

# Update of the oral health promotion evidence base for the National Oral Health Promotion Committee

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***Final  
Report***



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## 1. Background

This review updates the oral health promotion evidence base to provide a contemporary evidence platform for development of the National Oral Health Promotion Plan (NOHP). This is the third in a series of oral health promotion evidence reviews, the first review, *Evidence-based Health Promotion: Resources for Planning. Number 1 Oral Health, 2001* (1) was updated from June 1999 to June 2010 in *Evidence-based oral health promotion resource, 2011*(2) . This current review updates the evidence base from July 2010 to December 2012.

### Review Questions

- What are effective oral health promotion strategies for the Australian population?
- What innovative oral health promotion strategies show promise for the Australian population?
- What information and research gaps exist?

## 2. Methods

### Criteria for selecting studies

#### *Types of studies*

- Systematic reviews of oral health promotion interventions
- Studies which incorporated an evaluation (process, impact, outcome)  
Systematic reviews of interventions that are likely to promote oral health as a part of broader outcomes that had lessons for oral health promotion (e.g. on nutrition, social marketing and school based health promotion approaches)
- Individual studies that had oral health promotion as the primary focus
- Individual studies that had oral health promotion explicitly included and evaluated as a secondary focus

#### *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 with special needs

- Low income and socially disadvantaged groups

### ***Types of Interventions***

Interventions that can be applied across priority groups will be included as per the Integrated Health Promotion categories.

- Screening and individual risk assessment
- Health education and skills development
- Social marketing and health information
- Community action
- Settings and supportive environments

### ***Intervention Settings***

- Childcare and pre-school settings
- School settings
- Workplace settings
- Community settings
- Residential care settings

### ***Outcome Measures***

- Oral health knowledge
- Oral health attitudes
- Oral health behaviour
- Oral health status
- Process, impact and or/outcome measures using qualitative and /or quantitative methods

### ***Exclusion criteria***

- Dental clinic-based treatments (such as the application of fluoride varnish or dental sealants) were excluded unless the study incorporated implementation in childcare, school, workplace, community or residential care settings.
- Interventions aimed at increasing access to dental services were considered beyond the scope of this review, except where they overlapped with broader oral health promotion interventions.

## Search methods for identification of studies

The oral health promotion literature in English for the period beginning 1 July 2010 to 17 December 2012 was systematically searched. Comprehensive search strategies were developed by the search expert using a combination of controlled vocabulary and free-text terms for each of the database searched to identify relevant studies meeting the inclusion criteria. The initial search strategy was developed for MEDLINE Ovid and revised accordingly for each database. Databases searched included MEDLINE (searched on 17/12/2012), EMBASE (searched on 21/12/2012), CINAHL (searched on 21/12/2012), Cochrane Database of Systematic Reviews (21/12/2012), Centre for Reviews and Dissemination databases: particularly the Database of Abstracts of Reviews of Effectiveness (DARE) (searched on 7/1/2013). The search strategy used to search Medline Ovid is provided below.

In addition to searching electronic databases, relevant internet sources were searched to retrieve grey literature such as unpublished articles, reports, conference proceedings and abstracts. Articles and reports identified through grey literature were hand-searched manually to identify additional articles. National, regional and topic specific websites were also searched for eligible articles and reference lists from these articles were visually scanned to identify pertinent articles. Grey literature sources included:

- Google scholar
- Google
- Network investigation using Australian state oral health promotion/public health units and professional peer networks (including the Public Health Association of Australia and Australian Health Promotion Associations) to identify community, state and national oral health promotion activities published outside the peer reviewed literature
- Oral Health Promotion Clearinghouse ([www.adelaide.edu.au/oral-health-promotion](http://www.adelaide.edu.au/oral-health-promotion))
- National Health Service Evidence – Oral Health Promotion ([www.evidence.nhs.uk/search?q=Oral+Health+Promotion](http://www.evidence.nhs.uk/search?q=Oral+Health+Promotion))
- Community Preventive Services, The community Guide Supporting Materials: Oral Health ([www.thecommunityguide.org/oral/supportingmaterails/caries.html](http://www.thecommunityguide.org/oral/supportingmaterails/caries.html))

- Health-evidence.ca ([www.health-evidence.ca/articles/search](http://www.health-evidence.ca/articles/search))
- Australian Research Centre for Population Oral Health ([www.arcpoh.adelaide.edu.au/](http://www.arcpoh.adelaide.edu.au/))
- Australian Indigenous HealthInfoNet ([www.healthinfonet.ecu.edu.au/](http://www.healthinfonet.ecu.edu.au/))

### **Study identification and screening process**

The study selection and screening processes were initiated by piloting the inclusion criteria to a sample of papers to check for reviewer consistency in applying and interpreting the inclusion criteria appropriately. Two reviewers independently screened the title and abstracts retrieved by the searches for potential relevance against the predetermined inclusion criteria. Studies which did not meet the inclusion criteria were excluded. Studies that appeared to meet the inclusion criteria or cases where a clear decision could not be made based on title and abstract alone, full text of the articles were obtained to make a detailed assessment for potential inclusion. Full text articles were independently screened by six reviewers to include studies of potential relevance to the topic area. A third reviewer resolved any disagreements related to the inclusion of studies.

### ***Search and screening results***

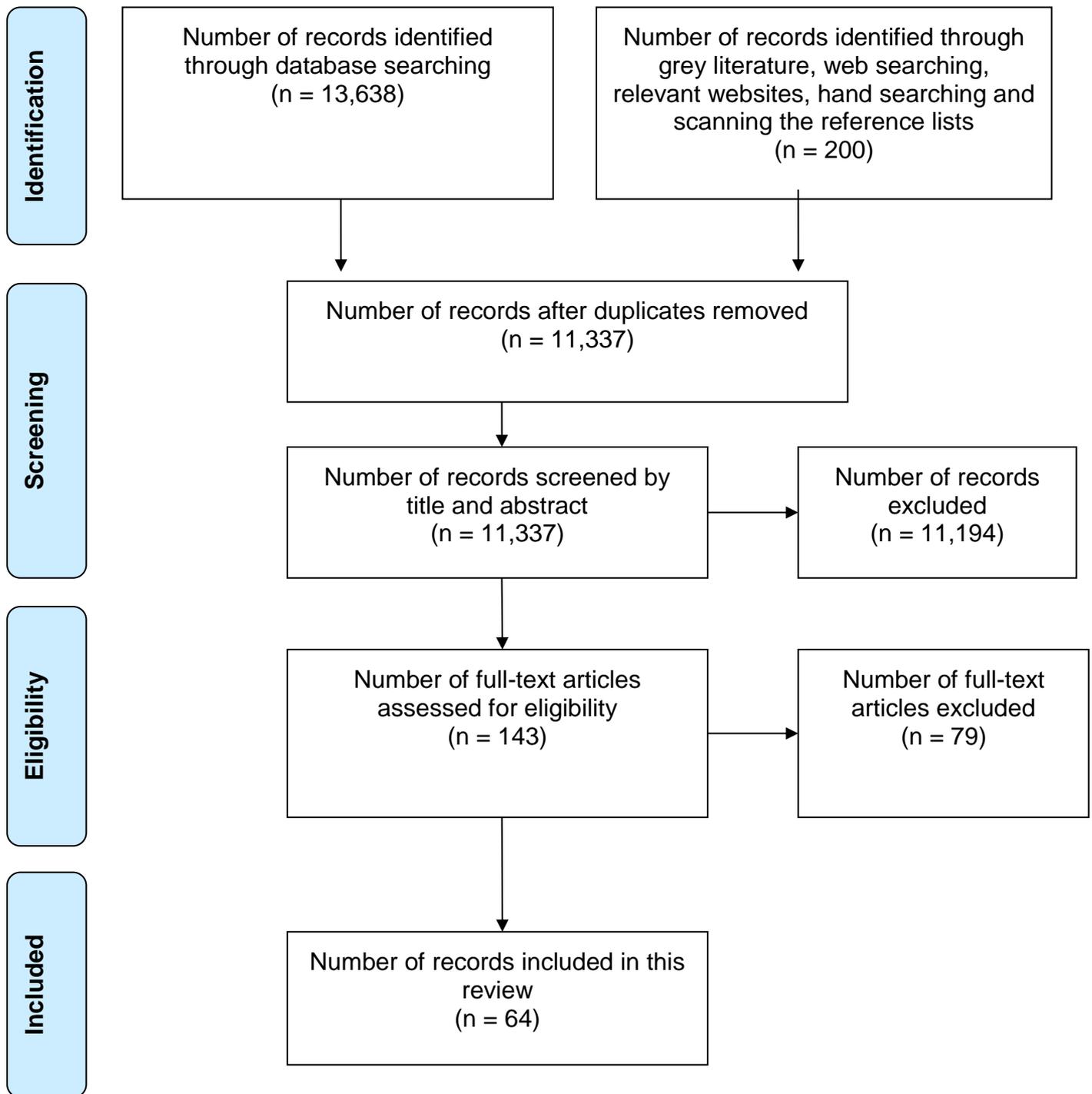
In total, the search identified 13,838 records out of which 13,638 records were identified from data base searches and 200 records from other sources such as grey literature, web searching, relevant websites, scanning the reference lists and hand searching relevant reports. Of these, 2,501 were duplicate records. A total of 11,337 records were screened by title and abstract and 11,194 records which did not meet the inclusion criteria were excluded. A total of 143 records were screened for full text eligibility out of which, 79 records were excluded due their ineligibility to meet the inclusion criteria and 64 records which met the inclusion criteria were included in this final review. The study flow chart (figure 1) provides the breakdown of the search and the screening results.

### ***Data extraction and management***

Data extraction form was piloted on a sample of studies to ensure only relevant information was being extracted. Six reviewers independently extracted the data from included studies to obtain necessary information relating to study characteristics and findings. Disagreements were discussed and resolved by consensus among reviewers. A

review database was established that comprised information on author/year of publication; population/ age group/ sample size/ country of the study; context/problem addressed; study settings; intervention type; evaluation method; comparison; outcome and issues identified by the authors in relation to feasibility, acceptability, sustainability, potential side effects and cultural reach.

Figure 1: Systematic search and screening results



## Search strategy for Medline Ovid

1. Parents/ or Child/ or Child, preschool/ or Infant/ or Adolescent/ or Students/ or Pregnant Women/ or Adult/
2. elderly.mp. or Aged/
3. Migrants/ or Refugees/ or Minority Groups/
4. (Aboriginal and Torres Strait Islanders).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
5. concept, unique identifier]
6. (Culturally and Linguistically Diverse communities).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
7. Low income communities.mp.
8. or/1-6
9. Oral health.mp. or exp Oral Health/
10. 'Oral health status'.ti,ab.
11. ("Oral health" or health) adj3 (knowledge or attitude\$1 or behavio\$)).ti,ab.
12. (('Quality of life' or 'self rated' or 'self reported' or 'self perceived') adj5 (oral or dental or health)).ti,ab.
13. Dental Caries/ or exp Toothache/ or Tooth Diseases/ or Tooth Loss/
14. Periodontal Diseases/ or exp Gingival Diseases/ or exp Gingivitis/ or exp Dental Plaque/ or exp Dental Deposits/ or Periodontitis/
15. ((dental or teeth or tooth or enamel) adj2 (missing or loss or filling\$ or cavit\$ or decay or demineral\$ or rot\$ or lesion\$)).ti,ab.
16. (White spot lesion\$ or dmft or DMFT or dmfs or DMFS).ti,ab.
17. or/8-15
18. Health promotion.mp. or exp Health Promotion/ or dental health promotion.mp.
19. exp Health Education, Dental/ or exp Health Education/ or exp Education, Nonprofessional/
20. exp Capacity Building/ or exp Health Literacy/ or exp Health Communication/
21. Preventive Dentistry/ or Public Health/
22. exp Fluoridation/ or Toothpaste/ or Fluorides/ or exp Toothbrushing/ or exp Mouthwashes/ or exp Dentifrices/
23. ((home or school or community) adj4 (dental screening\$ or oral screening\$ or mouth\$ screening\$)).ti,ab.
24. ((intervention\$1 or strateg\$ or program\$1 or policy or policies or legislation\$ or campaign\$) adj3 (health or oral or dental)).ti,ab.
25. ((tobacco cessation or smokeless tobacco cessation or nicotine) adj3 (intervention\$1 or law\$ or strate\$ or program\$ or initiative\$ or policy or policies)).ti,ab.
26. ((tobacco or nicotine or cigarette\$ or tobacco product\$) adj4 (marketing or social marketing or advert\$ or media or campaign\$ or awareness)).ti,ab.
27. ((school\$1 or play school\$ or child care service\$ or home or pre natal service\$ or post natal service\$ or kindergarten or residential or workplace) adj4 (health or oral or dental)).ti,ab.

28. (((outreach or mobile or enhanced) adj3 (service\$ or program\$ or initiative\$ or support or strateg\$)) and (dental or health or oral)).ti,ab.
29. or/17-27
30. (Systematic adj3 review\$1).mp. and (health or dental or oral or mouth).ti,ab.
31. ((meta analysis and reviews) adj4 ((Health or Dental or Oral) and health promotion)).ti,ab.
32. Evaluation adj3 (Health or Dental or Oral).ti,ab.
33. ((evaluat\$ or intervention or interventional or treatment) and (control or controlled or study or program\$ or comparison or comparative)).ti,ab.
34. ((intervention or interventional or process or program) adj5 (evaluat\$ or effect\$ or outcome\$)).ab,ti.
35. Evaluation Studies/ or Program Evaluation/ or Intervention Studies/ or Pilot Projects/
36. Randomized Controlled Trial.pt.
37. Epidemiologic Studies/ or Random Allocation/ or Clinical Trial/
38. ('Community-Based Participatory Research' or 'Community-Based Participatory Research stud\$' or 'Community Trials').ti,ab.
39. (Randomized or randomised or placebo or randomly or control or 'comparison group\$ ' or intervention or matching).ti,ab.
40. ((evaluat\$ or intervention or interventional or treatment) and (((control or controlled or study or program\$ or comparison or 'before) and after') or comparative)).ti,ab.
41. Cohort studies/ or Longitudinal Studies/ or Follow-Up Studies/
42. Case-Control Studies/
43. Cross-sectional studies/
44. ((Qualitative or 'mixed method' or quantitative) and stud\$).ti,ab.
45. Or/29-43
46. 7 and 16 and 28 and 44
47. Limit 45 to "humans" and ed=20100701-20121217

