separately for each of the four population groups.

Question 1 findings: What are the most effective types of health promotion interventions to prevent oral disease in the Australian population?

Within each population group, similar interventions have been grouped together and presented as different categories of interventions. This Evidence Check was a rapid review of reviews, and each review included a wide range of interventions. Therefore, the findings from each review in relation to the effectiveness of oral health promotion interventions are presented together.

Question 2 findings: Based on the findings from Question 1, which best practice evidence-based oral health promotion interventions are most relevant for the Australian population?

As Question 2 is linked to the findings of Question 1, analysis of the evidence in relation to both questions is presented together. For each included review, the effective interventions are first highlighted (Question 1), followed by a discussion of the applicability of the interventions in the Victorian and Australian context (Question 2). We have considered both the quality of evidence (based on NHMRC levels of evidence) and whether the included studies in the review were conducted in the countries of interest (i.e. the UK, New Zealand, Canada, the US or Australia) when suggesting the potential applicability of the effective interventions in the Victorian and Australian context. Further, studies conducted in an Australian setting have been highlighted, based on their promising results. For each of the population groups, we have also provided a summary of oral health promotion interventions applicable to the Victorian/Australian setting.

I. Children and adolescents

Analysis of evidence in relation to Questions 1 and 2

The characteristics and summaries of studies that focused on children and adolescents (n=28) are outlined in Table 4. A detailed summary of findings from these studies is presented in Appendix 2 (Table 9). The following sections synthesise the evidence as to the effectiveness of oral health promotion interventions for children and adolescents, along with an analysis of the applicability of the interventions for Victoria and Australia. The included reviews focused on different age groups of children and adolescents. Overall, we identified three population subgroups: (1) infants, toddlers and preschool children; (2) schoolchildren; (3) children and adolescents. As the results varied according to the population, the results were also synthesised as per these subgroups.

1. Infants, toddlers and preschool children

Supervised toothbrushing

Dickson-Swift et al.[1] reviewed 26 studies focused on guidelines facilitating development of early childhood or school toothbrushing programs. The studies ranged from NHMRC level IV to II. The review provided details of the evaluation of nine studies. A study conducted in La Trobe Valley, Victoria, in primary and preschool-aged **Indigenous children** demonstrated an after-lunch brushing program (brushing teeth before beginning afternoon classes) along with the provision of culturally sensitive oral health resources (fridge magnets, newsletters and information sheets) improved knowledge, awareness and acceptance of dentistry along with a substantial improvement in toothbrushing skills in children. Similarly, another study in Bayside, Brisbane, showed that an intervention with child health nurses providing oral health information to schools, a dental therapist conducting one session of toothbrushing technique, and the provision of oral health books and the Colgate Bright Smiles, Bright Futures package showed a small difference in the level of dental caries in the control and intervention groups but was not clinically and statistically significant. Another study, conducted among **remote Indigenous communities** in northern Australia, which involved working with the Closing the Gap Clinical Outreach teams for the application of fluoride and with the schools for a toothbrushing program, showed increased oral awareness in school and community. A study in New Zealand among a **rural and low socioeconomic Māori population** with schoolchildren aged 5–13 years showed oral health education sessions (conducted at baseline, six months, 18 months and 30 months) resulted in a reduction in plaque index from 1.49 to 0.72 along with a decrement in the gingival index. Although the quality of included studies varied, with poor confidence in the results because of the study design, the interventions conducted in Australia yielded promising results.

Aliakbari et al.[54] reviewed 42 studies that focused on parental involvement in home-based toothbrushing in children under eight years old. The studies varied in quality, ranging from NHMRC level IV to II. The study interventions also varied, with the notable interventions being oral health education intervention sessions (either individualised or group); provision of oral health educational resources; motivational interviewing; Enhanced Community Service (ECS); screening and referral; invitation to a dental clinic and the provision of toothbrush and toothpaste; supervised toothbrushing; and provision of an oral hygiene kit. The review provided information on the intervention development and delivery; however, many included studies lacked evaluation of the intervention. Twenty-nine studies explored the impact on caries, yielding mixed results. The review explored the theoretical

domain of intervention with limited information on the effectiveness. Therefore, the applicability and generalisation of the findings in the Australian context is of low certainty.

Use of fluoride toothpaste and fluoride varnish among preschool children

The review by dos Santos et al. (2013)[2] included eight studies into the use of fluoride toothpaste (440–1500 ppm) in children below the age of seven years (with primary dentition) in addition to oral health education (theoretical instruction, audiovisual resources and leaflets). The review only included randomised controlled trials and all eight studies were included in the quantitative synthesis. The pooled analysis concluded that standard fluoride toothpastes, when compared with placebo or no intervention, demonstrated significant carie reduction at surface (prevented fractions (PF) = 31%; 95% CI 18–43), tooth (PF = 16%; 95% CI 8–25) and individual (relative risks (RR) = 0.86; 95% CI 0.81–0.93) level. Similarly, low fluoride toothpastes were effective only at the surface level (PF = 40%; 95% CI 5–75). As the review is categorised as NHMRC level I evidence, with three of its studies conducted in England, the use of fluoride toothpaste may be a feasible and replicable intervention in the Victorian and Australian context.

Santos et al.[55] reviewed five studies into the use of standard fluoride toothpaste (<600 ppm) in comparison with low fluoride toothpaste (1000–1500 ppm) in children below the age of seven years. All the studies were randomised controlled trials, which were included in the quantitative synthesis. Two studies were conducted in England, with a comparable healthcare infrastructure to Australia. Furthermore, the review is of NHMRC level I evidence, showing low fluoride toothpastes increased the risk of caries in primary teeth (RR = 1.13; CI 1.07–1.20); and did not decrease the risk of aesthetically objectionable fluorosis in the upper anterior permanent teeth (RR = 0.32; CI 0.03–2.97). Based on the review, there is no evidence to support the use of low fluoride toothpaste in preschool children as it may not be as effective as standard fluoride toothpaste for protection against caries.

The review by de Sousa et al.[56] included 20 studies, with 16 included in quantitative synthesis. The review focused on the effectiveness of fluoride varnish in reducing the risk of developing new dentine caries lesions in children up to 71 months of age. The review included randomised controlled trials (NHMRC level I evidence), with the intervention of fluoride varnish (most commonly 5% sodium fluoride) with or without a combination of oral health education and/or dietary counselling and/or supervised toothbrushing. The intervention often included other sources of fluoride exposure such as a fluoride toothpaste. None of the pooled analysis (caries incidence, tooth caries and surface caries) showed a statistical significance. A single study was conducted among remote **Indigenous communities** of Australia's Northern Territory that showed fluoride varnish was effective in carie reduction; however, the pooled result from the meta-analysis was not consistent with the finding and demonstrates a questionable effectiveness of fluoride varnish in preschool children.

Motivational interviewing or counselling

Albino et al.[3] reviewed 18 studies of a diverse quality (ranging from NHMRC III-2 to II). The review included children from 0–12 years old; and in the studies with children below the age of six years, school-based interventions such as buccolingual cross-brushing, oral health education and use of fluoridated toothpaste and fluoride varnish showed no effect on dental carries. However, family-based interventions with children aged 6–7 years conducted in **low-income households** in South Australia showed lower caries as a result of motivational interviewing. Similarly, a study conducted among **low-income Indigenous Australians** aged 18–47 months, where the community-based intervention

included fluoride varnish with community level dental health promotion (such as fluoride varnish application, engagement of parents and families during dental screenings and varnish applications at children's play groups, preschool and community events), showed lower caries increment by 3.0 surfaces per child. As the Australian studies were of NHMRC level II evidence, the applicability of motivational interviewing and community level dental health promotion can be a feasible and effective intervention in the Victorian and Australian context.

Colvara et al.[4] reviewed 14 studies, of which eight were included in the quantitative synthesis. The populations in the review comprised children below the age of six years and included **Indigenous Australians, African Americans and Cree First Nations people in Canada**. The intervention was motivational interviewing (MI) or counselling techniques based on the principles developed by Miller and Rollnick[57] for preventing early childhood caries. Four studies in the review showed the intervention had a protective effect for caries, two studies showed the intervention improved oral hygiene (such as healthier gums and lower plaque index), and two studies demonstrated that the intervention improved parents' knowledge, practice and attitudes towards the oral health of their children. Moreover, the pooled analysis showed that a population's caries experience modifies the effect of an MI-based intervention. In populations with high caries experience, the MI-based approach was seen to prevent an average of 3.15 (95% CI: −6.14, −0.17) decayed, missing or filled tooth surfaces (DMFS) in young children. Alternatively, in the sample with a low caries experience, the differences were smaller, as the caries levels were already lower (−0.31; 95% CI: −0.63, 0.00). The review is of NHMRC level I evidence (all studies were randomised controlled trials), with one RCT conducted in Australia among **Indigenous Australian children**. Similarly, as a few other studies were conducted in settings similar to Australia and Victoria, such as Canada and US, the evidence generated by the review may be applicable in the Australian context.

2. Schoolchildren

Education program with oral health instructions

Adair et al.[5] reviewed six studies from five randomised controlled trials (making the review NHMRC level I evidence), which focused on school-based oral health education interventions targeting behaviour change to prevent childhood caries. Most of the interventions included interactive oral health education: one had supervised toothbrushing and three had information on diet and the influence of food on oral health. The review findings indicated there was some limited evidence that the intervention's behaviour change techniques were effective in reducing dental caries. In particular, one study conducted in the UK, which may be relatable to the Australian context, revealed multiple educational sessions—focusing on tooth function, diet and its effect on teeth, toothbrushing instruction and details about dietary topics—were effective in reducing plaque scores and improving oral health knowledge. Only one of the studies included in this review was conducted in the UK, with a comparable health system to the Victorian and Australian jurisdictions. However, the intervention was shown to be effective and may be replicated in Australia and Victoria.

Bramantoro et al.[58] reviewed 31 studies that varied in quality (ranging from NHMRC level III-2 to II). The studies' interventions also varied as they included all types of oral health intervention conducted in preschools, schools or high schools, with a wide range of age groups (4–17 years). The review provided evidence from a qualitative synthesis indicating that **preschool** education through interactive tasks (games, role-playing and drama) resulted in significantly better oral hygiene, oral health knowledge and oral health status. Moreover, preventive programs for parents, teachers and children

(application of sodium fluoride phosphate, supervised toothbrushing with fluoride) led to a reduction in the gingival and plaque indices. In **elementary schoolchildren**, oral health education incorporated into the school curriculum lowered the risk of caries. However, it was found that one-time teacher training in oral health was not effective in improving the oral health of children. Oral health education with constant support from teachers led to improvement in oral health knowledge and oral health-related quality of life. Interventions such as a dental hospital tour, provision of fluoride toothpaste and oral examinations were effective in improving oral health status. Furthermore, a comprehensive needs-related oral hygiene training program in elementary schoolchildren showed improvement in plaque and gingival bleeding scores. For **high-school students**, education through posters or pamphlets was effective in improving oral health knowledge, oral health behaviour and oral health-related quality of life; motivational interviewing was effective in improving oral health behaviour and preventing caries; and provision of a dental hygienist in schools providing oral health education, an open clinic and fluoride varnishes had an impact on the incidence of enamel dental caries, oral health knowledge and oral health attitudes. Four of the included studies were from the UK and one came from the US and they varied in quality. The interventions in the review were mostly reported to be effective; however, there is low certainty for the interventions' applicability in Victoria and Australia.

Geetha Priya et al.[6] reviewed 18 studies of varied quality (ranging from NHMRC III-2 to II) that focused on school-based oral health education (e.g. lecture-based oral health education, audiovisual resources such as videos and classroom presentations and activities such as oral health competitions). There was wide variation in the delivery of the intervention (teacher-led, parent-led, peer-led and dental profession-led). Most of the included studies showed school dental health education was effective in improving the oral health status, oral health knowledge and behaviour of the children. Three of the 18 studies were conducted in either the UK or the US. The RCTs conducted in the UK showed that multiple oral health education sessions (with either group activities or provision of leaflets) were effective in significantly reducing plaque or plaque score. The studies conducted in the UK were of NHMRC II level, which suggests that multiple oral health education sessions in schools may be effective in Australia and/or Victoria.

School screening with referrals

Sanjeevan et al.[7] reviewed five studies that focused on the effectiveness of dental screening (versus no screening) on dental attendance. All studies were randomised controlled trials, making the review NHMRC level I evidence. The intervention often included (singly or in combination) oral health education, referral cards and letters to parents. The pooled analysis showed school-based dental screening increased dental attendance by 16% compared with a non-screening group (RR 1.16; 95% CI 1.11, 1.21). Three of the five studies were conducted in the UK, all being NHMRC level II evidence. The results showed school-based dental screening followed by a referral card is effective in increasing dental attendance. However, as the studies were heterogeneous and had a profound variation in evidence, generalisability in the Victorian and Australia context should be done cautiously.

Joury et al.[59] reviewed five clustered randomised controlled trials (making the review NHMRC level I evidence) that focused on the effectiveness of school-based dental screening (versus no screening) on dental caries and dental attendance in schoolchildren aged 3–18 years. The intervention included personalised referral letters for the positively screened children. The pooled analysis concluded there was no difference in dental attendance between the children who received dental screening and those who did not (RR 1.11; 95% CI 0.97, 1.27). In terms of dental caries, a statistically significant difference was not observed. Furthermore, the review indicated a substantial heterogenicity.

Therefore, there is a lack of evidence as to the effectiveness of school-based dental screening on the prevalence of dental caries and dental attendance.

Arora et al. (2017)[60] reviewed six randomised controlled trials (making the review NHMRC level I) that compared the effectiveness of school dental screening programs on overall oral health status and the use of dental services. Four studies were pooled to evaluate dental attendance as an outcome; however, the results were inconclusive because of the heterogenicity of included studies. Similarly, two studies were pooled to evaluate criteria-based screening versus no screening and indicated a possible benefit for screening (RR: 1.07; 95%CI 0.99, 1.16). Four of the six studies were conducted in the UK, which has a contextual similarity in the school-based program with Victoria. However, the findings demonstrate low-certainty evidence as to the effectiveness of school dental screening programs on overall oral health status and the use of dental services.

Similarly, the review by Arora et al. (2019)[61] added another randomised controlled trial in the review, which was conducted in US. However, the results in the updated review were broadly similar to the initial review, demonstrating low-certainty evidence as to the effectiveness of school dental screening programs on overall oral health status and the use of dental services.

Oral hygiene intervention with toothbrushing

Hujoel et al.[62] reviewed three randomised controlled trials (making the review NHMRC level I evidence) that focused on personal oral hygiene interventions to influence toothbrushing with or without an interproximal cleaning device, and the effect on dental caries. The interventions included a health education program and supervised plaque removal or de-plaquing in children. Four additional non-randomised studies were also retained for sensitivity analysis but were not part of the pooled results. The pooled analysis showed the oral hygiene interventions did not influence the incidence of dental caries (DMFS = −0.11; 95% CI −0.91, 0.69). All the evidence was NHMRC level II, and was from countries comparable to Australia, such as the UK and the US. The findings indicated the interventions were not effective in reducing the incidence of dental caries.

3. Children and adolescents

Theory guided interventions

Xiang et al.[63] reviewed 10 studies, undertaking quantitative synthesis for four studies. All the included studies were randomised controlled trails, making the review of NHMRC level I evidence. The review focused on theory guided interventions (based on social cognitive theory; the precaution adoption process model; the authoritative parenting model; prospect theory with loss-framed and gain-framed components; the health action process approach; sense of coherence; health belief model; and theory of health behaviour). For the presence of plaque, theory guided intervention was not effective at three months compared with traditional intervention (SMD: –5.94; 95% CI: –16.39, 4.51); however, the follow-up at 12 months demonstrated the effectiveness of the intervention in reducing the occurrence of plaque (SMD: –0.25; 95% CI: –0.46, –0.04). All the studies in the pooled results were conducted in countries that may not be comparable to the Australian healthcare system, so the applicability of the theory guided intervention to Australia is questionable.

Education program with oral health instructions

Tsai et al.[42] reviewed 37 studies from 28 unique randomised controlled trials, making the review NHMRC level I evidence. The oral health promotion interventions were diverse, varying from oral health education by leaflets or videos to comprehensive programs involving child, family and the larger community. Four interventions also included clinical preventive measures (dental prophylaxis, fluoride varnish/rinse and fissure sealants). The pooled result favoured the intervention over the control in all the clinical outcomes (gingival index, plaque index, DMFS). The majority of the studies were conducted in a different context from the Australian healthcare system (34/37 studies) so the intervention may require further strong evidence to confirm its effectiveness in Australia.

Stein et al.[8] reviewed 12 studies qualitatively, of which six were included in the quantitative synthesis. All the included studies were randomised controlled trials, making the review NHMRC level I evidence. The review focused on the effectiveness of school-based oral health educational programs in improving oral hygiene and dental caries in children aged 5–18 years. The interventions included oral health education (lectures, albums, slides, leaflets, counselling, games, drawing, theatres and dieting guidance); oral health instruction of toothbrushing; toothbrushing demonstrations and supervised toothbrushing. Five out of eight studies found a reduction in plaque levels, while two studies looking at gingivitis as the outcome yielded no significant results. Traditional oral health educational interventions have been shown to be effective in reducing plaque, but not gingivitis, yet may be potentially replicated in the Australian and Victorian context.

Moore et al.[9] reviewed eight studies of varied design and quality (ranging from NHMRC level IV to II) that focused on the effectiveness of school-based primary preventive oral health interventions for children and adolescents aged 5–16 years. The interventions varied across the studies and included single or multiple sessions on oral health education and screening for plaque. The interventions adapted numerous theory/construct/health concepts and the review concluded the interventions were effective in improving oral health knowledge. One study, based in a **rural setting** in the US, showed school-based dental health education had positive effect on children's use of dental services and knowledge regarding the effective use of available dental care. Similarly, a study from the UK demonstrated that multiple sessions of oral health education were effective in reducing mean plaque scores and children's knowledge of the type of toothbrush to use and the role of disclosing tablets. The school-based dental health education intervention used in the rural setting in the US and the multiple oral health education sessions conducted in the UK may be applicable in Victoria and more widely in Australia.

Calderon et al.[64] reviewed eight studies that described factors that influence the oral health behaviour of American adolescents. Two of the eight studies described the effectiveness of the intervention and both were of NHMRC level III-3 evidence. The first study concluded that an educational program about gingival health was effective in improving oral health status and oral health knowledge. Similarly, another study concluded that the provision of messages about flossing influenced oral health behaviour. Given the quality of the included studies was low, with non-randomised smaller samples, the generalisation of the outcomes to the Australian context is uncertain.

Interventions focused on toothbrushing

The review by dos Santos et al. (2018)[65] included four randomised controlled trials, making the review NHMRC level I evidence. The review focused on the effectiveness of supervised toothbrushing of children and adolescents under the age of 18 years in reducing the incidence of caries at the dentine

level. There was variation regarding the children's age, the fluoride content of toothpaste, the baseline caries level and caries incidence. Two of the four studies concluded supervised toothbrushing was effective in reducing the incidence of caries. One of the four studies, conducted in the US, had an intervention of daily supervised toothbrushing with the provision of toothbrushes and non-active (no fluoride) toothpaste; however, the results were inconclusive as to its effectiveness. The review had a mixed outcome regardless of the strong study design; thus, we found no conclusive evidence in favour of supervised toothbrushing and its applicability in the Australian context.

Cooper et al.[10] reviewed four randomised controlled trials (NHMRC level I evidence). The review looked at behavioural interventions in primary schools (aged 4–12 years), addressing both toothbrushing and the consumption of cariogenic foods or drinks. Interventions included oral health education under the supervision of school health counsellors, parental-aid groups (provision of leaflets/brushing), school-based educational programs, supervised brushing and topical fluoride application. The review did not perform pooled analysis with respect to plaque outcomes; however, the three studies that reported plaque outcomes concluded there were significant reductions in plaque in the intervention groups compared with the controls. One of the studies reported the intervention had a positive impact on children's oral health knowledge, which was assessed through child focus groups, qualitative feedback from teachers and an oral health knowledge questionnaire (not validated). One of the four studies, from the UK, showed a school-based education program with four lessons (one hour each) designed to fit into the national curriculum improved the mean plaque score as well as oral health knowledge. Therefore, a school-based education program with multiple oral health education sessions may be a feasible and effective intervention in the Australian and Victorian contexts to improve oral health status and oral health knowledge.

Fluoride varnish, fluoride gel and fluoride mouth rinse

Marinho et al. (2013)[11] reviewed 22 randomised controlled trials (NHMRC level I evidence). The review explored the effectiveness of the topical use of fluoride in the form of varnishes at any concentration, amount and duration compared with placebo or no use in the prevention of dental caries in children and adolescents aged 16 and under. The pooled analysis showed 13 trials that looked at children and adolescents with permanent teeth treated with fluoride varnish experienced on average a 43% reduction in decayed, (missing) and filled permanent surfaces (D(M)FS) (PF 43%; 95% CI 30%, 57%; $p<0.001$). In the 10 trials evaluating the effect of fluoride varnish on first or baby teeth, the evidence suggests a 37% reduction in decayed, (extraction indicated/missing) and filled primary surfaces (D(E/M)FS) (PF 37%; 95% CI 24%, 51%; $p<0.001$). The findings from the review indicated that fluoride varnish has a substantial carie-inhibiting effect in both permanent and primary teeth. The review contains trials of strong quality from the UK, US and Canada; thus, there is good evidence that the use of fluoride varnish is applicable in Australian and Victorian dental care.

Marinho et al. (2015)[12] reviewed 28 randomised controlled trials (NHMRC level I evidence). The review focused on the effectiveness of the topical use of fluoride in the form of gel (operator-applied or self-applied) at any concentration, amount and duration compared with placebo or no use in the prevention of dental caries in children and adolescents aged 16 and under. The pooled analysis showed 25 trials that looked at children and adolescents with permanent teeth treated with fluoride gel experienced on average a 28% reduction in D(M)FS (PF 28%; 95% CI 19%, 36%; $p<0.001$). In the 10 trials evaluating the effect of fluoride gel on first or baby teeth, the evidence suggests a 20% reduction in D(E/M)FS (PF 20%; 95% CI 1%, 38%; $p=0.04$). The findings from the review indicated that fluoride gels can result in a large reduction in tooth decay in both permanent and primary teeth. As the review

contains strong-quality trials conducted in the UK, US and Canada, the use of fluoride gels may be applicable in Australian and Victorian dental care. However, further research is needed into the adverse effects and accidental swallowing of gel during the treatment.

Marinho et al. (2016)13 reviewed 37 randomised controlled trials (NHMRC level I evidence). The review explored the effectiveness of the topical use of fluoride in the form of mouth rinses (swished and expectorated, not swallowed) at any concentration, volume, duration and frequency compared with placebo or no use in the prevention of dental caries in children and adolescents aged 16 and under. The pooled analysis showed 35 trials that looked at children and adolescents with permanent teeth treated with fluoride mouth rinses experienced on average a 27% reduction in D(M)FS (PF 27%; 95% CI 23%, 30) and on average a 23% reduction in decayed, (missing) and filled permanent teeth (D(M)FT) (PF 23%; 95% CI 18%, 29%). None of the studies in the review explored the effectiveness in primary or baby teeth. The review contains trials conducted in the US (13/37), the UK (4/37), New Zealand (2/37) and Canada (2/37) that are of strong quality. Therefore, the use of fluoride mouth rinse may be a feasible and effective intervention in Australian and Victorian dental care for children with permanent teeth.

Interventions specifically for priority population groups

Skeie et al.[14] reviewed 37 studies of varied design and quality (ranging from NHMRC level IV to II). The review explored the effectiveness of dental caries prevention strategies in **children with immigrant and low socioeconomic background.** The interventions in the studies varied, with the most common being the use of fluoride (varnish, gel, tablet, sealant), thymol varnish with chlorhexidine, supervised toothbrushing, healthy eating, oral health education, and a dietary and nutritional program. The interventions had mixed outcomes. Sixteen of the 41 studies were conducted in Australia, the UK and the US, of which 13 reported the intervention to be effective. Two studies were conducted in Australia. The first showed no effect from the use of remineralising paste compared with antibacterial gel. The second was a cohort study based in Queensland and South Australia, which showed fissure sealants in combination with water fluoridation was effective in reducing decayed, missing or filled tooth surfaces. The use of fissure sealants in combination with water fluoridation may be effective in Victoria and also may help address oral health inequalities stemming from low socioeconomic status.

Gwynn et al.[15] reviewed nine studies (ranging from NHMRC IV to II) focusing on community based interventions to improve the oral health of **Indigenous adolescents**. The intervention included oral health education, fluoride rinsing, the introduction of reticulated fluoride water supply and daily brush-ins with fluoride application. Most of the studies (8/9) reported the interventions were effective in improving oral health status, with the most frequently reported outcome being the change in decayed, missing or filled teeth. Two studies were conducted in Australia (with **Aboriginal and Torres Strait Islander adolescents**). The first study demonstrated that the introduction of reticulated fluoridated water in a **remote community** in North Queensland decreased the mean DMFT at 10 years and at 15 years, decreased caries prevalence and severity from 2005–2012 by 37.3%, and resulted in a substantial decrement in teeth restorations. Similarly, the second pre-post-test study conducted in a **rural setting** with 17 participants consisted of a ‘new model’ of care with five interventions: partnerships (including community consultations); employment of Aboriginal and/or Torres Strait Islander health workers; cultural aides and equipment (timers, charts, toothbrushes); education package; and oral health assessment and dental treatment. The intervention was effective in reducing DMFS and resulted in a decrease in the proportion of unmet restorative needs. The ‘new model’

intervention may be applicable in the wider Australian community, although it may require further research to generate strong evidence to ascertain its applicability across Australia. Alternatively, the introduction of reticulated fluoridated water may have strong potential to improve oral health outcomes in rural Indigenous communities across Australia.

Chi et al.[66] reviewed nine studies focusing on oral health interventions among **Alaska Native children** under the age of 18 years that aimed to reduce the consumption of sugar-sweetened beverages. The quality of the included studies varied significantly, from reports and theses to peer-reviewed journal articles (NHMRC IV to II). The interventions included dental health aide therapists (DHATs); oral health education with the provision of educational resources; and xylitol chewing gum. The review provides limited details as to the effectiveness of the interventions, and therefore its findings provide limited evidence of the applicability of the interventions in the Australian context.