### 3. Results

Table 1: Database of included study characteristics and findings

Author & Year	Population/Context	Intervention type	Evaluation method	Comparison	Outcome	Issues identified by the authors - feasibility, acceptability, sustainability, potential side effects, cultural reach	Target Population	Settings
<b>McMahon et al (3)</b>	Scotland  3year old children, N=1022  Dental decay	<i>Childsmile</i> : National Health Service implemented program.  <ul style="list-style-type: none"> <li>Oral health advice (e.g. on healthy weaning, diet, teething &amp; toothbrushing instruction)</li> <li>Annual dental check-ups and treatment, if required</li> <li>2x yearly fluoride varnish applications from 2yrs old</li> <li>Supervised nursery school toothbrushing program</li> </ul>	Dental exam in nursery schools  <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 1year FU</li> <li>+2 years FU</li> <li>+3years FU</li> </ul>	No comparison	<ul style="list-style-type: none"> <li>Decay experience 9% ↓</li> <li>Mean d3mft ↓ over 4 years</li> <li>Decay reductions seen in all socioeconomic groups</li> </ul>	<ul style="list-style-type: none"> <li>Relative improvements in dental health were seen across the SES spectrum</li> <li><i>Childsmile</i> adopts a life-course approach commencing at the earliest age with differentially intensive interventions</li> <li>Customised to meet individuals' assessed oral health needs</li> </ul>	Preschool children	Pre-School
<b>Esfahanizadeh (4)</b>	Tehran  6 year old children, N=160  Oral health behaviours	<ul style="list-style-type: none"> <li>Parent oral health education</li> <li>Children given toothbrushing instruction</li> <li>Children given TB &amp; TP</li> </ul>	<ul style="list-style-type: none"> <li>Clinical exam (plaque index, gingival index) <ul style="list-style-type: none"> <li>+1.5mth FU</li> <li>+6mth FU</li> </ul> </li> <li>Demographics</li> <li>Oral hygiene habits</li> </ul>	RCT  Four preschools randomised by class	<ul style="list-style-type: none"> <li>↓ plaque</li> <li>↑ brushing frequency</li> <li>No difference in gingival index</li> </ul>	<ul style="list-style-type: none"> <li>Relatively brief one off education session</li> </ul>	Children	Pre-School
<b>Grant (5)</b>	USA  3-5 year old children, N=90  Majority Hispanic/African American  Low SES  Oral health & nutrition knowledge attitude and	<ul style="list-style-type: none"> <li>10 minute oral and health and nutrition education session</li> <li>N=47</li> </ul>	Child Interview/Questionnaire  <ul style="list-style-type: none"> <li>Baseline</li> <li>+35min FU</li> <li>+2wks FU</li> </ul>	RCT  Seven preschools randomised by class	<ul style="list-style-type: none"> <li>↑ knowledge, attitude &amp; behaviour 35min post</li> <li>No improvement 2wk post</li> <li>No differences between groups after adjustment</li> </ul>	<ul style="list-style-type: none"> <li>Intervention too brief – not effective when no additional resources provided</li> <li>Need for consistent integrated messages from classroom and parents</li> </ul>	Preschool children	Pre-School

	behaviour							
<b>Frazão (6)</b>	<p>São Vicente, Brazil</p> <p>5 year old children, N=627</p> <ul style="list-style-type: none"> <li>• ≥1 permanent molar with emerged/sound occlusal surface</li> </ul> <p>Enamel/dentin caries</p> <p>Low-income fluoridated area</p>	<p>Bucco-lingual technique by trained Dental Assistant</p> <p>N= 344</p> <p><i>Conventional treatment</i></p> <ul style="list-style-type: none"> <li>• Oral health education</li> <li>• Dental plaque dyeing</li> <li>• Toothbrushing with fluoride dentifrice supervised by DA four times/year</li> <li>• Other days children brushed teeth under indirect supervising of teachers</li> </ul> <p><i>+Test treatment</i></p> <ul style="list-style-type: none"> <li>• Professional cross-brushing on surfaces of 1st permanent molar by trained DA five times/year</li> </ul>	<p>Oral Exam - enamel and dentin caries on buccal, occlusal and lingual surfaces of permanent molars</p> <ul style="list-style-type: none"> <li>• Baseline,</li> <li>• + 1-6months FU</li> <li>• +7-12months FU</li> <li>• +13-18months FU</li> </ul> <p>Double blinded</p>	<p>RCT</p> <p>N= 283</p> <p>Comparison received conventional treatment only</p>	<ul style="list-style-type: none"> <li>• Difference of 21.6 lesions per 1,000 children between comparison and intervention groups</li> <li>• Incidence density was 50% lower in intervention boys</li> <li>• No significant differences amongst girls</li> </ul>	<ul style="list-style-type: none"> <li>• Intervention was effective among the boys independently of the variation of their caries experience and age</li> <li>• Strongly encourage further studies in a non-fluoridated area</li> </ul>	Preschool children	<b>Pre-School</b>
<b>Divaris (7)</b>	<p>USA</p> <p>Grade 1-5 children, N=1,363</p> <p>Caries</p>	<p><i>Weekly Fluoride Mouthrinse Program (FMP)</i>: Existing government program</p> <ul style="list-style-type: none"> <li>• Years of exposure to the program</li> </ul>	<ul style="list-style-type: none"> <li>• Clinical exam</li> <li>• Parental reported data</li> <li>• Secondary analysis of National Oral Health Survey</li> </ul>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• Each year in FMP associated with weak ↓ in caries prevalence</li> <li>• More pronounced ↓ in schools that were classified as high risk</li> </ul>	<ul style="list-style-type: none"> <li>• Potentially greater long term benefits in high risk schools (schools with more untreated caries)</li> </ul>	Children	<b>School</b>

<p><b>Macnab (8)</b></p>	<p>Rural Uganda</p> <p>Grade 1-4 children from four schools</p> <p>N=600</p> <p>&gt;2500 children exposed to program over 4 years</p> <p>Dental decay</p>	<ul style="list-style-type: none"> <li>Inclusion of health topics in curriculum</li> <li>Health education: eg. play acting, songs, demonstrations</li> <li>Teacher led toothbrushing program – correct techniques taught and reinforced</li> <li>TB and TP supplied</li> <li>Topical fluoride application every 6 months for original cohort</li> </ul>	<ul style="list-style-type: none"> <li>Student questionnaire: dental history, oral health practices &amp; behaviours</li> <li>Clinical exam (reported elsewhere)</li> <li>Teacher interviews</li> </ul> <p>Pre intervention</p> <p>+ 1 year FU</p> <p>+ 2 years FU</p> <p>+ 3 years FU</p> <p>+ 4 years FU</p> <ul style="list-style-type: none"> <li>Programme stakeholders workshop (x1) held after 4yrs of intervention</li> </ul>	<p>No comparison group</p>	<p><i>Behaviours (Baseline– 4yr FU)</i></p> <ul style="list-style-type: none"> <li>↑26% brushing at least 1x daily</li> <li>↓13.5% using agents other than toothpaste</li> <li>↑33% brush before bed</li> <li>No change in tooth-stick use</li> </ul> <p><i>Teacher Interviews</i></p> <ul style="list-style-type: none"> <li>↑ knowledge &amp; awareness of health,</li> <li>↓ absences from school due to pain &amp; emergency dental treatment,</li> <li>↑ oral health and toothbrushing knowledge and competence</li> <li>↑ confidence to address other locally relevant health issues</li> </ul> <p><i>Workshop Evaluation:</i></p> <ul style="list-style-type: none"> <li>Educational value for health professionals</li> <li>Flexible program</li> <li>Support provided by ongoing involvement of healthcare providers</li> </ul> <p>Teachers &amp; parents commented children's mouths no longer 'smelled bad'</p>	<ul style="list-style-type: none"> <li>Teachers included in development of materials</li> <li>Culturally appropriate activities developed</li> <li>Children shared what they were doing in class with siblings and families in larger community</li> <li>Problems with irregular supplies &amp; not all children included in program - would need ongoing provision of brushes &amp; paste</li> <li>Had flow on effect to other health issues</li> <li>Starting in one school in each area is a non threatening approach for the community</li> </ul>	<p>Children</p>	<p><b>School</b></p>
<p><b>Tolvanen (9)</b></p>	<p>Finland</p> <p>5th and 6th graders, N=1,691</p> <p>Toothbrushing frequency (TB freq) Oral health knowledge and attitude</p>	<p>Oral Health Promotion (OHP)</p> <ul style="list-style-type: none"> <li>Educate</li> <li>Change oral health behaviour</li> <li>Provide support.</li> </ul>	<p>Questionnaire</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 2 years FU</li> <li>+ 4 years FU</li> </ul>	<p>OHP only group and OHP + RCT group (children who were already participating in a randomized control trial)</p>	<ul style="list-style-type: none"> <li>↑Toothbrushing frequency, oral health related knowledge and attitudes in both groups</li> </ul>	<ul style="list-style-type: none"> <li>Changes in knowledge, attitudes, and behaviour were related, but children were ready for change at different times</li> <li>Oral health promotion should be continuous rather than short term</li> </ul>	<p>Children</p>	<p><b>School</b></p>

<p><b>Muirhead (10)</b></p>	<p>Ontario, Canada</p> <p>243 Elementary Schools</p> <p>Children aged 4-13</p> <p>Oral health outcomes.</p>	<p><i>Healthy Schools Program:</i> Existing voluntary health promotion program managed by Ontario School Boards</p> <p>Activities around</p> <ul style="list-style-type: none"> <li>• Healthy eating</li> <li>• Physical activity</li> <li>• Bullying prevention</li> <li>• Personal safety &amp; injury prevention</li> <li>• Substance use/abuse</li> <li>• Healthy growth &amp; development</li> <li>• Mental health</li> </ul>	<p>Data aggregated from 3 sources</p> <ul style="list-style-type: none"> <li>• Oral health data from school dental screenings (55% of participating children)</li> <li>• School health promotion data</li> <li>• Neighbourhood socioeconomic data</li> </ul>	<p>Schools not participating in <i>Healthy Schools</i></p> <p>Also compared schools by high SES and low SES</p>	<ul style="list-style-type: none"> <li>• ↓ % of children with ≥2 decayed teeth &amp; requiring urgent dental treatment</li> <li>• Schools with ≥3 health-related activities had ↓% of children with ≥2 decayed teeth requiring urgent dental treatment</li> <li>• ↓% of children in low-income <i>Healthy Schools</i> with dental treatment needs &amp; ≥ 2 decayed teeth compared to low SES non-participating schools</li> </ul>	<ul style="list-style-type: none"> <li>• Schools situated in poorer neighbourhoods may benefit more from health promotion activities than schools situated in more affluent neighbourhoods</li> </ul>	<p>Children &amp; Adolescents</p>	<p><b>School</b></p>
<p><b>Gowda (11)</b></p>	<p>New Zealand</p> <p>6-13 year olds, N=61</p> <p>High decay rates</p> <p>Poor access, non fluoridated area</p> <p>Low-SES &amp; Maori-high-risk rural community</p>	<p>3 year school-based toothbrushing programme</p> <ul style="list-style-type: none"> <li>• Supervised by teacher at lunch breaks</li> <li>• Colgate &amp; NZDA provide free fluoride toothpastes &amp; TB as part of the "Global Oral Health Care"</li> <li>• 30 minute oral health education sessions with DA/DT on <ul style="list-style-type: none"> <li>• launch day</li> <li>• +6 months</li> <li>• +18 months</li> <li>• +30 months</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Dental exam</li> <li>• Questionnaire of DT, DA, teachers experiences and perceptions at launch day pre intervention, + 6 mths FU</li> </ul> <p>+18mths FU</p> <p>+ 30mths FU</p>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• ↑ cleanliness of teeth &amp; gums</li> <li>• ↓ plaque index &amp; gingival index</li> <li>• Promoted toothbrushing (using adult strength fluoride toothpaste) became daily routine</li> </ul> <p><i>Teacher experiences and perceptions</i></p> <ul style="list-style-type: none"> <li>• Majority felt children enjoyed toothbrushing program, were motivated</li> <li>• Initially felt supported</li> <li>• Issues with TB storage, quality</li> </ul> <p><i>DA &amp; DT perceptions</i></p> <ul style="list-style-type: none"> <li>• Initially felt supported but this declined</li> <li>• Enjoyed program – some found lengthy, need to improve organization</li> </ul>	<ul style="list-style-type: none"> <li>• Success depended hugely on the DAs, DTs, teachers and school communities being involved at every stages of the program</li> <li>• Extend and expand program to other low SES communities primary schools, early childhood centres</li> <li>• ↑ OH Maori ↓ oral health inequalities</li> <li>• Low participants follow up</li> <li>• No DMFT collected</li> </ul>	<p>Indigenous children</p>	<p><b>School</b></p>
<p><b>AHW (12)</b></p>	<p>Northern Territory (NT), Australia</p> <p>Indigenous Children, N=6,002</p> <p>Dental health</p>	<p><i>Northern Territory Emergency Response (NTER)</i></p> <p><i>Child Health Check Initiative (CHCI) Closing the Gap Program</i></p> <ul style="list-style-type: none"> <li>• Dental check and follow up services provided</li> <li>• Preventative and restorative services</li> </ul>	<p>Dental professional questionnaire at time of dental service</p>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• 3,224 children received a dental referral</li> <li>• 1,946 of these children were seen by June 2010</li> <li>• Average waiting time of 14.3 months</li> <li>• 66% of those requiring follow-up care (2,368) were seen</li> </ul>	<ul style="list-style-type: none"> <li>• The high prevalence of oral health problems and a significant number of follow-up services required indicate that there is a considerable need for dental services among these children that is expected to continue into the future</li> <li>• High mobility of Indigenous children in these areas</li> </ul>	<p>Indigenous children</p>	<p><b>School</b></p> <p><b>Mobile dental clinics attending rural areas and schools</b></p>

		<ul style="list-style-type: none"> <li>Fluoride varnish and dental surgery</li> <li>Preventative interventions and health promotion <ul style="list-style-type: none"> <li>School based toothbrushing programs</li> <li>Fluoride varnish</li> <li>Child education</li> <li>Health care provider education</li> </ul> </li> </ul>				<p>presents a great challenge to provide follow-up services</p> <ul style="list-style-type: none"> <li>Prevalence of decayed, missing or filled teeth among these children is much higher than for comparable NT or Australian children from the National Child Dental Health Survey</li> </ul>		
<b>Chachra (13)</b>	India  5-16 year old children N=972  Dental caries	<p>Oral health education program</p> <ul style="list-style-type: none"> <li>Lectures</li> <li>Toothbrushing demonstrations</li> <li>Mouth rinse</li> <li>Education regarding the relationship of sugar to caries</li> </ul>	<p>Dental exam of caries</p> <p>Child questionnaire about oral health</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+6months FU</li> </ul>	<p>Four schools randomized into:</p> <ul style="list-style-type: none"> <li>No intervention</li> <li>Direct intervention by dentist</li> <li>Teacher trained by dentist IV</li> <li>Teacher trained by social organisation IV</li> </ul>	<ul style="list-style-type: none"> <li>↓ caries in all groups, most reduction in dentist intervention</li> <li>↑knowledge, attitude, practice and toothbrushing in all groups</li> </ul>	<ul style="list-style-type: none"> <li>Children directly trained by a dentist was the most effective method – but not sustainable</li> <li>Intervention conducted by teachers was better than control but did not match dentist intervention</li> </ul>	Children & adolescents	<b>School</b>
<b>Amalia (14)</b>	Indonesia  12 year old children N=1,906  Dental caries	<p>Existing <i>School Based Dental Program</i> (SBDP):</p> <ul style="list-style-type: none"> <li>Screening for oral disease</li> <li>Education including toothbrushing</li> <li>Training teachers</li> <li>Clinic treatment</li> </ul>	<p>Oral exam</p> <p>Questionnaire</p> <p>Cross sectional data</p>	<p>Good vs poor SBDP, categorized based on annual report of implementation targets</p>	<p>Good SBDP associated with</p> <ul style="list-style-type: none"> <li>↓DMFT, sugar consumption</li> <li>↑dental visit and tooth brushing</li> </ul>	<ul style="list-style-type: none"> <li>Place of residence was strongest association to caries experience no relationship SBDP performance</li> <li>Teachers trained to teach oral health matters</li> </ul>	Adolescents	<b>School</b>
<b>Anttonen (15)</b>	Finland  7 <sup>th</sup> grade children from 23 schools in 3 towns  N=769  Oral health behaviours	<ul style="list-style-type: none"> <li>DH trained students toothbrushing individually</li> <li>Followed up 2 months later</li> <li>Oral health promotion added as an extra component of dietary intervention</li> </ul>	<p>Questionnaire</p> <p>Clinical exam(teeth brushed prior to this)</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 1 year FU</li> </ul>	<p>RCT of schools into</p> <ul style="list-style-type: none"> <li>Dietary intervention</li> <li>Comparison.</li> <li>Two schools with dietary intervention also received OH intervention</li> </ul>	<ul style="list-style-type: none"> <li>↑ water consumption</li> <li>LF in molars at dietary intervention school</li> <li>↓ brushing frequency in OH intervention school</li> </ul>	<ul style="list-style-type: none"> <li>Required trained hygienist and individual training for each child</li> </ul>	Adolescents	<b>School</b>
<b>Pakpour (16)</b>	Iran  ~15 year old	<p>A form of motivational interviewing and action planning</p>	<p>Baseline questionnaire</p> <ul style="list-style-type: none"> <li>Attitude</li> <li>Intention</li> </ul>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>Intentions, perceived behavioural control, action planning and coping planning associated with ↑ brushing</li> </ul>	<ul style="list-style-type: none"> <li>Testing Theory of Planned Behaviour – attitude, intention and planning will lead to increased brushing over time</li> <li>Found that in particular</li> </ul>	Adolescents	<b>School (with elements implemented)</b>