Summary of oral health promotion interventions for the Victorian/Australian setting

Oral health promotion interventions designed for children and adolescents that have been found to be effective and may be feasible in the Victorian and Australian settings have been summarised below. The interventions have been collated as per the three identified population subgroups, based on the focus of each included review:

Infants, toddlers and preschool children

- After-lunch brushing program and provision of culturally sensitive oral health resources for improving oral health knowledge and toothbrushing skills among primary and preschool-aged Indigenous children[1]
- Working with the Closing the Gap Clinical Outreach teams for the application of fluoride and with the schools for the toothbrushing program for improving oral awareness among remote Indigenous communities[1]
- Oral health education sessions, conducted at baseline, six, 18 and 30 months, for improving oral health status among rural and low socioeconomic populations[1]
- Use of fluoride toothpastes for improving the oral health status of preschool children[2]
- Motivational interviewing and community based intervention—including fluoride varnish and community level dental health promotion with interactive activities—for improving oral health status among children in low-income households[3]
- Motivational interviewing or counselling techniques for preventing early childhood caries, particularly among Australian Indigenous children.[4]

Schoolchildren

- Multiple educational sessions—focusing on tooth function, diet and its effect on teeth, toothbrushing instruction and details about dietary topics—for improving oral health status and knowledge[5]
- School-based dental education program comprising multiple oral health education sessions, with either group activities or provision of leaflets, for improving oral health status[6]
- School-based dental screening followed by a referral card for increasing dental attendance.[7]

Children and adolescents

- School-based oral health education programs, such as oral health education (e.g. lectures, leaflets, counselling, dietary guidance), toothbrushing instruction, toothbrushing demonstrations and supervised toothbrushing, for improving oral health status[8]
- School-based dental health education for improving oral health knowledge and multiple oral health education sessions, for improving oral health status and knowledge[9]
- School-based education program with multiple oral health education sessions (four lessons, one hour each) designed to fit into the national curriculum, for improving oral health status and knowledge[10]
- Use of fluoride varnish, fluoride gel and fluoride mouth rinse among children and adolescents, for reducing tooth decay and improving oral health status[11–13]
- Fissure sealants in combination with water fluoridation for improving oral health status among children with low socioeconomic backgrounds[14]
- Multicomponent interventions including oral health education, fluoride rinsing, introduction of reticulated fluoride water supply and daily brush-ins with fluoride application for improving oral health status among Indigenous adolescents.[15]

Table 4—Characteristics and summary of included studies focused on children and adolescents

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
1.	Adair PM (2013) (5)	Systematic review (1994–2009)	6	School-aged children	-	-	✓	-	-	Behaviour change intervention targeting oral hygiene and cariogenic behaviour	School	OHS (?)	I
2.	Albino J (2016)[3] (3)	Systematic review (2011–2015)	18	Children ≤18y; including **low income; Indigenous; low-income Indigenous**	✓	✓	-	✓	✓	Health behaviour strategy divided into school-based, family-based or community-based interventions	School, home-based or community	OHS (+)	III-2

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
3.	Aliakbari E (2021) (54)	Systematic review (to 11/2019)	42	Children ≤8y	✓	-	✓	✓	✓	Intervention promoting parental involvement in home-based toothbrushing	Home-based	OHS (?)	IV
4.	Arora A (2017) (60)	Systematic review: Cochrane (to 15/03/17)	6	School-aged children and adolescents (4–15y)	-	-	✓	-	-	Traditional screening, criteria-based screening, screening with oral health motivation, specific/non-specific referral letters and parental	School	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
										information leaflets			
5.	Arora A (2019) (61)	Systematic review: Cochrane (to 04/03/19)	7	School-aged children and adolescents (4–15y)	-	-	✓	✓	-	Traditional screening, criteria-based screening, specific/non-specific referral letters, parental information leaflets, commonsense model of self-regulation (CSM)-based referral letter and dental information guide	School	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
6.	Bramantoro T (2021) (58)	Systematic review (to 24/04/20)	31	School-aged children and adolescents	-	-	✓	✓	-	Any type of oral health intervention conducted in a preschool, elementary school or high school	School	OHK, OHB, OHA, OHS, and OHRQoL (+)	III-2
7.	Calderon SJ (2014) (64)	Systematic review (1999–2013)	8	Adolescents	-	-	-	✓	-	Educational program on oral health and hygiene and targeted messages about flossing	School	OHB (?)	III-3
8.	Chi DL (2013)	Systematic review	9	**Alaska Native**	-	-	-	✓	-	Oral health interventions aimed at Alaska	Community	OHS (?)	IV

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
	(66)	(1970–2012)		**children** ≤18y						Native children below age 18 (educating families and communities; providing dental chemotherapeutics to pregnant women; and training mid-level dental care providers)			
9.	Colvara BC (2021) (4)	Systematic review (to 09/2019)	14	Children (0–6y) including **Australian Indigenous; low-income African American;**	✓	-	-	✓	✓	Motivational interviewing or counselling technique based on the principles developed by Miller and	Community	OHS (+); caregiver's OHK, OHB (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
				Cree group First Nations in Canada						Rollnick[57] for preventing ECC			
10.	Cooper AM (2013) (10)	Systematic review: Cochrane (to 18/10/12)	4	Children in primary school (4–12y)	-	-	✓	-	-	Behavioural intervention in primary school addressing toothbrushing and cariogenic food	Primary school	OHS (?)	I
11.	de Sousa, FSO (2019) (56)	Systematic review (to 08/2018)	20	Preschool children (≤71mo)	✓	-	✓	✓	✓	Fluoride varnish with or without other oral health programs (e.g. OHE, dietary counselling,	Community or home-based	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
										supervised toothbrushing)			
12.	Dickson-Swift V (2017) (1)	Scoping review (12/2003–12/2015)	26	Children in school, preschool, kindergarten and childcare centres	✓	✓	✓	✓	✓	Toothbrushing program (with guidelines) run in schools, preschools, kindergartens and childcare centres	School, preschool, kindergarten and childcare centres	OHS and OHK (?)	IV
13.	dos Santos APP (2013) (2)	Systematic review (to 03/2012)	8	Children in primary dentition phase (<7y)	-	-	✓	-	-	Fluoride toothpaste (range 440–1500 ppm) with/without oral health education	School and home-based	OHS (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
14.	dos Santos, APP (2018) (65)	Systematic review (to 2016)	4	Children and adolescents (<18y)	-	-	-	✓	-	Supervised toothbrushing	School and kindergarten	OHS (-)	I
15.	Geetha Priya PR (2019) (6)	Systematic review (to 2017)	18	School-aged children (6–12y)	-	-	✓	✓	-	School-based oral health education (e.g. lectures, AV resources, classroom activities)	School	OHK, OHB and OHS (+)	III-2
16.	Gwynn J (2020) (15)	Systematic review (2002–2014)	9	Indigenous adolescents (10–19y) including **Australian Aboriginal,**	✓	-	-	✓	✓	Intervention designed for Indigenous adolescents: included special educational	Community	OHK, OHB and OHS (+)	IV

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
				Canadian First Nations and American Indian						program (e.g. lectures), fluoride supplements (e.g. rinsing) and training (e.g. toothbrushing training)			
17.	Hujoel PP (2018) (62)	Systematic review (to 02/2017)	7	Children (11–13y)	-	-	✓	✓	-	Oral health hygiene intervention, i.e. brushing of teeth with or without interproximal cleaning devices	School and home-based	OHS (-)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
18.	Joury E (2017) (59)	Systematic review (to 04/2016)	5	Children and adolescents (3–18y)	-	-	✓	-	-	School-based dental screening compared with no screening: standard checklist or criteria (e.g. WHO, BASCD, ADA) and referrals	School	OHS (-)	I
19.	Marinho VCC (2013) (11)	Systematic review: Cochrane (to 22/04/16)	22	Children and adolescents (up to 16y)	-	-	✓	✓	✓	Use of fluoride varnishes for preventing tooth decay	School and dental practices	OHS (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
20.	Marinho VCC (2015) (12)	Systematic review: Cochrane (to 22/04/16)	28	Children and adolescents (up to 16y)	-	-	✓	✓	✓	Use of fluoride gels for preventing tooth decay	School and home-based	OHS (+)	I
21.	Marinho VCC (2016) (13)	Systematic review: Cochrane (to 22/04/16)	37	Children and adolescents (up to 16y)	-	✓	✓	✓	✓	Use of fluoride mouth rinse for preventing tooth decay	School and home-based	OHS (+)	I
22.	Moore J (2022) (9)	Systematic review (to 09/2018)	8	School-aged children (5–16y)	-	-	✓	✓	-	Oral health education intervention	School	OHK and OHB (+)	IV
23.	Sanjeevan V (2019)	Systematic review (to 2016)	5	School-aged children (<15y)	-	-	✓	-	-	Traditional screening, health education	School	OHB (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
	(7)									and referral cards			
24.	Santos APP (2013) (55)	Systematic review (03/2012)	5	Preschool children (<7y)	-	-	✓	-	-	Use of low fluoride toothpaste (<600 ppm) compared with use of standard (1000–1500 ppm) toothpaste	Community	OHS (-)	I
25.	Skeie MS (2018) (14)	Systematic review (to 02/03/15)	37	Children and adolescents of **immigrant or low socio-economic**	✓	-	✓	✓	-	Preventive intervention for caries other than water fluoridation and fluoride toothpaste (e.g. APF gel, fluoride	School, home-based, community or dental practice	OHS (+)	IV

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
				backgrounds						supplements, fluoridated salt, fluoride rinsing, MI, supervised toothbrushing)			
26.	Stein C (2018) (8)	Systematic review (to 09/06/15)	12	School-aged children (5–18y)	-	-	✓	-	-	Oral health educational intervention carried out by dentists in school program (e.g. lectures, leaflets, slides, classroom activities, toothbrushing demonstration, OHI)	School	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
27.	Tsai C (2020) (42)	Systematic review (to 09/2019)	37	Adolescents	-	-	✓	✓	-	Oral health promotion intervention that includes education by leaflets or video, comprehensive programs involving child, family and larger community	School and university	OHK, OHB, OHA, OHS, and OHRQoL (+)	I
28.	Xiang B (2021) (63)	Systematic review (01/01/ 1990 - 21/03/ 2019)	10	Adolescents (10–19y)	-	-	✓	-	-	Theory guided intervention aimed at improving oral health (e.g. SBT, HAPA, HBM)	School or home-based	OHB and OHS (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				

Abbreviations:

ADA: American Dental Association; APF: Acidulated Phosphate Fluoride; AV: Audiovisual; BASCD: British Association for the Study of Community Dentistry; CSM: Common-Sense Model of Self-Regulation; ECC: Early Childhood Caries; HAPA: Health Action Process Approach; HBM: Health Belief Model; MI: Motivational Interviewing; mo: months; OHK: Oral Health Knowledge; OHB: Oral Health Behaviour; OHA: Oral Health Attitude; OHE: Oral Health Education; OHI: Oral Health Instruction; OHS: Oral Health Status; OHRQoL: Oral Health-related Quality of Life; SBT: Standard Behavioural Treatment; WHO: World Health Organization; y: years.

Note:

[a] If the author does not provide information on the search date, the range of first and last study is included in the duration.

[b] Countries and jurisdictions that have comparable health systems to the Victorian and Australian jurisdictions, i.e. the UK, New Zealand, Canada, the US and Australian jurisdictions.

[c] Studies conducted in wide-ranging settings are categorised under 'community' if not mentioned in the manuscript.

[d] Effectiveness of interventions: '+': most of the interventions were effective; '-': most of the interventions were not effective; '?': most of the interventions had questionable effectiveness.

[e] As per NHMRC levels of evidence.

II. Older people residing in a care facility

Analysis of evidence in relation to Questions 1 and 2

The characteristics and summary of the included studies (n=6) that looked at older people residing in a care facility are outlined in Table 5. A detailed summary of findings from these studies are presented in Appendix 2 (Table 10). The following sections synthesise the evidence as to the effectiveness of oral health promotion interventions for older people residing in a care facility, along with an analysis of the applicability of the interventions for Victoria and Australia.

Interventions for caregivers and nursing home staff

Chen et al.[16] reviewed 28 studies that looked at different workforce models for addressing the oral care needs of older people residing in an aged care facility. The included studies varied in quality (ranging from NHMRC level IV to II). The review described four models of workforce interventions: nurse-led training of aged care staff; oral health professional-led training of aged care nurses; oral health professional-led training of nurses with ongoing clinical support; and oral health professionals also providing care. The review provided limited detail as to the effectiveness of the interventions and focused on the economic feasibility of the intervention. There were four studies from Australia; all of them showed statistically significant improvement in dental and denture plaque level. Two of these studies had a workforce model of nurse-led training of aged care nurses and the remaining two had oral health professional-led training of aged care nurses with ongoing clinical support. However, it should be noted that all the Australian studies in the review were of NHMRC level III evidence.

Coker et al.[67] reviewed 12 studies that focused on interventions targeting residential care staff who provided oral hygiene care to **older adults with functional or cognitive disabilities** residing in an institutional care facility. Interventions included oral health education and training of nursing staff with or without regular prophylactic treatment and provision of toothbrushes and toothpaste. The studies in the review reported varied results, with half the studies reporting improvement in dental plaque. Three studies were conducted in the UK and one in Canada. As the studies were of NHMRC level III evidence, conclusions as to the effectiveness of the intervention and its applicability in the Victorian and Australian context are questionable.

Wang et al.[68] reviewed five studies (ranging from NHMRC level III-3 to II), which focused on one or more oral health education program(s) for caregivers of elderly people (65 years and older) residing in nursing homes and aged care facilities. All the studies were included in the quantitative synthesis and the pooled analysis showed the proportion of residents with normal oral mucosa (OR=1.81, p=0.027), no visible plaque (OR=1.54, p=0.001) and no detectable denture stomatitis (OR=2.89, p<0.001) increased significantly among the residents who had a caregiver who had recently completed the oral health education program. Although 4/5 studies were not randomised controlled trials and of moderate quality, there is some limited evidence that the intervention is replicable and may be effective in Australia and Victoria.

Combination of interventions for caregivers/nursing home staff and elderly

Albrecht et al.[69] reviewed nine randomised controlled trials (making the review NHMRC level I) that compared the effectiveness of educational interventions (information and practical components) with usual care among residents living in facilities providing supervision or nursing care for the elderly (64 years and older). Eight of the nine studies were pooled and the results showed no evidence of difference between intervention and usual care for dental plaque (standardised mean difference (SMD)=-0.04; CI -0.26,0.17) or denture plaque (SMD=-0.60; CI -1.25,0.05). Half the studies were conducted in the US, the UK or Canada, which have contextual similarities in elderly care to Australia. However, the findings do not provide sufficient evidence to be able to draw conclusions as to the effectiveness of the education intervention on the oral health outcomes of elderly people in residential facilities.

Gomez-Rossi et al.[17] reviewed 81 studies, more than 90% of which were randomised controlled trials (RCTs); the studies ranged from NHMRC level III-2 to II. The interventions in the studies varied widely and included educational interventions (designed for caregivers, patients, staff or relatives); providing oral hygiene and assistance with toothbrushing; providing profession oral healthcare; restorative treatment; application of fluoride; mouthwashes, chewing gum and food supplements; toothbrush optimisation; telemedicine; dentifrices; probiotics; and tongue hygiene. There were two studies from Australia, both were non-RCT and showed that educational intervention was effective in improving plaque score. However, the review provided limited evidence from which to draw a robust conclusion.

Siegel et al.[70] reviewed 18 studies, which included various interventions designed to improve or maintain the oral health of older people (over 60 years) **with dementia and cognitive impairment**. The included studies ranged from NHMRC level III-3 to II. The intervention included oral hygiene care strategies; behavioural and communication strategies; oral healthcare training and oral care provision by staff and carers; and comprehensive oral health protocols. Few studies found provision of oral health education and training to nursing staff improved plaque and gingival scores. Interventions demonstrating a positive effect on oral health status included nursing/caring staff brushing the residents' teeth, providing oral care according to the designated protocol, one-to-two oral care sessions a week, nutritional supplements for residents and group exercise. The review concluded that the heterogenicity of the results and methodological weaknesses identified in the included studies prevented a rigorous conclusion. Four of the 18 studies were conducted in US and none were from Australia, which further limits the ability to draw a conclusion as to the applicability of the interventions in the Australian context.

Summary of oral health promotion interventions for the Victorian/Australian setting

Oral health promotion interventions designed for older people residing in a care facility that have been found to be effective and may be feasible in the Victorian and Australian settings are:

- Workforce models of nurse-led training of aged care nurses and oral health professional-led training of aged care nurses with ongoing clinical support for improving oral health status[16]
- Educational interventions designed for caregivers, patients, staff or relatives for improving oral health status.[17]

Table 5—Characteristics and summary of included studies focused on older people residing in a care facility

N.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectivenes[d]	Level of evidenc[e]
					Australia	New Zealand	UK	US	Canada				
1.	Albrecht M (2016) (69)	Systematic review: Cochrane (to 18/01/16)	9	Older adults	-	-	✓	✓	✓	Educational programs about oral health for nursing staff and/or residents	Residential nursing facilities for elderly	OHS, OHB, OHK and OHA (?)	I
2.	Chen R (2020) (16)	Systematic review (to 04/2019)	28	Older people residing in aged-care facilities	✓	-	✓	✓	✓	Nurse-led training, oral health professional-led training with/without clinical support, and oral health professional service provision only	Residential care facility	OHS (+)	IV

N.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectivenes[d]	Level of evidenc[e]
					Australia	New Zealand	UK	US	Canada				
3.	Coker E (2014) (67)	Systematic review (to 31/07/13)	12	Older adults with **functional and cognitive disability**	-	-	✓	-	✓	Aimed at nurse or nursing assistant providing oral care to primarily older adults with functional or cognitive disabilities	Residential nursing facilities for elderly	OHK, OHA, and OHB (-)	III-2
4.	Gomez-Rossi J (2020) (17)	Scoping review (1997–2019)	81	Older people (≥65y)	✓	✓	✓	✓	✓	Educational intervention (designed for caregivers, staff, patients, relatives), for assistance with oral hygiene and toothbrushing; application of fluoride;	Residential long-term care facility	OHS (+)	III-2

N.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectivenes[d]	Level of evidenc[e]
					Australia	New Zealand	UK	US	Canada				
										mouthwashes; chewing gums/food supplements; toothbrush optimisation; dentifrices; probiotics; tongue hygiene			
5.	Siegel E (2017) (70)	Systematic review (to 02/2015)	18	Older people (<60y) with **dementia or cognitive impairment**	-	-	-	✓	-	Intervention and implementation strategies to improve or maintain oral health of older people with dementia or cognitive impairment	Long-term care facility or nursing homes	OHS (?)	III-3

N.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectivenes[d]	Level of evidenc[e]
					Australia	New Zealand	UK	US	Canada				
6.	Wang TF (2015) (68)	Systematic review (to 09/2014)	5	Older people (≥65y)	-	-	✓	✓	-	Oral health education for caregivers: oral health, oral hygiene, dental diseases, common risk factors and oral hygiene instruction	Residential care facility	OHS (?)	III-3

Abbreviations:

OHK: Oral Health Knowledge; OHB: Oral Health Behaviour; OHA: Oral Health Attitude; OHS: Oral Health Status; y: years.

Note:

[a] If the author does not provide information on the search date, the range of first and last study is included in the duration.
[b] Countries and jurisdictions that have comparable health systems to the Victorian and Australian jurisdictions, i.e. the UK, New Zealand, Canada, the US and Australian jurisdictions.
[c] Studies conducted in wide-ranging settings are categorised under 'community' if not mentioned in the manuscript.
[d] Effectiveness of interventions: '+': most of the interventions were effective; '-': most of the interventions were not effective; '?': most of the interventions had questionable effectiveness.
[e] As per NHMRC levels of evidence.

III. Pregnant women and mothers with young infants

Analysis of evidence in relation to Questions 1 and 2

The characteristics and summary of included studies (n=3) focusing on pregnant women and mothers with young infants are outlined in Table 6. A detailed summary of findings from these studies is presented in Appendix 2 (Table 11). The following sections synthesise the evidence as to the effectiveness of oral health promotion interventions for pregnant women and mothers with young infants, along with an analysis of the applicability of the interventions for Victoria and Australia.

Multicomponent interventions during prenatal period

Vamos et al.[18] reviewed seven studies of diverse quality (ranging from NHMRC IV to II) and of varied study designs and populations. Participants in the review also included **African American and Hispanic women, Canadian First Nations women, women from rural communities and women from a low-income household**. The key theme of the review's interventions was oral health education and skills development in prenatal clinics. Prenatal dental education session was the most common intervention (5/7 studies), which included lectures or education sessions or an audiovisual session with varied duration (five minutes to 45 minutes). The topics of the education sessions included baby bottle use, breastfeeding, oral hygiene, first dental visit age, when to use bottled water, nutrition, fluoride, non-nutritive snacking habits, the role of medication, nursing and caries, toothbrushing, when to visit the dentist, connection with systemic health, myths, plaque, brushing, flossing, caries prevention, baby's teeth and oral evaluation. Most of the studies (4/5 studies) reported that educational interventions were effective in improving oral health knowledge and attitude, although one study concluded a single session was ineffective in improving oral health awareness. One of the studies had an intervention that included provision of fluoride varnish applications, mouthwash, oral hygiene instructions and scheduled examinations, and demonstrated improvement in oral health status. One study indicated that community based prenatal nutrition programs increased caregiver knowledge and attitude and improved the oral health hygiene of the child. Most studies in this review were conducted in the US and Canada, which have comparable health systems to Victoria and Australia. However, careful consideration is required given the studies ranged from NHMRC IV to II.

Multicomponent interventions during prenatal, postnatal and early parenthood

Faisal et al.[19] reviewed 36 studies of which 17 were randomised controlled trials and 19 had a quasi-experimental design (they ranged from NHMRC III-2 to II). The studies covered a wide range of oral health interventions with educational components for improving skills and eliciting behaviour change. The multicomponent intervention included oral health screening or examination (6/36 studies), fluoride varnish application (6/36 studies) and toothbrushing as part of the intervention (21/36 studies). Qualitatively, 28 studies showed significant effects in clinical outcomes with or without additional effects on oral health behaviour and knowledge. The pooled standardised mean difference (SMD) for caries experience demonstrated significant results for caries prevention at the surface level (0.15; 95% CI 0.25, -0.04) and at the tooth level (-0.24; 95% CI -0.42, -0.07). The review included studies conducted in the US, the UK and Canada as well as Australia, and its findings are applicable in the Victorian/Australian setting. Four studies were from Australia; one of these was conducted in

Aboriginal community-controlled health services and showed age-appropriate educational sessions for parents had a positive effect on the mean decayed, missing, filled surfaces (DMFS) and mean decayed, missing, filled, teeth (DMFT) scores. However, some interventions conducted in Australia were not found to be effective. An intervention conducted in culturally diverse local government areas (LGAs) in Australia showed oral health education (along with an oral health pack and SMS reminder) did not yield any statistically significant difference in oral health outcomes. Similarly, one study conducted in non-fluoridated rural Victoria with an oral health starter kit as an intervention (age-appropriate toothbrush, toothpaste and educational information for parents outlining key evidence-based oral health promotion messages) did not generate any significant results in oral health outcomes.

George et al.[20] reviewed nine studies (ranging from NHMRC III-3 to II) with the intervention delivered to expecting mothers or mothers with infants up to the age of 24 months. The intervention included antenatal oral health education with dental screening and referral (1/9 study) and showed that children whose mother did not attend the intervention had higher caries. Similarly, the postnatal intervention (6/9 studies) included oral health education with or without individualised counselling, provision of written oral health promotion materials, and community wide oral health initiatives (e.g. activity in a local festival, public display or oral health education resources). Both the antenatal and postnatal interventions yielded positive effects on oral health outcomes in children. However, two of the studies reported a combination of prenatal and postnatal interventions had mixed results. Five out of nine studies in this review were conducted in Canada and the US, which have comparable healthcare infrastructure to Victoria and Australia.

Summary of oral health promotion interventions for the Victorian/Australian setting

Oral health promotion interventions designed for pregnant women and mothers with young infants that have been found to be effective and may be feasible in Victoria and Australia are:

- Prenatal dental education sessions, which include lectures or education sessions or an audiovisual session, for improving oral health knowledge and attitude[18]
- Oral health interventions with educational components for improving skills and eliciting behaviour change and improving oral health status[19]
- Postnatal oral health education with or without individualised counselling, provision of written oral health promotion materials, and community wide oral health initiative (e.g. oral health education resources) for improving oral health status.[20]

Table 6—Characteristics and summary of included studies focusing on pregnant women and mothers with young infants

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
1.	Faisal MR (2022) (19)	Systematic review (1946–03/2021)	36	Pregnant women, parents/care-givers of children aged 0–7y	✓	-	✓	✓	✓	Preventive and behaviour change interventions with oral health education (written or verbal material or videos or combination), and/or oral health screening and/or preventive technique (e.g. fluoride varnish, provision of toothbrush),	Community and non-dental clinical setting	OHK, OHRQol (parent and child) and child's OHS (?)	III-2

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
										delivered by non-dental professional			
2.	George A (2019) (20)	Systematic review (to 09/2018)	9	Pregnant women or mothers with young infant (up to 24mo)	-	-	-	✓	✓	Intervention relating to oral health delivered to pregnant women and mothers with young infants by a non-dental professional	Community and outreach community centres	OHK and OHB; child's OHS (+)	III-3
3.	Vamos CA (2015) (18)	Systematic review (1991–2010)	7	Pregnant women including **Canadian First Nations,**	-	-	-	✓	✓	Educational intervention during individual and group prenatal visits, instruction about	Prenatal clinic and home-based	OHK, OHB, OHA, and OHS (+)	IV

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
				women from rural community, low-income women						oral hygiene, lectures, AV presentation and provision of dental supplies			

Abbreviations:

AV: Audiovisual; mo: months; OHK: Oral Health Knowledge; OHB: Oral Health Behaviour; OHA: Oral Health Attitude; OHS: Oral Health Status; OHRQoL: Oral Health-related Quality of Life; y: years

Note:

[a] If the author does not provide information on the search date, the range of first and last study is included in the duration.

[b] Countries and jurisdictions that have comparable health systems to Victoria and Australia, i.e. the UK, New Zealand, Canada, the US and Australian jurisdictions.

[c] Studies conducted in wide-ranging settings are categorised under 'community' if not mentioned in the manuscript.

[d] Effectiveness of interventions: '+': most of the interventions were effective; '-': most of the interventions were not effective; '?': most of the interventions had questionable effectiveness.

[e] As per NHMRC levels of evidence.

IV. Mixed population groups (children, adults and older people)

Analysis of evidence in relation to Questions 1 and 2

The characteristics and summary of included studies focusing on mixed population groups including children, adults and older people (n=9) are outlined in Table 7. A detailed summary of findings from these studies is presented in Appendix 2 (Table 12). The following sections synthesise the evidence as to the effectiveness of oral health promotion interventions for a mixed population group, along with an analysis of the applicability of the interventions for Victoria and Australia.

Oral health education

Nakre et al.[21] reviewed 40 studies that assessed the effectiveness of oral health education. The population groups in the study were diverse and included adolescents, mothers and caregivers of infants, the elderly, as well as a population group of all ages and children. The quality of the included studies ranged from NHMRC III-2 to II. Collectively, the review qualitatively synthesised oral health education, finding it effective in improving participants' knowledge, attitude and practice of oral health and in reducing plaque, bleeding on probing of the gingiva, and caries increment. One of the included studies was conducted in Melbourne, Australia, with older adults (55 years and older) of Greek and Italian descent. The intervention in the study included oral health advice and education, as well as referral to general dental practitioners, dental specialists and dental emergency services when needed. The intervention showed improvement in oral health knowledge, attitude and self-assessed physical health status, as well as self-reported oral hygiene practices and the use of oral health services. The intervention was shown to be effective in improving oral health status, knowledge and attitudes, and may be suitable for wider rollout across Victoria and Australia.

Ghaffari et al.[71] reviewed 16 studies focusing on the effectiveness of oral health education and promotion interventions in the relevant groups of people. The participants in the included studies ranged from children and adolescents to mothers and caregivers. The study designs were diverse, ranging from NHMRC level IV to II. The interventions were also diverse and were divided into two broad categories: (1) short-term effects, for interventions that included improving knowledge, attitudes, self-efficacy, oral health behaviour, theory constructs such as perceived susceptibility and perceived severity, and perceived behaviour; and (2) long-term effects, such as reduced risk of tooth loss and treatment needs. This review indicated that oral health education interventions are effective in improving gingival health and reducing plaque levels. However, it included broad groups of interventions with varied outcomes and limited information as to their effectiveness. Therefore, the interventions' applicability in the Australian context is uncertain.

Xylitol and other alternative sweeteners

Yazdani et al.[22] reviewed 50 studies of which six were included in the quantitative synthesis; all the included studies were randomised controlled trials, with the review being of NHMRC level I evidence. The review focused on comparing the efficacy of sugar alcohols with the placebo for preventing caries. The most common intervention was xylitol; other forms of alternative sweetener had scare evidence in terms of efficacy. The meta-analysis showed significant difference in salivary *Streptococcus mutans* (*S. mutans*) favouring xylitol use. The review concluded xylitol was an effective

measure for reducing dental caries by reducing the count of *S. mutans* in saliva. Subgroup analysis showed it was an effective intervention in adults (>18 years); however, there were non-significant differences seen in children and adolescents (0–6 years and 6–18 years). The review did not explore which dosage of xylitol was most effective. All the studies were randomised controlled trials and one study was conducted in the US, which also showed consistent results. These findings suggest the use of xylitol as an alternative sweetener may be a feasible intervention in an Australian/Victorian setting to prevent dental caries among adults.

Söderling et al.[23] reviewed 22 studies, of which 21 examined the use of xylitol (in any form including chewing gum, tablets, gummy bears and candies) as an intervention, and one study evaluated erythritol as an intervention. The participants included children, adults and older people (aged 2–73 years). All the included studies were randomised controlled trials, making the review NHMRC level I evidence. The review did not perform a pooled analysis, although most of the included studies showed the intervention lowered dental caries and the *S. mutans* count in the saliva. Four studies were conducted in the US (two studies in adults 18–73 years; one in school-aged children; and one in preschoolers) and all studies showed a statistically significant change in the *S. mutans* count in the saliva. Therefore, xylitol and erythritol consumption may be a feasible intervention that can be replicated in Australian and Victorian settings.

Riley et al.[24] reviewed 10 studies, of which two were included in the quantitative synthesis. The review assessed the effects of different xylitol-containing products for the prevention of dental caries in children and adults. All the included studies were randomised controlled trials, making the review NHMRC level I evidence. The change in dental caries and the proportion of participants without dental caries were assessed. The participants in the review included children, adults and older people, ranging in age from nine months to 80 years. The review concluded that a fluoride toothpaste containing 10% xylitol (used for 2.5–3 years) may reduce caries by 13% when compared with a fluoride-only toothpaste (prevented fractions (PF) -0.13; 95% CI -0.18 to -0.08). Two studies were conducted in US, which has comparable healthcare infrastructure to that of Australia. Thus, the use of xylitol-containing products may be an effective intervention replicable in Victoria and Australia.

Nasseripour et al.[25] reviewed 14 studies (from 13 trials) of which 13 studies were included in the quantitative synthesis. All the included studies were trials, although two were not randomised, so the included studies ranged from NHMRC level III-1 to II evidence. The study population ranged from kindergarten children to adults and the duration of follow-up ranged from two weeks to 18 months. The intervention in the review was the use of sugar-free gums, of which 13/14 studies used xylitol gum. The pooled analysis showed the *S. mutans* load reduced in the intervention group (effect size: −0.42; 95% CI −0.60 to −0.25) and there was a decline in *S. mutans* trends. The intervention was found to be effective in the studies conducted in the UK and US, and thus may be applicable in the Australian and Victorian context.

Tobacco cessation

Holliday et al.[72] reviewed 20 clinical trials, of which 16 assessed the effectiveness of interventions for tobacco use cessation in a dental clinic. The review was of NHMRC level I evidence as all the included studies were randomised controlled trials. The primary outcome of the review was to explore the abstinence of tobacco. However, oral health outcome was reported in a single study. Participants showed improvements in all the oral health measures (percentage of bleeding on probe, oral dryness score, and oral health-related quality of life) as a result of the smoking cessation advice. Since the

review did not broadly focus on oral health outcomes, there was limited evidence as to the effectiveness of tobacco cessation on improvement in oral health status.

Water fluoridation

Iheozor-Ejiofor et al.[26] reviewed 20 studies on effect of fluoridated water on tooth decay and 135 studies on dental fluorosis. All the included studies were randomised controlled trials, making the review NHMRC level I evidence. The studies included in the review were conducted in Australia, New Zealand, the UK, the US and Canada, with comparable settings to Victoria and Australia. The pooled analysis showed water fluoridation resulted in reductions in DMFT of 1.81 (95% CI: 1.31 to 2.31) and in DMFT of 1.16 (95% CI 0.72 to 1.61). The review further demonstrated a 35% reduction in DMFT and a 26% reduction in DMFT compared with the median control group mean values. The study also concluded that water fluoridation led to an increase in the percentage of carie-free children of 15% (95% CI: 11%–19%) in deciduous dentition and 14% (95% CI: 5%–23%) in permanent dentition. Most of the studies were conducted before 1975 and there has been widespread fluoridation of water since then. While the coverage of water fluoridation in Australia is about 90%, this review provides further evidence to expand the water fluoridation program.

Use of fluoride toothpaste

Walsh et al.[27] reviewed 96 studies looking at the use of fluoride toothpaste and compared fluoride toothpastes with different fluoride strengths and/or non-fluoride or no toothpaste. All the included studies were RCTs, making the review NHMRC level I evidence. The pooled analysis showed that in the primary teeth of young children, use of a toothpaste containing 1500 ppm fluoride reduced new decay when compared with non-fluoride toothpaste. Similarly, in the adult permanent dentition, 1000 or 1100 ppm fluoride toothpaste reduced DMFS increment when compared with non-fluoride toothpaste among adults of all ages. Two of the included studies were conducted in Australia; both studies concluded that the use of fluoride toothpaste (as against non-fluoride toothpaste) was effective in improving oral health outcomes. However, both the studies were conducted in the 1960s. As a significant proportion of the included studies (63/96) was conducted in the US, the UK, Australia and Canada, the intervention may be replicable in the Australian and Victorian context.

Summary of oral health promotion interventions for the Victorian/Australian setting

Oral health promotion interventions designed for mixed population groups that have been found to be effective and may be feasible in the Victorian and Australian settings are:

- Oral health advice and education, along with referral to general dental practitioners, dental specialists and dental emergency services, for improving oral health status, knowledge and attitude[21]
- Use of xylitol as an alternative sweetener among adults[22]; xylitol and erythritol use among children, adults and older people[23]; and use of fluoride toothpaste containing 10% xylitol (for 2.5–3 years) among children, adults and older people[24], for improving oral health status
- Use of sugar-free gums for children and adults, for improving oral health status[25]
- Water fluoridation for improvement in oral health status among children and adults[26]
- Use of fluoride toothpaste for improving oral health status among children and adults.[27]

Table 7—Characteristics and summary of included studies focused on mixed population groups including children, adults and older people

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
1.	Ghaffari M (2018) (71)	Systematic review (to 12/2016)	16	Children, adolescents, and mothers/ caregivers	-	-	✓	✓	-	Health promotion and health education interventions effective in improvement of oral health condition (e.g. lectures, pamphlets, booklets, audiovisual sessions, AV oral health educational content)	Community	OHK, OHB and OHS (+)	IV

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
2.	Holliday R (2021) (72)	Systematic review: Cochrane (to 19/02/15)	20	Tobacco user of any age	-	-	✓	✓	-	Tobacco cessation intervention (advice to quit, provision of self-help materials, counselling, pharmacotherapy, referral to other support or any combination of those)	Community school and college, dental clinic	OHS (?)	I
3.	Iheozor-Ejiofor Z (2015) (26)	Systematic review: Cochrane (to 19/02/15)	155	Children and adults	✓	✓	✓	✓	✓	Water fluoridation for prevention of dental caries	Community	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
4.	Nakre PD (2013) (21)	Systematic review (from 1990)	40	School-children, adolescents and older people	✓	-	✓	✓	-	Oral health program with oral health education component	School, nursing home and health centre	OHK, OHA and OHB (+)	III-2
5.	Nasseripour M (2021) (25)	Systematic review (01/01/ 1946– 31/08/ 2020)	13	Children and adults	-	-	✓	✓	-	Chewing of sugar free gum ('sugar free' included polyols such as xylitol, sorbitol or mannitol)	Community	OHS (+)	III-1
6.	Riley P (2015) (24)	Systematic review: Cochrane (to	10	Children and adults	-	-	-	✓	-	Use of xylitol (natural sweetener in sweets, candy,	School and dental practices	OHS (?)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
		14/08/2014)								chewing gum and toothpaste)			
7.	Söderling E (2020) (23)	Systematic review (01/01/2000–31/12/2019)	22	Children and adults (2–73y)	-	-	-	✓	-	Consumption of xylitol (five-carbon polyol sweetener) and erythritol (four-carbon polyol sweetener)	Community	OHS (+)	I
8.	Walsh T (2019) (27)	Systematic review: Cochrane (to 15/08/18)	96	Children and adults	✓	-	✓	✓	✓	Toothbrushing with a fluoride toothpaste	Community	OHS (+)	I

No.	First author (year) (reference)	Study type (search duration)[a]	No. of studies	Type of participants	Country of studies[b]					Type of intervention	Intervention setting[c]	Outcome and effectiveness[d]	Level of evidence[e]
					Australia	New Zealand	UK	US	Canada				
9.	Yazdani R. (2019) (22)	Systematic review (to 03/05/14)	6	Children and adults	-	-	-	✓	-	Consumption of xylitol chewing gum	Community	OHS (+)	I

Abbreviations:

AV: Audiovisual; OHA: Oral Health Attitude; OHB: Oral Health Behaviour; OHK: Oral Health Knowledge; OHS: Oral Health Status; y: years.

Note:

[a] If the author does not provide information on the search date, the range of first and last study is included in the duration.
[b] Countries and jurisdictions that have comparable health systems to Victoria and Australia, i.e. the UK, New Zealand, Canada, the US and Australian jurisdictions.
[c] Studies conducted in wide-ranging settings are categorised under 'community' if not mentioned in the manuscript.
[d] Effectiveness of interventions: '+': most of the interventions were effective; '-': most of the interventions were not effective; '?': most of the interventions had questionable effectiveness.
[e] As per NHMRC levels of evidence.

Interventions by Integrated Health Promotion framework categories

We categorised the oral health promotion interventions found in this Evidence Check according to the Victorian Integrated Health Promotion framework.[29, 30] The five categories of health promotion interventions and the description provided by the framework are:

Screening and individual risk assessment: Screening is the use of a test or investigative tool to detect individuals at risk of developing a disease that can be prevented or treated. Individual risk factor assessment is a process of detecting the overall risk of a single or multiple diseases.[29, 30]

Health education and skills development: Health education and skills development includes the provision of education to individuals (through discrete, planned sessions) or groups, with the aim of improving knowledge, attitudes, self-efficacy and individual capacity to change.[29, 30]

Social marketing and health information: Social marketing involves programs designed to advocate for change and influence the voluntary behaviour of target audiences, which benefits the audience and society as a whole. Health information aims to improve people's understanding of the causes of health and illness, the services and support available to help maintain or improve health, and to encourage personal responsibility for actions affecting health.[29, 30]

Community action: Community action aims to encourage and empower communities (both geographic and communities of interest) to build their capacity to develop and sustain improvements in their social and physical environments.[29, 30]

Settings and supportive environments: Interventions include organisational development, economic and regulatory activity and advocacy to develop a health-promoting environment.[29, 30]

Table 8 provides a summary of all effective oral health promotion interventions found in this Evidence Check, arranged by Integrated Health Promotion categories and population groups.

Table 8—Summary of all effective oral health promotion interventions by Integrated Health Promotion categories and population groups

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
Children and adolescents ***Infants, toddlers and preschool children**			After-lunch brushing program and provision of culturally sensitive oral health resources[1]		
		Child health nurses providing oral health information to school, dental therapist conducting a session of toothbrushing and provision of oral health books[1]			
		Working with the Closing the Gap Clinical Outreach teams for the application of fluoride and with schools for the toothbrushing program[1]			
		Oral health education sessions (baseline, six, 18, and 30 months)[1]			
				Use of fluoride toothpastes for preschool children[2]	
		Motivational interviewing and community based intervention including fluoride varnish and community level dental health promotion with interactive activities[3]			

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
		Motivational interviewing or counselling techniques for preventing caries[4]			
***School-children**		Multiple educational sessions focusing on tooth function, diet and its effect on teeth, toothbrushing instruction and details about dietary topics[5]			
		Preschool children: education through interactive tasks; preventive program for parents, teachers and children **Elementary school children:** oral health education incorporated into school curriculum, with constant support from teachers; dental hospital tour, provision of fluoride toothpaste and oral examinations; oral hygiene training **High-school children:** education through posters or pamphlets; motivational interviewing; dental hygienist in schools providing oral health education, open clinic and fluoride varnishes[58]			
		Multiple oral health education sessions (with either group activity or provision of leaflets)[6]			
	School-based dental screening followed by a referral card[7]				

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
***Children and adolescents**	Oral health education with leaflets or videos; comprehensive programs involving child, family and community; clinical preventive measures (dental prophylaxis, fluoride varnish/rinse and fissure sealants)[42]				
		Oral health education (e.g. lectures, leaflets, counselling); oral health toothbrushing instruction; toothbrushing demonstration and supervised toothbrushing[8]			
	School-based single or multiple sessions on oral health education and screening for plaque[9]				
		Educational program about gingival health and the provision of messages about flossing[64]			
		School-based education program with multiple oral health education sessions designed to fit into the national curriculum[10]			
					Fluoride varnish, fluoride gel and fluoride mouth rinse11–13

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
					Fissure sealants in combination with water fluoridation[14]
	Oral health education, fluoride rinsing, introduction of reticulated fluoride water supply and daily brush-ins with fluoride application[15]				
Older people residing in a care facility	Nurse-led training of aged care nurses[16] Oral health professional-led training of aged care nurses, with ongoing clinical support[16]				
	Oral health education and training of nursing staff with or without regular prophylactic treatment and provision of toothbrush and toothpaste[67]				
		One or more oral health education program(s) for caregivers of elderly people in nursing homes and residential facilities[68]			

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
		Educational interventions (designed for caregivers, patients, staff or relatives)[17]			
		Providing oral health education and training for nursing staff[70]			
	Multicomponent interventions including nursing/caring staff brushing the residents' teeth, providing oral care according to the designated protocols, 1–2 oral care sessions per week, giving residents nutritional supplements, and group exercise[70]				
Pregnant women and mothers with infants		Dental education sessions in prenatal period[18]			
	Provision of fluoride varnish applications, mouthwash, oral hygiene instructions and scheduled examinations[18]				
		Community based prenatal nutrition program[18]			
	Oral health interventions with educational components for improving skills and eliciting behaviour change[19]				

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
		Age-appropriate educational session to parents[19]			
	Antenatal oral health education with dental screening and referral[20]				
		Postnatal oral health education with or without individualised counselling, provision of oral health promotion materials, and community wide oral health initiative[20]			
Mixed population groups (children, adults and older people)	Oral health advice and education; referral to general dental practitioners, dental specialists and dental emergency services[21]				
				Use of xylitol as an alternative sweetener among adults[22]; xylitol and erythritol use among children, adults and older people[23]; use of fluoride toothpaste containing 10% xylitol (for 2.5–3 years)[24]	
					Use of sugar-free gums for children and adults[25]

Population groups	Screening and individual risk assessment	Health education and skills development	Social marketing and health information	Community action	Settings and supportive environments
					Water fluoridation[26]
				Use of fluoride toothpaste for children and adults[27]	

Legend:

Assessment of quality of evidence as per NHMRC levels of evidence[28]:

Level I	Level II	Level III-**1**	Level III-**2**	Level III-**3**	Level IV

Note:

When choosing interventions, as well as choosing interventions based on the strength of evidence, consideration needs to be given to implementing a mix of interventions across the Integrated Health Promotion categories. An appropriate mix of interventions that balance both individual and population-wide interventions has the maximum impact.[29, 30]

* The included reviews focused on different age groups of children and adolescents. Overall, we identified three subgroups of the population: (1) Infants, toddlers and preschool children; (2) Schoolchildren; (3) Children and adolescents. As the results varied according to the population, the results were also synthesised as per these subgroups.

Case Studies

Case study 1: Rural expectant mothers' attitudes and beliefs about oral health during pregnancy

This case study is based on a prenatal program, Centering Pregnancy Smiles® (CPS), which had a primarily positive impact on rural expectant mothers' attitudes and beliefs about maintaining good oral health during pregnancy. The findings of this study, conducted in a rural setting in the US, indicate CPS is an appropriate model for educating rural expectant women about pregnancy-related oral health behaviours. This intervention may be replicable in Victoria and/or elsewhere in Australia, especially in rural and remote communities.

This study is based on the Centering Pregnancy® (CP) program, a successful prenatal program adopted across the US and Canada, which was extended to Centering Pregnancy Smiles® (CPS) through the addition of an oral health component. The CPS program provides prenatal care sessions to groups of 10–12 expectant mothers who have similar due dates and prenatal care needs. The group sessions are initially held at the beginning of the first trimester, with sessions continuing until the early postpartum stage. The three key components of the CP program include: perform medical assessments of the expectant mothers; educate in a discussion format about issues such as nutrition during pregnancy, pregnancy problems and postpartum issues; and develop a support network for mothers.

The CPS program includes oral health instruction and treatment targeted at expectant mothers. Oral health professionals including dentists and dental hygienists are involved in the women's prenatal care, along with an obstetrics team. The oral health professionals educate the women about oral health issues during pregnancy and the oral health of a baby. The topics include descriptions of the parts of the mouth and teeth; common oral diseases and causes; prevention of oral diseases for mothers and babies; and what to expect when a baby starts teething. These topics are presented in facilitated discussion and active learning styles that are culturally sensitive and age-appropriate for the women.

The study assessed the effectiveness of the CPS messages through an evaluation of rural expectant mothers' attitudes, beliefs and behaviours about oral infections before and after the eighth session of the group-based prenatal program. The CPS program had a primarily positive impact on expectant mothers' attitudes and beliefs regarding oral health, which suggests the potential to improve both mothers' and children's oral health.

Note: This case study was based on the study by Anderson et al.[73], which was included in the systematic review conducted by Vamos et al.[18]

Case study 2: Xylitol gummy bear snacks for students in rural elementary school

This case study is based on a school-based oral health promotion program integrating xylitol gummy bear snacks. This study demonstrated that six weeks of habitual xylitol gummy bear consumption among children reduced the levels of *S. mutans/ S. sobrinus* in plaque. The study, conducted in a rural setting in the US, also suggested that an in-classroom gummy bear snack program is a feasible intervention that is well accepted by parents and children. Therefore, the use of xylitol gummy bear snacks may be a feasible and replicable intervention in school settings across Victoria and Australia.

This study included first to fifth grade children attending elementary schools in rural Washington State in the US. First, the children were shown a skit with an oral health message during a general assembly to introduce them to the research team. Through the partnership with the schools, parents were sent an information letter describing the Gummy Bear Study and asking permission for their child's participation in it. Interested parents signed and returned the enclosed consent form and a brief general health questionnaire.

As this was a randomised trial, there were three groups of children who received either 15.6 g (X16; n=53) or 11.7 g (X12; n=49) xylitol/day, or maltitol (M45; n=52) 44.7 g/day. The dose of xylitol was varied by combining maltitol and xylitol gummy bears. Prepackaged and labelled gummy bear unit doses were distributed in the classroom during school hours three times a day. However, the gummy bears were not sent home on non-school or missed school days. The xylitol and maltitol gummy bear snacks looked identical and had the same weight (5 g/gummy bear), size, colours (red and green) and flavour (strawberry), with similar texture and sweetness. The gummy bears were prepackaged in unit doses for classroom distribution three times a day: 15.6 g/day = 4 xylitol gummy bears; 11.7 g/day = 3 xylitol and 1 maltitol gummy bears; and maltitol control = 4 maltitol gummy bears per unit dose for a total of 12 gummy bears a day for all three groups. Unit-dose packages were ordered and prepacked into bins before being delivered to schools on a weekly basis. People who regularly served as classroom volunteers were identified by the school principals to hire as community workers. These women were trained to distribute and monitor consumption of the gummy bear snacks in the classroom.

For the evaluation of the intervention, plaque samples were collected by research staff at enrolment and after six weeks. Xylitol gummy bear snack consumption at therapeutic dose and frequency reduced *S. mutans/ S. sobrinus*. The study suggests a xylitol gummy bear snack may be an alternative to xylitol chewing gum for dental carie prevention.

Note: This case study was based on the study by Ly et al.[74], which was included in the systematic review conducted by Söderling et al.[23]

Case study 3: Interactive oral health education program for school-aged children

This case study is based on a school-based dental health education program designed to improve the oral hygiene and dental knowledge of 10-year-old children. The intervention is entitled Good Teeth Program—My Mouth Matters, and the children receiving the program had significantly lower mean plaque scores and greater knowledge about toothbrushes and disclosing tablets than those who did not. This intervention was included in several systematic reviews presented in this Evidence Check. Conducted in primary schools in the northwest of England, this intervention may be replicable in the Victorian and Australian setting.

Good Teeth Program—My Mouth Matters is an educational approach designed to allow pupils to investigate dental health issues and draw their own conclusions with the aid of a professional facilitator. The program was designed to fit with the national curriculum, focusing on group work and discussions to learn new knowledge. A total of 32 primary schools in the northwest of England participated. As this was a cluster RCT, schools were randomly allocated to active and control groups. The active group received four lessons at four-weekly intervals for four months, and children's plaque levels and knowledge were evaluated. The control group was split into a new active group and a residual control group, with a further evaluation at seven months. The new active program was given to the children every two weeks and the program was withdrawn from the original active group.

A dental facilitator undertook the teaching using a program entitled My Mouth Matters, which consisted of four one-hour lessons based on interactive group activity. Lesson one focused on tooth function and appearance and used case studies of people of different ages and their dental problems. Lesson two focused on diet and its effect on teeth, lesson three concentrated on toothbrushing and the use of disclosing tablets, and lesson four reviewed dietary topics and toothbrushing. Home extension work, involving parents, caregivers and grandparents, was an integral part of the program. This integrated three projects, with each taking approximately one hour to complete. Children worked in groups of 5–7 and the facilitators ensured that all children actively participated in all tasks. The results showed the active groups had 20% and 17% lower mean plaque scores than the control groups at four and seven months. Children's knowledge of which type of toothbrush to use and the role of disclosing tablets improved in the initial test group.

The school-based dental health education program was also evaluated among adolescents attending secondary schools in the UK. An improvement in knowledge of dental disease and an increase in the reported duration of brushing were observed, along with a significant improvement in oral hygiene and a reported reduction in gingival bleeding.

Note: This case study was based on the studies by Worthington et al.[75] and Redmond et al.[76], which were included in the systematic reviews conducted by Adair et al.[5], Geetha Priya et al.[6], Tsai et al.[42], Stein et al.[8] and Moore et al.[9]

Case study 4: Oral health promotion program for older migrant adults

This case study is based on a community oral health promotion program on the use of oral health services, oral health knowledge, attitudes and practices of older migrant adults. The population focus was older Greek and Italian adults attending community clubs and living in Melbourne, Australia. The program was successful in improving oral health knowledge and attitudes to oral health and led to an increase in dental visits and oral hygiene behaviours. The intervention was successful within the setting of social clubs and highly acceptable to these communities, which demonstrates the possibility for a wider rollout of the intervention across Victoria and Australia.

The study participants included ambulant adults aged 55 years or older, from Italian or Greek background, who regularly attended senior citizens clubs within metropolitan Melbourne. After individual written consent was obtained, participants were asked to undergo a structured interview and a standard oral examination as part of the pre-intervention data collection. Several programs were identified and initiated for all participants: on-site oral health advice and education, along with referral to general dental practitioners, dental specialists and dental emergency services when needed. Participants received brochures with information on public dental clinic addresses and a written statement of their oral health treatment needs.

Oral Health Information Seminars/Sheets (ORHIS), which was the oral health promotion program, consisted of three components: oral health seminars; provision of oral care products relevant to each oral health seminar topic; and oral health information sheets. The oral health seminars comprised nine oral health sessions discussing oral health issues for groups of 8–10 older adults, offered at fortnightly intervals on club premises. The sessions were facilitated by two bilingual research assistants and lasted 20–25 minutes. The topics and contents of each seminar were selected based on what the participants identified as most relevant to their needs, and about which they wanted information and new skills, along with topics identified through the oral clinical examination and oral health interview. Packages containing the final material (a folder and nine topic inserts) were distributed in all participating clubs and the participants received this package during the intervention. The post-test evaluations, consisting of questionnaires and an oral health examination, were conducted between two and four months after the seminars ended.

Participants who took part in the intervention responded with higher levels of achievement than those who did not. The experimental groups were also significantly more likely to have improved oral health attitudes, oral health knowledge and self-assessed physical health status, along with self-reported oral hygiene practices and use of oral health services.

Note: This case study was based on the study by Mariño et al.[77], which was included in the systematic review conducted by Nakre et al.[21]

Case study 5: Indigie-Grins: an Indigenous youth oral healthcare and education initiative

This case study is based on Indigie-Grins, an Indigenous youth oral healthcare and education initiative. A new model of care was implemented and trialled among Indigenous children aged 5–12 years over a period of 12 months. After participating in the program, participants showed statistically significant improvements in the proportion of unmet restorative needs. Further, the model of care supported greater awareness, access and reinforcement of positive oral health behaviours. As it was successfully implemented among Indigenous children in the Southern Grampians Shire of Western Victoria, this intervention may be feasible for wider rollout among Indigenous populations across Victoria and Australia.

The development of the Indigie-Grins model of care considered four key concepts: the need for Indigenous health professionals; mainstream dental funding and recognition; the use of specific Indigenous oral healthcare products; and the need for an evidence-based model to assess the intervention outcome. The structured model of care focused on four key elements: (1) Community consultation and building and strengthening of partnerships: collaboration with Indigenous services and dental/community health service; (2) Design of cultural aides and equipment (e.g. toothbrushes, timers, charts); (3) Development of a specific Indigenous education package or learning strategy; (4) Assessment/evaluation: establishment of oral health focus and identification of children's needs. The practice model structure was delivered via monthly themes including brushing, nutrition, flossing technique, mouthwash, dental appointments, transportation, reviews and family support.

Participants included 5–12-year-old children of Indigenous background in the Southern Grampians Shire, who had not visited or engaged with oral healthcare services within the previous 12 months. Demographic data, nutrition assessment, education status and current oral healthcare behaviours were recorded. A dental therapist and Indigenous health worker conducted monthly visits to the children's homes and delivered a structured education program, assessments, oral health aids and equipment. Topics included nutrition, flossing, brushing, disclosing tablets, mouthwash and advice on required clinical treatments. Children were provided with dental aides such as toothbrushes, toothpaste, Indigenous brushing charts, timers and artwork for encouragement. Rewards such as pencils, stickers and hairbands were provided for positive oral health behaviours.

Focus groups were conducted at baseline and after 10 months, and a full oral health assessment was undertaken. The study findings revealed the model of care supported greater awareness, access and reinforcement of positive oral health behaviours. There was significant improvement in image and preventative strategies for dental disease with the use of fissure sealants, extractions and restorations.

Note: This case study was based on the study by Willder et al.[78], which was included in the systematic review conducted by Gwynn et al.[15]

Discussion

Discussion of key findings

This Evidence Check included a total of 46 reviews, of which 25 included only randomised controlled trials and were of NHMRC level I evidence. The following sections discuss the Evidence Check's findings, categorised according to the population groups identified.

I. Children and adolescents

Of the reviews included in this Evidence Check, 28 focused on children and adolescents and were further divided into three subgroups.

Infants, toddlers and preschool children

An Australian study among Indigenous children showed positive effects of an after-lunch brushing program and provision of culturally sensitive oral health resources.[1] A slight improvement in oral health status was observed in another Australian study, where child health nurses provided oral health information to schools and dental therapists conducted a session on toothbrushing techniques, along with the provision of oral health books.[1] A study among **remote Indigenous communities** in northern Australia showed increased oral awareness as a result of working with the Closing the Gap Clinical Outreach teams for the application of fluoride and with schools for the toothbrushing program.[1] Oral health status improvement was also observed among **rural and low socioeconomic Māori populations** in New Zealand as a result of oral health education sessions at baseline, six, 18, and 30 months.[1] While the interventions appear to be applicable in the Australian setting, the quality of the studies should be taken into consideration.

Use of fluoride toothpastes among preschool children has demonstrated significant caries reduction at surface, tooth and individual levels in a review that is of NHMRC level I evidence.[2] Therefore, the use of fluoride toothpastes among preschool children may be a feasible and replicable intervention in the Victorian and/or Australian settings.

A study among **low-income households** in South Australia showed motivational interviewing had a positive effect on oral health status.[3] Another study among **low-income Indigenous Australians**, where the community-based intervention included fluoride varnish and community level dental health promotion with interactive activities, also showed positive effects.[3] There is also some evidence generated by a review into the effectiveness of motivational interviewing or counselling techniques for preventing early childhood caries, which included an Australian study among an **Australian Indigenous** population.[4] Therefore, motivational interviewing and community level dental health promotion may be feasible and effective interventions that can be replicated in the Victorian and Australian context.

Schoolchildren

There is limited evidence as to the effectiveness of multiple educational sessions focusing on tooth function, diet and its effect on teeth, toothbrushing instruction and details about dietary topics in improving oral health status and oral health knowledge.[5] The intervention may be replicated in Australia and Victoria as well.

Among **preschool children**, education through interactive tasks and the addition of preventive programs for parents, teachers and children have shown positive effects.[58] In **elementary school children**, oral health education incorporated into the school curriculum, with constant support from teachers, interventions such as dental hospital tours, provision of fluoride toothpaste and oral examinations, as well as a comprehensive needs-related oral hygiene training program have been found to be effective.[58] Among **high-school children**, education through posters or pamphlets, motivational interviewing and provision of dental hygienists in schools providing oral health education, open clinic, and fluoride varnishes have shown positive results.[58] However, the applicability of these interventions in the Victorian or Australian context is uncertain.

Multiple oral health education sessions, with either group activities or provision of leaflets, have proved effective in improving oral health status, which may be applicable in Australia and/or Victoria.[6] Similarly, school-based dental screening followed by a referral card was found to be effective in increasing dental attendance.[7] Given the quality of the evidence, however, the suitability of this intervention to the Victorian and Australia context should be treated cautiously.

Children and adolescents

A wide range of interventions including oral health education with leaflets or videos, comprehensive programs involving children, family and the community, and clinical preventive measures including dental prophylaxis, fluoride varnish/rinse and fissure sealants have been shown to improve oral health status.[42] However, as most studies were conducted in a different healthcare setting, the interventions' applicability in Australia is questionable. Similarly, oral health education (e.g. lectures, leaflets, counselling), toothbrushing instruction, toothbrushing demonstrations and supervised toothbrushing have shown positive results.[8] Traditional oral health educational interventions may potentially be replicated in the Australian and Victorian context to reduce plaque levels. Single or multiple sessions of oral health education and screening for plaque have been shown to improve oral health knowledge.[9] Multiple sessions of school-based oral health education sessions may be applicable in Victoria as well as more widely in Australia. While educational programs about gingival health and the provision of messages about flossing have shown positive results, the generalisation of the outcomes to the Australian context is uncertain.[64] There is also some evidence that school-based education programs with multiple oral health education sessions to improve oral health status and oral health knowledge are feasible and could be replicated in Victoria and more widely in Australia.[10]

There is substantial evidence as to the effectiveness of the topical use of fluoride in the form of varnish, gel and mouth rinse in improving oral health status, as found in reviews of NHMRC level I evidence.[11–13] Therefore, these interventions may be feasible and effective in the Australian and Victorian dental care setting. An Australian study demonstrated the efficacy of fissure sealants in combination with water fluoridation in improving oral health status, which may be applicable in Victoria, and is also an attempt to address oral health inequity stemming from low socioeconomic status.[14] A wide range of interventions aimed at improving the oral health of **Indigenous adolescents**, including oral health education, fluoride rinsing, introduction of reticulated fluoride water

supply and daily brush-ins with fluoride application, have shown positive results.[15] Studies conducted in **rural and remote settings** with **Australian Aboriginal and Torres Strait Islander adolescents** were included in the review and showed promising results. The introduction of reticulated fluoridated water may have a strong potential in improving the oral health outcomes in rural Indigenous communities across Australia. While a 'new model' of care integrating five interventions (partnerships; employment of Aboriginal and/or Torres Strait Islander health workers; cultural aides and equipment; education package; oral health assessment and dental treatment) showed positive results, further research is required to generate strong evidence to ascertain its applicability across Australia.

II. Older people residing in a care facility

Six reviews focused on older people residing in a care facility. Interventions mainly targeted the caregivers and nursing home staff, with some targeting the elderly.

Interventions for caregivers and nursing home staff

There was limited evidence from Australian studies as to the positive effect on the oral health status of residents of nurse-led training of aged care nurses or oral health professional-led training of aged care nurses with ongoing clinical support.[16] There was some evidence on the effectiveness of oral health education and training of nursing staff who provided oral hygiene to **older adults with functional or cognitive disabilities**, with or without regular prophylactic treatment and provision of toothbrushes and toothpaste.[67] One or more oral health education program(s) for caregivers of the elderly in nursing homes and residential facilities also showed improvement in oral health status.[68] However, the applicability of these interventions within Australia is questionable.

Combination of interventions for caregivers/nursing home staff and the elderly

There was some evidence from Australian studies as to the effectiveness of educational interventions (designed for caregivers, patients, staff or relatives) in improving oral health status.[17] Provision of oral health education and training for nursing staff also led to improvement in oral health status among older people with **dementia and cognitive impairment**.[70] Multicomponent interventions that had a positive effect on oral health status included nursing/caring staff brushing the residents' teeth, providing oral care according to the designated protocol, 1–2 oral care sessions a week, nutritional supplements for residents, and group exercise.[70] However, the applicability of the interventions in the Australian context is uncertain.

III. Pregnant women and mothers with young infants

Only three reviews focused on this population and the interventions were targeted at the prenatal, postnatal and early parenthood periods.