	adolescents  N=800  Tooth brushing. Iran.		<ul style="list-style-type: none"> <li>Action &amp; planning</li> <li>Self report brushing behaviour</li> <li>+1 month FU</li> </ul> <ul style="list-style-type: none"> <li>Self report brushing behaviour only</li> </ul>			<p>intentions, perceived behavioural control, action and coping planning explained variance in tooth brushing</p> <ul style="list-style-type: none"> <li>Overall toothbrushing remained relatively stable.</li> </ul>		<b>at home)</b>
<b>Sinor (17)</b>	Malaysia  Children 5-6 years of age  N= 66  Oral health knowledge	Animated cartoon and a talk about oral health and instruction every morning for 5 days	Questionnaire <ul style="list-style-type: none"> <li>Baseline</li> <li>+1 wk FU</li> <li>+2 wks FU</li> </ul>	Comparison group received health education from trained dental nurse (current practice in Malaysia)	<ul style="list-style-type: none"> <li>↑KAP scores after oral health education was given but it was sustained in the intervention group</li> <li>Animation draws children's attention, more effective as delivery method than traditional method</li> </ul>	<ul style="list-style-type: none"> <li>Teachers can play a major role by playing the oral health message in a multimedia format everyday in their class, will increase sustainability of information given</li> <li>Standardized information can be given</li> </ul>	Preschool children	<b>School</b>
<b>Passalacqua (18)</b>	United Kingdom  Adults, mean age 47 years  N= 149  Oral health promotion	Exposure to oral Health Promotion programmes including: <i>National Healthy Schools</i> , <i>Sure Start</i> and <i>Brushing for Life</i>	<ul style="list-style-type: none"> <li>Structured overview of papers, websites and reports</li> <li>Cross sectional questionnaire of dental patients</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>34% of participants had been exposed to some OHP program</li> <li>Exposure to OHP program did not influence knowledge of oral health</li> <li>OHP programs did influence some oral health related attitudes and perceptions</li> </ul>	<ul style="list-style-type: none"> <li>Need to apply to WHO guidelines for oral health promotion more widely across the UK</li> </ul>	Children and adults	<b>School</b>
<b>Parker (19)</b>	Port Augusta, Australia  Indigenous children, 0-18 years of age  Oral health services	<i>Aboriginal Children's Dental Program</i> <ul style="list-style-type: none"> <li>Modified service model to address barriers to care</li> <li>Health promotion at primary schools – activities, demonstrations and information sheets</li> </ul>	<ul style="list-style-type: none"> <li>Informal interviews with service staff</li> <li>Active consent on School dental service database</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>Participation rate increased from 53% to 70% after 3.5 years</li> </ul>	<ul style="list-style-type: none"> <li>Incorporated into existing Aboriginal Community Controlled Health Service allowing a more culturally appropriate delivery</li> <li>Transport to clinic meant carers less likely to attend and reduced information that could be transferred to home environment</li> </ul>	Indigenous children	<b>School</b>
<b>Patil (20)</b>	Pimpri, India  Special needs children	<ul style="list-style-type: none"> <li>Cariogram model – computer program which assesses caries risk profile &amp; interaction of causing factors</li> </ul>	<i>Phase I:</i> <ul style="list-style-type: none"> <li>Cariogram model</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>57% ↑ children in low caries risk group.</li> <li>↓diet content, diet frequency, plaque amount and Mutans</li> </ul>	<ul style="list-style-type: none"> <li>Mainly dental intervention that reduced risk of caries</li> <li>Children could not care for their own oral health, so need</li> </ul>	Special needs children and	<b>School (Special)</b>

	and adolescents  7-17 years of age, N=54	<ul style="list-style-type: none"> <li>Recommendations for targeted preventive measures</li> <li>Fluoride gel</li> <li>Supervised toothbrushing</li> <li>Parent oral health education</li> <li>Pit and fissure sealant (if required)</li> <li>Restorations, extractions and root canal (if required)</li> </ul>	<p>(caries risk profile)</p> <ul style="list-style-type: none"> <li>Clinical exam</li> <li>Dietary diary as reported by parents, baseline</li> <li>Divided into 5 risk groups (chance of avoiding caries)</li> </ul> <p>Phase II</p> <ul style="list-style-type: none"> <li>Risk based preventive program/treatment</li> </ul> <p>Phase III</p> <ul style="list-style-type: none"> <li>+10 months – review caries profile</li> </ul>		<p>streptococci count</p> <ul style="list-style-type: none"> <li>↑“chance to avoid caries” from a mean of 44% to 87%</li> </ul>	<p>to educate parents to be sustainable</p> <ul style="list-style-type: none"> <li>Cariogram model -caries related factors easily monitored, tested and evaluated by dental personnel, but only expresses overall caries risk</li> <li>Skewed distribution with one third of the children having high caries status.</li> </ul>	adolescents	<b>needs)</b>
<b>Simmer-Beck (21)</b>	<p>Kansas, USA</p> <p>0-14 year old children and adolescents, N=339</p> <p>Low SES</p> <p>~50% children Hispanic</p>	<p><i>Miles of Smiles</i></p> <p>Preventive oral care directly into elementary school during normal school hours</p> <ul style="list-style-type: none"> <li>Radiographs</li> <li>Prophylaxis</li> <li>Sealants</li> <li>Fluoride varnish</li> <li>Education</li> <li>Nutritional counselling</li> </ul>	<p>Dental exam (decay, sealants, oral hygiene, gingival health and urgency of care)</p> <ul style="list-style-type: none"> <li>Start of school year</li> <li>End of school year</li> </ul> <p>Parent Questionnaire,</p> <ul style="list-style-type: none"> <li>Oral health needs</li> <li>Ability to access oral health care</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>Care provided to 339 of the 389 children in year one</li> <li>63% children had decay and were referred to a dentist</li> <li>At end of year one, 11% begun transition process seeking restorative care at safety net clinic/ local dentist</li> <li>37% had not been to a dentist in the last year</li> <li>24% of these reported times they needed dental care but couldn't get it due to lack of money and Medicaid dentists</li> </ul>	<ul style="list-style-type: none"> <li>School based programs are one approach to reaching vulnerable children</li> <li>Transitioning children outside of their school to a safety net clinic or local dentist to receive restorative care was problematic</li> <li>Expanded scopes of practice that allow for simple restorative procedures could address this problem</li> <li>Beneficial for university, students and community</li> <li>Barriers - cost, transport, language, lack of providers and inability for parents to take off work.</li> </ul>	Children & Adolescents	<b>School</b>
<b>Isensee (22)</b>	<p>Western Europe (Finland, Holland &amp; Germany)</p> <p>11-14 year old children and adolescents</p> <p>N=16,302</p>	<p><i>Smoke Free Class Competition(SFC):</i> Smoking prevention program running in Europe since 1997</p> <p>Core elements:</p> <ul style="list-style-type: none"> <li>Commitment</li> <li>Contract management</li> <li>Prize rewards</li> </ul>	<ul style="list-style-type: none"> <li>Reviewed &amp; meta-analysed RCTs and CTs with FU assessment</li> <li>Five studies (of 24 identified) were analysed</li> </ul>	All included studies had a comparison group	<ul style="list-style-type: none"> <li>In a class of 23 or 24 students, participating in SFC leads to prevention of smoking in about 1 student over 24 months</li> <li>↓ current smoking at latest follow up</li> </ul>	<ul style="list-style-type: none"> <li>Program has been shown to be cost-effective and doesn't provoke negative side effects</li> <li>Possible reporting bias</li> </ul>	Children & adolescents	<b>School</b>

<b>Shenoy (23)</b>	Mangalore, India  12-13 year old adolescents from 6 schools  N=415  Mixed SES  Oral health knowledge and practices	Dental health education [DHE]  <ul style="list-style-type: none"> <li>20 min session (audio-visual aids) on oral health and toothbrushing technique</li> <li>Run every 3 weeks or every 6 weeks</li> </ul>	Clinical exam (plaque & gingival status)  Questionnaire (OH knowledge & practices)  <ul style="list-style-type: none"> <li>Baseline</li> <li>+18 weeks FU</li> <li>+36 weeks FU</li> </ul>	<ul style="list-style-type: none"> <li>6 schools randomized crossover design</li> <li>At each time point 2 schools received intervention and 4 were comparison</li> </ul>	<ul style="list-style-type: none"> <li>Decreased plaque and gingival score</li> <li>Increased knowledge</li> <li>Increased frequency and duration of toothbrushing, mouth rinse after each meal in schools that received intervention</li> </ul>	<ul style="list-style-type: none"> <li>SES influenced how often toothbrush changed and what hygiene aids were used</li> <li>Involvement of school personnel might ensure sustainability</li> <li>Overall schools with more frequent exposures to DHE [1A and 2A] scored better than schools with fewer exposures [1B and 2B]. Maintained at 36 weeks (intervention ceased at 18wks)</li> </ul>	Adolescents	<b>School</b>
<b>Tubert-Jeannin (24)</b>	France  5 year old children from 21 schools  N=478  Dental Caries	Oral Health Promotion Program  <ul style="list-style-type: none"> <li>Educational activities to improve TB habits of children</li> <li>Oral health guidelines for parents, teachers and school nurses</li> </ul>	<ul style="list-style-type: none"> <li>Parent Questionnaire</li> <li>Clinical exam</li> <li>+ 6yrs with different sample of 5yr olds and parents</li> </ul>	No OHP program	<ul style="list-style-type: none"> <li>Caries experience varied with deprivation status, oral hygiene and SES</li> <li>In deprived areas, mean dmft ↑ in schools without the OHP program</li> </ul>	<ul style="list-style-type: none"> <li>High caries experience, large inequalities between children</li> <li>The OHP program has done little to ↓ disparities in oral health despite improved dental status in four schools</li> <li>Schools' deprivation and individual household indicators were more important to oral health outcomes</li> </ul>	Children and adolescents	<b>School</b>
<b>Tolvanen (25)</b>	Finland  Grade 5-6 children  N=1,691  Oral health behaviours	Oral Health Promotion  <ul style="list-style-type: none"> <li>Education</li> <li>Change oral health behaviour</li> <li>Provide support</li> </ul>	Questionnaire  <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 2 years FU</li> <li>+ 4 years FU</li> </ul>	OHP only group and OHP + RCT group (children who were already participating in a randomized control trial)	<ul style="list-style-type: none"> <li>Good behaviour at baseline associated with ability to maintain &amp; recover from lapses</li> <li>Poor behaviour at baseline associated with no change</li> </ul>	<ul style="list-style-type: none"> <li>Behaviours are adopted at young age, which makes their improvement difficult</li> <li>Children are ready for change at different times so oral health promotion should be continuous</li> </ul>	Children	<b>School</b>
<b>Nammontri (26)</b>	Khonkaen, Thailand  10-12 year old children from 12 schools  N=257  Oral health related quality of life (OHRQoL)	Six teachers trained (1 day course) to deliver intervention  Intervention – 6 schools (N=133)  <ul style="list-style-type: none"> <li>Seven sessions</li> <li>40-60 min each over 2 months</li> <li>4 sessions were classroom activities <ul style="list-style-type: none"> <li>Didactic teaching</li> <li>Discussion</li> <li>Activities &amp; games</li> </ul> </li> <li>3 sessions involved activities to increase self esteem, self efficacy &amp; confidence</li> </ul>	Clinical exam  Self report questionnaire  <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 2wks FU</li> <li>+ 3month follow up</li> </ul>	Cluster RCT, clustered by school  Comparison group received no intervention  6 schools (N=128)	<ul style="list-style-type: none"> <li>No difference between groups on clinical exam</li> <li>↑ OHRQoL</li> <li>Sense of coherence predicted improved OHRQoL</li> </ul>	<ul style="list-style-type: none"> <li>Intervention requires teachers to be trained</li> <li>Encouraged participation of children in all activities and events</li> <li>SES status did not predict OHRQoL</li> </ul>	Children	<b>School</b>