Multicomponent interventions during prenatal period

A number of interventions showed positive results in terms of effectiveness in the prenatal period. Educational interventions were found to improve oral health knowledge and attitudes; and provision of fluoride varnish applications, mouthwash, oral hygiene instructions and scheduled examinations showed positive results.[18] Similarly, a community based prenatal nutrition program was found to

increase caregiver knowledge and improve attitudes and the oral health hygiene of the child.[18] The applicability to the Australian and Victorian setting requires careful consideration.

Multicomponent interventions during prenatal, postnatal and early parenthood periods

Oral health interventions with an educational component for improving skills and eliciting behaviour change showed significant effects, which appeared applicable in the Victorian/Australian setting.[19] Age-appropriate educational sessions for parents, conducted in an Australian setting, also led to improvements in oral health status.[19] There was some limited evidence as to the effectiveness of antenatal oral health education with dental screening and referral.[20] Similarly, postnatal oral health education with or without individualised counselling, provision of oral health promotion materials and community wide oral health initiatives also showed positive effects on oral health outcomes.[20] Most studies were conducted in a health system comparable to Australia's.

IV. Mixed population groups (children, adults and older people)

There were nine reviews covering a diverse population that included children, adults and older people. Among a wide range of participants, oral health education was found to improve oral health status, knowledge and attitudes.[21] An Australian study among older adults also showed positive effects of oral health advice and education along with referral to general dental practitioners, dental specialists and dental emergency services when needed; it may be suitable for wider rollout across Victoria and Australia.[21] There is extensive evidence from reviews of NHMRC level I evidence as to the effectiveness of xylitol as an alternative sweetener among adults[22]; xylitol and erythritol use among children, adults and older people[23]; and the use of fluoride toothpaste containing 10% xylitol (for 2.5–3 years) for children and adults[24] to improve oral health status. These interventions may be replicable and feasible in the Victorian and Australian settings as well. There is also some evidence as to the positive effects of the use of sugar-free gums for children and adults, which could also be translated to the Australian context.[25] Finally, there is strong evidence that water fluoridation is effective in reducing dental caries[26], and that use of fluoride toothpaste (compared with non-fluoride toothpaste) is effective in preventing tooth decay among young children and adults of all ages.[27]

Gaps in the evidence base

This Evidence Check found there has been substantial research into the effectiveness of oral health promotion interventions over the past decade (2012–2021), identifying 46 relevant reviews.

Each review focused on a particular population and we identified four population subgroups: children and adolescents; older people residing in a care facility; pregnant women and mothers with young infants; and mixed population groups of children, adults and older people. However, studies among specific priority groups were scare. For instance, we found only six studies focused on older people in residential care and three studies among pregnant women and mothers with young infants. None of the identified systematic reviews focused on priority populations, including people with disabilities or complex medical conditions such as diabetes. This demonstrates a significant research gap in relation to the priority populations as outlined in the National Oral Health Plan 2015–2024. These include people who are socially disadvantaged or on low incomes; Aboriginal and Torres Strait Islander people; people living in regional and remote areas; and people with additional and/or specialised

healthcare needs.[39] It is worth noting, however, that even within the population groups identified in this Evidence Check, there was some focus on the priority populations. For instance, Gwynn et al.[15] focused on community based interventions to improve the oral health of **Indigenous adolescents**, while the review by Siegel et al.[70] included various interventions to improve or maintain the oral health of older people **with dementia and cognitive impairment**. Similarly, the review by Vamos et al.[18] also included **Canadian First Nations people, women from rural communities and women from low-income households**. Nonetheless, rigorous future research is required focusing specifically on the following priority participant groups: antenatal and early childhood (preschool); school-aged children and adolescents; older people; Aboriginal and Torres Strait Islanders; culturally and linguistically diverse (CALD) communities; people living in regional and remote areas; people with special needs (mental illness; disabilities; complex medical conditions—obesity, diabetes, cardiovascular diseases, stroke); low-income and socially disadvantaged groups.

We also identified other significant research gaps in relation to the design and delivery of the interventions. While this Evidence Check focused on interventions delivered in non-clinical and community settings, some reviews also included studies conducted in both clinical and non-clinical settings. Further research needs to be conducted with a focus on interventions delivered in non-clinical or community settings, with further clarity on what interventions can be effective in: childcare and preschool settings; school settings; workplace settings; community settings; and residential care settings. Moreover, while this Evidence Check focused on a number of outcome measures, the majority of the reviews reported oral health status as the outcome, with few reporting oral health knowledge, oral health attitudes and oral health behaviours. None of the included reviews reported on oral health literacy, which signifies a further research gap.

The studies included in this Evidence Check varied in terms of NHMRC levels of evidence. While just over 50% of the included reviews were of NHMRC level I evidence, most of these focused on children and adolescents. Therefore, all the interventions this Evidence Check found to be effective require careful consideration based on the quality of evidence. The included studies were conducted in countries and jurisdictions that have comparable health systems to the Victorian and Australian jurisdictions. However, not all reviews included a majority of studies conducted in the countries of interest. Those studies conducted in the countries of interest were taken into consideration when suggesting the potential applicability of interventions in the Victorian and Australian context. We also highlighted studies conducted in an Australian setting based on their promising results. This revealed a significant research gap, which was the lack of studies that looked at the effectiveness of oral health promotions in Australia. This limited our ability to draw robust conclusions as to the applicability of the interventions in the Victorian/Australian setting. For instance, evidence as to the effectiveness of fluoride toothpastes have mostly been generated from populations with low or no water fluoridation coverage. While the health systems of the UK and Australia are comparable, there is a major difference in water fluoridation rates, which is about 10% in the UK but 90% in Australia.[43] This highlights the need for studies analysing the effectiveness of the interventions in the Australian setting. Further, rigorous research across diverse priority population groups in Australia is required to ascertain the feasibility and effectiveness of the identified interventions in an Australian context.

Conclusion

This Evidence Check rapid review—funded by the Victorian Department of Health and commissioned by Dental Health Services Victoria—aimed to synthesise the evidence as to the effectiveness of oral health promotion interventions for the Australian population. The reviewers found there has been substantial research into the effectiveness of oral health promotion interventions over the past decade (2012–2021), identifying 46 reviews for inclusion in the Evidence Check. Each review focused on a particular population and we identified four population subgroups: children and adolescents (n=28), older people residing in a care facility (n=6), pregnant women and mothers with young infants (n=3), and mixed population groups of children, adults and older people (n=9).

The oral health promotion interventions differed widely across the population groups. The interventions identified for each group are summarised as follows:

- **Children and adolescents:**
  - *Infants, toddlers and preschool children:* supervised toothbrushing; use of fluoride toothpaste and fluoride varnish among preschool children; motivational interviewing or counselling
  - *Schoolchildren*: education program with oral health instructions; school screening with referrals; oral hygiene intervention with toothbrushing
  - *Children and adolescents*: theory guided interventions; education program with oral health instructions; interventions focused on toothbrushing; fluoride varnish, fluoride gel and fluoride mouth rinse; interventions specifically for priority population groups
- **Older people residing in a care facility:**
  - Interventions for caregivers and nursing home staff; combination of interventions for caregivers/nursing home staff and the elderly
- **Pregnant women and mothers with young infants:**
  - Multicomponent interventions during the prenatal period; multicomponent interventions during the prenatal, postnatal and early parenthood periods
- **Mixed population groups (children, adults and older people)**
  - Oral health education; xylitol and other alternative sweeteners; tobacco cessation; water fluoridation; use of fluoride toothpaste

This Evidence Check has synthesised the evidence for effective oral health promotion interventions in various population groups, analysing their applicability for the Victorian/Australian setting. While the interventions presented in the Evidence Check have been found to be effective in countries with comparable health systems to Australia's, we recommend that they be considered carefully, based on the quality of evidence. We identified significant research gaps in the evidence base, most notably the limited number of studies conducted in Australia, which limits our ability to draw robust conclusions as to their applicability in the Victorian/Australian setting. Therefore, there is a need for rigorous future research targeting diverse priority population groups across Australia to ensure the improvement of oral health for all Australian populations.

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References

1. Dickson-Swift V, Kenny A, Gussy M, de Silva AM, Farmer J, Bracksley-O'Grady S. Supervised toothbrushing programs in primary schools and early childhood settings: A scoping review. Community Dent Health. 2017;34(4):208–25. doi: https://dx.doi.org/10.1922/CDH_4057Dickson-Swift18
2. dos Santos APP, Nadanovsky P, de Oliveira BH. A systematic review and meta-analysis of the effects of fluoride toothpastes on the prevention of dental caries in the primary dentition of preschool children. Community Dent Oral Epidemiol. 2013;41(1):1–12. doi: https://dx.doi.org/10.1111/j.1600-0528.2012.00708.x
3. Albino J, Tiwari T. Preventing Childhood Caries: A Review of Recent Behavioral Research. J Dent Res. 2016;95(1):35–42. doi: 10.1177/0022034515609034
4. Colvara BC, Faustino-Silva DD, Meyer E, Hugo FN, Celeste RK, Hilgert JB. Motivational interviewing for preventing early childhood caries: A systematic review and meta-analysis. Community Dent Oral Epidemiol. 2021;49(1):10–16. doi: 10.1111/cdoe.12578
5. Adair PM, Burnside G, Pine CM. Analysis of health behaviour change interventions for preventing dental caries delivered in primary schools. Caries Res. 2013;47(SUPPL. 1):2–12. doi: https://dx.doi.org/10.1159/000351829
6. Geetha Priya PR, Asokan S, Janani RG, Kandaswamy D. Effectiveness of school dental health education on the oral health status and knowledge of children: A systematic review. Indian J Dent R: official publication of Indian Society for Dental Research. 2019;30(3):437–49. doi: https://dx.doi.org/10.4103/ijdr.IJDR_805_18
7. Sanjeevan V, Janakiram C, Joseph J. Effectiveness of school-based dental screening in increasing dental care utilization: A systematic review and meta-analysis. Indian J Dent Res: official publication of Indian Society for Dental Research. 2019;30(1):117–24. doi: https://dx.doi.org/10.4103/ijdr.IJDR_523_18
8. Stein C, Santos NML, Hilgert JB, Hugo FN. Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis. Community Dent Oral Epidemiol. 2018;46(1):30–37. doi: https://dx.doi.org/10.1111/cdoe.12325
9. Moore J, Bond K, Turner LW. Reducing Chronic Disease Risk through Positive Oral Health Practices: A Systematic Review of School-based Dental Health Programs. Am J Health Educ. 2022;53(3):133–41. doi: 10.1080/19325037.2022.2048749
10. Cooper AM, O'Malley LA, Elison SN, Armstrong R, Burnside G, Adair P, et al. Primary school-based behavioural interventions for preventing caries. Cochrane Database Syst Rev. 2013(5):CD009378. doi: https://dx.doi.org/10.1002/14651858.CD009378.pub2
11. Marinho VCC, Worthington HV, Walsh T, Clarkson JE. Fluoride varnishes for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2013(7):95. doi: 10.1002/14651858.CD002279.pub2
12. Marinho VCC, Worthington HV, Walsh T, Chong LY. Fluoride gels for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2015(6):CD002280. doi: https://dx.doi.org/10.1002/14651858.CD002280.pub2
13. Marinho VCC, Chong LY, Worthington HV, Walsh T. Fluoride mouthrinses for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2016;2016(7) (no pagination). doi: https://dx.doi.org/10.1002/14651858.CD002284.pub2
14. Skeie MS, Klock KS. Dental caries prevention strategies among children and adolescents with immigrant - or low socioeconomic backgrounds- do they work? A systematic review. BMC Oral Health. 2018;18(1):20. doi: https://dx.doi.org/10.1186/s12903-018-0478-6
15. Gwynn J, Skinner J, Dimitropoulos Y, Masoe A, Rambaldini B, Christie V, et al. Community based programs to improve the oral health of Australian Indigenous adolescents: a systematic

review and recommendations to guide future strategies. BMC Health Serv Res. 2020;20(1):384. doi: https://dx.doi.org/10.1186/s12913-020-05247-w
16. Chen R, Irving M, Wright FAC, Cunich M. An evaluation of health workforce models addressing oral health in residential aged care facilities: A systematic review of the literature. Gerodontology. 2020;37(3):222–32. doi: 10.1111/ger.12475
17. Gomez-Rossi J, Hertrampf K, Abraham J, Gassmann G, Meyer G, Schlattmann P, et al. Interventions to improve oral health of older people: A scoping review. J Dent. 2020;101:11. doi: 10.1016/j.jdent.2020.103451
18. Vamos CA, Thompson EL, Avendano M, Daley EM, Quinonez RB, Boggess K. Oral health promotion interventions during pregnancy: a systematic review. Community Dent Oral Epidemiol. 2015;43(5):385–96. doi: 10.1111/cdoe.12167
19. Faisal MR, Mishu MP, Jahangir F, Younes S, Dogar O, Siddiqi K, et al. The effectiveness of behaviour change interventions delivered by non-dental health workers in promoting children's oral health: A systematic review and meta-analysis. PLoS One. 2022;17(1):e0262118. doi: 10.1371/journal.pone.0262118
20. George A, Sousa MS, Kong AC, Blinkhorn A, Norrie TP, Foster J, et al. Effectiveness of preventive dental programs offered to mothers by non-dental professionals to control early childhood dental caries: a review. BMC Oral Health. 2019;19(1):9. doi: 10.1186/s12903-019-0862-x
21. Nakre PD, Harikiran AG. Effectiveness of oral health education programs: A systematic review. J Int Soc Prev Community Dent. 2013;3(2):103–15. doi: 10.4103/2231-0762.127810
22. Yazdani R, Albujeer ANH, Rahnama E, Kharazifard MJ. Effect of xylitol on salivary Streptococcus mutans: a systematic review and meta-analysis. Journal of Contemporary Medical Sciences. 2019;5(2):64–70. doi: 10.22317/jcms.04201901
23. Söderling E, Pienihäkkinen K. Effects of xylitol and erythritol consumption on mutans streptococci and the oral microbiota: a systematic review. Acta Odontologica Scandinavica. 2020;78(8):599–608. doi: 10.1080/00016357.2020.1788721
24. Riley P, Moore D, Ahmed F, Sharif MO, Worthington HV. Xylitol-containing products for preventing dental caries in children and adults. Cochrane Database Syst Rev. 2015(3):64. doi: 10.1002/14651858.CD010743.pub2
25. Nasseripour M, Newton JT, Warburton F, Awojobi O, Di Giorgio S, Gallagher JE, et al. A systematic review and meta-analysis of the role of sugar-free chewing gum on Streptococcus mutans. BMC Oral Health. 2021;21(1):11. doi: 10.1186/s12903-021-01517-z
26. Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, et al. Water fluoridation for the prevention of dental caries. Cochrane Database Syst Rev. 2015(6):CD010856. doi: https://dx.doi.org/10.1002/14651858.CD010856.pub2
27. Walsh T, Worthington HV, Glenny AM, Marinho VC, Jeroncic A. Fluoride toothpastes of different concentrations for preventing dental caries. Cochrane Database Syst Rev. 2019;3(3):Cd007868. doi: 10.1002/14651858.CD007868.pub3
28. National Health and Medical Research Council. NHMRC levels of evidence and grades for recommendations for guideline developers. Canberra: National Health and Medical Research Council, 2009.
29. Department of Human Services. Integrated health promotion A practice guide for service providers. Melbourne, Victoria: Victorian Government Department of Human Services, 2003.
30. Rogers JG. Evidence-based oral health promotion resource. Melbourne, Australia: Prevention and Population Health Branch, Government of Victoria, Department of Health, 2011.
31. Glick M, Williams DM, Kleinman DV, Vujicic M, Watt RG, Weyant RJ. A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. J Am Dent Assoc. 2016;147(12):915–17. doi: https://doi.org/10.1016/j.adaj.2016.10.001
32. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century–the approach of the WHO Global Oral Health Programme. Community Dent Oral Epidemiol. 2003;31:3–24 https://doi.org/10.1046/j..2003.com122.x
33. Kassebaum NJ, Smith AGC, Bernabé E, Fleming TD, Reynolds AE, Vos T, et al. Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990–2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. J Dent Res. 2017;96(4):380–87. doi: 10.1177/0022034517693566

34. Peres MA, Macpherson LMD, Weyant RJ, Daly B, Venturelli R, Mathur MR, et al. Oral diseases: a global public health challenge. Lancet. 2019;394(10194):249–60. doi: https://doi.org/10.1016/S0140-6736(19)31146-8
35. Australian Institute of Health and Welfare. Oral health and dental care in Australia. Canberra: AIHW, 2022.
36. Ha D, Roberts-Thomson K, Arrow P, Peres K, Do L. Children's oral health status in Australia, 2012–14. In: Do L, Spencer A, editors. Oral Health of Australian Children: The National Child Oral Health Study 2012–2014. Adelaide, Australia: University of Adelaide Press; 2016.
37. Do L, Luzzi L. Oral health status. Australia's Oral Health: National Study of Adult Oral Health 2017–18. Adelaide: The University of Adelaide; 2019.
38. Watt RG, Sheiham A. Integrating the common risk factor approach into a social determinants framework. Community Dent Oral Epidemiol. 2012;40(4):289-96. doi: https://doi.org/10.1111/j.1600-0528.2012.00680.x
39. Australian Government. Healthy Mouths, Healthy Lives: Australia's National Oral Health Plan 2015–2024. Adelaide: COAG Health Council, 2015.
40. Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. Community Dent Health. 1998;15(3):132–44
41. Satur JG, Gussy MG, Morgan MV, Calache H, Wright C. Review of the evidence for oral health promotion effectiveness. Health Educ J. 2010;69(3):257–66. doi: 10.1177/0017896909349240
42. Tsai C, Raphael S, Agnew C, McDonald G, Irving M. Health promotion interventions to improve oral health of adolescents: A systematic review and meta-analysis. Community Dent Oral Epidemiol. 2020;48(6):549–60. doi: 10.1111/cdoe.12567
43. Moore D, Allen T, Birch S, Tickle M, Walsh T, Pretty IA. How effective and cost-effective is water fluoridation for adults? Protocol for a 10-year retrospective cohort study. BDJ Open. 2021;7(1):3. doi: 10.1038/s41405-021-00062-9
44. UK Department of Health. An oral health strategy for England. London: Department of Health, 1994.
45. Naseri-Salahshour V, Abredari H, Sajadi M, Sabzaligol M, Karimy M. The Effect of Oral Health Promotion Program on Early Dental Decay in Students: a Cluster Randomized Controlled Trial. J Caring Sci. 2019;8(2):105–10. doi: 10.15171/jcs.2019.015
46. Watt RG. Strategies and approaches in oral disease prevention and health promotion. Bull World Health Organ. 2005;83(9):711–18
47. Australian Institute of Health and Welfare. Australian hospital statistics 2012–13. Health services series no. 54. Cat. no. HSE 145. Canberra: Australian Institute of Health and Welfare, 2014.
48. World Health Organization. The Ottawa charter for health promotion. Geneva: World Health Organization, 1986.
49. Green LW, Kreuter MW. Health Promotion Planning: An Educational and Ecological Approach. New York: McGraw-Hill Professional; 2005.
50. de Silva AM, Hegde S, Akudo Nwagbara B, Calache H, Gussy MG, Nasser M, et al. Communit-based population-level interventions for promoting child oral health. Cochrane Database Syst Rev. 2016(9). doi: 10.1002/14651858.CD009837.pub2
51. Petersen PE, Kwan S. Equity, social determinants and public health programmes—the case of oral health. Community Dent Oral Epidemiol. 2011;39(6):481–87. doi: 10.1111/j.1600-0528.2011.00623.x
52. Higgins JP, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, et al. eds. Cochrane handbook for systematic reviews of interventions: 2nd edn. Chichester, UK. John Wiley & Sons. 2019.
53. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1. doi: 10.1186/2046-4053-4-1
54. Aliakbari E, Gray-Burrows KA, Vinall-Collier KA, Edwebi S, Marshman Z, McEachan RRC, et al. Home-based toothbrushing interventions for parents of young children to reduce dental caries: A systematic review. Int J Paediatr Dent. 2021;31(1):37–79. doi: 10.1111/ipd.12658
55. Santos APP, Oliveira BH, Nadanovsky P. Effects of low and standard fluoride toothpastes on caries and fluorosis: Systematic review and meta-analysis. Caries Res. 2013;47(5):382–90. doi: https://dx.doi.org/10.1159/000348492

56. de Sousa FSO, dos Santos APP, Nadanovsky P, Hujoel P, Cunha-Cruz J, de Oliveira BH. Fluoride Varnish and Dental Caries in Preschoolers: A Systematic Review and Meta-Analysis. Caries Res. 2019;53(5):502–13. doi: https://dx.doi.org/10.1159/000499639
57. Miller WR. Motivational Interviewing with Problem Drinkers. Behavioural Psychotherapy. 1983;11(2):147–72. doi: 10.1017/S0141347300006583
58. Bramantoro T, Santoso CMA, Hariyani N, Setyowati D, Zulfiana AA, Nor NAM, et al. Effectiveness of the school-based oral health promotion programmes from preschool to high school: A systematic review. PLoS One [Electronic Resource]. 2021;16(8 August) (no pagination). doi: https://dx.doi.org/10.1371/journal.pone.0256007
59. Joury E, Bernabe E, Sabbah W, Nakhleh K, Gurusamy K. Systematic review and meta-analysis of randomised controlled trials on the effectiveness of school-based dental screening versus no screening on improving oral health in children. Journal of Dentistry. 2017;58:1–10. doi: https://dx.doi.org/10.1016/j.jdent.2016.11.008
60. Arora A, Khattri S, Ismail NM, Nagraj SK, Prashanti E. School dental screening programmes for oral health. Cochrane Database of Systematic Reviews. 2017;12:CD012595. doi: https://dx.doi.org/10.1002/14651858.CD012595.pub2
61. Arora A, Khattri S, Ismail NM, Nagraj SK, Eachempati P. School dental screening programmes for oral health. Cochrane Database of Systematic Reviews. 2019;2019(8) (no pagination). doi: https://dx.doi.org/10.1002/14651858.CD012595.pub3
62. Hujoel PP, Hujoel MLA, Kotsakis GA. Personal oral hygiene and dental caries: A systematic review of randomised controlled trials. Gerodontology. 2018;35(4):282–89. doi: 10.1111/ger.12331
63. Xiang B, Wong HM, Perfecto AP, McGrath CPJ. The application of theory-guided oral health interventions in adolescents: a systematic review and meta-analysis of randomized controlled trials. Psychol Health. 2021;36(7):879–94. doi: 10.1080/08870446.2020.1801679
64. Calderon SJ, Mallory C. A systematic review of oral health behavior research in American adolescents. J Sch Nurs: the official publication of the National Association of School Nurses. 2014;30(6):396–403. doi: https://dx.doi.org/10.1177/1059840514544034
65. dos Santos APP, de Oliveira BH, Nadanovsky P. A systematic review of the effects of supervised toothbrushing on caries incidence in children and adolescents. Int J Paediatr Dent. 2018;28(1):3–11. doi: https://dx.doi.org/10.1111/ipd.12334
66. Chi DL. Reducing Alaska Native paediatric oral health disparities: a systematic review of oral health interventions and a case study on multilevel strategies to reduce sugar-sweetened beverage intake. Int J Circumpolar Health. 2013;72:21066. doi: https://dx.doi.org/10.3402/ijch.v72i0.21066
67. Coker E, Ploeg J, Kaasalainen S. The Effect of Programs to Improve Oral Hygiene Outcomes for Older Residents in Long-Term Care A Systematic Review. Res Gerontol Nurs. 2014;7(2):87–100. doi: 10.3928/19404921-20140110-01
68. Wang TF, Huang CM, Chou C, Yu S. Effect of oral health education programs for caregivers on oral hygiene of the elderly: A systemic review and meta-analysis. Int J Nurs Stud. 2015;52(6):1090–96. doi: 10.1016/j.ijnurstu.2015.01.015
69. Albrecht M, Kupfer R, Reissmann DR, Muhlhauser I, Kopke S. Oral health educational interventions for nursing home staff and residents. Cochrane Database of Syst Rev. 2016(9):76. doi: 10.1002/14651858.CD010535.pub2
70. Siegel E, Cations M, Wright C, Naganathan V, Deutsch A, Aerts L, et al. Interventions to improve the oral health of people with dementia or cognitive impairment: A review of the literature. J Nutr, Health Aging. 2017;21(8):874–86. doi: https://dx.doi.org/10.1007/s12603-016-0851-6
71. Ghaffari M, Rakhshanderou S, Ramezankhani A, Buunk-Werkhoven Y, Noroozi M, Armoon B. Are educating and promoting interventions effective in oral health?: A systematic review. Int J Dent Hyg. 2018;16(1):48–58. doi: 10.1111/idh.12305
72. Holliday R, Hong B, McColl E, Livingstone-Banks J, Preshaw PM. Interventions for tobacco cessation delivered by dental professionals. Cochrane Database Syst Rev. 2021;2(2):Cd005084. doi: 10.1002/14651858.CD005084.pub4
73. Anderson C, Harris MS, Kovarik R, Skelton J. Discovering expectant mothers' beliefs about oral health: an application of the Centering Pregnancy Smiles program. Int Q Community Health Educ. 2009;30(2):115–40. doi: 10.2190/IQ.30.2.c

74. Ly KA, Riedy CA, Milgrom P, Rothen M, Roberts MC, Zhou L. Xylitol gummy bear snacks: a school-based randomized clinical trial. BMC Oral Health. 2008;8:20. doi: 10.1186/1472-6831-8-20
75. Worthington HV, Hill KB, Mooney J, Hamilton FA, Blinkhorn AS. A Cluster Randomized Controlled Trial of a Dental Health Education Program for 10-year-old Children. J Public Health Dent. 2001;61(1):22–27. doi: https://doi.org/10.1111/j.1752-7325.2001.tb03351.x
76. Redmond CA, Blinkhorn FA, Kay EJ, Davies RM, Worthington HV, Blinkhorn AS. A Cluster Randomized Controlled Trial Testing the Effectiveness of a School-based Dental Health Education Program for Adolescents. J Public Health Dent. 1999;59(1):12–17. doi: https://doi.org/10.1111/j.1752-7325.1999.tb03229.x
77. Mariño R, Calache H, Wright C, Schofield M, Minichiello V. Oral health promotion programme for older migrant adults. Gerodontology. 2004;21(4):216–25. doi: 10.1111/j.1741-2358.2004.00035.x
78. Willder S, Nelson J, Morgan M, Mariño R. 'Indigie-Grins': an Indigenous youth oral health research project. Australian Indigenous Health Bulletin. 2014;14(2)

Appendices

Appendix 1—Search strategy

The search strategy used for all four databases in this Evidence Check is presented below.

MEDLINE (OVID) search strategy

Database: Ovid MEDLINE(R) ALL <1946 to July 29, 2022>

Search Strategy:

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1 Health Promotion/ (79,784)

2 Health promotion*.tw. (34,475)

3 Screening*.tw. (621,717)

4 Health information*.tw. (27,234)

5 ((oral health or dental health or oral disease or dental disease or dental caries or tooth decay or oral trauma or oral cancer or gum disease or periodon* or gingiv*) adj3 (evaluat* or screen* or assess* or skill development or social marketing or community action or prevent* or program* or initiative* or educat* or improv* or intervention* or integrated*)).tw,kw. (25,221)

6 Skill development*.tw. (2351)

7 Health Education/ (63,022)

8 Health educat*.tw. (37,918)

9 "Marketing of Health Services"/ or Social Marketing/ (17,272)

10 (Social marketing or "Marketing of health service*").tw. (2019)

11 exp Community Participation/ (46,956)

12 (Community participat* or Community action* or community involvement*).tw. (6382)

13 Targeted* program*.tw. (542)

14 community based program*.tw. (1830)

15 individual risk assessment*.tw,kw. (487)

16 exp Preventive Dentistry/ (36,580)

17 (Preventive Dentistry or fluorid* or mouth protector* or Oral hygiene* or dental prophylaxis or mouth hygiene).tw. (67,462)

18 Dental Scaling/ (4141)

19 Dental scaling*.tw. (114)

20 cariostatic agents/ or fluorides, topical/ or sodium fluoride/ or tin fluorides/ (15,480)

21 (anticaries agent or cariostatic agents* or topical fluoride* or sodium fluoride* or tin fluoride*).tw. (6684)

22 Calcium Fluoride/ (568)

23 Calcium Fluoride*.tw. (563)

24 Chlorhexidine/ or Chlorhexidine.tw. (13,902)

25 "Pit and Fissure Sealants"/ (3535)

26 ("Pit and Fissure Sealants" or Fissure Sealant*).tw. (1656)

27 ((varnish* or product* or sealant* or mouth rinse* or mouth wash* or toothpaste* or dentifrice* or tablet* or drop* or gel or chewing gum*) adj4 Fluorid*).tw. (6428)

28 silver diamine fluoride*.tw. (435)

29 Xylitol/ (2540)

30 xylitol.tw. (3535)

31 casein phosphopeptide-amorphous calcium phosphate.mp. (626)

32 CPP-ACP.tw. (516)

33 tooth mousse*.tw. (160)

34 exp Oral Hygiene/ (20,539)

35 (Oral hygiene* or mouth hygiene* or tooth?brushing* or floss* or interdental brush*).tw. (18,229)

36 ((anticipatory guidance or needs assessment*) adj4 (dental health or oral health or periodont*)).tw. (69)

37 Toothpastes/ (3664)

38 Mouthwashes/ (5780)

39 (Toothpaste* or mouthwash* or fluoride mouth?rinse*).tw. (7937)

40 (sugar free gum* or sugarfree gum* or xylitol or sugarless chewing gum*).tw. (3644)

41 "Tobacco Use Cessation"/ (1393)

42 "Tobacco Use Cessation".tw. (230)

43 Smoking Cessation/ (31749)

44 triclosan/ or triclosan*.tw. (4683)

45 Smoking Cessation*.tw. (27,660)

46 motivational interviewing/ or motivational interview*.tw. (5495)

47 Home visit*.tw. (10,185)

48 or/1-47 (1,056,972)

49 (non-clinical setting* or community setting* or Childcare* or pre?school* or school* or workplace* or residential care or Child Day Care Center* or Residential Facilit* or "Homes for the Aged" or Nursing Home* or Nursery school*).tw. (445,620)

50 Schools/ (48,281)

51 Child Care/ or Child Day Care Centers/ (10,739)

52 Workplace/ or Residential Facilities/ or Homes for the Aged/ or Nursing Homes/ or Schools, Nursery/ (78,055)

53 or/49-52 (496,892)

54 48 and 53 (60,406)

55 Pregnant Women/ (12,637)

56 Pregnant women*.tw. (108,356)

57 Infant, Newborn/ (653,331)

58 (infant* or newborn*).tw. (555,421)

59 Child, Preschool/ (978,886)

60 (Preschool child* or Toddler* or Young child*).tw. (83,619)

61 adolescent/ or child/ or infant/ (3,419,090)

62 (Adolescent* or Teen* or young adult* or Young people*).tw. (428,540)

63 (Older people* or elderly* or Geriatric* or frail).tw. (344,979)

64 Adult/ (5,379,827)

65 adult*.tw. (1,451,426)

66 "Native Hawaiian or Other Pacific Islander"/ or (Native Hawaiian or Pacific Islander*).tw. (15,865)

67 (Aboriginal* or Indigenous* or First nation*).tw. (51,030)

68 Torres strait islander people*.tw. (719)

69 "Transients and Migrants"/ (13,596)

70 Migrant*.tw. (21,467)

71 exp "Emigrants and Immigrants"/ (14,964)

72 (Immigrant* or Emigrant*).tw. (29,231)

73 ("culturally and linguistically*" or CALD).tw. (1625)

74 Ethnic Groups/ (69,992)

75 Ethnic*.tw. (166,462)

76 Refugees/ (12,444)

77 Refugee*.tw. (12,817)

78 Cultural Diversity/ (12,639)

79 culturally divers*.tw. (1859)

80 Rural Population/ (67,415)

81 ((Population* or communit*) adj3 (rural* or regional* or remote*)).tw. (37,995)

82 Low income*.tw. (43,115)

83 Vulnerable Populations/ (12,531)

84 (socially disadvantage* or vulnerable population*).tw. (15,628)

85 Antenatal*.tw. (43,213)

86 "People with special need*".mp. (114)

87 Mental illness*.tw. (36,820)

88 Disabled Persons/ (46,205)

89 (Disabled person* or disabled people* or "people with disabilit*").tw. (6950)

90 Visually Impaired Persons/ (2691)

91 (Visually impaired person* or "People with visual impairment*").tw. (426)

92 overweight/ or obesity/ (219,096)

93 (Overweight* or obesity).tw. (316,966)

94 diabetes mellitus/ or diabetes mellitus, type 1/ or diabetes mellitus, type 2/ (353,103)

95 diabet*.tw. (723,047)

96 Gestational diabet*.tw. (18,990)

97 Cardiovascular Diseases/ (169,015)

98 cardiovascular diseas*.tw. (201,526)

99 Stroke/ (123,047)

100 Stroke*.tw. (290,405)

101 (complex medical need* or complex medical condition* or chronic diseas*).tw. (76,854)

102 ((additional or special*) adj3 health care need*).tw. (1629)

103 or/55-102 (9,966,320)

104 Oral Health/ (19,339)

105 (Oral health* or Oral hygiene).tw,kw. (43,659)

106 Dental health*.tw. (9151)

107 Mouth Diseases/ (18,081)

108 Mouth diseas*.tw. (10,655)

109 exp Dental Care/ (34,336)

110 Dental care*.tw. (13,744)

111 Tooth decay.tw. (1500)

112 Gum disease*.tw. (350)

113 Mouth Neoplasms/ (38,722)

114 (mouth tumo?r or Mouth Neoplasm* or Oral cancer*).tw. (14,618)

115 Oral traum*.tw. (190)

116 Dental Caries/ or dental caries.tw. (53,901)

117 (Oral health knowledge* or Oral health attitude* or oral health behavio?r* or oral health literacy).tw. (2072)

118 Health literacy/ or Health behavior/ or Attitude to health/ or health knowledge, attitudes, practice/ or exp health inequities/ or capacity building/ or health communication/ (273,068)

119 (Health litera* or Health behavio?r or "Attitude to health" or "health knowledge, attitudes, practice*" or health belief* or health practice* or health status disparit* or health inequitie* or capacity building* or health communication* or health literac*).tw. (54,135)

120 (Non?clinical indicator* or Non?dental professional* or Health check* or health visit*).tw. (11,699)

121 or/104-120 (498,145)

122 meta-analysis/ (164,931)

123 Meta?analysis*.tw,kw. (47,876)

124 "systematic review"/ (203,007)

125 systematic review*.tw,kw. (254,413)

126 "review"/ (3,023,362)

127 review*.tw. (2,541,881)

128 or/122-127 (4,221,440)

129 54 and 103 and 121 and 128 (1311)

130 limit 129 to yr="2012 - 2021" (637)

Embase search strategy

Database: Embase Classic <1947 to 1973>, Embase <1974 to 2022 July 29>

Search Strategy:

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1 exp health promotion/ (110,345)

2 Health promotion*.tw. (40,491)

3 Screening*.tw. (876,489)

4 medical information/ (82,511)

5 (Health information* or medical information*).tw. (45,691)

6 ((oral health or dental health or oral disease or dental disease or dental caries or tooth decay or oral trauma or oral cancer or gum disease or periodon* or gingiv*) adj3 (evaluat* or screen* or assess* or skill development or social marketing or community action or prevent* or program* or initiative* or educat* or improv* or intervention* or integrated*)).tw. (25,550)

7 Skill development*.tw. (2956)

8 health education/ (105,354)

9 Health educat*.tw. (45,235)

10 social marketing/ (4077)

11 (Social marketing or "Marketing of health service*").tw. (2252)

12 community participation/ (3640)

13 (Community participat* or Community action* or community involvement).tw. (7326)

14 Targeted* program*.tw. (698)

15 community program/ (3218)

16 community* program*.tw. (2316)

17 individual risk assessment*.tw,kw. (774)

18 exp preventive dentistry/ (8718)

19 mouth protector/ (1366)

20 mouth hygiene/ (30,355)

21 dental prophylaxis/ (767)

22 (Preventive Dentistry or fluorid* or mouth protector* or Oral hygiene* or mouth hygiene or dental prophylaxis).tw. (73,546)

23 dental scaling/ (1163)

24 anticaries agent/ (4885)

25 exp fluoride varnish/ (3526)

26 sodium fluoride/ (2451)

27 tin fluoride/ (863)

28 (anticaries agent* or Dental scaling* or cariostatic agents* or topical fluoride* or sodium fluoride* or tin fluoride*).tw. (8117)

29 calcium fluoride/ (1127)

30 Calcium Fluoride*.tw. (610)

31 chlorhexidine/ (20,421)

32 Chlorhexidine.tw. (14,465)

33 "Pit and Fissure Sealant*".mp. (804)

34 exp fissure sealant/ (3481)

35 ("Pit and Fissure Sealants" or fissure sealant).tw. (1101)

36 ((varnish* or product* or sealant* or mouth rinse* or mouth wash* or toothpaste* or dentifrice* or tablet* or drop* or gel or chewing gum*) adj4 Fluorid*).tw. (6494)

37 silver diamine fluoride*.tw. (386)

38 xylitol/ (4474)

39 xylitol.tw. (4023)

40 casein phosphopeptide-amorphous calcium phosphate.mp. (549)

41 CPP-ACP.tw. (472)

42 tooth mousse*.tw. (144)

43 mouth hygiene/ (30,355)

44 tooth brushing/ (12,471)

45 dental floss/ (4384)

46 (mouth hygiene or Oral hygiene* or tooth?brushing* or floss* or interdental brush*).tw. (19,647)

47 ((anticipatory guidance or needs assessment*) adj4 (dental health or oral health or periodont*)).tw. (73)

48 toothpaste/ (8579)

49 mouthwash/ (5660)

50 (Toothpaste* or mouthwash* or fluoride mouth?rinse*).tw. (9031)

51 (sugar free gum* or sugarfree gum* or sugarless chewing gum*).tw. (160)

52 exp smoking cessation/ (65,407)

53 "Tobacco Use Cessation".tw. (260)

54 triclosan/ or triclosan*.tw. (6523)

55 Smoking Cessation*.tw. (36,756)

56 motivational interviewing/ (6183)

57 motivational interview*.tw. (7183)

58 home visit/ (4298)

59 Home visit*.tw. (13,434)

60 or/1-59 (1,455,524)

61 school/ (80,674)

62 child care/ (38,784)

63 workplace/ (50,303)

64 residential home/ (7706)

65 home for the aged/ (12,005)

66 nursing home/ (59,128)

67 (non-clinical setting* or community setting* or Childcare* or pre?school* or school* or workplace* or residential care or Child Day Care Center* or Residential Facilit* or "Homes for the Aged" or Nursing Home* or Nursery school*).tw. (563,711)

68 or/61-67 (661,144)

69 60 and 68 (80,633)

70 pregnant woman/ (106,981)

71 Pregnant women*.tw. (152,059)

72 infant/ or child/ or newborn/ (2,828,819)

73 (infant* or newborn*).tw. (707,431)

74 preschool child/ (596,444)

75 toddler/ (6019)

76 (Preschool child* or Toddler* or Young child*).tw. (106,189)

77 adolescent/ (1,690,191)

78 young adult/ (467,939)

79 (Adolescent* or Teen* or young adult* or Young people*).tw. (568,531)

80 aged/ (3,443,022)

81 geriatrics/ (35,339)

82 frail elderly/ (11,590)

83 (Older people* or elderly* or Geriatric* or frail).tw. (496,062)

84 adult/ (8,534,646)

85 adult*.tw. (1,972,668)

86 oceanic ancestry group/ or pacific islander/ or torres strait islander/ (9407)

87 "Native Hawaiian or Other Pacific Islander".tw. (101)

88 indigenous people/ (8555)

89 (Aboriginal* or Indigenous* or First nation*).tw. (62,201)

90 Torres Strait Islander/ (1281)

91 Torres strait islander people*.tw. (921)

92 Migrant*.tw. (22,742)

93 (Immigrant* or Emigrant*).tw. (34,595)

94 ("culturally and linguistically*" or CALD).tw. (2192)

95 ethnic group/ (76,105)

96 Ethnic*.tw. (236,206)

97 refugee/ (15,141)

98 Refugee*.tw. (14,126)

99 culturally divers*.tw. (2218)

100 rural population/ (54,040)

101 ((Population* or communit*) adj3 (rural* or regional* or remote*)).tw. (46,540)

102 lowest income group/ (33,014)

103 Low income*.tw. (50,702)

104 vulnerable population/ (23,719)

105 (socially disadvantage* or vulnerable population*).tw. (20,298)

106 Antenatal*.tw. (61,815)

107 "People with special need*".mp. (146)

108 Mental illness*.tw. (48,194)

109 disabled person/ (39,097)

110 (Disabled person* or disabled people* or "people with disabilit*").tw. (9616)

111 visually impaired person/ (9140)

112 (Visually impaired person* or "People with visual impairment*").tw. (608)

113 obesity/ (497,615)

114 (Overweight* or obesity).tw. (470,459)

115 diabetes mellitus/ (659,997)

116 diabet*.tw. (1,104,804)

117 pregnancy diabetes mellitus/ (38,818)

118 (Gestational diabet* or pregnancy diabetes mellitus).tw. (29,893)

119 cardiovascular disease/ (316,361)

120 cardiovascular diseas*.tw. (292,152)

121 Stroke*.tw. (466,716)

122 (complex medical need* or complex medical condition* or chronic diseas*).tw. (108,519)

123 ((additional or special*) adj3 health care need*).tw. (1879)

124 or/70-123 (14,534,175)

125 (Oral health* or Oral hygiene).tw. (44,512)

126 Dental health*.tw. (9063)

127 mouth disease/ (23,938)

128 Mouth diseas*.tw. (10,656)

129 Dental care*.tw. (13,931)

130 Tooth decay.tw. (1790)

131 Gum disease*.tw. (478)

132 mouth tumor/ (14,111)

133 (Mouth Neoplasm* or Oral cancer or Mouth tumo?r*).tw. (16,726)

134 Oral traum*.tw. (227)

135 dental caries/ (55,765)

136 dental caries.tw. (20,391)

137 (Oral health knowledge* or Oral health attitude* or oral health behavio?r* or oral health literacy).tw. (2138)

138 health literacy/ (16,219)

139 health behavior/ (75,184)

140 attitude to health/ (124,962)

141 exp health disparity/ (28,171)

142 capacity building/ (6399)

143 medical information/ (82,511)

144 (Health litera* or Health behavio?r or "Attitude to health" or "health knowledge, attitudes, practice*" or health belief* or health practice* or health status disparit* or health inequitie* or capacity building* or health communication* or health literac* or medical information*).tw. (76,774)

145 (Non?clinical indicator* or Non?dental professional* or Health check* or health visit*).tw. (14913)

146 or/125-145 (517,397)

147 meta analysis/ (25,2155)

148 Meta?analysis*.tw. (9463)

149 "systematic review"/ (361,100)

150 systematic review*.tw. (304,737)

151 "review"/ (2,757,777)

152 review*.tw. (3,325,273)

153 or/147-152 (4,988,330)

154 69 and 124 and 146 and 153 (1891)

155 limit 154 to yr="2012 - 2021" (943)

Web of Science search strategy

1	"Health promotion*" OR Screening* OR "Health information*" OR "Skill development*" OR "Health educat*" OR "Social marketing" OR "Marketing of health service*" OR "Community participat*" OR "Community action*" OR "Targeted* program*" OR "community based program*" OR "individual risk assessment*" OR "Preventive Dentistry" OR fluorid* OR "mouth protector*" OR "Oral hygiene*" OR "dental prophylaxis" or "Dental Scaling*" OR "cariostatic agents*" OR "topical fluoride*" OR "sodium fluoride*" OR "tin fluoride*" OR "Calcium Fluoride*" OR "Pit and Fissure Sealants" OR "silver diamine fluoride*" OR xylitol OR "casein phosphopeptide-amorphous calcium phosphate" OR CPP-	1,129,135

	ACP OR "tooth mousse*" OR "Oral hygiene*" OR tooth$brushing* OR floss* OR "interdental brush*" OR Toothpaste* OR mouthwash* OR "fluoride mouth$rinse*" OR "sugar free gum*" OR "sugarfree gum*" OR xylitol OR "sugarless chewing gum*" OR "Tobacco Use Cessation" OR "Tobacco Use Cessation" OR triclosan OR triclosan* OR "Smoking Cessation*" OR "motivational interviewing" OR "motivational interview*" OR “Home visit*" (Topic) or (("oral health" OR "dental health" OR "oral disease" OR "dental disease" OR "dental caries" OR "tooth decay" OR "oral trauma" OR "oral cancer" OR "gum disease" OR periodon* OR gingiv*) NEAR/3 (evaluat* OR screen* OR assess* OR "skill development" OR "social marketing" OR "community action" OR prevent* OR program* OR initiative* OR educat* OR improv* OR intervention* OR integrated*)) (Topic) or ((varnish* OR product* OR sealant* OR "mouth rinse*" OR "mouth wash*" OR toothpaste* OR dentifrice* OR tablet* OR drop* OR gel OR "chewing gum*") NEAR/4 (Fluorid*)) (Topic) or (("anticipatory guidance" OR "needs assessment*") NEAR/4 ("dental health" OR "oral health" OR periodont*)) (Topic)	
2	"non-clinical setting*" OR "community setting*" OR Childcare* OR pre$school* OR school* OR workplace* OR "residential care" OR "Child Day Care Centers" OR "Residential Facilit*" OR "Homes for the Aged" OR "Nursing Home*" OR "Nursery school" (Topic)	1,022,204
3	#1 AND #2	50,438
4	"Pregnant women*" OR infant* OR newborn* OR "Preschool child*" OR Toddler* OR "Young child*" OR Adolescent* OR Teen* OR "young adult*" OR "Young people*" OR "Older people*" OR elderly* OR Geriatric* OR frail OR adult* OR "Native Hawaiian" OR "Other Pacific Islander*" OR Aboriginal* or Indigenous* or "First nation*" OR "Torres strait islander people*" OR Migrant* OR Immigrant* or Emigrant* OR "culturally linguistically*" OR CALD OR Ethnic* OR Refugee* OR "culturally divers*" OR "Low income*" OR "socially disadvantage*" OR "vulnerable population*" OR Antenatal* OR "People with special need*" OR "Mental illness*" OR "Disabled person*" OR "disabled people*" OR "people with disabilit*" "Visually impaired person*" OR "People with visual impairment*" OR Overweight* OR obesit* OR diabet* OR "Gestational diabet*" OR "cardiovascular diseas*" OR Stroke* OR "complex medical need*" OR "complex medical need*" OR "complex medical condition*" OR "chronic diseas*" (Topic) or ((additional OR special*) NEAR/3 ("health care need*")) (Topic) or ((Population* OR communit*) NEAR/3 (rural* OR regional* OR remote*)) (Topic)	5,601,211
5	#3 AND #4	27,075
6	"Oral health*" OR "Oral hygiene" OR "Dental health*" OR "Mouth diseas*" OR "Dental care*" OR "Tooth decay" OR "Gum disease*" OR "Mouth Neoplasm*" OR "Oral cancer* Oral traum*" OR "dental caries" OR "Oral health knowledge*" OR	170,288

	"Oral health attitude*" OR "oral health behavio?r*" OR "oral health literacy" OR "Health litera*" OR "Health behavio$r" OR "Attitude to health" OR "health knowledge, attitudes, practice*" OR "health belief*" OR "health practice*" OR "health status disparit*" OR "health inequitie*" OR "capacity building*" OR "health communication*" OR "health literac*" OR "Non$clinical indicator*" OR "Non$dental professional*" OR "Health check*" OR "health visit*" (Topic)	
7	#5 AND #6	4772
8	Meta?analysis* OR "systematic review*" OR review* (Topic)	3,304,293
9	#7 AND #8	572
10	#9 AND #10 and 2012 or 2013 or 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 (Publication Years)	429

ERIC search strategy

Database: ERIC (Education) <1966 to present>

Search Strategy:

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1 Health Promotion/ (8738)

2 Health promotion*.tw. (9,400)

3 Screening*.tw. (13,583)

4 Health information*.tw. (1157)

5 ((oral health or dental health or oral disease or dental disease or dental caries or tooth decay or oral trauma or oral cancer or gum disease or periodon* or gingiv*) adj3 (evaluat* or screen* or assess* or skill development or social marketing or community action or prevent* or program* or initiative* or educat* or improv* or intervention* or integrated*)).tw. (237)

6 skill development/ (29,369)

7 Skill development*.tw. (31,672)

8 health education/ (12,457)

9 Health educat*.tw. (17,099)

10 (Social marketing or "Marketing of health service*").tw. (218)

11 community involvement/ (10,224)

12 (Community Participat* or Community involvement* or Community action*).tw. (15,242)

13 Targeted* program*.tw. (150)

14 exp Community Programs/ (9462)

15 community* program*.tw. (9967)

16 individual risk assessment*.mp. (2)

17 (Preventive Dentistry or fluorid* or mouth protector* or Oral hygiene* or dental prophylaxis).tw. (229)

18 Dental scaling*.mp. (1)

19 (cariostatic agents* or topical fluoride* or sodium fluoride* or tin fluoride*).tw. (5)

20 Calcium Fluoride*.mp. (0)

21 Chlorhexidine.tw. (2)

22 "Pit and Fissure Sealants".tw. (6)

23 ((varnish* or product* or sealant* or mouth rinse* or mouth wash* or toothpaste* or dentifrice* or tablet* or drop* or gel or chewing gum*) adj4 Fluorid*).tw. (18)

24 silver diamine fluoride*.tw. (0)

25 xylitol.tw. (4)

26 casein phosphopeptide-amorphous calcium phosphate.mp. (0)

27 CPP-ACP.tw. (0)

28 tooth mousse*.tw. (0)

29 (Oral hygiene* or tooth?brushing* or floss* or interdental brush*).tw. (171)

30 ((anticipatory guidance or needs assessment*) adj4 (dental health or oral health or periodont*)).tw. (0)

31 (Toothpaste* or mouthwash* or fluoride mouth?rinse*).tw. (53)

32 (sugar free gum* or sugarfree gum* or xylitol or sugarless chewing gum*).tw. (4)

33 "Tobacco Use Cessation".tw. (10)

34 Smoking Cessation*.tw. (410)

35 triclosan*.tw. (5)

36 motivational interview*.tw. (287)

37 exp Home Visits/ (1681)

38 Home visit*.tw. (2552)

39 or/1-38 (94,080)

40 exp Schools/ (268,479)

41 exp Child Care/ (4985)

42 exp Residential Care/ (1281)

43 exp Nursing Homes/ (1247)

44 (non-clinical setting* or community setting* or Childcare* or pre?school* or school* or workplace* or residential care or Child Day Care Center* or Residential Facilit* or "Homes for the Aged" or Nursing Home* or Nursery school*).tw. (773,069)

45 or/40-44 (839,941)

46 39 and 45 (49,106)

47 Pregnant women*.tw. (500)

48 (infant* or newborn*).tw. (21,205)

49 young children/ or infants/ or preschool children/ or toddlers/ (62,434)

50 (Preschool child* or Toddler* or Young child*).tw. (67,621)

51 adolescents/ or children/ (92,360)

52 (Adolescent* or Teen* or young adult* or Young people*).tw. (101,992)

53 exp older adults/ (15,241)

54 geriatrics/ (1055)

55 (Older people* or elderly* or Geriatric* or frail).tw. (7572)

56 Adult*.tw. (150,099)

57 (Native Hawaiian or Pacific Islander*).tw. (2583)

58 exp indigenous populations/ (23,237)

59 (Aboriginal* or Indigenous* or First nation*).tw. (11,996)

60 exp pacific islanders/ (2654)

61 Torres strait islander people*.tw. (71)

62 (Migrant* or Immigrant* or Emigrant*).tw. (23,279)

63 ("culturally and linguistically*" or CALD).tw. (1799)

64 ethnic groups/ (13,808)

65 Ethnic*.tw. (51,577)

66 refugees/ (3812)

67 Refugee*.tw. (4557)

68 culturally divers*.tw. (2491)

69 exp Rural Population/ (4098)

70 ((Population* or communit*) adj3 (rural* or regional* or remote*)).tw. (8632)

71 exp Low Income/ (3049)

72 Low income*.tw. (21,853)

73 (socially disadvantage* or vulnerable population*).tw. (779)

74 Antenatal*.tw. (101)

75 "People with special need*".mp. (103)

76 Mental illness*.tw. (1700)

77 (Disabled person* or disabled people* or "people with disabilit*").tw. (3442)

78 (Visually impaired person* or "People with visual impairment*").tw. (252)

79 exp Obesity/ (3004)

80 (Overweight* or obesity).tw. (3772)

81 exp Diabetes/ (1007)

82 diabet*.tw. (1458)

83 Gestational diabet*.tw. (16)

84 cardiovascular diseas*.tw. (373)

85 Stroke*.tw. (1074)

86 (complex medical need* or complex medical condition* or chronic diseas*).tw. (589)

87 ((additional or special*) adj3 health care need*).tw. (188)

88 or/47-87 (425,172)

89 (Oral health* or Oral hygiene).tw. (340)

90 exp Dental Health/ (894)

91 Dental health*.tw. (1035)

92 Mouth diseas*.tw. (16)

93 Dental care*.tw. (325)

94 Tooth decay.tw. (46)

95 Gum disease*.tw. (4)

96 (Mouth Neoplasm* or Oral cancer*).tw. (19)

97 Oral traum*.tw. (0)

98 dental caries.tw. (51)

99 (Oral health knowledge* or Oral health attitude* or oral health behavio?r* or oral health literacy).tw. (18)

100 Health Behavior/ (6549)

101 exp Capacity Building/ (2943)

102 (Health litera* or Health behavio?r or "Attitude to health" or "health knowledge, attitudes, practice*" or health belief* or health practice* or health status disparit* or health inequitie* or capacity building* or health communication* or health literac*).tw. (12,516)

103 (Non?clinical indicator* or Non?dental professional* or Health check* or health visit*).tw. (159)

104 or/89-103 (13,914)

105 exp Meta Analysis/ (5604)

106 Meta?analysis*.tw. (29)

107 systematic review*.tw. (3656)

108 review*.mp. (173,078)

109 or/105-108 (176,029)

110 46 and 88 and 104 and 109 (141)

111 limit 110 to yr="2012 - 2021" (62)

Appendix 2—Detailed data extraction

Table 9—Detailed summary of findings from the included studies focused on children and adolescents