<b>Stefanovska(27)</b>	Skopje, Macedonia  9-16 year old special needs children and adolescents  N=100  Oral hygiene	Over 6 months:  <ul style="list-style-type: none"> <li>Teacher supervised tooth-brushing (2x per day)</li> <li>Individual instruction</li> <li>Assistance and demonstration of brushing technique</li> <li>Visit by dental team (2x per week) encourage and support staff and demonstrate technique.</li> </ul>	Clinical exam  <ul style="list-style-type: none"> <li>Baseline</li> <li>+6 months FU</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>↓ plaque and gingivitis scores</li> <li>↓ mean date-base OHI index Ivl from 2.46 to 0.73 after 6 months</li> <li>↓CPITN mean level from 2.11 to 0.95</li> <li>High correlation of index levels pre and post</li> </ul>	<ul style="list-style-type: none"> <li>Children with special needs can be instructed in simple oral hygiene procedures and can carry out tooth brushing themselves with encouragement and motivation</li> <li>Long term success depends upon maintaining motivation to make oral hygiene part of their daily routine</li> <li>Require time for the individual and commitment of caregiver</li> <li>Tooth brushing is cost-effective ↓ visit of dental team and need for treatment.</li> </ul>	Special needs children and adolescents	<b>School</b>
<b>D'Cruz (28)</b>	Bangalore, India  13-15 year old adolescents from 3 schools  N=568  Oral health education	<i>Intervention Group I</i> (N=141)  <ul style="list-style-type: none"> <li>Oral health education – powerpoint presentation</li> </ul> <i>Intervention Group II</i> (N=143)  <ul style="list-style-type: none"> <li>Oral health education – powerpoint presentation</li> <li>Toothbrushing demonstration</li> <li>Practice toothbrushing on models</li> </ul> Reinforcement for both groups at +3 and +6 months	Double Blinded  Questionnaire -oral hygiene knowledge & practices  <ul style="list-style-type: none"> <li>Baseline</li> <li>+3mths FU</li> <li>+6mths FU</li> <li>+9mths FU</li> </ul> Clinical exam - plaque & gingival index  <ul style="list-style-type: none"> <li>Baseline</li> <li>+9mths FU</li> </ul>	Comparison group had no intervention  N=284	<ul style="list-style-type: none"> <li>↑ oral hygiene knowledge and practices in both intervention groups</li> <li>Significant ↓ in mean plaque index and gingival index in intervention groups</li> <li>No significant difference between intervention groups after 3 months FU, significant difference seen after 6 &amp; 9 months</li> </ul>	<ul style="list-style-type: none"> <li>Lecture can improve knowledge and practice</li> <li>Reinforcing a lecture with individual toothbrushing demonstration can yield better results</li> <li>Reinforcement of information is key to success</li> <li>Easy to organise and inexpensive</li> <li>Useful in a country with developing oral health care system</li> <li>No environmental or lifestyle changes were advocated</li> </ul>	Adolescents	<b>School</b>
<b>Sharma (29)</b>	Karnataka, India  Preschool children and their mothers, N=150  Oral health knowledge and practices	<i>Intervention Group I</i> (N=72)  <ul style="list-style-type: none"> <li>Text messages containing oral health information</li> <li>3 per day for 7 days</li> <li>Repeated every week for 4 weeks</li> </ul>	Clinical Exam – Plaque index  Parent Questionnaire  <ul style="list-style-type: none"> <li>Baseline</li> <li>Post-intervention</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>↓ visible plaque in both groups, no difference between groups</li> <li>↑ knowledge, attitude and behaviour in both groups, significantly higher in text message group</li> </ul>	<ul style="list-style-type: none"> <li>Excluded women who did not have mobile phone or English knowledge</li> <li>Text messaging effective way to send information about oral health</li> <li>All participants came from similar Socio-Economic Status (SES) backgrounds: challenges the sustainability</li> </ul>	Families	<b>Home</b>

		<p><i>Intervention Group II (N=71)</i></p> <ul style="list-style-type: none"> <li>• Pamphlets containing oral health information</li> <li>• Sent home with child from preschool</li> </ul>				of this method		
<b>Cardenas (30)</b>	<p>USA</p> <p>Pregnant women (12-40wks), aged 21-40 yrs</p> <p>N=40</p> <p>Oral health knowledge</p>	<p>Ten minute powerpoint presentation</p> <ul style="list-style-type: none"> <li>• Maternal health during pregnancy</li> <li>• Infant oral health</li> <li>• Child oral health</li> </ul>	<p>Questionnaire</p> <ul style="list-style-type: none"> <li>• Prior to presentation</li> <li>• Immediately after</li> <li>• +4 weeks FU</li> </ul>	No comparison group	<ul style="list-style-type: none"> <li>• ↑ knowledge both immediately and 4 weeks after presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Could tie in with frequency (monthly) of antenatal visits</li> </ul>	Pregnant women	<b>Prenatal Clinic</b>
<b>Freudenthal (31)</b>	<p>East Idaho, USA</p> <p>Mothers with preschool children (6-24mths age)</p> <p>N=68</p> <p>Low SES, Non fluoridated area</p> <p>Oral health knowledge and behaviours</p>	<p>Motivational interviewing (N=39)</p> <ul style="list-style-type: none"> <li>• Delivered by trained researcher</li> <li>• Help to facilitate change in caries related behaviours</li> <li>• 20-30 minutes</li> <li>• Follow up phone calls at 1 and 2 weeks post intervention</li> </ul>	<p>Modified RAPIDD tool</p> <ul style="list-style-type: none"> <li>• Mother's beliefs about caring for child's teeth</li> </ul> <p>Questionnaire</p> <ul style="list-style-type: none"> <li>• Oral health behaviours</li> </ul> <p>Both administered prior to intervention and 4 weeks post intervention</p>	<p>Comparison group</p> <ul style="list-style-type: none"> <li>• N=29</li> <li>• No formal education</li> <li>• Pamphlets available as part of the normal health service</li> </ul>	<ul style="list-style-type: none"> <li>• ↓ in valuing dental health (but not clinically significant)</li> <li>• ↓ % sharing utensils in intervention group</li> <li>• ↑ toothbrushing frequency in intervention group</li> <li>• No change in any other behaviours</li> </ul>	<ul style="list-style-type: none"> <li>• Short follow up time to see change in attitudes</li> <li>• Need further investigation to determine feasibility in diverse populations and use of counsellors in public health setting</li> </ul>	Families	<b>Maternal and Child Health Care &amp; Home</b>
<b>Cibulka (32)</b>	<p>Missouri, USA</p> <p>Pregnant women (&lt;24 weeks), 18-39 yrs of age</p> <p>N= 146</p> <p>Low SES</p> <p>Oral health knowledge</p>	<p>Oral Health Promotion (at ~24 weeks pregnant)</p> <ul style="list-style-type: none"> <li>• Five minute educational DVD</li> <li>• Nurse or researcher discussed information</li> <li>• TB, TP and floss distributed</li> <li>• Dental check-up scheduled and reminder sent</li> </ul>	<p>Questionnaire</p> <ul style="list-style-type: none"> <li>• 24wks pregnant</li> <li>• 36 wks pregnant</li> </ul>	<p>RCT</p> <p>Comparison group received no intervention</p>	<ul style="list-style-type: none"> <li>• ↑ perception of good oral health</li> <li>• ↑ brushing and flossing</li> <li>• ↓ in sugar consumption</li> <li>• ↑ dental utilisation</li> </ul>	<ul style="list-style-type: none"> <li>• Scheduling appointments for women effective</li> <li>• Barrier -very few dentists accepted Medicaid for pregnant women, some women turned away from appointments</li> <li>• Sample was primarily African-American low income pregnant women – may not be generalisable</li> </ul>	Pregnant women	<b>Prenatal Clinic</b>

	and behaviours							
<b>Clifford (33)</b>	Queensland, Australia  Pregnant women (~30 weeks), 28 ±5yrs of age  N=611  Oral health knowledge and behaviours, dental utilisation	Oral Health Promotion  • Nine minute <i>Teeth for Life</i> DVD • Bag with TB TP, pamphlets and details of local services <i>Intervention group I</i> - DVD only  <i>Intervention Group II</i> – Bag only  <i>Intervention Group III</i> – Bag & DVD	Questionnaire  • 30wks pregnant • 4 months post birth	Comparison group received no intervention	<ul style="list-style-type: none"> <li>• All interventions ↑ knowledge of baby's oral health and appropriate drinks for bottles</li> <li>• No change in toothbrushing or dental utilisation</li> <li>• DVD only group - aware teeth cleaning should start once any teeth erupted.</li> </ul>	<ul style="list-style-type: none"> <li>• DVD had strongest impact on knowledge</li> <li>• Young and single mothers, unemployed and health care card were less likely less likely to apply knowledge from interventions</li> <li>• DVD useful provision through antenatal clinic</li> </ul>	Pregnant women	<b>Public hospital</b>  <b>Antenatal clinic</b>
<b>Neumann (34)</b>	Rural Victoria, Australia  Children 7-8mths of age at baseline, approx 4 yrs of age at follow up  N=915  Oral health knowledge, behaviours	Maternal and Child Health Nurse (MCHN) oral health promotion training  Oral Health Starter Kit distribution  • TP & TB • Oral health information • Distributed at 8 month ages & stages visit  Random allocation of 2 out of 3 Local Government Areas (LGA) to receive intervention (in year 2).	Clinical examination  • Carious lesions • Pre-cavitated • Cavitated • Annual exams (total 3 per child)	First year of recruited children from all LGAs (prior to intervention implementation)  Random allocation of 1 LGA to not receive any intervention in year two	<ul style="list-style-type: none"> <li>• Lower proportion of intervention children had evidence of disease at exam one and two than comparison group, but no difference by third exam (age 4yrs)</li> <li>• Some evidence that trend held when adjusted for slight differences in age between the two groups, but no longer significant</li> </ul>	<ul style="list-style-type: none"> <li>• Feasible, but MCH visits drop off markedly after 12 months of age, which limits oral health promotion received</li> </ul>	Families with young children  Health Professionals	<b>Maternal and Child Health Care</b>
<b>Plutzer (35)</b>	Adelaide, Australia  Pregnant women expecting first child Baseline: N=649  Follow up: N=441  Early childhood caries.	Baseline (pregnancy)  • Printed OHP material Child age 6 & 12 months  • Printed OHP material • Mouth rinse, toothbrush/finger toothbrush  Half of the intervention group received phone counselling when child was between 6-12 months old	Clinical exam of child  • Post intervention • Child age 20±2.5 months	RCT  Comparison group received no intervention  This paper compared one parent (N=87) and two parent (N=339) families	<ul style="list-style-type: none"> <li>• ↓ frequency of severe early childhood caries in intervention families Within intervention in relation to severe early childhood caries</li> <li>• Larger relative risk reduction in two parent intervention families compared to one parent families</li> <li>• Larger absolute risk reduction in one parent families compared to two parent families</li> </ul>	<ul style="list-style-type: none"> <li>• Greatest reduction of ECC in one parent families – but still at four times higher the risk</li> <li>• Relatively brief, sustainable intervention.</li> </ul>	Pregnant women  Families	<b>Home based/hospital</b>

<b>Rothe (36)</b>	USA  Parents with 3-12mth old children  N=47  Oral health knowledge	<ul style="list-style-type: none"> <li>• 30 min powerpoint and video presentation about infant oral hygiene followed by question and answer session (total 1 hour)</li> <li>• Held in medical centre</li> <li>• Oral health pamphlet, TB &amp; TP after presentation</li> </ul>	Parent Questionnaire (True/False), Pre and post presentation	No comparison group	<ul style="list-style-type: none"> <li>• Significant ↑ in mean test score pre and post presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Unclear if knowledge is maintained over time or impacts child oral health</li> </ul>	Families with young children	<b>Maternal and Child Health Care</b>
<b>Strippel (37)</b>	Kassel, central Germany  Families with children < 2yrs of age  Intervention: (N=2,040)  Comparison: (2,170)  Paediatricians  Intervention: (N=36)  Oral health knowledge and behaviours	<p><i>Structured comprehensive paediatric oral health education supported by written information (SC-OHE)</i></p> <ul style="list-style-type: none"> <li>• 2 day training session for all paediatricians in intervention area</li> </ul> <p>Child Health Exam</p> <ul style="list-style-type: none"> <li>• Paediatricians spent 15 minutes conveying oral health prevention information (in addition to general health information)</li> <li>• Parents given information leaflets</li> <li>• Recommend use of fluoride salt or dispense fluoride supplements</li> <li>• Two age groups</li> <li>• 7mths of age – also received oral SC-OHE at ~ 6wks of age</li> <li>• 24mths age group – received SC-OHE once</li> </ul> <p>All children attending visit over 6 month period.</p>	<p>Prospective intervention</p> <p>Self-administered parent questionnaires post exam</p> <ul style="list-style-type: none"> <li>• Activities of physician</li> <li>• Topics discussed with physician</li> <li>• Information gained from dentist</li> <li>• Parent knowledge, self efficacy</li> </ul>	<p>Comparison group (N=2,170)</p> <p>Northern Germany</p> <p>Matched to intervention area</p> <p>Received normal health check</p>	<ul style="list-style-type: none"> <li>• Intervention parents (all ages) reported receiving information on more oral health topics</li> <li>• Self efficacy and attitudes unchanged</li> <li>• Lower % of 7 month intervention children received baby bottles with cariogenic content during daytime</li> <li>• No difference in night time bottle use or frequency of toothbrushing</li> <li>• Less 7 month intervention parents added sugar to baby foods</li> <li>• Slightly lower % of 24 month intervention children received cariogenic beverages during the day</li> </ul>	<ul style="list-style-type: none"> <li>• Primary care providers can be trained to perform SC-OHE that improves parental oral health knowledge</li> <li>• SC-OHE provided by clinicians alone will not be able to influence behaviours in such a way that prevents ECC</li> <li>• Wider oral health promotion or clinical fluoride application need implementation</li> </ul>	<p>Young children &amp; families</p> <p>Health Professionals</p>	<b>Medical Clinics</b>
<b>Vichayanrat (38)</b>	Chone Buri Province, Thailand  Caregivers of children	<p>Training of lay health workers (LHW)</p> <ul style="list-style-type: none"> <li>• Multimedia</li> <li>• Illustrate caries</li> </ul>	Quasi-experimental, pre and post intervention	Four sub-districts (matched to intervention) in Province	<ul style="list-style-type: none"> <li>• ↑ toothbrushing using toothpaste, fluoride supplements</li> <li>• No significant effect on child bottle feeding and snack</li> </ul>	<ul style="list-style-type: none"> <li>• Multilevel factors influenced reported oral health behaviour but not caries outcomes</li> <li>• Program was not fully implemented</li> </ul>	Families – parents with young children	<b>Community</b>

	<p>aged 6-36 month</p> <p>N=114</p> <p>Oral health knowledge and behaviours</p> <p>Lay health workers</p>	<ul style="list-style-type: none"> <li>• Fluoride drop application</li> <li>• Oral screening</li> <li>• Brushing, bottle feeding, sugary snacks</li> <li>• Fluoride supplement use</li> </ul> <p>Four sub-districts in province, 1 year pilot multi-level intervention with three main components:</p> <p><i>Oral health education and services at health centres</i></p> <ul style="list-style-type: none"> <li>• Every 3 months</li> <li>• Dental screening</li> <li>• Oral health education</li> <li>• Fluoride supplements</li> <li>• TB &amp; TP distribution</li> </ul> <p><i>Home visits by LHW</i></p> <ul style="list-style-type: none"> <li>• Every 3 months</li> <li>• Social support – emotional, informational and appraisal Oral health education</li> </ul> <p><i>Community Mobilisation</i></p> <ul style="list-style-type: none"> <li>• Education and group discussion with community member</li> </ul>	<p>Formative interview &amp; discussion with stakeholders – guide planning</p> <p>Process Evaluation</p> <ul style="list-style-type: none"> <li>• Group discussions</li> <li>• Attendance at health centre</li> <li>• Program component delivery</li> </ul> <p>Pre and post intervention</p> <ul style="list-style-type: none"> <li>• Clinical exam of children</li> <li>• Self administered questionnaire</li> </ul>	<p>Routine health services + toothbrushes pre and post</p>	<p>consumption</p> <ul style="list-style-type: none"> <li>• No effect on dental caries, ↑ dental caries in both group</li> <li>• Improved caregiver knowledge, attitudes, outcomes, expectations and self efficacy in intervention group</li> <li>• Greater perceived social support in intervention</li> <li>• Integration of oral services and community participation in child oral health</li> </ul>	<ul style="list-style-type: none"> <li>• Further process evaluation is needed to determine actual implementation level, barriers and suggestions for modification of the program in the future to improve caries outcomes</li> </ul>		
<b>Macintosh (39)</b>	<p>Manitoba, Canada</p> <p>Non-dental professionals who work with young children</p> <p>N=108</p> <p>Oral health knowledge</p>	<p><i>Healthy Smile Happy Child</i></p> <p>Capacity building workshop for non-dental professionals who work with young children</p>	<p>Convenience sample</p> <p>Questionnaire</p> <ul style="list-style-type: none"> <li>• Prior to workshop</li> <li>• ~1 month post workshop FU</li> <li>• Assess changes in knowledge</li> </ul>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• ↑ knowledge levels</li> <li>• Significant increase in knowledge around first dental visit, maternal caries and supervised toothbrushing</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity-based workshops increased oral health knowledge and self reported behaviours</li> <li>• High proportion reported changing information they gave parents</li> <li>• Raised awareness amongst service providers of first dental visit is essential</li> <li>• Need to equip non-dental professionals with knowledge and training to provide advice to parents</li> </ul>	<p>Professionals</p>	<p><b>Community/ Workplace</b></p>
<b>Chinn (40)</b>	<p>USA</p> <p>Staff from Head Start and Early Head Start program</p>	<p><i>Columbia Head Start Oral Health Program (C-HSOHP)</i></p> <p>Collaboratively designed oral health program, staff selected from menu of options</p> <ul style="list-style-type: none"> <li>• Two hour staff workshop</li> </ul>	<p>Questionnaire</p> <ul style="list-style-type: none"> <li>• Knowledge</li> <li>• Competencies</li> <li>• Baseline</li> <li>• +1month FU</li> </ul>	<p>No comparison group</p>	<p>Increased confidence to</p> <ul style="list-style-type: none"> <li>• Explain to explain oral health issues to parents</li> <li>• Refer for paediatric services</li> <li>• Talk to dentist about concerns</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>	<p>Non dental workforce</p>	<p><b>Workforce</b></p>