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
1.	Adair PM (2013) (5)	**Description:** Group-based education program (with 5–7 children in each group) was delivered in four lessons: (1) tooth function and appearance, (2) diet and its effect on teeth, (3) tooth brushing and use of disclosing tablets, and (4) dietary topics and tooth brushing review. The intervention also included a home program for 1 hour, based on completing 3 projects. Targeted behaviour was toothbrushing and diet. **Delivery:** Dental nurse delivered the educational program and parents, caregivers, grandparents delivered the home program. The program was delivered as either 4 weekly or 2 weekly lessons.	• Dental caries in school-aged children	**Qualitative synthesis:** Narrative description of the intervention only provided. **Quantitative synthesis:** Not applicable.	"We conclude that behaviour change techniques used in school interventions to reduce dental caries were limited and focused around providing information about how behaviour impacts on health and the consequences of not developing the correct health behaviours as well as providing oral hygiene instruction. Establishing which techniques are effective is difficult due to poor reporting of interventions in studies. Future design of oral health promotion interventions using behaviour change theory for development and evaluation (and reporting results in academic journals) could strengthen the potential for efficacy and provide a framework to use a much wider range of behaviour change techniques. Future studies should include development	One study was relevant to the research question and population. Authors of the systematic review have not provided evidence synthesis on the relation of intervention and outcome.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
					and publication of intervention manuals which is becoming standard practice in other health promoting programmes."	
2.	Albino J (2016) (3)	**Description:** Interventions categorised into three groups: (1) School-based intervention: information and skill training, Sense of Coherence (SOC); (2) Family based intervention: Motivational Interviewing (MI) providing dietary information; and (3) Community based intervention: information and skill training. **Delivery:** (1) School based-intervention: trained dental professionals; (2) Family based intervention: mostly mothers; (3) Community based intervention: laypeople of same community, community health workers.	• Dental caries	**Qualitative synthesis:** The results summate the effect of intervention on dental caries: *Family-based intervention:* • Intervention: MI; Population: Low-income African American up to 5y; Effect: No effect • Intervention: MI; Population: Cree community in Quebec at birth; Effect: No main effect; S-ECC lower for children in test group • Intervention: MI; Population: Low-income South Australian 6–7y; Effect: Caries increment lower in intervention group: 33% vs. 42% in comparison group. *Community-based intervention:* • Intervention: Information and skill; Population: Low-income Australian Aboriginal 18–47 mo; Effect: Lower caries increment by 3.0 surfaces per child • 7 studies were ongoing clinical trials measuring caries outcome.	"Outcomes were variable, although motivational interviewing, which involves individuals in decisions about oral health within the context of their respective life circumstances, proved effective in 3 of 4 reported studies, and more definitive trials are underway. Recommendations for future research include examinations of the cost-effectiveness of interventions, as well as work focused on understanding the mechanisms underlying oral health behaviour change and variables that may mediate or moderate responses to interventions."	None of the school-based interventions were relevant to the research question and population. However, intervention such as MI and information and skill training (e.g. supervised brushing, training in hygiene skills) had a significant effect on dental caries.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				Quantitative synthesis: Not applicable.		
3.	Aliakbari E (2021) (54)	**Description:** Intervention promoting parental involvement in home-based toothbrushing in children under 8 years of age. The intervention included educational intervention, provision of educational app, MI, Enhanced Community Service (ECS: public based broadcasting service, billboard etc.), health check-up with educational content provided, health talk, provision of printed material, provision of health promotion package, online messaging, and oral health counselling. Some of the interventions were in conjunction with oral health assessments. **Delivery:** Health practitioner (i.e. primary care provider, health visitors, nurses, health centre/healthcare unit staff, vaccination staff, dental health educators and lay health workers) with dental practitioner (including dental students), researcher, interdisciplinary team (including	• Dental caries	**Qualitative synthesis:** The results summate the narrative descriptive and provided the Theoretical Domain Framework (TDF) of the intervention. • Oral health status: Of 42 interventions, 28 explored the impact of intervention on caries; 19/29 found improvement in caries. • The review provided sufficient information about the intervention development and delivery, but evaluation was lacking in the included studies. **Quantitative synthesis:** Not Applicable.	"There are few interventions targeting home-based oral health behaviours underpinned by theory and methodological rigour in their development and evaluation. This demonstrates a clear need for future interventions to be guided by complex intervention methodology."	Twenty-nine studies had an intervention relevant to the research question; 19/29 studies with the intervention to promote Parent Supervised Brushing (PBS) showed improvement in caries in children under the age of 8 years.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		medical, dental and nursing professional). Remote app in one study.				
4.	Arora A (2017) (60)	**Description:** Screening and referral was the intervention in the included studies. Considerable variation was observed in all the 6 trials in screening interventions, particularly in identifying test-positive children and follow-up referral procedures. Interventions included: (1) Traditional screening compared with no screening; (2) Criteria-based screening; (3) Specific versus non-specific referral letters; (4) Screening versus screening with oral health motivation; (5) Parents' information leaflets. **Delivery:** Dental examination or screening was performed by personnel who were licensed or trained in the process as per the state laws of the country where studies were conducted, for example, schoolteachers, medical practitioners.	• Proportion of children with untreated caries • Proportion of children with other untreated oral health needs • Dental attendance	**Qualitative synthesis:** Narrative description only of the intervention provided. **Quantitative synthesis:** • Four studies were pooled to look at dental attendance as an outcome; however, the results were inconclusive because of the heterogenicity of included studies. Similarly, two studies were pooled to evaluate criteria-based screening versus no screening and indicated possible benefit for screening (RR:1.07; 95%CI 0.99,1.16). • Four of six studies were conducted in the UK, which has contextual similarity in school-based programs with Victoria; however, the finding shows low-certainty evidence in the effectiveness of school dental screening programs on overall oral health status and use of dental services.	"The trials included in this review evaluated short-term effects of screening, assessing follow-up periods of three to eight months. We found very low-certainty evidence that was insufficient to allow us to draw conclusions about whether there is a role for traditional school dental screening in improving dental attendance. For criteria-based screening, we found low-certainty evidence that it may improve dental attendance when compared to no screening. However, when compared to traditional screening there was no evidence of a difference in dental attendance (very low-certainty evidence). We found low-certainty evidence to conclude that personalised or specific referral letters improve dental attendance when compared to non-specific counterparts. We also found low-certainty evidence that screening supplemented with	The review is of very strong evidence (NHMRC level I). A study conducted in the UK was included in the review. In terms of effectiveness of school-based intervention, the evidence was of low certainty.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
					motivation (oral health education and offer of free treatment) improves dental attendance in comparison to screening alone. We did not find any trials addressing cost-effectiveness and adverse effects of school dental screening."	
5.	Arora A (2019) (61)	**Description:** Screening and referral was the intervention in the included studies. Considerable variation was observed in all the 7 trials in screening interventions, particularly in identifying test-positive children and follow-up referral procedures. Interventions included: (1) Traditional screening compared with no screening; (2) Criteria-based screening; (3) Specific versus non-specific referral letters; (4) Screening versus screening with oral health motivation; (5) Parents' information leaflets; (6) Commonsense model of self-regulation (CSM) referral letter; (7) CSM-based referral letter plus dental information guide. **Delivery:**	• Proportion of children with untreated caries • Proportion of children with other untreated oral health needs • Dental attendance	**Qualitative synthesis:** Narrative description only of the intervention provided. **Quantitative synthesis:** • Four studies were pooled to look at dental attendance as an outcome; however, the results were inconclusive because of the heterogenicity of included studies. Similarly, two studies were pooled to evaluate criteria-based screening versus no screening and indicated possible benefit for screening (RR:1.07; 95%CI 0.99,1.16). • Four studies were conducted in the UK, which has contextual similarity in school-based programs with Victoria; however, the finding shows low-certainty evidence in the effectiveness of school dental screening programs on overall oral health status and use of dental attendance.	"The trials included in this review evaluated short-term effects of screening. We found very low-certainty evidence that is insufficient to allow us to draw conclusions about whether there is a role for traditional school dental screening in improving dental attendance. For criteria-based screening, we found low-certainty evidence that it may improve dental attendance when compared to no screening. However, when compared to traditional screening, there is no evidence of a difference in dental attendance (very low-certainty evidence). We found low-certainty evidence to conclude that personalised or specific referral letters may improve	The review is of very strong evidence (NHMRC level I). Studies conducted in the UK and US were included in the review. However, in terms of the effectiveness of school-based intervention, the evidence was of low certainty.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Dental examination or screening was performed by personnel who were licensed or trained in the process as per the state laws of the country where studies were conducted, for example schoolteachers, medical practitioners.		• The updated review added another study, which was conducted in the US; however, the overall results and results from the pooled analysis remained unchanged.	dental attendance when compared to non-specific counterparts. We also found low-certainty evidence that screening supplemented with motivation (oral health education and offer of free treatment) may improve dental attendance in comparison to screening alone. For children requiring treatment, we found very-low certainty evidence that was inconclusive regarding whether or not a referral letter based on the 'common-sense model of self- regulation' was better than a standard referral letter. We did not find any trials addressing possible adverse effects of school dental screening or evaluating its effectiveness for improving oral health."	
6.	Bramantoro T (2021) (58)	**Description:** The intervention differed across the studies: (1) 5 preventive and therapeutic measures (which include fluoridated drinking water, OHE, dental examination, application of sealant to posterior teeth and the provision of all necessary restorative	• Dental caries • Dental attendance • OHRQoL • OHK • Salivary fluoride level • OHA	**Qualitative synthesis:** The results summate the effect of intervention on dental caries: • 5 preventive and therapeutic measures: The comparison group had significantly higher caries increment than the intervention group.	"Positive results were obtained through oral health promotion programmes in schools, especially those involving children, teachers, and parents."	Five studies were relevant to the research question and population. Numerous school-based interventions have shown to have positive effects on the incidence of

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		care); (2) School-based screening, referral and follow-up; (3) Daily teacher-supervised toothbrushing at school with fluoridated toothpastes; (4) Winning Smiles school-based toothbrushing program (with health promoter component, teacher component, and an award ceremony); (5) Natural Nashers program: 3-week oral health educational program in high-school biology curriculum. **Delivery:** Study did not report who delivered the interventions but were conducted in a school setting.	• Plaque and gingival scores.	• School-based screening, referral and follow-up: Effective in increasing dental attendance of schoolchildren. • Daily teacher-supervised toothbrushing at school with fluoridated toothpastes: Caries increment in children in intervention group was significantly lower than in non-intervention group. • Winning Smiles school-based toothbrushing program: Intervention had significant effect on OHK and borderline effect in OHRQoL. OHK was strongly associated with saliva fluoride concentration. • Natural Nashers program: Intervention improved OHK and OHA and reduced plaque and gingival scores. **Quantitative synthesis:** Not applicable.		dental caries, increased dental attendance, and improved OHK and OHA.
7.	Calderon SJ (2014) (64)	**Description:** Strategies limited to the studies included using an educational program about oral health and hygiene and targeted messages about flossing using framing from motivational theory of reward and avoidance of punishment. The focus of the review was on the factors that	• Gingival health (gingival index) • Dental plaque • Motivation scale • OHB	**Qualitative synthesis:** • The review provides limited details as to the effectiveness of the intervention. Two studies described the effectiveness of the interventions used. • The first study concluded that the educational program on gingival health was effective in improving OHS and OHK.	"Findings suggest that ethnicity, race, and gender may influence oral health behavior in adolescents and that interventions have an effect. Research is needed to explore what other factors may influence oral health behavior in adolescents, long-term health outcomes, and school performance."	The quality of the included studies was low with non-randomised smaller samples. The generalisation of the outcome to the Australian context yields low certainty.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		influence the oral health behaviour in American adolescents. **Delivery:** The intervention delivery varied across studies, as some interventions were performed by teachers through pre-existing peer groups within the school environment. Another study included interventions that were delivered by dental practitioners. All the interventions were in school setting.		• The second study concluded provision of message about flossing influenced OHB. **Quantitative synthesis:** Not applicable.		
8.	Chi DL (2013) (66)	**Description:** Interventions were categorised into: (1) Reducing tooth decay in Head Start children through community and caregiver education: Oral health education for lay community volunteers, health workers and site coordinators; educational materials and counselling for caregivers including a media campaign on oral health (2 studies); (2) Dental chemotherapeutics for pregnant women: provision of xylitol chewing gum during pregnancy vs. placebo chewing gum (2 studies); (3) Increasing access to dental care by training mid-level providers: Intervention based on level of	• Proxy measure of dental health (dental and denture)	**Qualitative synthesis:** • The review provides limited details as to the effectiveness of intervention. • The intervention had a primary focus on reducing consumption of sugar-sweetened beverages. • Two studies reported improvement in DMFT. **Quantitative synthesis:** Not applicable.	"Few oral health interventions have been tested within Alaska Native communities. Community-centred multilevel interventions are promising approaches to improve the oral and systemic health of Alaska Native children. Future investigators should evaluate the feasibility of implementing multi- level interventions and policies within Alaska Native communities as a way to reduce children's health disparities."	The review provides limited details as to the effectiveness of the intervention. The review included grey literature as well as reports (peer review status undisclosed). The applicability of the intervention in the Australian context is limited, based on the findings of the review.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		service provided by dental health aid therapists (DHATs) (5 studies). **Delivery:** All studies were delivered by trained personnel in venues such as medical clinics, hospitals, day cares, recreational centres, schools and churches. The intervention focused on Alaska Native children.				
9.	Colvara BC (2021) (4)	**Description:** Most studies were found to have used motivational interviewing alone as a test intervention, with two studies testing it against a caries risk assessment program and a two-year oral health promotion program. Motivational interviewing, or indicating use of a counselling technique was based on the principles developed by Miller and Rollnick[57], were considered eligible interventions. **Delivery:** The intervention delivery technique varied widely; it included lay South Asian women (in one study, training provided); researcher; oral health therapists; local community health representatives; dental nurses;	• Dental caries • OHK • OHB • Plaque index • Gingival index	**Qualitative synthesis:** • Motivational interviewing (MI) has a protective effect on caries, but the effect may be larger in children of mothers who pre-chew children's food and were raised in a rural environment with higher family income. Two studies observed children with healthier gum and lower plaque index in the test group when compared with the control group. • MI-based interventions resulted in higher frequency of brushing and increased knowledge of toothpaste quantity as well as favourable attitudes towards cleaning child's teeth and higher perceived control scores. **Quantitative synthesis:** • Population caries experience modifies the effect of MI-based intervention.	"Motivational interviewing has the potential to modify knowledge and behaviours and reduce ECC with a more significant impact on children with high caries experience."	The review included strong study designs with one randomised trial being conducted in Australia with Indigenous Australians as the study population. A few other studies were also conducted in settings similar to Australia and Victoria, such as Canada and the US, and the evidence generated by the review (motivational interviewing to improve OHS, OHK and OHB) is

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		dental hygienists; local people living in the reserves; and oral health advocates.		• In populations with high caries experience, the MI-based approach prevented an average of 3.15 (95% CI: −6.14, −0.17) DMFS in young children. • In samples with low caries experience, differences were smaller, since the caries levels were already lower (−0.31; 95% CI: −0.63, 0.00).		applicable in the Australian context.
10.	Cooper AM (2013) (10)	**Description:** Interventions were in the form of educational programs delivered through a series of classroom-based lessons, and in one study fitted into the UK national curriculum. All interventions included toothbrushing instruction and skill lessons and information on fluoride toothpaste use. Only two interventions had supervised toothbrushing practice sessions. Dietary elements (was an inclusion criteria) were found in all studies but varied in form. One study provided it through group discussion, one study through lessons, one study through instructions and one study through leaflets or worksheets. All interventions had behavioural health components. The UK study was delivered through group work at school and family involvement at	• Changes in dental caries increment (dmft/DMFT) • Changes in caries increment on tooth surfaces (dmfs/DMFS) • Changes in plaque scores for permanent and deciduous teeth.	**Qualitative synthesis:** Narrative description only of the intervention provided. **Quantitative synthesis:** There is at present no single reliable method for recording toothbrushing or sugar snacking behaviours. One study of interest (UK) reported: • Changes in dental caries increment: NR • Changes in caries increments on tooth surfaces: NR • Changes in plaque scores: Intervention group showed reduction in plaque by SMD -0.64 lower in intervention group (95% CI -0.9 t0 -0.38). Rest of studies in the review reported a similar beneficial effect. • Frequency of brushing: children reported brushing twice daily and maintained throughout study.	"Currently, there is insufficient evidence for the efficacy of primary school-based behavioural interventions for reducing caries. There is limited evidence for the effectiveness of these interventions on plaque outcomes and on children's oral health knowledge acquisition. None of the included interventions were reported as being based on or delivered from behavioural theory. There is a need for further high-quality research to utilise theory in the design and evaluation of interventions for changing oral health related behaviours in children and their parents."	One study was relevant to the research question and population. The school-based intervention indicates a positive association with dental caries and an increasing effect on oral health knowledge.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		home and involved repetition and social norms. **Delivery:** The intervention was delivered and monitored by trained dental nurses and by school health counsellors and teachers. Only two studies included a combination of school and home-based elements with varying levels of parental involvement.		• Frequency of cariogenic food and drink consumption: less children in intervention group reported routinely eating sugary snacks after school (15% vs. 19%). • Change in oral health knowledge and skills: greater difference in intervention group (35% increase) vs. control (15% increase). Post-intervention intervention group had 10% improvement in knowledge and skills (from follow-up measure) vs. the control group. • Change in dental attendance: no change.		
11.	de Sousa FSO (2019) (56)	**Description:** Study participants ranged from 6 months to 5 years (preschoolers). Studies were categorised into (1) FV vs. placebo; (2) FV vs. usual care; (3) FV vs. no intervention; (4) FV + oral health advice + community health promotion + 500ppm F toothpaste vs. no intervention; (5) FV + oral health advice + 1450ppm F toothpaste vs. oral health advice. **Delivery:** Study did not report who delivered the interventions.	• Dentine caries in preschoolers	**Qualitative synthesis:** At the surface level, the result concludes a statistically significant difference, favouring the intervention (FV). The difference is clinically irrelevant. **Quantitative synthesis:** Results where studies of interest were included in the synthesis: *FV vs. no intervention:* • Dentine caries: significant difference favouring FV (RR=0.85, 95% CI 0.73 and 0.98) though not observed in other comparisons. • The NNT is 17 (95% CI 11,40) for populations with 50% of children developing new dentine caries (when	"We conclude that FV showed a modest and uncertain anticaries effect in pre-schoolers. Cost-effectiveness analyses are needed to assess whether FV should be adopted or abandoned by dental services."	Authors stated they could not be confident of the beneficial effect of FV considering that studies that used a placebo did not show beneficial effect of FV. However, authors note that despite the uncertainty about the effect estimates in FV applications, it may still be the most cost-effective.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				pooling RR across FV vs, placebo, usual care, or no intervention). *FV + oral health advice + community health promotion + 500 ppm F toothpaste vs. no intervention:* • Dentine caries: RR 1 (95% CI: 0.94 to 1.06).		
12.	Dickson-Swift V (2017) (1)	**Description:** A total of 26 studies were included in this review. The strategies included an after-lunch brushing program where each child brushed their teeth before commencing afternoon classes. Oral health education sessions on the first day of the program, after 6 months, 18 months and 30 months. Free oral health packs (toothbrush and toothpaste) given to every child at least 6 times from age 0–5. All schools were provided with a pack that included oral health books, a puppet and a Colgate Bright Smiles, Bright Futures package. Informed of other oral health promotion programs available (Germ Busters, Food for Smiles). In the New Zealand studies, cultural	• Dental caries in childhood • OHK • OHA • OHB	**Qualitative synthesis:** The result demonstrated the effectiveness of the program by improving oral health outcomes. The effectiveness of the program and outcome were diverse. *Studies conducted in Australia and New Zealand:* • Gingival Index: decreased; Plaque scores: significant improvement in the students' brushing techniques; Students' awareness of teeth and gums and individual brushing techniques and coordination: improved; Knowledge, awareness and acceptance of dentistry: improved. • As a result of this successful program, oral health has been included as part of the school curriculum and Top Tips for Teeth is a component of the Koori Health and Wellbeing Project. • Dental caries level: Small difference between the control and intervention	"The delivery of toothbrushing programs in schools and other early childhood settings has the ability to address some of the social determinants that impact on oral health through a settings approach. The goal of this review was to provide an overview of toothbrushing programs within these settings and to outline some of the key points for consideration when establishing them. As schools and early childhood settings are a popular site for oral health promotion, it is important for those wishing to develop and implement such programs to consider what might be included. The review highlights important aspects that must be considered before implementing them. Evaluations should consider	Not all programs and guidelines included specific detail about evaluation or effectiveness. Two key exceptions were the Child smile and the Smiles for Miles Programs. Both have undergone extensive evaluation and have been shown to improve children's oral health status and to be cost-effective. Most of the programs were not evaluated, limiting the ir strength. For the Australian context, the authors did not recommend the development of

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		components were included in the learning aids. **Delivery:** Child health nurses provided information to schools about oral health. Dental therapists also conducted one session at the school where participants were taught about correct brushing techniques. The local health service staff and dental team attended each class from kindergarten to year 6 and provided the children with oral health education. Poster and activity booklet and toothbrushing demonstration from an oral health professional.		groups; Oral health awareness in schools and local community: increased; Fluoride accessibility for children: increased; Brushing technique: improved. *Studies conducted in US and Canada:* • The result demonstrated that the lunchtime tooth brushing program for schoolchildren using the xylitol pre-pasted toothbrush was feasible, well accepted and effective in controlling plaque. **Quantitative synthesis:** Not applicable.	how best to promote good brushing technique and how to ensure the long-term provision of toothbrushes and fluoridated toothpaste for program sustainability, particularly in challenging contexts. Guidelines for supervised toothbrushing programs vary within and across countries due to differences in water fluoridation and availability of low fluoride toothpastes. The results of this review provide critical information to be considered when establishing and implementing toothbrushing programs in these settings."	national guidelines because of the significant diversity in Australia. The authors recommended supervised toothbrushing programs in schools during early childhood as cost-effective measures among populations with high dental caries prevalence and a lack of access to a fluoridated water supply.
13.	dos Santos APP (2013) (2)	**Description:** The study of preschool children had an inclusion criterion of using fluoride toothpaste vs. placebo or no intervention. Therefore, all interventions involved providing of fluoride toothpaste, with one study testing low fluoride vs. standard fluoride. All studies had an oral health education component and included supervised brushing at	• Dental caries increment in primary dentition	**Qualitative synthesis:** Narrative description only of the intervention provided. **Quantitative synthesis:** • Only 2 studies of interest were included in the qualitative synthesis. • Meta-analysis determined non-significant benefit of using low fluoride toothpaste vs. no intervention.	"Standard F toothpastes are effective in reducing dental caries in the primary teeth of preschool children and thus their use should be recommended to this age group."	Only three studies met our countries of interest (UK). Hence, only interventions in these studies are described. Outcome of interest reported is oral health behaviour (using standard fluoride toothpaste

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		school; leaflets to parents to encourage brushing twice daily, with information on the size of toothpaste (pea-sized), oral hygiene, fluoride (low fluoride vs. standard tested) and diet recommendations. **Delivery:** The interventions were delivered either by leaflet for parents or by teachers at preschool (only 1 study from the UK used teachers).		• Standard fluoride toothpastes were determined to significantly prevent dental caries by a RR of 0.86; 95% CI 0.81–0.93. NNTBs was 11 (95% CI 7–20) and 15 (95% CI 10–28) if high (70%) or medium (50%) caries incidence scenarios. The highest NNTBs was found in low (20%) caries incidence scenarios at 37 (95% CI 26–59).		on primary teeth of preschool children).
14.	dos Santos APP (2018) (65)	**Description:** All studies (n=4) involved supervised toothbrushing. Interventions can be summarised into: (1) oral hygiene instruction sessions and practical demonstration daily during school days (5–days); (2) daily supervised toothbrushing at school and dental clinic; (3) intensive daily dental hygiene sessions at kindergartens with toothbrush and toothpaste samples distributed; (4) daily school-supervised toothbrushing with participants provided with toothbrushes and non-fluoride toothpaste. Comparison interventions or control groups either	• Dental caries incidence at dentine level in primary or permanent dentition	**Qualitative synthesis:** • One study of interest failed to detect any benefit from supervised toothbrushing, this means that it does not increase (or decrease) anti-caries benefit provided by fluoride toothpastes. Incremental change in DMFS (SD) was 1.55 (2.4) (test group) vs. 1.18 (3.9) (control group) and incremental change in DMFT (SD) in the test group vs. the control group resulted in no difference. • Only 1 study was delivered in a geography of interest (US). All studies were moderate to high risk of bias. **Quantitative synthesis:**	"There is no conclusive evidence that supervised toothbrushing increases the anticaries benefit provided by F toothpastes. For supervision during toothbrushing to be widely recommended and adopted, high-quality trials with proper control groups should confirm whether caries could be reduced further by supervising children when they are brushing their teeth with F toothpaste."	The results of this study were inconclusive as to the effectiveness of supervised toothbrushing in a school setting by trained professionals. The 4 included studies were of moderate to high risk of bias.

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		only received information with no demonstration or no intervention. **Delivery:** All delivery implemented by trained professionals such as a dental or research assistant. Delivery was primarily in school settings.		• Attempt was made to calculate RR but failed due to missing SD of control groups (to use as comparison).		
15.	Geetha Priya PR (2019) (6)	**Description:** Interventions in health education: (1) Health curriculums delivered in 3–4 sessions over 3 weeks a year; 6-month periods; four times a year (twice each semester); monthly lectures; 30 minutes of oral hygiene instruction over 5 consecutive school days and repeated twice a year; instruction for mothers once a year; (2) Group sessions and discussions between students; and students and teachers; multimedia was used, including a puppet play to stimulate health education; experimental learning by dividing into working groups and given specific oral health projects; using different forms of theatrical play, posts, songs, crafts, role playing with dentists visiting; flip charts and models to demonstrate brushing (by teachers or dentists); contests on	• OHK • OHA • OHB • Oral health status (plaque score and gingival health status)	**Qualitative synthesis:** • The review was limited to studies with follow-up periods of 6 months or more in order to reduce the effect of short-term learning. Minimum follow-up period was 6 months and maximum follow-up was more than 10 years. • Authors suggested direct communication with dentists proved to be most effective compared with other communication approaches (e.g. teacher-led or organisation-led). • It was also found that frequent oral health education by teachers was more effective than infrequent health education by professionals. Some schools have a dental hygienist who can be an authoritative person to care for the oral hygiene of children. • It was also found peer-led oral health education was as effective as dentist-led education and better than self-learning. For example, dental knowledge and	"School dental health education had a positive impact on the oral health status, knowledge, and practice behavior of children. There is a definite need for high-quality RCTs analyzing the effectiveness of school dental health education on specific oral health outcomes."	Three of 18 studies were conducted either in UK or US. RCTs conducted in the UK showed that multiple OHE sessions (with either group activity or provision of leaflets) were effective in significantly reducing plaque or plaque score. Multiple OHE sessions in school can be effective in Australia and/or Victoria.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		oral health; dental hospital tour; (3) Application of oral prophylaxis and fluoride applied manually once a year; supervised toothbrushing daily during school days for 1 semester; oral examination by local dentists in the classrooms; (4) Providing teachers with aids and training in order to deliver the interventions themselves. **Delivery:** The intervention was delivered in clinical and school settings by a range of professionals: dentists, postgraduate students, schoolteachers, parents, dental facilitators (e.g. school dental hygienists or nurse) and peers in school.		habits significantly improved in children who received the oral hygiene program and were supervised during toothbrushing for 1 semester. This continued to be the case even after 10 years' follow-up. • It was also found that using drama (dental residents dressed to mimick cartoon characters) and theatrical plays was effective; using puppet plays along with traditional lectures was effective. **Quantitative synthesis:** Not applicable.		
16.	Gwynn, J. (2020) (15)	**Description:** Strategies were identified as either targeting the individual, family or peer groups, and environmental interventions: *(1) Family or community level strategies:* (a) Intervention used principles of community participation, general health promotion, personnel training,	• Change in oral health status (DMFT; caries; teeth restorations; dental plaque; presence of fissure sealants; gingivitis; and	**Qualitative synthesis:** • Authors identified 8 of the 9 studies reporting statistically significant improvements in at least one component of oral health. The most frequently reported outcome was change in the number of decayed, missing or filled tooth surfaces (dmfs/DMFS). • Two studies reported significant changes in oral health knowledge and/or behaviour and two studies reported a	"Few good quality peer reviewed international studies of community-based oral health interventions which address the needs of Indigenous adolescents exist. Studies must include strong Indigenous community leadership and governance at all stages of the research, adopt participatory action-based research	Most of the studies reported improved oral health status, with the most frequently reported outcome being the change in decayed missing or filled teeth. Introduction of reticulated fluoridated water in a remote community

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		technology and fluoride education; (b) Fluoride rinsing program; (c) Five intervention strategies delivered monthly: partnership; employment of Aboriginal and/or Torres Strait Islander health workers); 'cultural aides and equipment'; education package; and oral health assessment and dental treatment. *(2) Peer group or school setting strategies:* (a) Daily brush-ins; fluoride application; educational presentations; and incentive scheme; (b) Health education comparing three groups; (i) 20 min OHE video; (ii) 20 min verbal OHE. (c) Education program covering oral health-related topics. *(3) Environmental targeted strategies:* (a) Intervention involved introducing a reticulated fluoridated water supply. **Delivery:** One study was a video educational component, and another indicated recruitment of local aides. The studies focused on Indigenous adolescents.	presence of cavities) • OHB • OHK	decline in caries prevalence (no statistical testing carried out). • Statistically significant outcomes reported were reduction in treatment hours required (p≤0.001), reduced levels of debris, calculus and oral hygiene scores (following video education vs. verbal education) (p<0.05), and decreased levels of unmet restorative needs and increased numbers of fissure sealants (p≤0.001). **Quantitative synthesis:** Not applicable.	approaches, and are required in urban communities."	may have a strong potential to improve oral health outcomes in rural Indigenous communities.

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17.	Hujoel PP (2018) (62)	**Description:** Studies reported oral hygiene interventions. All studies were in a school setting, with the intervention delivered over a range of weeks and supervised oral hygiene provided at varying time points. Four of the 7 studies were delivered daily, one study was delivered weekly, and one study did not indicate deliver timepoints. **Delivery:** The interventions were delivered by trained professional dental staff.	• Dental caries	**Qualitative synthesis:** Narrative description only of the intervention only. **Quantitative synthesis:** • Results of the meta-analysis confirm the hypothesis that improved personal oral hygiene without fluoride decreases the risk of coronal caries cannot be supported (DFMS) = −0.11; 95% CI 0.91, 0.69; p<0.79). • Its lack of effectiveness cannot be attributed to the presence of water fluoridation as 2/3 randomised trials were conducted in nonfluorinated communities. • This review highlights that lack of effectiveness also cannot be attributed to non-supervision of the oral hygiene intervention. Two randomised trials with strict protocols involving daily supervised plaque staining and removal on school days reported significant reduction in gingivitis but not of dental caries. • Authors indicate the randomised trial findings are robust towards sensitivity analyses. The randomised trial findings are robust when considering nonrandomised trials except for one industry-funded, nonrandomised study which was the only study to report highly	"Personal oral hygiene in the absence of fluorides has failed to show a benefit in terms of reducing the incidence of dental caries."	The pooled analysis showed the oral hygiene interventions did not influence the incidence of dental caries. Although all the evidence was from comparable countries such as UK and the US, and all the studies were NHMRC level II, they did not find the intervention was effective in reducing the incidence of dental caries.

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				significant benefits of personal oral hygiene.		
18.	Joury E (2017) (59)	**Description:** This review considered only studies that compared dental screening vs. no dental screening. The interventions included: (1) dental screening against a checklist of treatment needs criteria, including personalised letters for every child tailored to the child's registration status and sent home with the child, including a list of local dentists who will accept NHS child patients; (2) screening carried out as per BASCD (British standards) and personalised referral letters for positively screened children; (3) screened using the WHO criteria and personalised referral letters for positively screened children tailored to their required treatment and oral health education provided; (4) screening based on criteria determined by screening dentist and a referral letter for positively screened children; (5) screening using American Dental Association type III clinical examination criteria. **Delivery:**	• Changes in mean number of teeth with caries • Dental attendance	**Qualitative synthesis:** Narrative description only of the intervention provided. **Quantitative synthesis:** • The study did not find a statistically significant effect of school based dental screening programs on dental attendance in children. • Using an intraclass correlation coefficient (ICC) (to account for the cluster effect) of 0.030, there was no difference between screening and non-screening (RR 1.11, 95% CI 0.97, 1.27). • A similar risk ratio was found when testing with ICC values of 0.015 and 0.060, indicating that there is no clinical evidence of the benefit of school-based dental screening; however, intervals were wide, suggesting the possibility of random errors. • There were also no significant differences reported in the prevalence and mean number of deciduous and permanent teeth with caries, or the prevalence of sepsis, gross plaque or calculus and trauma to permanent incisor	"There is currently no evidence to support or refute the clinical benefits or harms of dental screening. Routine dental screening may not increase the dental attendance of school children, but there is a lot of uncertainty in this finding because of the quality of evidence."	Three of 5 studies were conducted in the UK. The review indicated a substantial heterogenicity. There is lack of evidence regarding the effectiveness of school-based dental screening on the prevalence of dental caries and dental attendance.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Mostly dentists or trained professionals carried out the screening with only one study using parents to identify problems supported by a leaflet with information.		teeth between screening and no screening groups.		
19.	Marinho VCC (2013) (11)	**Description:** Interventions included 10 trials involving manual painting of teeth with fluoride varnish using a small brush, other trials used a probe or cotton swab. Other trials also reported using of NaF-based varnishes such as Duraphat, Lawefluor, Biflourid 12, 3M™ CavityShield™, Fluoridin, Difluorsilane (Fluor Protector). Two trials applied less than 5% fluoride, 17 trials applied twice a year and 3 trials applied 4 times a year. One study applied 3 times in a week, with no other applications. The amount of varnish was 0.5ml per child (5 trials), where actual application time ranged between 1 and 4 minutes. Seven trials reported some form of tooth prophylaxis before administering the varnish and 4 trials reported no paste and 3 trials reported non-fluoride paste. If any prior toothbrushing or cleaning was	• Changes in caries on the surfaces of permanent teeth	**Qualitative synthesis:** • This study found no significant association between the estimates of D(M)FS or d(e/m)fs prevented fractions and the pre-specified factors of baseline caries severity, background exposure to fluorides, prior application of prophylaxis, concentration of fluoride or on frequency of application. • There was also no significant association between estimates of D(M)FS or d(e/m)fs prevented fractions and post hoc factors: either using a placebo or no treatment control, length of follow-up or whether individual or cluster randomisation was used, in the meta-regression models. • There was also no clear relationship between prevented fraction and study precision. As a result of the limited number of trials, the study was not adequately powered. **Quantitative synthesis:**	"The evidence produced has been found to be of moderate quality due to issues with trial designs. However in the 13 trials that looked at children and adolescents with permanent teeth the review found that the young people treated with fluoride varnish experienced on average a 43% reduction in decayed, missing and filled tooth surfaces. In the 10 trials looking at the effect of fluoride varnish on first or baby teeth the evidence suggests a 37% reduction in decayed, missing and filled tooth surfaces. There was little information concerning possible adverse effects or acceptability of treatment."	The finding from the review indicated fluoride varnish has a substantial caries-inhibiting effect in both permanent and primary teeth. The review contains trials conducted in the UK, US and Canada, which are of strong quality. Thus, they may be replicable in Australian and Victorian dental care setting.