	N=61  Oral health knowledge and confidence	<ul style="list-style-type: none"> <li>• 45 minute parental education /question and answer session</li> <li>• Half day onsite dental screening</li> <li>• Assisted referrals to local clinics</li> </ul> <p>Four sites involved, all chose differing options based the needs in their community.</p>						
<b>Slade (41)</b>	Northern Territory, Australia  Children 18-47 months of age from 30 remote indigenous communities  Baseline: N=666  Follow Up: N= 543  Oral health knowledge and behaviours  Environment	N=281  Five visits by study team (2-4 people) to each of the 15 intervention communities over a 2 year period  <ul style="list-style-type: none"> <li>• Visits at ~6 monthly intervals</li> <li>• Lasted between 2-5 days</li> <li>• Three interventions provided at each visit <ul style="list-style-type: none"> <li>• Duraphat fluoride varnish applied to children's teeth</li> <li>• Advice to parents and family groups about caries prevention – during fluoride application and at playgroups and preschools</li> <li>• Community health promotion and engagement</li> </ul> </li> <li>• Encouraged sale of children's TB and TP</li> <li>• Primary health care workers trained in preventive dental care</li> <li>• Aboriginal health workers were used to engage community</li> </ul>	Clinical exam at baseline and follow up	Cluster randomised  15 comparison communities received no intervention  N=262	<ul style="list-style-type: none"> <li>• Adjusted d<sub>3</sub>mfs increment significantly lower in intervention children</li> </ul>	<ul style="list-style-type: none"> <li>• Toothpaste used probably didn't have the sufficient level of fluoride for without fluoridated water</li> <li>• Adult toothpaste may be appropriate for high risk children</li> <li>• Local health staff in remote Aboriginal communities should receive training and support to deliver comprehensive prevention program</li> <li>• More resource allocation to identify healthy initiatives already promoted by Aboriginal families</li> </ul>	Indigenous preschool children	<b>Community</b>
<b>Roberts-Thomson (42)</b>	Northern Territory, Australia  Children 18-47 months of age from 30 remote indigenous communities  Baseline: N=666  Follow Up: N= 543	<i>Community Oriented Primary Health Care (CPHC)</i> Five visits by study team (2-4 people) to each of the 15 intervention communities over a 2 year period  <ul style="list-style-type: none"> <li>• Visits at ~6 monthly intervals</li> <li>• Lasted between 2-5 days</li> <li>• Three interventions provided at each visit <ul style="list-style-type: none"> <li>• Duraphat fluoride varnish applied to children's teeth</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Interviews – risk factors &amp; behaviours</li> <li>• Community policy</li> <li>• Programs</li> <li>• Store practices</li> <li>• Clinical exam</li> </ul>	Cluster randomised  15 comparison communities received no intervention	<ul style="list-style-type: none"> <li>• No significant differences seen in self reported or clinical measure of oral hygiene</li> <li>• Proportion brushing teeth twice/day increased in both intervention and comparison group</li> </ul>	<ul style="list-style-type: none"> <li>• Good participation rates were largely due to having indigenous staff members, one who was well known to the community.</li> <li>• Photographs of the children &amp; displayed on return visits encouraged follow up</li> <li>• Face painting children prior to applying the fluoride varnish built relationships and made the visits fun</li> <li>• Difficulty engaging primary health care staff in</li> </ul>	Indigenous preschool children	<b>Community</b>

	<p>Oral health knowledge and behaviours</p> <p>Environment</p>	<ul style="list-style-type: none"> <li>• Advice to parents and family groups about caries prevention – during fluoride application and at playgroups and preschools</li> <li>• Community health promotion and engagement</li> <li>• Encouraged sale of children's TB and TP</li> <li>• Primary health care workers trained in preventive dental care</li> <li>• Aboriginal health workers were used to engage community</li> </ul>				<p>intervention deliver</p> <ul style="list-style-type: none"> <li>• Integration of oral health into general health is needed to make process sustainable</li> </ul>		
<b>Roucka (43)</b>	<p>Western Tanzania</p> <p>Refugees in two long term refugee camp</p> <p>2-87yrs of age (mean 29.2yrs)</p> <p>Oral health behaviours</p>	<p>Four volunteer dentists</p> <ul style="list-style-type: none"> <li>• Establishment of a small dental clinic</li> <li>• Two week training course in emergency dental care and health promotion to 12 refugee health care workers, aiming to give health workers the capacity to: <ul style="list-style-type: none"> <li>• Teach community based dental health promotion</li> <li>• Provide safe emergency dental care</li> <li>• Know when to refer patients to hospital</li> </ul> </li> <li>• Two week refresher course 1 year later</li> </ul>	<p>Analysis of clinic log books 22 months after implementation</p> <p>Investigation into health promotion sessions conducted</p>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• 1,61 patient visits across the two camps</li> <li>• 99% of people visited clinic due to pain</li> <li>• Highest caries rate in adults, followed by children &lt;12yrs and adolescents 12-15yrs</li> <li>• 95% of patients received an extraction</li> <li>• 50% of referrals made were treated</li> <li>• Health promotion sessions were occurring twice per week</li> <li>• Teamed up with health educators in camp and went out into the community to talk about oral health</li> <li>• Went into schools to discuss oral health and perform toothbrushing demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Programme became self-sustaining and provided access to care where none existed previously</li> <li>• Possible solution dental care access in long term refugee camps</li> <li>• Geographical movement, diet, cultural background and SES all need to be considered when determining needs of population</li> <li>• High proportion of patients were Burundian (58%), possible bias</li> <li>• High cost of getting treatment in hospital from a referral</li> </ul>	Refugees	<b>Refugee camp</b>
<b>Milgrom (44)</b>	<p>Rural Oregon, USA</p> <p>Mothers with young children</p> <p>Intervention: N=113, mean age 24 months</p> <p>Comparison: N=56, mean age 28 months</p> <p>Low income</p> <p>Non fluoridated area</p>	<p>Dental Managed care program</p> <ul style="list-style-type: none"> <li>• Pregnant women received home visits or attended counselling sessions &amp; were assigned a 'dental home'</li> <li>• Women received care during pregnancy or within 2 months of delivery through program</li> </ul>	<p>Visual exam of child</p> <ul style="list-style-type: none"> <li>• Only frank cavitations recorded as tooth decay</li> </ul> <p>Demographic data &amp; dental care during pregnancy</p>	<p>56 children from 2 counties similar to intervention county</p> <p>Mother's did not receive intervention during pregnancy</p>	<ul style="list-style-type: none"> <li>• Significantly higher proportion of children in the intervention group were caries free than comparison group</li> <li>• Significantly lower mean decayed teeth in intervention group than in comparison group</li> </ul>	<ul style="list-style-type: none"> <li>• Suggests that intervention during pregnancy could transfer to health outcomes for child</li> <li>• Workforce shortages in rural areas still a problem</li> <li>• Need to address reluctance of dentists to see very young children</li> </ul>	Pregnant women/preschool children	<b>Community</b>

	Oral health behaviours							
<b>De Visschere(45)</b>	Belgium  Older adults (N=1,393), mean age 84.7 years  75% female	Oral hygiene protocol aiming to integrate oral hygiene into the daily care of residents  <ul style="list-style-type: none"> <li>1 hour intro with director of institution</li> <li>½ day theory &amp; prac session for appointed oral health coordinator (OHC), who then had to train nurses &amp; aids (train the trainer)</li> <li>Oral assessment of all new arrivals by OHC</li> <li>Individualized oral hygiene plan</li> <li>Integration of individual plans into daily routines</li> </ul>	Denture plaque and dental plaque  <ul style="list-style-type: none"> <li>Trained &amp; calibrated dental examiners</li> <li>Baseline</li> <li>+2yr FU</li> <li>+5yr FU</li> </ul>	Comparison group received normal care  Randomised at nursing home level (I&C) and within intervention nursing home (I & C)  C resident in C home n = 671  I resident in I home n = 211  C resident in I home n = 511  Stratified based on level of dependency	<ul style="list-style-type: none"> <li>Lowest denture plaque observed in all groups at 2 years FU</li> <li>Dental plaque levels lower in all groups at end of study</li> <li>Adjusted model showed capacity of nursing home, presence of TP were the only factors significantly correlated with denture plaque</li> <li>Residents dependency level and presence of mouth rinse significantly correlated with dental plaque</li> <li>Could not demonstrate intervention effect</li> </ul>	<ul style="list-style-type: none"> <li>Require qualitative data to explore why carers find it hard to take care of residents oral health</li> <li>There are unknown characteristics of nursing home which may influence oral care</li> <li>May be difficult to sustain over long periods of time</li> </ul>	Older People	<b>Nursing Home/Age/Residential Care</b>
<b>Tan (46)</b>	Hong Kong Older adults, (mean age 78.8±6.2 at baseline) from 21 nursing homes  Baseline (N = 306)  Follow Up (N= 203)  Root caries  At least 5 teeth with exposed roots  Oral health behaviours	Individualised oral hygiene instruction  and application of  <i>Intervention I</i>  <ul style="list-style-type: none"> <li>1% chlorhexidine varnish (CV) every 3 months</li> </ul> <i>Intervention II</i>  <ul style="list-style-type: none"> <li>5% sodium fluoride varnish (SFV) every 3 months</li> </ul> <i>Intervention III</i>  <ul style="list-style-type: none"> <li>38% silver diamine fluoride (SDF) solution annually</li> </ul>	Oral exam  <ul style="list-style-type: none"> <li>Baseline</li> <li>+ 1years</li> <li>+ 2years</li> <li>+3 years</li> </ul>	Single blind, Parallel group RCT. Randomized into one of four interventions  Comparison group received individualised oral hygiene instruction and application of water annually	<ul style="list-style-type: none"> <li>All treatment applications were more effective at preventing new root caries than oral health information alone</li> </ul>	<ul style="list-style-type: none"> <li>Non-dental professionals, such as primary health-care workers, can be trained to apply the treatments</li> <li>Low cost treatments which do not require expensive equipment or support infrastructure</li> <li>SDF needs to be applied only once a year – treatment time and labour cost are the lowest</li> <li>CV stains teeth yellow for hours after application</li> <li>SDF stains lesions black</li> </ul>	Older adults in residential care	<b>Residential homes (for the elderly) – Hong Kong</b>

<p><b>Le (47)</b></p>	<p>Toronto, Canada</p> <p>76 Personal support workers (PSW) from 5 long term care (LTC) homes</p> <p>Intervention N=47 (2 homes), 32 completed all 3 time-points</p> <p>Comparison N =29 (3 homes)</p>	<p><i>Mouth Care for Persons in Residential Care Program</i></p> <ul style="list-style-type: none"> <li>• Oral health promotion</li> <li>• Mouth care</li> <li>• Overcoming care barriers</li> <li>• In-service using CD ROM chosen as mode of delivery</li> <li>• 60 minute session including testing</li> <li>• Minimum of 1 session per home</li> </ul>	<p>PSW knowledge test</p> <ul style="list-style-type: none"> <li>• Baseline-pre-training</li> <li>• Immediately post-training</li> <li>• +6 month FU</li> </ul> <p>Resident oral health outcomes</p> <ul style="list-style-type: none"> <li>• Plaque Index (PI)</li> <li>• Gingival Index (GI) <ul style="list-style-type: none"> <li>• Baseline</li> <li>• +6 months FU</li> </ul> </li> <li>• Intervention N= 41, mean age 80±10yrs</li> <li>• Comparison N = 39, mean age 79±12yrs</li> </ul> <p>Controlled single blind</p>	<p>Comparison Group</p> <p>Took knowledge test pre and post at conclusion of study</p>	<ul style="list-style-type: none"> <li>• Significant ↑ in knowledge levels between baseline and immediate post training, was sustained over 6 months</li> <li>• Significant improvement in PI in both groups</li> <li>• No significant difference in GI</li> </ul>	<ul style="list-style-type: none"> <li>• Sustained knowledge increase</li> <li>• Future research should identify and assign participating caregivers to specific residents</li> <li>• Regularly reviewed, individualized oral care plans are needed to improve residents oral health</li> <li>• Advocates of oral health within the organisation help proper administration of oral health promotion</li> <li>• Limited time for staff in-service</li> <li>• Daily mouth care activities not formally observed – can't confirm what contribution mouth care education had</li> </ul>	<p>Workforce</p>	<p><b>Long term care (LTC) homes (Residential homes)</b></p>
<p><b>Satur (48)</b></p>	<p>Review of evidence for oral health promotion effectiveness</p>	<p>Programs with</p> <ul style="list-style-type: none"> <li>• Oral health preventative focus</li> <li>• Published evaluations</li> </ul>	<p>Systematic search</p>	<ul style="list-style-type: none"> <li>• Fluoride &amp; other preventative measures</li> <li>• Settings</li> <li>• Capacity building</li> <li>• Policy</li> <li>• Community based programmes.</li> </ul>	<p>Evidence supported</p> <ul style="list-style-type: none"> <li>• Continued water fluoridation</li> <li>• Interventions aimed at early childhood and aged care settings</li> <li>• Smoking cessation</li> <li>• Capacity building with non-oral health care providers.</li> </ul>	<ul style="list-style-type: none"> <li>• Challenges exist in finding workable approaches for low income groups, adolescents, Aboriginal communities, older adults, those affected by disability, mental illnesses and drug and alcohol addictions</li> <li>• There is concern that the profile of oral health is still too low in the competition for resources</li> </ul>	<p>Australian population</p>	<p><b>Systematic review</b></p>
<p><b>Webel (49)</b></p>	<p>Health related behaviours in Adults (18+). Systematic review of 25 RCTs</p>	<ul style="list-style-type: none"> <li>• Peer based interventions for health behaviour change –</li> <li>• Group based education led by peer leaders and peer dyads where matched participants give one on one advice</li> </ul>	<p>Systematic search for prospective, experimental studies</p>	<p>Group based peer education vs peer dyads vs combination of group and dyad</p>	<ul style="list-style-type: none"> <li>• Small to medium effect on Physical activity, smoking cessation and condom use</li> <li>• No changes in breastfeeding, medication adherence women's health preventive measures self care</li> </ul>	<ul style="list-style-type: none"> <li>• Subgroup analyses by intervention model did not reveal significant differences in outcomes</li> <li>• The majority (72%) of studies employed the dyad model, perhaps because it is the simplest to implement</li> </ul>	<p>Adult pop  +18 years old</p>	<p><b>Systematic review</b></p>
<p><b>Thomson (50)</b></p>	<p>Intake of fruit and vegetables (F/V).</p>	<ul style="list-style-type: none"> <li>• Behavioural interventions that applied behaviour theory or constructs</li> </ul>	<p>Systematic search for clinical trials and RCT, human, English.</p>	<p>Adults vs children, lower income or minority vs general</p>	<ul style="list-style-type: none"> <li>• Average increase in F/V servings per day 1.13 for adults and 0.39 for children</li> </ul>	<ul style="list-style-type: none"> <li>• Achieving and sustaining F/V intake at recommended levels of intake across the population cannot be</li> </ul>	<p>Adult and Children</p>	<p><b>Systematic review</b></p>