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		reported it was included as part of the intervention. **Delivery:** The review did not identify who delivered the interventions; however, based on the types of interventions, with the majority being delivered in a clinical setting, we have good reason to believe the majority were delivered by dentists and professionals.		Effect of fluoride varnish on caries increment was reported in two main ways: • Effect on tooth surfaces, permanent dentition: D(M)FS prevented fraction. For all 13 trials combined the D(M)FS prevented fraction pooled estimated was 0.43 (95% confidence interval (CI) 0.30 to 0.57; P < 0.0001), possibly indicating a substantial benefit from fluoride varnish. However, the potential effectiveness was not seen in individual studies. • Effect on tooth surfaces, primary dentition: d(e/m)fs prevented fraction. A total of 10 trials reported data used to calculate a 0.37 (95% CI 0.24 to 0.51; P < 0.0001) pooled estimate of d(e/m)fs prevented fraction, indicating a substantial benefit of fluoride varnish in primary dentition, although there was substantial heterogeneity between trials. • Effect on whole teeth, primary dentition: d(e/m)ft prevented fraction. Only 2 trials contributed to this result indicating a fixed-effect pooled estimate was 0.65 (95% CI 0.48 to 0.82; P < 0.0001), suggesting a substantial benefit of fluoride varnish in the primary dentition.		
20.	Marinho VCC (2015) (12)	**Description:** Application of fluoride gel was either administered by a professional or under supervision. It was	• Changes in caries on the surfaces of	**Qualitative synthesis:** • This study identified (based on moderate-quality evidence) that fluoride gel "has a caries-inhibiting effect in the permanent	"The application of fluoride gel results in a large reduction in tooth decay in both permanent and baby teeth. We found little	The findings from this review indicated that fluoride gels can result in a large

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		administered either using a tray (18 trials) or a brush (6 trials), with only 1 trial reporting floss and cotton-tip application. Different fluoride gel types were used including acidulated phosphate fluoride (APF) and NaF. Application frequency ranged between once a year and 140 times a year. Application duration was reported to range between 2 and 10 minutes, with 16 studies reporting 3–5 minutes gel application time. **Delivery:** Majority of the studies were carried out by professionals (i.e., fluoride was operator applied). Fluoride gel was also self-applied under supervision (either by dental personnel or by non-dental personnel or by mothers and dental personnel).	permanent teeth • Changes in caries in the permanent teeth	dentition" by about 28% (95% CI 19% to 36%). **Quantitative synthesis:** • Results of the meta-analysis, though graded low-quality evidence, suggested a 20% (95% CI 1% to 38%) reduction in decayed, missing and filled tooth surfaces; there was no heterogeneity in this estimate. • Results of the meta-analysis of changes in caries on the surfaces of primary teeth indicated a comparative risk of 0.52 (95% CI 0.17 to 0.88) lower when using fluoride gel compared with no treatment or placebo. • There were also signs of acute toxicity (nausea and vomiting) by 10 per 1000 (very low-quality evidence). • When using subgroup and meta regression analysis, the effect of fluoride gel varied by type of control group used, with D(M)FS PF on average being 17% (95% CI 3% to 31%; P = 0.018) higher in non-placebo-controlled trials.	information about potential unwanted or harmful effects from accidental swallowing of the gel during treatment. As children often swallow gel during application, more research is needed on these effects."	reduction in tooth decay in both permanent and primary teeth. The review contains trials conducted in the UK, US and Canada, which are of strong quality, thus may be applicable in Australian and Victorian dental care setting. However, further research is required to explore the adverse effect and accidental swallowing of gel during treatment.
21.	Marinho VCC (2016) (13)	**Description:** Interventions in the review included supervised fluoride mouth rinsing at school (2 trials tested in the home). Participants were aged 6–14 years old. Trials tested different mouth	• Changes in caries on the surfaces of permanent teeth • Changes in caries in the	**Qualitative synthesis:** Narrative description only provided with limited information on effectiveness of the intervention. **Quantitative synthesis:**	"This review found that supervised regular use of fluoride mouth rinse by children and adolescents is associated with a large reduction in caries increment in permanent teeth. We are moderately certain of	All but two of the 37 trials (13 trials were conducted in the US, four in the UK and two in New Zealand) reported caries increment data at the

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		rinses (sodium fluoride- NaF), phosphate fluoride (APF), stannous fluoride (SnF2), sodium monofluorophosphate (SMFP), amine fluoride (AmF) and ammonium fluoride (NH4F). Trials used various fluoride concentration ranging from 100ppm to 3000ppm with frequencies ranging from 3 to 330 times annually. **Delivery:** All studies of interest (studies in the US, UK and New Zealand) were delivered/ supervised by trained professionals in the school setting.	permanent teeth	• Changes in caries on the surfaces of permanent teeth: Intervention group: DMFS 3.80 (95% CI 3.64 to 4.0) vs. 0.74 to 21.5 in the control (large effect). • Changes in caries in the permanent teeth: Intervention group: DMFT 2.46 (95% CI 2.27 to 2.6) vs. 0.72 to 8.41 in the control (moderate to large effect). • Dental caries increment: clinically important.	the size of the effect. Most of the evidence evaluated use of fluoride mouth rinse supervised in a school setting, but the findings may be applicable to children in other settings with supervised or unsupervised rinsing, although the size of the caries-preventive effect is less clear. Any future research on fluoride mouth rinses should focus on head-to-head comparisons between different fluoride rinse features or fluoride rinses against other preventive strategies and should evaluate adverse effects and acceptability."	tooth surface level. Authors reported that supervised regular use of fluoride mouth rinse (most usual amount of mouth rinse per application was 5ml–10ml for one or two minutes) among children and adolescents was found to be clinically important.
22.	Moore J (2022) (9)	**Description:** A total of 8 studies with only 2 as studies of interest (one in the UK and one in the US). All studies were school-based dental health education among children aged 5–13 years. Each study was conducted in a school setting and used students in the targeted schools. Studies of interest included four 1-hour sessions and a clinical examination supported by social support, reinforcement and skill	• Dental caries • OHK • OHB	**Qualitative synthesis:** • In the two studies of interest, there was evidence suggesting dental health education had a positive effect on children's use of dental services. The children receiving the program had significantly lower mean plaque scores and greater knowledge about toothbrushes and disclosing tablets than the control children who had not received the program. The children's knowledge of which type of toothbrush should be used and the role of disclosing tablets	"In conclusion, improving oral health behaviours in the early years offers hope for reducing the many chronic diseases associated with poor dental health, including heart disease and strokes, uncontrolled diabetes, oral and other cancers, and impaired mental and social wellbeing. Theory-based programs that educate about dental health strategies can help achieve these goals."	There were two studies of interest (one was delivered in the UK and one in the US). One study suggests teachers and/or parents play a key role in determining whether children make effective use of available dental care. However, authors determined from this

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		building. Another study involved oral examination, dental treatment provided from a school-based mobile van and oral health protocol lessons. **Delivery**: A dentist or oral healthcare specialist was the primary educator; teachers were also utilised as additional intervention instructors. In addition, peer education was incorporated as an added mode of instruction. The delivery also used a specific health behaviour theoretical framework to design and implement the interventions.		improved in the initial test group when compared with the control group and this was retained. • The US study also reported evidence from log-liner modelling to support health education having a positive effect on children's overall use of dental services. Teachers and/or parents play a key role in whether they make effective use of the dental care available. • One of the studies was based in a rural setting in the US; it showed school-based dental health education had positive effect on children's use of dental services and knowledge as to the effective use of available dental care. • A study from the UK showed multiple session of oral health education was effective in reducing mean plaque scores and children's knowledge of the type of toothbrush to use and the role of disclosing tablets. **Quantitative synthesis:** Not applicable.		review, there was insufficient evidence demonstrating how teachers and parents' roles increase effectiveness of children using dental care services. The intervention of school-based dental health education used in the rural US and multiple education sessions used in the UK may be applicable in Victoria and also widely in Australia.
23.	Sanjeevan V (2019) (7)	**Description:** The interventions included were a comparison of screening vs. non-screening in a school-based setting. Interventions included: (1) Letter only with non-screening groups; (2)	• Dental attendance	**Qualitative synthesis:** Narrative description only provided. **Quantitative synthesis:** • The results estimated a RR 1.16 (95% CI 1.11–1.21) concluding that dental	"There is evidence of marginally increased dental attendance rate of 16% following screening. As the quality of evidence was found to be low, the results of this	Three studies were relevant to the research question and population (all three of the studies were from the UK). The authors sought

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Letter only with traditional screening or through the National Dental Inspection Programme (NDIP); and (3) Dental screening followed by: i) home referral cards; ii) referral cards; iii) referral cards and health education (this was subdivided into traditional screening, new screening model and dental information leaflets). Comparison or control groups were characterised by no dental screening. **Delivery:** All interventions were delivered in a school-based setting but there was no information as to who delivered the interventions.		screening increases dental attendance by 16% in comparison with the non-screening group (i.e. for every 1000 people screened, 40 more children will attend a healthcare facility compared with those who were not screened). There was considerable unexplained heterogeneity. • Letter-only intervention: No significant effect. • Letter-only with traditional screening: Marginal improvement in dental attendance (RR 1.10 (95% CI 1.05–1.16). • No other comparisons between interventions were carried out in the meta-analysis. • Studies in the UK showed only marginal effect from screening in a Caucasian population.	review may be used with caution."	confirmation of the true effectiveness of screening on dental service use as a preventive measure for oral disease. The included studies were heterogenous and with profound variation in evidence; thus, care should be taken in generalising results to the Victorian and Australia context.
24.	Santos APP (2013) (55)	**Description:** Details of the interventions were made available in supplementary material that was no longer available. Information found within the review itself indicated all interventions involved a comparison between low and standard fluoride toothpastes with various	• Dental caries in the primary dentition • Moderate to severe fluorosis in the permanent dentition	**Qualitative synthesis:** Narrative description only of the studies provided. **Quantitative synthesis:** • Meta-analysis estimated significant increased risk of caries in primary teeth (RR=1.13 (1.07–1.20)) and it did not significantly reduce risk of aesthetically	"There is no evidence to support the use of low F toothpastes by preschoolers regarding caries and fluorosis prevention."	Description of the interventions was provided in supplementary material, which was not available. Of the 5 studies, 1 was delivered in the UK. Based on the review, there is no evidence

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		combinations of fluoride agent and abrasive. **Delivery:** Delivery of interventions was not found in the review.		objectionable fluorosis in the upper anterior permanent teeth. • Projections of harm (NNTH) estimated that in populations of high 5-year caries incidence (70%) 11 preschool children needed to use low F toothpaste to harm 1 preschooler (i.e. for 1 preschooler to develop at least 1 dentine caries lesion). For populations of medium (50%) and low caries incidence (20%) NNTHs would be 15 and 38, respectively.		to support use of low fluoride toothpaste in preschool children as it may not be as effective as standard fluoride toothpaste in protection against caries.
25.	Skeie MS (2018) (14)	**Description:** The interventions in the study varied, with the most common being use of fluoride (varnish, gel, tablet, sealant), thymol varnish with chlorhexidine use, supervised toothbrushing, healthy eating, OHE, and dietary and nutritional program. The interventions can be grouped into the following domains: "Other fluoride supplements", "Oral health studies and programs including fluoride supplements with other intervention types", "Sealants", "Supervised toothbrushing", "Nutrition", "Motivating interviewing", "Oral health education", and "Remineralising paste". **Delivery:**	• Dental caries	**Qualitative synthesis:** • Interventions found to be effective were milk fluoridation; fluoride rinsing; slow-releasing fluoride device; fluoride varnish and reinforcement of caries prevention in high-caries-risk subjects; oral hygiene instructions; fissure sealants together with water fluoridation; supervised toothbrushing; communication skills training for parents; oral health long-term education program. • Sixteen of 41 studies were conducted in Australia, the UK and US; 13/16 of the studies reported the intervention to be effective. • Two studies were conducted in Australia; the first study showed no effect from use of remineralising paste compared with antibacterial gel.	"On the basis of this review, we maintain that in addition to studies of water fluoridation and fluoride toothpaste, other preventive intervention studies provide scientific evidence for caries reduction among children and adolescents with immigrant or low socioeconomic backgrounds. Supervised toothbrushing for 5-year-olds in schools was found to be an effective prevention technique for use in underprivileged groups but also studies with a child/mother approach from a very early age, targeting nutrition and broad oral health education of mothers. For older children, a slow-release fluoride device	Thirteen studies were delivered in the UK (n=6), US (n=3) and Australia (n=3). Most of the 5-year school-based intervention was relevant to this review. The study was extensive, with studies in the UK, US and Australia (categorised as high quality) showing effectiveness in preventing dental caries through a slow releasing fluoride device; fissure sealants with water fluoridation,

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Details of intervention delivery is minimally mentioned in the review. However, the intervention was conducted at a community level targeting immigrants or people with sub-national socioeconomic status.		• The second study showed fissure sealants in combination with water fluoridation was effective in reducing DMFS; this was a cohort study based in Queensland and South Australia. **Quantitative synthesis:** Not applicable.	and application of an APF gel have been shown to be effective."	supervised toothbrushing and long-term oral health education programs. The intervention of using fissure sealants in combination with water fluoridation may also be effective in Victoria.
26.	Stein C (2018) (8)	**Description:** All interventions included in the review are considered oral health education activities and authors categorised them into: (1) OHE: activities with lectures, albums, slides, leaflets, counselling, games, drawings, theatre, dieting guidance; (2) Oral Health Instruction (OHI) reported as additional delivery of information directed particularly to toothbrushing methods; (3) Toothbrushing demonstration (TD) with macro models or dental dummies; (4) Supervised Tooth brushing (ST): the intervention study period ranged from 1 month to 4 years. **Delivery:**	• Dental caries • Gingivitis • Dental pain and tooth loss	**Qualitative synthesis:** Narrative description of the studies only provided. **Quantitative synthesis:** • A meta-analysis demonstrated a positive effect of using any oral health education intervention for plaque outcome of -0.36 (95% CI between -0.61 and -0.12), df=2. • When comparing oral health education, OHI and toothbrushing demonstrations vs. control; there was a beneficial effect of -0.42 (95% CI between -0.69 and -0.15). When comparing oral health education vs. control, there was a non-significant beneficial effect, though much smaller in size -0.07 (95% CI -0.32 and 0.19). • Although limited, the studies suggest a positive effect of oral health education on	"Traditional oral health educational actions were effective in reducing plaque, but not gingivitis. There is no long-term evidence in respect of the effectiveness of these interventions in preventing plaque accumulation, gingivitis, and dental caries in the school environment."	The review had a study conducted in the UK. Traditional oral health educational interventions were shown to be effective in reducing plaque, but not gingivitis, and may be potentially replicated in the Australian and Victorian context.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Either a dental hygienist or dentist delivered the intervention. Only one study reported a research assistant supporting a dental hygienist as part of the intervention delivery.		plaque levels in the short term. For gingivitis, there was no difference between control and intervention groups, revealing that oral health education had no effect on gingivitis reduction.		
27.	Tsai C (2020) (42)	**Description:** Interventions were divided into education-only interventions and comprehensive interventions. Education-only interventions: lectures, audiovisual presentations, leaflets or videos. Comprehensive interventions: combination of education with broader elements such as family or community involvement, peer-to-peer workshops, self-diagnosis, needs-related oral hygiene instructions, dental produce use and/or clinical measures such as fluoride varnish, sealants and restorations. Oral health education was incorporated into all interventions. Comprehensive interventions involved programs involving child, family and larger communities with clinical preventive measures of dental prophylaxis, fluoride varnish or rinse and fissure sealants. In some studies, dental take-home products were supplied.	• Plaque level • Dental caries • Gingivitis	**Qualitative synthesis:** • This review strongly concluded there was a need to adopt comprehensive approaches including behavioural techniques and clinical interventions (such as fluoride) to implement successful health promotion programs. • The review noted when dealing with this age group (10–19 years) top-down approaches may not be effective. They recommend knowledge-based education predominantly for younger children and use of longer-term, more inclusive, holistic interventions involving the wider social circles and preventive clinical measures (fluoride) together with behavioural theory. • The use of non-dental professionals with peer-to-peer teaching and community figures seems promising. They also recommend economic analysis for future studies. **Quantitative synthesis:** • The meta-analysis pooling of results favoured the intervention over control for	"Oral health promotion programmes targeting adolescents have the ability to improve clinical oral health outcomes in the short and long term. Programmes should use more behavioural theory-based interactive and strategic methods, including self-awareness and the use of the wider community and peers for oral health promotion activities over a longer intervention duration."	The majority of the studies were conducted in a different context to Australia (34/37 studies), so the intervention (indicated in the review) may require strong evidence to confirm its applicability and effectiveness in Australia.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Delivery: Interventions were delivered mainly by dental personnel (dentists and dental auxiliaries) or study investigators. However, education was also provided by teachers, student peers, health education specialists and leaflets / videos. Three programs compared effectiveness of education delivered by different personnel: dentist vs. teachers, dentist vs. peers and dentist vs. teachers vs. peers.		all clinical outcomes, except DMFS in the education-only subgroup. • Stronger intervention effects were seen in the comprehensive intervention subgroup than the education-only subgroup for DMFS (P = .02). • The effect was unclear for the other subgroup.		
28.	Xiang B (2021) (63)	**Description:** Interventions have been grouped into the following 7 main types: (1) face-to-face interventions delivered by dentists vs. conventional one-time dental visit; (2) using social cognitive theory (SCT) in face-to-face interventions delivered by peers and dentists vs. control: no intervention; (3) Health Action Process Approach (HAPA): multicomponent intervention vs. control:no intervention; (4) Prospect theory: pamphlets vs. control: no intervention; (5) SOC: classroom activities by teachers vs. control: no intervention; (6) Health Belief Model (HBM) 1: classroom-based sessions	• Presence of plaque (visible plaque index: VPI, or the Oral Hygiene Index Simplified: OHI-S) • Gingival health (Community Periodontal Index: CPI) • OHB	**Qualitative synthesis:** • This study found strong evidence that psychological factors such as self-efficacy, intention and social influences are strong determinants of oral health behaviours. • One study in this review found social circles of their own peers influenced adolescents' oral health. If the effect of peers is considerable then existing social networks may present a great opportunity for oral health promotion in adolescents. This means theories reliant only on parental support (such as the Authoritative Parenting Model) may not be particularly effective among adolescents. It was also found that motivational interviewing was more	"Theory-guided interventions for improving oral hygiene status appear to be more effective than traditional interventions for adolescents in the long term. However, more comprehensive studies are required for validation to support the implementation and adoption of these programs in the clinical setting."	As all the studies in the pooled results were conducted in a country that may not be comparable to the Australian healthcare system, the applicability of the theory guided intervention is questionable.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		and homework by a health education specialist; HBM 2: HBM1+parents and school staff, teachers received a five-page booklet; vs. control: no intervention; (7) 3 SCT group: booklets + posters + instructions by dentists, teachers or peers vs conventional: booklet vs. control: no intervention. **Delivery:** Interventions were delivered in both clinical and non-clinical community settings by oral health professionals (e.g. dentists), teachers and peers.		effective vs. conventional education in promoting oral health behaviours and preventing dental caries in adolescents. **Quantitative synthesis:** • Findings from pooled effects of theory-guided interventions suggest they are more effective than conventional interventions for long-term oral health. • Four studies (out of 10) found statistically significant difference in plaque reduction using theory guided interventions compared with conventional interventions (SMD: –0.25, 95% CI: –0.46 to –0.04) with no evidence of heterogenicity (p = 0.38, I2 = 2%) at ≥12 months with a non-significant different at 3 months MD: –5.94, 95% CI: –16.39 to 4.51), with no evidence of heterogeneity (p = 0.99, I2 = 0%).		

Abbreviations:

APF: acidulated phosphate fluoride; CI: Confidence Interval; CPI: Community Periodontal Index; CSM: Commonsense model of self-regulation; DHATs: Dental Health Aid Therapists; dmfs/DMFS: Decayed, Missing or Filled Tooth Surfaces; D(M)FS: decayed (missing) and filled permanent surfaces; d(e/m)fs: decayed, (extraction indicated/missing), and filled primary surfaces; dmft/DMFT: Decayed, Missing and Filled Teeth; D(M)FT: decayed, (missing) and filled permanent teeth; d(e/m)ft: decayed, (extraction indicated/missing), and filled primary teeth; ECS: Enhanced Community Service; F: Fluoride; FV: Fluoride Varnish; HAPA: Health Action Process Approach; HBM: Health Belief Model; ICC: Intraclass Correlation Coefficient; MI: Motivational Interviewing; mo: months; NDIP: National Dental Inspection Programme; NHMRC: National Health and Medical Research Council; NHS: National Health Service; NNT: Number Needed to Treat; NNTB: Number needed to treat for an additional beneficial outcome; NNTH: Numbers needed to treat for an additional harmful outcome; NR: Not Reported; OHA: Oral Health Attitude; OHB: Oral Health Behaviour; OHE: Oral Health Education; OHI: Oral Health Instruction; OHI-S: Oral Hygiene Index Simplified; OHK: Oral Health Knowledge; OHRQoL: Oral Health Related Quality of Life; OHS: Oral Health Status; ppm: parts per million; PSB: Parent Supervised Brushing; RCTs: Randomised Controlled Trials; RR: Risk Ratio;

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments

SD: Standard Deviation; SCT: social cognitive theory; S-ECC: Severe Early Childhood Caries; SMD: Standardised Mean Difference; SOC: Sense of Coherence; ST: Supervised Toothbrushing; TD: Toothbrushing demonstration; TDF: Theoretical Domain Framework; VPI: visible plaque index; WHO: World Health Organization; y: years.

Table 10—Detailed summary of findings from the included studies focused on older people residing in a care facility

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
1.	Albrecht M (2016) (69)	**Description:** Oral health program that included direct-to-staff program or direct-to-resident program (e.g. oral hygiene promotion or skill training) or combination of both. The interventions varied in terms of frequency, duration and education content. **Delivery:** Dentists, dental hygienists, trained nursing staff (i.e. oral health coordinators, ward oral healthcare organisers, nurse educators) and health promoters.	• OHRQoL • Dental plaque • Gingivitis • Dentures-induced stomatitis • OHK • OHA	**Qualitative synthesis:** • OHRQoL: outcome not reported • Oral health related knowledge: outcome not reported in resident • Oral health related attitude: outcome not reported in resident • Oral health related behaviour: one study reported changes in behaviour by a qualitative methodology. **Quantitative synthesis:** • Dental plaque: 0.04 lower in intervention group (95% CI 0.26 lower to 0.17 higher); measures: Plaque Index, Oral Hygiene Index, Geriatric Simplified Debris Index; included 6 RCTs • Dental plaque: 0.6 lower in intervention group (95% CI 1.25 lower to 0.05 higher); measures: Denture Plaque Index, method of Augsburger; included 5 RCTs • Oral health related knowledge (staff): Standard mean difference: 0.94 (95% CI -0.04,1.92) • Oral health related attitude (staff): Standard mean difference: 0.3 (95% CI -0.23,0.83)	"We found insufficient evidence to draw robust conclusions about the effects of oral health educational interventions for nursing home staff and residents. We did not find evidence of meaningful effects of educational interventions on any measure of residents' oral health; however, the quality of the available evidence is low. More adequately powered and high-quality studies using relevant outcome measures are needed."	The study had quantitative synthesis of pooled data of numerous studies in relation to our research question and population. However, there was insufficient evidence demonstrating the effectiveness of the oral health educational intervention in a residential aged care facility.
2.	Chen R (2020)	**Description:**	• Short-term proxy measures for dental	**Qualitative synthesis:**	"All workforce models of care had some positive impact on oral health for	There were only 4 (out of 28 studies) conducted in Australia

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
	(16)	The review described 4 models of workforce as intervention which are: (1) nurse-led training of aged care staff; (2) oral health professional-led training of aged care nurses; (3) oral health professional-led training of nurses with ongoing clinical support; and (4) oral health professionals also providing care. **Delivery:** Workforce model included in the study was delivered by aged care nurses and oral health professionals.	hygiene (dental plague and denture plague) • Medium-term outcomes (gingivitis and periodontal disease) • Broader comprehensive oral health assessment.	• The review provided narrative description of the studies with limited information on effectiveness. • The review provided limited detail about the effectiveness of the intervention and focused on its economic feasibility. • There were four studies based in Australia, all of them showed statistically significant improvement in dental and denture plaque level. • Two of these studies had a workforce model of nurse-led training of aged care nurses and the remaining half had oral health professional-led training of aged care nurses with ongoing clinical support. • Fourteen studies reported a positive and statistically significant result at the end of the trial (i.e. the workforce intervention produced an improvement in the patients' clinical outcomes). • One study produced a statistically significant negative result. • Four studies showed statistically significant positive improvements in reducing gingival bleeding (as medium-term outcomes) and eight studies reported statistically significant improvements in soft tissue outcomes. • Two studies under "oral health professional-led training of nurses with ongoing clinical support" reported statistically significant positive outcomes.	residents of aged care. Oral health should be included as a health focus in age care facilities. Future studies should include longer-term health outcomes with rigorous economic analysis to ensure sustainably delivered workforce models of care for oral health management within aged care."	and 7/28 were from the US, UK and Canada. The inclusion and exclusion criteria were broad and the results reflect the large number of interventions and strategies on different workforce models that address the oral care needs of older people residing in aged care facilities.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				Only 1 study demonstrated positive long-term improvements for root caries. **Quantitative synthesis:** Not applicable.		
3.	Coker E (2014) (67)	**Description:** All 12 studies reported an educational program component. Study interventions can be clustered into three categories: (1) single in-service education session; (2) single in-service education session supplemented by a pyramid approach or 'train-the-trainer'; and (3) education sessions supplemented with ongoing active involvement of a dental hygienist. Two studies conducted in the UK reported only educational components using demonstrations and other teaching aids. with one study including ongoing care plans. **Delivery:** Dentists, dental hygienists, trained nursing staff (oral health coordinators, ward oral healthcare organisers, nurse educators) and health promoters.	Dental and denture hygiene defined by: • Dental debris • Denture debris • Denture plaque • Dental plaque • Calculus score.	**Qualitative synthesis:** Finding from this review suggest educational approaches may have an effect, although perhaps limited, on measures of oral health of dependent older adults in long-term care. **Quantitative synthesis:** Not applicable.	"None of the approaches emerged as being desirable over the others, as methodologically strong studies with good intervention integrity were lacking, and variety of oral health outcomes were used to measure effectiveness of the interventions, making comparisons across studies difficult."	Although several studies used the same measurement (e.g. plaque index and debris index), some measurement protocols were modified and there was inconsistence in how the measurements were performed across the studies. There were two studies of interest (delivered in the UK).

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
4.	Gomez-Rossi J (2020) (17)	**Description:** A total of 81 studies were included. Interventions were grouped according to their location in the care process (carer/patient, dentist and system/policy maker levels). A range of intervention types (methods, techniques) were employed; educational interventions (designed for caregivers, patients, staff, relatives); providing oral hygiene and assistance with toothbrushing; providing professional oral healthcare; application of fluoride; mouthwashes; toothbrush optimisation; telemedicine; dentifrices; probiotics; tongue hygiene. Interventions could be located on more than one level. Subgrouping along different categories was further performed. For the system/ policy maker level, these categories were borrowed from the Behaviour Change Wheel. Additionally, studies were charted on their focus on the care process as primary, secondary or tertiary prevention. Most interventions	• Caries/root caries incidence • Plaque index • Plaque scores • Dental healthcare need.	**Qualitative synthesis:** • More than two-thirds (64/81) of the included studies were found to show a statistically significant benefit from the intervention. • A total of 13 different aims were identified and a range of intervention types employed (e.g. educational interventions, professional oral healthcare, restorative treatment, fluoride application and, generally, dentifrices, mouthwashes, chewing gums/food supplements). • Most studies were conducted at the carer/patient level (56/81 studies) and the system/policy maker level (44/81). • Studies conducted in the US, UK, Australia, New Zealand and Canada showed improvement in plaque scores. **Quantitative synthesis:** Not applicable.	"Oral health improvement interventions are widely studied. However, study aims, methods and outcome measures are highly heterogeneous, which limits the ability for robust conclusions. Current research focuses on primary prevention on the level of patients/carers or system/policy maker level. Future studies may want to consider interventions on the dentists' level focusing on secondary prevention. These studies should rely on a core set of comprehensive, standardized set of outcome measures."	About 69% of the interventions were effective according to the evaluated outcomes. However, most of the implementations were not evaluated. This limits suggestions as to the most effective interventions for future policy makers. However, as a primary intervention, education related to oral health was a crucial intervention. There were 10 studies in the UK and nine in the US.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		were aimed at primary preventive measures. **Delivery:** Most studies focused on the clinical dimensions at the carer/patient level (56 studies out of 81, or 69%) and were administered by trained professionals.				
5.	Siegel E (2017) (70)	**Description:** Interventions varied across studies (18 papers) and settings (nursing homes and long-term care facilities). Authors broadly categorised interventions into: (1) oral hygiene strategies; (2) behavioural and communication strategies; (3) oral healthcare training and oral care provision by staff and carers; and (4) comprehensive oral health protocols. Some studies fitted into multiple categories. **Delivery:** All interventions were delivered by trained professionals except in	Proxy measures of oral health: • Plaque • Debris • Gingival health or OHRQoL.	**Qualitative synthesis:** Findings summarised against intervention strategies. Population across all studies were persons with special needs (dementia) or studies with >50% persons with special needs. *Preventive oral hygiene care strategies:* • Intervention: POHC and assisted brushing; Effect: mixed/ inconclusive. • Intervention: electric toothbrush; Effect: significant reduction. • Intervention: Liquorice root: no significant improvement in oral microflora but observed a non-significant reduction in Streptococcus mutans. • Intervention: Occupational therapy; Effect: evidence of improved dental and denture hygiene in those who received weekly	"There is a lack of high-quality evidence to support the effectiveness of oral health interventions and implementation strategies for older people with dementia or cognitive impairment. More rigorous, large-scale research is needed in this area. Recommendations are provided to improve the overall quality of evaluation in this area. Emphasis must be placed on developing evidence-based, achievable and sustainable oral health strategies if the needs of people with dementia and cognitive impairment are to be met into the future."	There were only 5 (out of 18) studies that were from the US, but the inclusion and exclusion criteria were broad and results are reflective of a large number of interventions and strategies targeting reduction and prevention of oral health disease. This study includes interventions that target both trainers and participants (recipients of oral health promotion and education).

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		the peer-to-peer facilitations, but training was provided for peers.		monitoring and gesture education vs. only occupational therapy instruction. *Behavioural and communication strategies:* • Intervention: best practice mouth care twice daily with soft brush and flossing with interdental brushes and rinsing with mouthwash; Effect: significant improvement in oral health measured by OHAT after 14 days and reduction in care-resistant behaviour. • Intervention: training for peer-to-peer approach including person-centred behavioural strategies; Effect: significant improvements in dental plaque, denture plaque and gingival health after 8 weeks. *Oral healthcare training and oral hygiene care provision by staff and carers:* • Intervention: education program with overview and demonstration; another study included a care plan for modifications to the physical environment; Effect: significant reductions in plaque, improved gingival health and improved swallowing. *Comprehensive protocols/complex interventions:* • Intervention: members of nursing staff appointed to OHC positions responsible		

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				for implementing protocols in their wards; Effect: mixed / inconclusive. **Quantitative synthesis:** Not applicable.		
6.	Wang TF (2015) (68)	**Description:** Five studies were included in this review reporting educational programs given to caregivers. Studies covered oral health, oral hygiene, dental diseases, common risk factors and oral hygiene instruction. Most studies (n=4) were educational programs that included demonstrations of proper oral care and an interactive instructional period using models and manikins. The programs included discussions on overlooked patients and residents with behaviour problems; discussion time between the caregivers and residents (discussing common oral conditions and oral health challenges). The length of the educational programs ranged from 1–4 hrs. **Delivery:**	• Percentages of mucosa • Denture stomatitis	**Qualitative synthesis:** Narrative description only provided. **Quantitative synthesis:** *Change in mucosa measurement:* • Pooled summary statistics reported statistically significant improvement in residents' normal mucosa by 81% following the health education program (p=0.027). (OR = 1.81; 95% CI: 1.07, 3.05). • One study was found to affect the magnitude of pooled estimates and after it was excluded, sensitivity analysis reported a 2.29 times significant improvement (p<0.001) in normal mucosa measurements following the caregivers' educational program. *Change in visible plaque with/without denture stomatitis:* • Meta-analysis results reported 54% of residents showing no visible plaque	"The systemic review and meta-analysis found limited evidence that oral health education for caregivers may be effective for improving the oral health of the elderly."	Results of this study confirmed that following the treatment by caregivers who had received the intervention training resulted in improvements in oral health and training of caregivers for oral health education.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Delivery of the intervention was by caregivers. Training of caregivers ranged from a professor and dental students, two speech/language pathologists, dentists and/or dental hygienists or a health promoter trained in dental and oral care.		following caregivers' oral health education (OR = 1.54; 95% CI: 1.19, 2.00).		

Abbreviations:

CI: Confidence Interval; OHA: Oral Health Attitude; OHAT: Oral Health Assessment Tool; OHC: Oral Health Coordinators; OHK: Oral Health Knowledge; OHRQoL: Oral Health Related Quality of Life; OR: Odds Ratio; POHC: Professional Oral Health Care; RCT: Randomised Controlled Trial.

Table 11—Detailed summary of findings from the included studies focused on pregnant women and mothers with young infants

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
1.	Faisal MR (2022) (19)	**Description:** In all 36 of the included studies, oral health education was the basic component used together with other assessments such as caries risk assessment or oral health assessment/ screening/ oral examination, and other preventive techniques such as fluoride varnish application. **Delivery:** The study only assessed use of non-dental intervention delivery, defined in the inclusion criteria as using schoolteachers. Results reported studies involving personnel such as physicians, nurses, midwives, dieticians, health centre staff, administration staff, vaccination staff, health visitors, community health workers, peers and community members to deliver the interventions.	• Dental caries (at tooth surface and tooth level) • OHB.	**Qualitative synthesis:** • Provision of toothbrushes and toothpaste was part of the intervention in 21 studies. Intervention materials about oral health education consisted of verbal or written material, videos or a combination of both. • The review reported 21 studies with clinical outcomes and 10 studies reporting significant effect sizes. A total of 24 studies reported behavioural outcomes together with clinical outcomes. Effect size calculations were found to be significant for studies (n=2) that reported behavioural outcomes. • Synthesis suggested evidence for effectiveness of these interventions at preventing dental caries (measured at surface level) with great variability. **Quantitative synthesis:** • Meta-analysis reported an SMD -0.15 (-0.25, -0.04) favouring the intervention, with sensitivity analysis showing greater beneficial effect at both surface level (SMD -0.14 (95% CI: -0.26, -0.02) and tooth level (SMD-0.47 (95% CI: -0.84, -0.10)), with high levels of heterogeneity observed.	"Oral health promotion and behaviour change techniques facilitated by primary care workers may help address the global burden of dental caries. The results of this review provide evidence supporting the use of non-dental health professionals and health workers in reducing caries incidence through various BCTs. However, the quality of the existing studies to date is low, with a high risk of bias. Future research and robust clinical trials using standardised taxonomy may improve the generalisability of these findings."	The intervention content differed significantly between studies; it was impossible to clearly distinguish the most effective type of behaviour change theory (BCT). However, it can be positively stated that interventions that usually employed a variety of methods such as disseminating oral health education with either provision of dental products, community engagement, dental visits, or fluoride varnish application were more effective in producing behaviour change. Authors report studies recommending comprehensive interventions delivered at both the personal level and the wider family and community level as more effective

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				• Due to great variation in how behavioural outcomes were measured and reported, it was impossible to pool them together in a meta-analysis; hence, a narrative synthesis was presented for them.		than oral health education alone.
2.	George A (2019) (20)	**Description:** The intervention methods varied across studies and included a combination of (1) oral health education, (2) oral health assessment/ screening and (3) referrals of participants to dental services. Furthermore, the intervention may have included provision of oral hygiene products and resources, reminders of oral health instruction and graphical material. Some of the oral health education sessions were accompanied by counselling. The intervention was divided into antenatal, postnatal and a combination of both. **Delivery:** Provision of oral health education by a non-dental health professional was the focus of all the studies. Three also included referrals for dental care by non-dental health professionals, obstetricians, community-based	• Dental caries • OHB • OHK • OHP • DSU.	**Qualitative synthesis:** • Interventions in the antenatal period improved childhood oral health outcomes. Interventions including oral health education, referral and screening resulted in: (1) fewer caries (p=0.019); (2) fewer extractions (p<0.021); (3) fewer teeth with caries at 2–3 years old (p<0.001); and (4) increased uptake of oral health services. • Interventions in the postnatal period showed significant improvement in the child's OHS and the mother's OHB. Interventions including oral health education with counselling, community wide intervention, oral health resources such as pamphlets and DVDs led to significant improvement in oral health outcomes in children. • Combination of antenatal and postnatal interventions including oral health education with home visits and counselling with dental referral showed meaningful improvements in children's	"Non-dental professionals can promote maternal oral health by providing oral health education, risk assessment and referrals. Combining these interventions could provide a sustained improvement in oral health outcomes for children although current evidence is weak. More high-quality studies are needed to confirm these findings and determine whether the antenatal and/or postnatal period is best suited to deliver these interventions."	The combined oral health education and referral strategy indicate significant clinical outcomes of oral health status. However, involving non-dental health professionals played a minor role in providing education at home visits and improving the dental care component. In addition, health education (focused on nutrition) as an intervention during both periods showed no significant differences.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		nurses, and outreach coordinator who was a health department employee and one involving dental screening initiated by a multi-disciplinary team.		caries risk (RR = 1.48, 95% CI 1.13 - 1.93). **Quantitative synthesis:** Not applicable.		
3.	Vamos CA (2015) (18)	**Description:** Interventions were oral health education and skills development in prenatal clinics: (1) Prenatal dental education lecture on baby bottle use, breastfeeding, oral hygiene, first dental visit age, when to use bottled water, nutrition, fluoride, non-nutritive snacking habits, role of medication, fluoride, nursing and caries, when to visit the dentist, connection with systemic health, myths, plaque, brushing, flossing, caries prevention, baby's teeth, and oral evaluation; (2) audiovisual presentation on maternal health during pregnancy, infant oral health and child's oral health; (3) provision of fluoride varnish applications, mouthwash, oral hygiene instructions and scheduled examinations for the experimental group; (4) movie about periodontal disease and the proper techniques for brushing and flossing teeth. **Delivery:**	• OHK • OHB • OHA • Self-efficacy • Oral hygiene • Health-seeking behaviours.	**Qualitative synthesis:** • Six (out of 7) studies demonstrated significant improvements in oral health, particularly with several sessions of oral health education. • One study indicated a single session was ineffective at improving outcomes. • Two RCTs demonstrated significant improvements in brushing/flossing and regular visits to a dentist during pregnancy in the experimental group. • A community based prenatal nutrition program identified significant improvement in caregivers' knowledge, beliefs and attitudes in infant oral health. **Quantitative synthesis:** Not applicable.	"Few oral health interventions among pregnant women addressed oral-related symptoms, hygiene behaviors, and potential oral–systemic implications specific to mothers. Subsequently, more theory- and evidence-based interventions addressing current prenatal oral health guidelines using rigorous designs are needed to improve oral and systemic health for both women and their offspring."	Six studies were relevant to the research question and population. Most of the studies (6/7) have shown that oral health education and skills development in prenatal clinics had a positive effect on oral health knowledge, oral health beliefs, oral health attitudes, self-efficacy, oral hygiene and health-seeking behaviours.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		The intervention was delivered to pregnant women in prenatal clinical settings by clinic staff or researchers.				

Abbreviations:

BCT: Behaviour Change Theory; CI: Confidence Interval; DSU: Dental Service Uptake; OHA: Oral Health Attitude; OHB: Oral Health Behaviour; OHK: Oral Health Knowledge; OHP: Oral Health Practice; OHS: Oral Health Status; RCT: Randomised Controlled Trial; RR: Risk Ratio; SMD: Standardised Mean Difference.

Table 12—Detailed summary of findings from the included studies focused on mixed population groups including children, adults and older people

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
1.	Ghaffari, M. (2018) (71)	**Description:** Interventions were divided into short-term and long-term effects. Studies were determined as having short-term effects if they included improving knowledge, attitudes, self-efficacy, oral health behaviour (e.g. toothbrushing and flossing), and included: (i) classroom-based sessions, lectures and demonstration colloquy, messages and pamphlets, three sessions, a booklet and mobile phone text messages; (ii) booklet supplemented sessions, CCOHEP classes, flipchart book and a CD, brainstorming, audiovisual aids and a lecture using PowerPoint, demonstrating toothbrushing; and (iii) video games, verbal advice, oral health education curriculum, leaflets and photographs, planning exercise, brochures and virtual learning, and photographs. Long-term effects included studies targeting improving decayed teeth, plaque, bleeding and gingival and included: (i) oral health educational sessions and posters and classroom-based sessions; messages and pamphlets; book and a CD; brainstorming leaflets and photographs; lecture using PowerPoint, and demonstration of toothbrushing.	Short-term effects: • OHK • OHA • Self-efficacy • OHB. Long-term effects: • Decayed teeth • Plaque, • Bleeding • Gingivitis.	**Qualitative synthesis:** • This review found educational interventions targeting short-term effects have greater influence in changing beliefs and behavioural skills when policies and environments are supportive of the desired behaviour change. Learning and understanding delivered through health-educating and health-promoting interventions can result in a positive impact on knowledge, attitudes, self-efficacy, oral health behavioural and theory constructs. For example: one included study reported children's perceptions increased at 2 weeks follow-up and students in the comprehensive intervention group were more likely to brush their teeth twice a day compared with the control group (OR = 1.74, 95% CI: 1.38-2.19; p = .023), and the intervention group was more likely to floss compared with the control group (OR = 1.58, 95% CI: 1.31-1.91; p = .036). • This review also found that in studies targeting long-term consequences—such as reducing risk of tooth loss and treatment needs—oral health education interventions were also effective in improving gingival health	"Approximately, this study supports effectiveness of all oral health education and promotion interventions, especially in short-term outcomes. Regarding the importance of long-term and short-term outcomes for oral health education and promotion programmes, these interventions could be performed in the future with several target groups including family and teachers."	As the study included a broad group of interventions with varied outcomes and limited information as to their effectiveness, the applicability of the interventions in the Australian context is uncertain.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Delivery: Delivery varied between studies and study design; however, it was in a non-clinical community setting.		and reducing plaque levels. For example, one study showed a reduction in plaque index for bleeding and plaque build-up following intervention (vs. control) (0.5 vs. 0.3, P < .05). Similarly, another study, reported significant improvement in the gingival index on gingival health in children on the comprehensive intervention group (OR = 0.60, 95% CI: 0.53-0.67; p = .025). **Quantitative synthesis:** Not applicable.		
2.	Holliday R (2021) (72)	**Description:** Information extracted from this review relates only to studies delivered in community based settings (5 out of the 20 included studies). Interventions in community contexts included oral cancer screening and education for athletes (school and college settings); 'tailored' tobacco advice following the 5As approach and nicotine replacement therapy (delivered through the national Quit Line); one-to-one counselling session, setting a quit date and developing a quit plan; identifying triggers for smoking and setting up	• Oral health outcome measures as secondary outcome.	**Qualitative synthesis:** • Oral health outcome was reported in a single study. Participants showed improvements in all the oral health measures (percentage of bleeding on probe, oral dryness score and OHRQoL) because of intervention smoking cessation advice. **Quantitative synthesis:** Not applicable.	"There is very low-certainty evidence that quit rates increase when dental professionals offer behavioural support to promote tobacco cessation. There is moderate-certainty evidence that tobacco abstinence rates increase in cigarette smokers if dental professionals offer behavioural support combined with pharmacotherapy. Further evidence is required to be certain of the size of the benefit and whether adding pharmacological interventions	Since the review was not particularly focused on the oral health measure, the findings as to the oral health outcome obtained from the review may not be applicable.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		follow-up (accountability); educational meetings using learning aids (videos, small group discussion) were also included. Interventions were delivered through face-to-face, telephone, text messages, and via the internet or a combination of modalities. **Delivery:** Trainers / dentists / dental hygienists; Quit Line counsellors.			is more effective than behavioural support alone. Future studies should use biochemical validation of abstinence so as to preclude the risk of detection bias. There is insufficient evidence on whether these interventions lead to adverse effects, but no reasons to suspect that these effects would be specific to interventions delivered by dental professionals. There was insufficient evidence that interventions affected oral health."	
3.	Iheozor-Ejiofor Z (2015) (26)	**Description:** Intervention included initiation of water fluoridation program or cessation of water fluoridation. The fluoridation of water supply in the study area was of focus. **Delivery:** Wider community, national government and local government, water supply authority.	• Dental caries • Dental fluorosis.	**Qualitative synthesis:** Narrative description only provided. **Quantitative synthesis:** • The pooled analysis showed water fluoridation results in reductions in dmft of 1.81 (95% CI: 1.31 to 2.31) and in DMFT of 1.16 (95% CI 0.72 to 1.61). • The study further shows 35% reduction in dmft and a 26% reduction in DMFT compared with the median control group mean values. • The study also concludes that water fluoridation led to an increase in the	"There is insufficient information to determine the effect on caries levels of stopping water fluoridation programs. There is a significant association between dental fluorosis (of aesthetic concern for all levels of dental fluorosis) and fluoride level. The evidence is limited due to high risk of bias within the studies and substantial between-study variation."	Most of the studies were conducted prior to 1975; there has been widespread initiation of water fluoridation since then. While the coverage of water fluoridation in Australia is about 90%, this review provides further evidence to expand the water

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
				percentage of caries-free children by 15% (95% CI: 11% to 19) in deciduous dentition and 14% (95% CI: 5% to 23%) in permanent dentition.		fluoridation program.
4.	Nakre PD (2013) (21)	**Description:** All interventions were delivered in the form of oral health education instructions and two studies were campaigns. Four studies distributed oral health information sheets, four studies used oral health demonstration sessions with participants in a school setting, three studies used education videos, one had group discussions and two studies had campaigns. Twelve studies were education sessions delivered in groups (one delivered to individuals) over a period ranging from 20 minutes to 2 hours. Two studies provided an incentive. No studies had policy backing. Only one study provided preventive and curative interventions providing oral prophylaxis to the participants. **Delivery:** Trained professionals: dentists or dental hygienists.	• OHK • OHA • OHP • Gingival health • Plaque • Bleeding on probing • Caries increment.	**Qualitative synthesis:** The results varied widely as the population group included: adolescents (4/40), mothers and caregivers of infants (4/40), elderly (1/40), one among all age groups (1/40), and children (5/40). The review provided narrative description: • 13 studies showed significant effect of intervention to OHK • 4 studies showed significant effect of intervention to OHA • 13 studies showed significant effect of intervention to OHP • 7 studies showed significant effect of intervention to gingival health • 9 studies showed significant effect of intervention to plaque • 7 studies showed significant effect of intervention to bleeding on probing • 5 showed significant effect of intervention to bleeding on caries increment. **Quantitative synthesis:** Not applicable.	"This study identifies a few important variables which contribute to the effectiveness of the programs. There is an indication in this review that the most successful oral health programs are labor-intensive, involve significant others and have received funding and additional support. A balance between inputs and outputs and health care resources available will determine if the program can be recommended for general use."	One of the studies included in the review was conducted in Victoria. The intervention (oral health advice and education; referral) in the study showed a positive result and may be applicable for wider rollout in Victoria.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
5.	Nasseripour M (2021) (25)	**Description:** All 14 studies involved chewing sugar-free gum (SFG) as the main intervention included in the review. 'Sugar' referred to monosaccharides (i.e. glucose, fructose, galactose) and disaccharides (i.e. sucrose, lactose, maltose) while polyols such as xylitol, sorbitol or maltitol in gums satisfied the 'sugar-free' criteria. Studies that reported *Streptococcus mutans* levels were included. **Delivery:** Information on who delivered the intervention was not reported (though extracted as a potential modifier).	• Streptococcus mutans count • *Streptococcus mutans* trends (decline) • *Streptococcus mutans* mean % change.	**Qualitative synthesis:** • *Streptococcus mutans* count: the effect of chewing xylitol containing SFG on *Streptococcus mutans* counts is potentially long-lasting, with evidence suggesting that it lowers the oral bacterial load for up to 5 years after 2 years of use. **Quantitative synthesis:** • *Streptococcus mutans* load: − 0.42 reduced in the intervention group (95% CI − 0.60 to − 0.25). • *Streptococcus mutans* trends: decline. • *Streptococcus mutans* mean % change: changing the correlation between the baseline and end of study data to 0.95 for the SFG group gave an effect size of −0.55 (95% CI− 0.80 to − 0.30).	"Chewing SFG reduces the load of *Streptococcus mutans* in the oral cavity in comparison to non-chewing controls. Considering the degree of variability in the effect and the moderate quality of the trials included, there is a need for future research exploring the use SFG as a preventive measure for reducing the cariogenic oral bacterial load."	It is important to acknowledge that the level of *Streptococcus mutans* is only one component of an individual's risk/susceptibility to dental caries. However, the beneficial impact of chewing SFG on caries has been demonstrated and may be in part mediated through changes in levels of *Streptococcus mutans*.
6.	Riley P (2015) (24)	**Description:** Total of 10 studies with only 2 studies of interest (US). The intervention compared xylitol-containing products with placebo or no intervention (which includes routine care). One study of interest compared xylitol lozenges with standard lozenges in adults and one study used xylitol wipes vs. placebo wipes in children. The	• Dental caries increment • Number of participants with/ without dental caries increment • Quality of life (QoL).	**Qualitative synthesis:** The result summarises there is no compelling evidence, from other comparisons in this systematic review, to support the use of xylitol products. Results below report only the two studies of interest.	"We found some low quality evidence to suggest that fluoride toothpaste containing xylitol may be more effective than fluoride-only toothpaste for preventing caries in the permanent teeth of children, and that there are no associated adverse-effects from	The body of evidence for all other comparisons and caries outcomes is rated as being low to very low quality. This is because they are single

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		rest of the trials involved children testing xylitol candy vs. control (sorbitol) candy; xylitol lozenges vs. no treatment; xylitol syrup vs. (low-dose xylitol) syrup; xylitol sucking tablets vs. no treatment; xylitol toothpaste vs. control toothpaste; xylitol tablet vs. control (sorbitol) tablet. **Delivery:** Study did not report on who delivered the interventions.		• Adult: Xylitol lozenges vs. control lozenges: non-significant. • Children: Xylitol wipes vs. control wipes: increment for dmfs. • No difference in the number of infants with caries. **Quantitative synthesis:** Only 2 studies were included in the quantitative synthesis. Our studies of interest were not included in the meta-analysis. The results of the synthesis were: • Dental caries increment: caries reduced by 13% in intervention group (a fluoride toothpaste containing 10% xylitol) compared to a control group (fluoride-only toothpaste) (PF -0.13, 95% CI -0.18 to -0.08, 4216 children analysed, low-quality evidence) • Quality of life (QoL): low	such toothpastes. The effect estimate should be interpreted with caution due to high risk of bias and the fact that it results from two studies that were carried out by the same authors in the same population. The remaining evidence we found is of low to very low quality and is insufficient to determine whether any other xylitol-containing products can prevent caries in infants, older children, or adults."	studies with imprecision mostly due to very small sample sizes, and most have a high risk of bias. There were two studies of interest (delivered in the US).
7.	Söderling E (2020) (23)	**Description:** A total of 20 (out of 21) studies included in the review reported the effects of xylitol on mutans streptococci (MS) count. All interventions involved distributing different forms of xylitol: chewing gum (different concentrations), tablets, gummy bears and candies. Participant ages ranged widely from 2–	• Dental caries • Mutans streptococci (MS) • Saliva MS • Plaque and saliva MS	**Qualitative synthesis:** The results show the effect of the intervention in significant reduction of mutans streptococci (MS). Intervention: lower *Streptococcus mutans* scores in the US studies: • Significant effect on the intervention group (p<.05).	"Xylitol consumption is likely to decrease MS counts, but it may not change the overall microbiota. Xylitol shows thus properties of an oral prebiotic. More studies are needed to demonstrate the effects of erythritol on MS."	Only one paper on the effects of erythritol on mutans streptococci counts fulfilled the inclusion criteria. Although the author synthesised the results as

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		73 years and study duration from 2 days to 3 years. **Delivery**: The delivery modalities included chewing gums or candies (pastilles/tablets/gummy bears).		• In 5 weeks, chewed xylitol gum 3x or 4xd showed lower MS counts (p<.1). • Plaque MS/5 weeks (p<.01) and plaque and saliva MS/6 mo (p<.05). • Mutans streptococci decreased in all groups (p<.001) when children with non-measurable MS were excluded. **Quantitative synthesis:** Not applicable.		statistically significant but small changes in the MS levels, some of the interventions did not monitor the outcome levels after xylitol consumption was discontinued. Only four studies were delivered in countries of interest (US).
8.	Walsh T (2019) (27)	**Description:** The studies included in the review compared toothbrushing using a fluoride toothpaste with toothbrushing using either another fluoride toothpaste of a different concentration or a non-fluoride toothpaste or no toothpaste. Based on fluoride concentration, there were seven categories (0, 250, 440–550, 1000–1250, 1450–1500, 1700–2200 and 2400–2800 ppm F). The fluoride agents included (1) sodium fluoride (NaF), (2) sodium monofluorophosphate (SMFP), (3) stannous fluoride (SnF_2), (4) acidulated phosphate fluoride (APF) and (5) amine fluoride (AmF).	• Oral health status • D(M)FS/T • d(e/m)fs/t • Proportion of people developing new caries.	**Qualitative synthesis:** Narrative description only provided. **Quantitative synthesis:** *In primary dentition:* • 1500 ppm fluoride toothpaste reduces caries increment when compared with non-fluoride toothpaste (MD -1.86 dfs, 95% CI -2.51 to -1.21). • 1055 ppm and 550 ppm fluoride toothpastes are similar (MD -0.05, dmfs, 95% CI -0.38 to 0.28). • 1450 ppm fluoride toothpaste slightly reduces dmft increment when compared with 440 ppm fluoride	"This Cochrane Review supports the benefits of using fluoride toothpaste in preventing caries when compared to non-fluoride toothpaste. Evidence for the effects of different fluoride concentrations is more limited, but a dose-response effect was observed for D(M)FS in children and adolescents. For many comparisons of different concentrations the caries-preventive effects and our confidence in these effect estimates are uncertain and could be challenged by further	Authors found use of fluoridated toothpaste was effective in improving oral health status in primary as well as permanent dentition. In particular, two studies conducted in Australia showed consistent results with the review. However, the trials

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		Delivery: The intervention was delivered as a part of their routine oral care.		toothpaste (MD -0.34, dmft, 95%CI -0.59 to -0.09). *In permanent dentition:* • 1000 or 1100 ppm fluoride toothpaste reduces DMFS increment when compared with non-fluoride toothpaste in adults of all ages (MD -0.53, 95% CI -1.02 to -0.04).	research. The choice of fluoride toothpaste concentration for young children should be balanced against the risk of fluorosis."	were conducted in the 1960s.
9.	Yazdani R (2019) (22)	**Description:** A total of 15 studies were included to consider the effect of xylitol on salivary *Streptococcus mutans* (*S. mutans*). Intervention groups were those using sugar alcohols in the form of chewing gums, and studies on sugar alcohols consumed in other forms such as pills, drops, lozenges and sugar-saturated wipes. Active intervention (types of sugar alcohols) group using xylitol and a minimum of one control group not receiving xylitol or receiving placebo or any other form of preventive treatment (such as sealants, fluoridated toothpastes, or specific hygienic instructions) were included. Groups were divided into three groups based on the age range of subjects namely 0–6 years old (which also included studies on	• Dental caries • (*S. mutans* in saliva) and plaque	**Qualitative synthesis:** Narrative description only provided. **Quantitative synthesis:** • Results were reported by age groups for studies comparing xylitol vs. control group. • 6–18-year-olds: non-significant difference favouring xylitol SMD -0.08 (95% CI: -0.22, 0.06), df =1, I2 = 0%. • >18 years: significant difference favouring xylitol -0.12 (95% CI: -0.23, -0.01), df = 1, I2 = 0%. • 0–6 years old: non-significant difference favouring xylitol -0.24 (95% CI: -0.73, 0.25), df = 1, I2 = 51%. • Across all ages: Significant effect favouring xylitol -0.11 (95% CI: -0.19, -0.02), df =5, I2 = 0%.	"Based on the results, the available literatures show xylitol as an alternative sweetener, which is capable of preventing dental caries by reducing the count of *S. mutans* in the saliva. The daily dosage of xylitol as an anti-caries agent is still controversial and calls for further investigations."	Authors found xylitol to be an effective measure to reduce dental caries by reducing the count of *S. mutans* in saliva. However, authors did not assess which dosage of xylitol was the most effective.

No.	First author (year) (reference)	Intervention description and delivery	Outcome(s)	Summary of findings	Authors' conclusions	Reviewers' comments
		infants and pregnant mothers), 6–18 years and above 18 years old. **Delivery:** Not reported.				

Abbreviations:

CCOHEP: Contra Caries Oral Health Education Program; CI: Confidence Interval; dmft/DMFT: decayed, missing, and filled primary/permanent teeth; dmfs: decayed, missing, or filled tooth surfaces; D(M)FS/T: decayed, missing, filled permanent surfaces/teeth; d(e/m)fs/t: decayed, missing, filled primary surfaces/teeth; F: Fluoride; MD: Difference in means; MF: mutant streptococci; OHA: Oral Health Attitude; OHB: Oral Health Behaviour; OHK: Oral Health Knowledge; OHP: Oral Health Practice; OHRQoL: Oral Health Related Quality of Life; OR: Odds Ratio; PF: prevented fractions; ppm: parts per million; QoL: Quality of Life; SFG: sugar-free gum; SMD: Standardised Mean Difference; S. mutans: Streptococcus mutants.