	No age limits  N= 36 studies			population.		achieved through behaviour based interventions alone		
<b>Liu (51)</b>	Smoking, diet and physical activity in ethnic minority groups in the UK.	<ul style="list-style-type: none"> <li>Health promotion interventions related to smoking cessation, physical activity and healthy eating</li> </ul>	Review of 15 UK guidelines and 111 systematic reviews and 173 adapted intervention User engagement conference and 26 qualitative interviews	<p>Synthesis of findings.</p> <p>Not possible to undertake meta-analysis</p>	<ul style="list-style-type: none"> <li>Strongest evidence for smoking cessation</li> <li>Individual level strategies (ie. better resource provision and aiming to increase uptake and compliance of pharmacological interventions</li> <li>Population level strategies associated with healthy eating and physical activity promotion</li> <li>Lacked evidence for effectiveness particularly long lasting changes</li> </ul>	<ul style="list-style-type: none"> <li>Motivating behaviour change in ethnic minority populations should consider the role of the individual in the context of families and communities</li> <li>Development of communication strategies should match needs and preferences of ethnic minority populations</li> <li>Insufficient evidence to make conclusions about the clinical effectiveness or cost-effectiveness of un-adapted compared with adapted health promotion interventions</li> </ul>	African  Chinese  Sth Asian-organ population in the UK	<b>Review</b>
<b>Suresh(52)</b>	Kuwait  Adults approx 30 yrs of age, N= 53  Oral health behaviour	<p>Action-control intervention, matched to stage of change - volitional (floss sometimes)</p> <ul style="list-style-type: none"> <li>Four-week daily flossing calendar</li> <li>Dental floss</li> <li>Demonstration and written instructions on flossing</li> </ul>	<p>Questionnaire</p> <ul style="list-style-type: none"> <li>Behavioural stage of change</li> <li>Baseline only</li> </ul> <p>Plaque &amp; bleeding scores</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+4 weeks FU</li> </ul> <p>Flossing calendar &amp; self report flossing</p> <ul style="list-style-type: none"> <li>+4 weeks FU</li> </ul>	<p>Mismatched stage of change-motivational (don't floss) received the same intervention</p> <p>N=-21</p>	<ul style="list-style-type: none"> <li>↑ flossing in both groups</li> <li>Significant ↓ plaque scores in both groups, larger ↓ in motivational group</li> <li>Bleeding scores improved equally for both groups</li> </ul>	<ul style="list-style-type: none"> <li>Simple self-monitoring intervention improved dental flossing regardless of their behavioural stage of change</li> <li>Stage-matching interventions to bring about behavioural change may be unnecessary</li> </ul>	Adults	<b>Dental clinic</b>
<b>Carr (53)</b>	Tobacco cessation for oral health  Any age  Systematic review. 14 studies, N=10500	<ul style="list-style-type: none"> <li>Any intervention conducted by oral health professional designed to promote tobacco cessation</li> <li>Including brief advice to quit, provision of self-help materials, counselling, pharmacotherapy or referral to other sources of support</li> </ul>	Systematic review	<p>Cochrane review. Heterogeneity explored by cigarette smokers and smokeless tobacco users. Method of randomization, who delivered intervention and outcomes.</p>	<ul style="list-style-type: none"> <li>Interventions for tobacco users delivered by oral health professionals, either in the dental office or in the school community, increase the odds of quitting tobacco</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient evidence to make conclusions about the effectiveness of specific intervention components</li> <li>Behavioural counselling or brief advice from physicians may be an effective means to promote cessation</li> <li>Adult smokers particularly responsive to the effect of an intervention in this setting</li> </ul>	Tobacco users	<b>Systematic Review</b>

<b>Rozier (54, 55)</b>	USA  Children aged 6 months – 3 years  Dental caries	<ul style="list-style-type: none"> <li>Physicians reimbursed for up to 6 preventative oral health visits for Medicaid enrolled children</li> <li>Services include assessment of dental caries&amp; risk, fluoride application&amp; parental counselling on oral health</li> <li>Referral to dentist if needed</li> </ul>	Evaluation of Medicaid claims from 2000 - 2006	No comparison group	<ul style="list-style-type: none"> <li>↑ in the provision of preventive oral health services</li> </ul>	<ul style="list-style-type: none"> <li>Primary care medical settings used to deliver preventative oral health services to young children</li> <li>Increases access in areas where no dentists</li> </ul>	Children	<b>Medical clinic</b>
<b>Fjellstrom (56)</b>	Sweden  Adults, 20-30 years of age, N=4  Oral hygiene	<ul style="list-style-type: none"> <li>Two visits 3 weeks apart , N=2</li> <li>Traditional information <ul style="list-style-type: none"> <li>Pictures of periodontal health and disease</li> </ul> </li> <li>Modified Cognitive Behavioural Therapy (CBT) model <ul style="list-style-type: none"> <li>Diary of thoughts &amp; feelings around tooth brushing,</li> <li>Visualization &amp; noticing clean teeth</li> <li>All received toothbrush, floss and professional cleaning</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Questionnaire</li> <li>Clinical exam</li> <li>Intervention group recorded thoughts and feelings in a diary</li> </ul>	N=2  Received traditional information only	<ul style="list-style-type: none"> <li>↓ plaque index, gingival index and gingival bleeding index in both groups, greater ↓ in CBT group</li> <li>CBT group had increased knowledge and awareness</li> </ul>	<ul style="list-style-type: none"> <li>Small pilot study</li> <li>Participants were motivated to engage in CBT – may not be the case in a larger sample</li> <li>CBT method is more time intensive than traditional method</li> </ul>	Adults	<b>Dental clinic</b>
<b>Arpalahti (57)</b>	Finland  Dental hygienists and nurses (N=28) who work with young children  Acceptance of new Oral Health Promotion (OHP) program	<p>Staff from two regions completed training</p> <ul style="list-style-type: none"> <li>19 hours over 9 sessions</li> <li>Written instructions on 2 programs</li> <li>Use of fluoride and cleaning teeth</li> <li>Proper nutrition</li> <li>Xylitol</li> <li>Transtheoretical model (TTM) of counselling</li> </ul>	<ul style="list-style-type: none"> <li>Questionnaire</li> <li>Interviews</li> </ul>	One region received routine program (information at a universal level)	<ul style="list-style-type: none"> <li>All felt that the work performed had been important during their working career</li> <li>Instructions and education were suitable</li> <li>Intervention group felt they advanced more as health professionals and acquired more confidence</li> <li>~50% felt TTM was useful or quite useful</li> </ul>	<ul style="list-style-type: none"> <li>The new programmes for small children were well accepted by the dental hygienists and the in-service trained dental nurses</li> <li>Increased confidence may be due to extra support and attention paid to them</li> <li>Education and new responsibilities enhanced their professional performance</li> </ul>	Dental professionals	<b>Dental clinic</b>
<b>Meyer (58)</b>	Hannover, Germany  Adolescents (age 13-14)  N=29  Mothers recruited whilst pregnant (original N=86)	<p>Phase IV of long-term prevention program on dental and oral health pregnant mothers and their children.</p> <ul style="list-style-type: none"> <li>Phase I - individual preventive care during pregnancy</li> <li>Phase II- educate, assess &amp; treat mothers &amp; children every 3 months until 3 years old</li> <li>Phase III- educate, assess &amp; treat mothers &amp; children every 12 months until 6 years old</li> </ul>	<p>Clinical Exam</p> <ul style="list-style-type: none"> <li>DMFS/dmfs</li> <li>Hygiene index</li> <li>Bleeding index</li> <li>Saliva S Mutans</li> </ul> <p>Questionnaire</p> <ul style="list-style-type: none"> <li>Oral health knowledge</li> </ul>	<p>Comparison group randomly selected adolescents of same age &amp; education level</p> <p>No treatment</p>	<ul style="list-style-type: none"> <li>Intervention group had 33% more caries-free dentition</li> <li>Comparison group had significantly higher mean DMFT</li> <li>Standard of OH knowledge was similar in the prevention and control group</li> </ul>	<ul style="list-style-type: none"> <li>Oral health promotion starting during pregnancy may have a sustained and long-term improvement of the oral health of children, influences deciduous and permanent teeth</li> <li>Many women don't see dentists during pregnancy, support of other medical professionals is needed</li> <li>Incentives are needed to encourage women to see</li> </ul>	Pregnant women/  adolescents	<b>Dental clinic</b>

	Oral health knowledge and behaviours	<ul style="list-style-type: none"> <li>Phase IV – Follow up on oral health of 13-14-year-old teenagers examined, mouth rinse &amp; fluoride application</li> </ul>				dentists after eruption of child's first tooth		
<b>Ismail (59)</b>	<p>Detroit, USA</p> <p>0-5 year old African American children</p> <p>Intervention N=506</p> <p>Comparison N = 515</p> <p>Low SES</p> <p>Oral health knowledge and behaviours</p>	<ul style="list-style-type: none"> <li>15 minute DVD on oral health</li> <li>40 minutes of motivational interviewing with child's primary caregiver</li> <li>Goals setting – self or project developed</li> <li>7 months later child specific brochures re-mailed (with the goals that had been set)</li> <li>Final N= 299</li> </ul>	<p>Parent questionnaire</p> <ul style="list-style-type: none"> <li>6 months after initial session</li> <li>+2 years FU</li> </ul> <p>Clinical exam</p> <ul style="list-style-type: none"> <li>+2 years FU</li> </ul>	<p>RCT</p> <p>Comparison received DVD only</p> <p>final N = 300</p> <p>Intervention and comparison stratified based on age and caries severity</p>	<p>Six month FU</p> <ul style="list-style-type: none"> <li>Intervention group more likely to be checking for pre-cavities and making sure child sees a dentist</li> <li>Intervention group more likely to report child brushes twice a day and brushes before bed (not significant)</li> </ul> <p>Two year FU</p> <ul style="list-style-type: none"> <li>Intervention group more likely to be checking child for pre-cavities</li> <li>Other behaviours in right direction but not statistically significant</li> <li>Intervention children did not have fewer new untreated lesions at final evaluation</li> </ul>	<ul style="list-style-type: none"> <li>Motivational interviewing made only minor difference to behaviour and not difference to long term caries.</li> <li>Motivational interviewing was administered regardless of readiness to change</li> <li>Strong control and assessment itself may have had an effect on control group improvement.</li> </ul>	Families with young children	<b>Clinic and home</b>
<b>Jonsson (60)</b>	<p>Sweden</p> <p>Adults with chronic periodontitis</p> <p>Mean age 51.2 years</p> <p>N=113</p>	<p>Individually tailored oral health education</p> <ul style="list-style-type: none"> <li>Motivational interviewing</li> <li>Practicing toothbrushing</li> <li>Delivered by dental hygienist</li> <li>N=57</li> </ul>	<p>Clinical exam</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+12month FU</li> <li>Plaque</li> <li>Bleed on probing (BoP)</li> <li>Periodontal pocket depth (PPD)</li> </ul>	<p>RCT</p> <p>Comparison group received standard oral health information only</p> <p>N= 56</p>	<ul style="list-style-type: none"> <li>↓ bleed on probe in intervention group</li> <li>More overall treatment success in intervention group</li> </ul>	<ul style="list-style-type: none"> <li>Intervention is individually tailored</li> <li>Requires training in motivational interviewing</li> <li>Need to test MI in relation to person's stage and commitment to change and life events.</li> </ul>	Adults	<b>Clinic</b>
<b>Lepore (61)</b>	<p>USA</p> <p>Children 1-6 years of age</p> <p>N=69</p> <p>Caries risk</p>	<ul style="list-style-type: none"> <li>Examination</li> <li>Dental prophylaxis</li> <li>Topical fluoride application</li> <li>Verbal oral hygiene &amp; diet instructions</li> <li>Personalised oral health action plan including assessment of caries risk level (low, medium, high)</li> </ul>	<p>Clinical exam</p> <ul style="list-style-type: none"> <li>Baseline</li> <li>+2month FU</li> </ul> <p>Questionnaire</p> <ul style="list-style-type: none"> <li>Oral hygiene and child's diet</li> <li>Baseline</li> <li>+2month FU</li> </ul>	<p>Quasi-experimental</p> <p>Randomised to intervention or control</p> <p>Single blind</p> <p>Comparison group received dental</p> <p>Control group</p>	<ul style="list-style-type: none"> <li>Statistically significant improvement in all oral hygiene and diet measures in both groups</li> <li>Statistically significant improvement in S. Mutans, plaque and gingival health in intervention group only at FU</li> </ul>	<ul style="list-style-type: none"> <li>Indicates that comparison group have knowledge/information but clinical evidence doesn't support that they are doing what they have reported</li> <li>Action plan may not be necessary to increase understanding but could help with adherence</li> <li>Longer follow up time needed</li> </ul>	Children	<b>Dental clinic</b>

				received the same as intervention except for the personalised oral health action plan				
<b>Lin (62)</b>	Vancouver, Canada  Pregnant women, mean age 27.7±5 years  N=61  At risk of preterm or low birth weight babies	<i>Healthiest Babies Possible (HBP)</i>  Clinic visit 1 (antenatal)  <ul style="list-style-type: none"> <li>• Oral exam, treatment recommendations (dentist)</li> <li>• Hygienist performed: <ul style="list-style-type: none"> <li>• Periodontal treatment</li> <li>• Oral health counselling</li> <li>• Oral hygiene instruction</li> <li>• Dental provider list &amp; oral hygiene handouts</li> <li>• Interview</li> <li>• Toothbrushing observation</li> <li>• Antibacterial rinse</li> </ul> </li> </ul> Clinic visit 2 (antenatal)  <ul style="list-style-type: none"> <li>• Periodontal treatment</li> <li>• Review of education</li> <li>• Prophylaxis/fluoride as needed</li> <li>• Antibacterial rinse</li> </ul> Clinic visit 3 (3-4 months postnatal)  <ul style="list-style-type: none"> <li>• Oral exam, treatment recommendations (dentist)</li> <li>• Hygienist performed: <ul style="list-style-type: none"> <li>• Periodontal treatment</li> <li>• Review of education</li> <li>• Interview &amp; observations</li> </ul> </li> </ul>	Questionnaire  <ul style="list-style-type: none"> <li>• Knowledge &amp; behaviours</li> <li>• Self-report pain etc</li> </ul> Clinical measures  <ul style="list-style-type: none"> <li>• Perio disease index</li> <li>• Visible decay</li> <li>• Treatment needs</li> <li>• Self-report pain etc</li> </ul> Administered at each of the 3 clinic visits	No comparison group	<ul style="list-style-type: none"> <li>• Significant improvement in gingival indices between visits one and two</li> <li>• Significant improvement in tooth cleaning between visit one and two</li> <li>• Significant increases in oral health knowledge</li> <li>• Participants reported to be satisfied with the program</li> </ul>	Possible transfer of new knowledge to care of child's mouth  May not be transferrable to whole HBP client base , as these people volunteered to take part & clientele is usually quite transient , hard to follow up  Extension further into postnatal period	Pregnant women	<b>Dental clinic</b>
<b>Yuen (63)</b>	USA  Adults with systemic sclerosis  N=48	<ul style="list-style-type: none"> <li>• Powered toothbrush and handled floss</li> <li>• Taught orofacial exercise</li> <li>• Toothbrushing instruction</li> <li>• Twice daily for six months</li> <li>• Phone calls at 2 weeks, 2 months and 5 months</li> </ul>	Clinical exam  <ul style="list-style-type: none"> <li>• Baseline</li> <li>• + 3 month FU</li> <li>• + 6 month FU</li> </ul>	Same as intervention but with standard toothbrush and floss	<ul style="list-style-type: none"> <li>• Both groups showed significant reduction in gingival inflammation , but was larger in intervention group</li> </ul>	<ul style="list-style-type: none"> <li>• Powered toothbrush better than manual.</li> <li>• All participants received same education</li> </ul>	Adults with systemic sclerosis	<b>Clinic and home</b>

	Gingival health							
<b>Declerck(64)</b>	Flanders, Belgium  Children, birth >2.0=5 years of age  Intervention N=1080  Comparison N=1057	<i>Smile for Life</i> - multi-component oral health intervention  <ul style="list-style-type: none"> <li>Extended care program on oral health promotion incorporated into child and family program</li> <li>Delivered by nurses and physicians of the program</li> <li>Education</li> <li>Dietary advice</li> <li>Pacifier use</li> <li>Toothbrushing</li> <li>Dental visit</li> <li>Communication tools – placemat, toothbrush &amp; cup</li> <li>Brochure - pregnant women</li> <li>Posters</li> <li>Child health booklet</li> <li>Information &amp; training for health workers</li> <li>4 home visits, 11 consultations at office</li> </ul>	Evaluation at age 3 and 5 years  Oral Exam  <ul style="list-style-type: none"> <li>At school</li> <li>Demineralisation levels &amp; cavitation levels</li> </ul> Parent questionnaire  <ul style="list-style-type: none"> <li>Behaviours</li> <li>SES</li> </ul>	Comparison group received the normal visits from the child and family program – with 2 specific education topics on oral health	Limited effects on  <ul style="list-style-type: none"> <li>Caries experience</li> <li>Plaque accumulation</li> <li>Dietary habits</li> <li>Oral hygiene habits</li> <li>Dental attendance</li> </ul>	<ul style="list-style-type: none"> <li>Limited impact of intervention</li> <li>Issues with implementation</li> <li>Possibly the wrong target group</li> </ul>	Preschool children	<b>Child and family service</b>
<b>Feldens (65)</b>	São Leopoldo, Brazil,  Newborn babies  Intervention N = 200 and  Comparison N = 300 at baseline	Child nutrition & feeding practice advice  <ul style="list-style-type: none"> <li>30 minute sessions</li> <li>First visit within 10 days of birth, monthly for 6 months and then at age 8, 10 and 12 months</li> <li>Sessions run by undergraduate nutrition students</li> </ul>	Parallel randomized trial  <ul style="list-style-type: none"> <li>Face-to-face structured home interviews with mothers at 6 and 12 months postpartum</li> <li>24 hour dietary recall at 12 months</li> <li>Child clinical exam at 1 and 4 years of age</li> </ul>	Comparison group did not receive intervention	<ul style="list-style-type: none"> <li>Smaller proportion of children in intervention group developed caries</li> <li>Mean number of affected teeth was lower in the intervention group</li> <li>Longer duration of exclusive breastfeeding, later introduction of sugar, lower frequency of dietary intake and lower probability of high sugar/lipid foods in intervention group</li> <li>No difference in night time bottle frequency or introduction of solid foods</li> </ul>	<ul style="list-style-type: none"> <li>Reduced caries incidence – home nutritional advice feasible</li> <li>Large proportion of intervention group still presented with caries</li> <li>Some targeted feeding practices did not differ between group</li> <li>Higher compliance with the more objective practices – eg delaying introduction of sugar – possibly more easily learned and followed</li> <li>Difficult to distinguish white spots from hypoplastic defects</li> </ul>	Families with young children	<b>Home</b>
<b>Binkley (66)</b>	USA  4-15 year old children (baseline) and their	Dental care coordinator, through phone calls and home visits assisted participants with  <ul style="list-style-type: none"> <li>Oral health education</li> </ul>	Dental utilisation	RCT  Comparison group did not have access to	<ul style="list-style-type: none"> <li>Utilisation of dental services higher in intervention group than comparison group</li> </ul>	<ul style="list-style-type: none"> <li>Intervention was of most benefit to those below the poverty line</li> <li>Costly – need to target those with the greatest need</li> </ul>	Families	<b>Home/health</b>

	<p>parents</p> <p>N=136</p> <p>Dental utilisation</p>	<ul style="list-style-type: none"> <li>• Assistance finding a dentist</li> <li>• Scheduling and keeping appointments</li> <li>• Overcoming barriers – eg. transport to appointment</li> </ul>		<p>dental care coordinator</p>		<ul style="list-style-type: none"> <li>• Dental care coordinator may need to be matched to race/gender or from the same community</li> </ul>		<p><b>system</b></p>
<p>Bonevski (67)</p>	<p>Australia</p> <p>Homeless adults 18+ years of age</p> <p>Baseline N=12</p> <p>Follow Up N=6</p> <p>Smoking, alc</p> <p>cohol, diet, physical activity, sun protection</p> <p>-18 yrs + homeless</p> <p>Australia</p> <p>N=12 baseline, N= 6 completed intervention</p>	<ul style="list-style-type: none"> <li>• Telephone counselling</li> <li>• Motivational interviewing and health information</li> <li>• Smoking, alcohol, diet, physical activity and sun protection</li> <li>• Once per week for six weeks</li> </ul>	<p>Baseline and follow up survey of health behaviours</p>	<p>No comparison group</p>	<ul style="list-style-type: none"> <li>• High acceptability in retained participants</li> <li>• Feasible</li> <li>• Some reduction in health behaviours</li> </ul>	<ul style="list-style-type: none"> <li>• Sample too small to draw any conclusions</li> <li>• Retention rate of 60% - homeless with no fixed address, difficult to reach and engage</li> <li>• Accessing population through outreach services the best way to reach them</li> </ul>	<p>Homeless</p>	<p>Accommodation centre</p>

**Table 2: Summary of oral health promotion interventions by Integrated Health Promotion categories and population, settings and priority groups**

	Screening, individual risk assessment	Health education and skill development	Social marketing; health information	Settings and supportive environments (healthy public policy)	Community action
<b>Population approaches</b>		Behavioural interventions targeting nutrition and diet (50)	Multi-component interventions including oral health promotion programmes, social marketing, policy and settings based strategies through school and children’s settings(18)		
				Integration of oral health into sessions with general practitioners. Funding for physicians to undertake preventative oral health visits and referrals for disadvantaged children (54, 55)	
				Training professional groups in basic oral hygiene, nutrition, fluoride application, and counselling techniques(57)	
				Smoking cessation programs in the dental clinic or in a community, school or college setting (53)	
<b>Pregnant women, babies and young children/childhood</b>	Multi-component oral health promotion intervention delivered by nurses & physicians related to diet, weaning and child development, oral hygiene, fluoride application and dental visits (3, 64)				

		Oral health education delivered by a professional or via slideshow, DVD with and without follow up and counselling (4, 17, 30, 33, 35, 36)	Multi-component oral health promotion intervention which involved integration of oral health into well child Key Ages and Stages visits to MCH nurses, including anticipatory guidance, oral hygiene products, screening and referral, and training for MCH nurses (34)	
		Motivational Interviewing and goal setting (31, 59)		
		Nutrition education (5, 65)		
		Oral health screening, treatment and education (6, 32, 58, 61, 62)		Professional training in oral health for clinicians, paediatricians, lay health-workers, professionals from children's services (37-40)
				Dental managed care program implemented through public health service (44)
<b>Children and adolescents/school settings</b>		Oral health screening, treatment and education (14, 21)		
		Oral health education delivered by a professional or via lectures in the curriculum, slideshow, DVD with and without follow up, support or counselling (8, 9, 13, 15, 23-25, 28, 66) and via SMS(29)		Weekly oral health programs integrated into school program (eg Weekly Fluoride Mouthrinse Program (7), tooth brushing program (8, 11, 14), curriculum education delivered by teachers (8)

		Motivational Interviewing and goal setting (16)		Professional training for teachers, school staff and school nurses in oral health and oral hygiene instruction (14, 24, 26)	
		Smoking prevention program education (22)		Oral health promotion integrated into a broader health promotion and prevention program implemented in schools (10)	
<b>Older people</b>					
<b>Aboriginal &amp; Torres Strait Islanders</b>	Northern Territory Emergency Response (NTER) Child Health Check Initiative (CHCI) and Closing the Gap Program. Dental check and follow up services (preventive and treatment), broader preventative oral health promotion and education programs implemented in children's settings and health services, training in oral health for health professionals (12)				
	School-based treatment services, health promotion and education (19)				
	Community-based, multi-component interventions which include preventive oral health strategies (fluoride varnish, sealants) parent education, professional training, integration into children settings and services (41, 42)				
<b>Culturally and linguistically diverse communities</b>		Health promotion interventions related to smoking cessation, physical activity and healthy eating (51)			
<b>People with special needs</b>	Oral health screening, risk assessment, treatment, education, supervised tooth brushing, flossing (63) and fluoride application and fissure sealants (20)			Dental clinic established in refugee camp, health workers trained in oral health, oral hygiene, and emergency dental care (43)	

	Individualized oral hygiene instruction, with fluoride varnish and other preventive strategies (46)	Oral health education, motivational interviewing and support (67)		Oral hygiene integrated into the daily care of nursing home residents, nursing staff and aides trained in oral health and oral hygiene, resident receive individualised oral health assessments and care planning (45, 47)	
		Teacher supervised tooth-brushing program (27)			
<b>Workplace settings and Adults</b>		Behaviour change interventions: Peer-led (49) Motivational interviewing and oral health education (52, 60) Modified Cognitive Behavioural Therapy (CBT) model (56)			

<b>Level 1: Strong Evidence</b>	<b>Level 2: Sufficient Evidence</b>	<b>Level 3: Some evidence</b>	<b>Level 4: Weak Evidence</b>
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Note: The table does not include the Satur systematic review (48), although it is included in the synthesis of evidence.

## 4. Evidence summary and narrative synthesis by Integrated Health Promotion categories and population, settings and priority groups

### Population approaches

Satur et al (48) reported the findings from a systematic review of the evidence for oral health promotion. Oral health promotion literature in English, with no age restrictions, post 1998, was systematically searched using published and unpublished sources (study types included systematic reviews of health promotion programs; health promotion programs which incorporated an evaluation measure (process/ impact and/or outcome) using either qualitative or quantitative methods; programmes with oral health as a primary focus or, oral health explicitly included and evaluated as a secondary focus; interventions which aimed at preventing oral diseases; identification, screening and referral programs that collaborated with non-dental personnel). The quality of both quantitative and qualitative evidence was assessed using the framework developed by the Cochrane Public Health and Health Promotion Field Handbook and the Health Gains Notation to sequentially develop a synthesis approach to reporting, structured around the Ottawa Charter. The review identified evidence supporting continued water fluoridation; interventions aimed at early childhood and residential care settings, smoking cessation and capacity building with non-oral health care providers. Evidence supporting multi-component community based strategies with some success were also identified and reported. The review identified diverse health promotion evidence that supported, advocated and incorporated oral health into general health promotion, however challenges finding feasible and sustainable approaches existed in particular for low income and Aboriginal communities, older people and adolescents, people with disabilities and drug and alcohol addictions.

### *Behavioural interventions targeting nutrition and diet (50)*

Thomson and Ravia (50) undertook a high quality systematic review of behavioural interventions to promote intake of fruit and vegetables. The review included only English language studies and clinical trials, or randomized controlled trials, with publication dates between 2005 and 2010. The results of this systematic review indicate that behaviour change interventions can modestly increase fruit and vegetable consumption, although the absolute increase identified was small, although statistically significant. The review interpreted the findings in relation to meeting current US dietary guidance and no linkages with oral health were made. The authors note the usual limitations of using self-reported dietary data in all included studies.

### *Multi-component interventions including oral health promotion programmes, social marketing, policy and settings based strategies through school and children's settings (18)*

The study by Passalacqua et al (18) examines settings-based oral health promotion strategies implemented in the United Kingdom (any policy, practice and interventions pertaining to oral health promotion in a school in the National Healthy Schools Program) and estimates the spread of implementation and impact on oral health, and influence on oral health-related knowledge and behaviour in a patient population (cross-sectional study which analysed patients referred for a tooth extraction in one dental surgery in south-east London; n=149 patients recruited over during a 4-week period in 2009). The literature review included published papers, government publications, official government websites and policy reports, and although the dates of searching are not specified it appears to include 2010. It was determined that the settings-based oral health promotion programme was not significantly associated with oral health related knowledge, anxiety,

behaviours and attitudes, although there was a statistically significant association with patients' perception of their own oral health, and beliefs about their ability to prevent oral disease. The authors interpret these findings as showing some impact of the publicly funded programs schemes on population oral health.

*Integration of oral health into sessions with general practitioners. Funding for physicians to undertake preventative oral health visits and referrals for disadvantaged children (54, 55)*

Rozier 2010 (55) is a descriptive analysis of oral health services that were provided in medical offices and as part of dentist visits (2000–2006) in North Carolina. During this period a program was implemented to reimburse physicians for up to six preventive oral health visits for Medicaid-enrolled children aged less than three years. The analysis of the administrative claims data for this period (n=629,005) shows a large increase in claims for preventive oral health services. Historically these young Medicaid-enrolled children have had very limited access to dentists. The increase in oral health services observed in this study resulted from a substantial increase in services provided in medical offices while there was only a small effect of the program on dentist visits. More recent data has been obtained by the authors and demonstrate a continuing upward trend in oral health services provided in medical offices. The study however does not examine the effectiveness of the services provided (counselling or professional application of topical fluoride) in preventing dental caries. The paper describes well the barriers encountered and approaches to overcome these during implementation.

Rozier 2012 (54) reviews the comprehensive and innovative range of oral health initiatives implemented in North Carolina for young people and their outcomes. The initiatives focus on access to oral health care; assessing, educating, and building the dental workforce; new practice models and trends; insurance innovation; and patients with special needs. The paper describes the importance of Medicaid as an important dental insurance benefit and the impact of its inclusion being optional for adults. The importance of policy for addressing access and workforce issues and oral health literacy is highlighted, and a state-wide plan for improving oral health literacy using broad-based, coordinated strategies involving community health workers and health care professionals is recommended for improving access to dental care and oral health.

*Training professional groups in basic oral hygiene, nutrition, fluoride application, and counselling techniques (57)*

The study by Arpalahiti et al (57) examined the acceptability and influence on clinical practice of a training program delivered to dental hygienists and in-service trained dental nurses implementing health promotion programs for young children in two communities (compared to those in another community not exposed to the training program). The program (instructions and education) were deemed by participants to be suitable for oral health promotion, and perceived professional competencies and confidence were enhanced as a result of the program

*Smoking cessation programs in the dental clinic or in a community, school or college setting (53)*

This study by Carr and Ebbert (53) is a Cochrane systematic review assessing the effectiveness of interventions for tobacco cessation delivered by oral health professionals and offered to cigarette smokers and smokeless tobacco users in the dental office or community setting. Included studies are randomized and pseudo-randomized clinical trials (n=14) of behavioural interventions with an oral examination. Analysis of the pooled 14 studies suggested that interventions conducted by oral health professionals can effectively increase tobacco abstinence rates at six months or longer, but there was evidence of heterogeneity. For the sub-group of studies with smokers only there was clear evidence of benefit. Interventions in all studies were a team effort involving brief dental

encounters plus additional behavioural interventions and/or pharmacotherapy. The observed heterogeneity may be related to the differences in intervention intensity, intervention strategy (brief behavioural counselling with an oral examination appears an effective strategy) and location of intervention delivery.

**Summary:** A variety of population approaches have been tested however it is difficult to identify which strategies hold most promise given the heterogeneous nature of the studies grouped here. Further, direct impacts on dental disease are often not measured in studies of this nature. Despite this, the activities in North Carolina are particularly comprehensive and impressive in the array of strategies being implemented in a cohesive and co-ordinated manner.

### **Pregnant women, babies and young children/childhood**

*Multi-component oral health promotion intervention delivered by nurses & physicians related to diet, weaning and child development, oral hygiene, fluoride application and dental visits (3, 64)*

The study by McMahon et al. (3) examined patterns of dental decay in four consecutive academic years for three-year old children in the NHS Greater Glasgow and Clyde area in the West of Scotland. Repeated cross sectional dental data was available on >10,000 children with data collected over the period of the initial roll out of the *Childsmile* intervention programme. *Childsmile* was a comprehensive multi-component, community based, cross-sectoral, whole of community program of activities. Implementation achieved a high level of community reach into settings and to community members. The program utilised a 'directed-population' approach with differentially intensive interventions across the socioeconomic spectrum. The data showed reductions in prevalence of dental decay experience in each of the five socioeconomic grades, and poorest children were shown to have benefited the most. This study demonstrates that it is possible to impact upon both the prevalence and morbidity of dental decay across the socioeconomic spectrum in a population. This type of 'anticipatory care' model is worthy of consideration for implementation elsewhere

The unpublished study by Declerk et al. (64) examines the impact of the *Smile for Life* project. Parents in the intervention group received an extended care program on oral health promotion (compared to standard care as the control group). The multi-component intervention was delivered by nurses and physicians of Child & Family, and also included professional training and capacity building, integration into usual practice, parent education, products, communications (pamphlets etc), anticipatory guidance, and skill development. The program was implemented with high fidelity. Data was collected at child age 3 and 5 years and limited effects were observed on caries experience, plaque accumulation, dietary habits, oral hygiene habits and dental attendance. The authors provide a comprehensive review of process evaluation data and implementation to determine why the program was not as effective as anticipated. There was a high level of intervention fidelity however time limitations on consultations and changes in nursing staff reduced fidelity. In addition other factors thought to limit effectiveness included the mother's education level. The attitudes of highly educated mothers tend to increase more over first 3 years, especially regarding dietary habits. Overall there were no differences between intervention and control groups that could be attributed to the intervention

**Summary:** Comprehensive multi-component, community based hold promise as effectively improving child oral health although implementation can be challenging and integrating strategies into general health services requires overcoming a range of barriers.

*Oral health education delivered by a professional or via slideshow, DVD with and without follow up and counselling (4, 17, 30, 33, 35, 36)*

The study by Cardenas et al. (30) was a small study (n=40) examining the gain in knowledge of oral health after education to pregnant women on dental anticipatory guidance and the retention of this information by the women over time. The study comprised a pre-test, participants watched a ten minute presentation and then completed the post-test assessment. A second visit occurred 4 weeks/1 month after the first visit and all subjects were asked to complete the follow-up test. All women mentioned that they had not received any oral health education from their physicians (obstetrician/gynaecologist) during their pregnancy. As a result of the intervention (presentation on dental anticipatory guidance) knowledge improved immediately and four weeks after the pregnant women were able to retain most of the information, as only a slight reduction in overall scores was observed from the follow-up test to the post-test.

A quasi-experimental, longitudinal (pre-post) Australian study by Clifford et al.(33), examined the influence of oral health education provided to pregnant mothers (compared to 'usual care'). The trial had 4 arms, with 3 active intervention groups (the 'Video' intervention consisted of a nine-minute "Healthy Teeth for Life" video/DVD, the 'Bag' intervention consisted of a free "Oral Health for your Infant" pack for mothers to take home, contained an adult toothbrush and toothpaste (for the mother), educational materials, other communication strategies and information on local oral health services; and the 'Combination' group who were offered both of these resources. Four months after the birth of their child, relative to the usual care condition, each of the oral health education interventions had independent or combined positive impacts on mother's knowledge of oral health practices. However it was demonstrated that young, single, health care card-holder or unemployed mothers were less likely to apply healthy behaviours or to improve knowledge of healthy choices, as a result of these interventions. The 'video' intervention provided the strongest and most consistent positive impact on mothers' general and infant oral health knowledge. While mothers indicated that the later stage of pregnancy was a good time to receive oral health education, many suggested that this should also be provided after birth at a time when teeth were a priority issue, such as when "baby teeth" start to erupt.

Plutzer et al (35) specifically examined if single parenthood (mother only) affects the effectiveness of an oral health promotion programme to prevent ECC in their child. First-time mothers were enrolled in a randomized controlled trial of anticipatory guidance to prevent ECC. The intervention was applied during pregnancy and when the child was 6 and 12 months old. Mothers in the control group received no intervention. The intervention consisted of three rounds of printed oral health promotion material. The first round was provided at enrolment, the second and third rounds were mailed home when the child was 6 and 12 months old. The information related predominantly to the child's nutrition and oral hygiene at that stage of development, as well as information on maternal oral health. With each round of information mothers in the intervention group also received a small incentive, consisting of mouth rinse, toothbrush or finger toothbrush for the child, to boost the information. In half of the mothers (randomized) in the intervention group the intervention was enhanced through telephone counselling at child age 6 and 12 months,. Evaluation showed a greater reduction in the frequency of ECC in children from one-parent families than in those from two-parent families. Importantly, this did not reduce their disadvantage, as the children still had a four times higher risk than children from two-parent families. The authors conclude that mothers and children in one-parent families need substantially more attention and support than those in two-parent families to eliminate their disadvantage in suffering ECC.

Rothe et al (36) reported on a nonrandomised interventional study conducted in March and April 2008. Data was collected immediately before and after the introduction of a 30 min educational intervention in the form of a PowerPoint presentation and a video of infant oral hygiene for parents

(education and anticipatory guidance at well baby appointments at 3, 6, and 9 months of age). Evaluation showed that this brief intervention was effective in improving the oral health knowledge of parents caring for an infant and the majority of parents found the presentation was helpful and indicated that the information would change the way they care for their baby's teeth at home.

The study by Esfahanizadeh (4) was a cluster randomised controlled trial examining the effectiveness of a dental health education programme for 6-year-olds. The intervention comprised one session of oral and dental education for parents (compared to control group with no education session). The children of the intervention group were also instructed for 30 minutes using brochures, catalogues, poems, stories, models, etc. on the correct brushing method, brushing frequency and appropriate characteristics of a toothbrush. The children were also given toothbrushes and toothpaste and were asked to use only the brushes and the toothpastes they were given during the study. The findings showed that the educated group had significantly lower Plaque index at the first and the second follow-ups and increased frequency of brushing. However no statistically significant difference was found between the two groups in terms of brushing technique and the application of other hygienic measures ( $p > 0.05$ ).

Sinor (17) examined the effectiveness and sustainability of cartoon animation as a medium for delivering oral health education to preschool children. The intervention group received the oral health education in the form of the cartoon animation, while for the comparison group the oral health education was given by dental nurses. Cartoon animation was developed focusing on three core message (the importance of tooth brushing, diet, and tooth brushing technique). This animation was developed after focus group discussion had been conducted (tailoring on content, character and presentation) and also from expert opinion. In the intervention group (5-6 year old children), oral health talk and oral hygiene instruction was given by staff nurses followed by the showing of cartoon animation every morning for five days. Data collected 1 week after and 2 weeks after intervention and the results demonstrated that cartoon animation as a medium was more effective and sustainable in delivering oral health education messages compared to traditional method. It was suggested that preschool teachers can play a major role by playing the oral health education in compact disc format everyday in their classes.

**Summary:** Brief education interventions can effectively increase parent and child knowledge however the mode of delivery is critical, and the support and additional strategies that accompany the educational intervention will influence the outcome. Further, special attention to higher risk population sub-groups is required, and the sustainability of the increased knowledge and translation into altered behaviours remains to be determined in most cases.

### *Motivational Interviewing and goal setting (31, 59)*

Motivational Interviewing (MI) is an individual centred brief counselling technique that uses an empathic, collaborative style to elicit and build on patients' own reasons for change. Four principles guide the implementation of MI: (i) expression of empathy: the counsellor understands the individual's feelings without judging; (ii) exploring ambivalence: through open-ended questions, the counsellor facilitates the individual's formulation of arguments for changing; (iii) rolling with the resistance: the counsellor focuses on creating a new perspective for the importance of change; and (iv) supporting self-efficacy: the counsellor facilitates development of the individual's confidence to cope with obstacles and succeed in changing. Freudenthal et al. (31) conducted a small study examining the influence of MI and telephone counselling, with data collected pre and 4 weeks post a brief intervention. Results showed no change in the main psycho-social constructs of interest (Readiness Assessment of Parents concerning infant dental decay (RAPIDD)), or in the majority of

cariogenic behaviours measured (two positive behavioural changes were observed: frequency of mother brushing child's teeth, and sharing utensils). These modest results were found in the sample of disadvantaged mothers of and the short duration of study was thought to be related to the lack of impact observed.

Ismail et al (59) report on a long term randomised trial examining the effectiveness of a tailored educational intervention on oral health behaviours and new untreated carious lesions in low-income African-American children (extremely low-income, high risk urban sample). The intervention comprised MI and DVD education, with MI including risk assessment and individualised goal setting, and had a booster session at 6 months (compared to only watching the DVD education and standard goals, no booster). Post-assessment was done at 2 years. This study found that after 2 years caregivers who participated in an MI session that lasted around 40 minutes with one brief telephone booster within 7 months post intervention reported more often than those in the comparison group that they check their child for precavities. Other behaviours were also more frequently reported by those in the MI session than those in the other group including the child brushing twice a day, the child brushing every day at bedtime, making sure the child sees the dentist every 6 months, making sure the child brushes at bedtime, and making sure that the child brushes twice per day, although these differences did not reach statistical significance. The study did not find any clinical nor statistically significant difference in the development of untreated caries in children. Importantly, in this study dental care was not provided and is not readily accessible in the community, further no professional fluoride varnish applications were given in the intervention group. Also, the control group did not get standard care, they has a comprehensive dental assessment and a high-quality 15-minute video) which may have influenced their behaviour and reduced the differences between the groups.

**Summary:** Study design, including length of duration and lack of comparison groups limits our ability to draw definitive conclusions about the effectiveness of motivational interviewing on child dental health, however promising results have emerged with longer intervention sessions and supporting strategies.

#### *Nutrition education (5, 65)*

This Brazilian study by Feldens et al (65) investigated the effectiveness of home visits advising mothers about healthy feeding practices during the first year of life on the occurrence of early childhood caries and severe early childhood caries at 4 years. The intervention group received monthly advice up to 6 months and then at 8, 10 and 12 months by undergraduate nutrition students, based on the "Ten Steps for Healthy Feeding", a Brazilian national health policy for primary care based on World Health Organization guidelines. This was a high quality trial and found that home nutritional advice during the first year of life decreases caries incidence and severity at four years of age in a low income community. The results of this study should be interpreted within the context of low and middle income countries where childhood rates of dental disease are very high.

This small pre-post study by Grant et al (5) examined the influence of a brief (8 minute) prop-based oral health and nutrition intervention in Head Start children at high risk of dental disease. The intervention was found to have improved scores in the immediate post-test but these improvements were not sustained two weeks later. The only positive relationship found to be sustained two weeks post intervention was oral health knowledge. There were no significant findings when adjusted for race, intervention type or group. Obtaining a more positive impact on oral health knowledge, attitude and behaviour, and nutritional attitudes and behaviours may require a more intense, repetitive intervention in this age cohort. In addition, clinicians, researchers and educators need to

continue to develop age-appropriate teaching materials and to continue to refine the teaching schedule that will maximize positive long-term knowledge, attitude and behaviour changes.

**Summary:** The comprehensive, long term intervention implemented in Brazil provides evidence that that home nutritional advice during the first year of life decreases caries incidence and severity at four years of age in a low income community, although the translation of this intervention into the Australian context requires careful consideration.

*Multi-component oral health promotion intervention which involved integration of oral health into well child Key Ages and Stages visits to MCH nurses, including anticipatory guidance, oral hygiene products, screening and referral, and training for MCH nurses (34)*

This study by Neumann et al. (34), reports the outcome data from the Country KIDS intervention program. The intervention was developed based on the PRECEDE/PROCEED framework and was a community-based intervention to improve the oral health of children in non-fluoridated rural Victoria three local government areas, with two receiving the intervention and one remaining with standard care. A large part of the intervention involves the distribution of an oral health starter kit (OHSK), which included an age-appropriate toothbrush, toothpaste and educational information for parents outlining key evidence-based oral health promotion messages. The kits were distributed to all families with infants/toddlers in the intervention areas by MCHNs at their routine 8-month 'ages and stages' visit. In addition, an oral health promotion training programme was provided for the MCHNs in these LGAs along with posters, pamphlets and a video/DVD where required. Children were followed up annually to the age of three. Modest intervention effects were observed with some evidence of effectiveness in exams 1 and 2 (up to the end of the second year of life) however this was not apparent by the third exam. Despite this, the study provides evidence that there is the potential for the MCHNs to deliver programmes designed to prevent ECC in very young children. The modest effects at 1 year of age, which later disappeared, may be due in part to inadequate intensity of intervention, (the oral health starter kits were only delivered on one occasion and by one health-care professional (the MCHN). The attenuation in intervention effect may be because of the lack of intensity of the intervention.

*Oral health screening, treatment and education (6, 32, 58, 61, 62)*

Cibulka et al (32) report on a randomized controlled trial with pretest–posttest questionnaires and an educational intervention with the experimental group. The intervention was planned and implemented by five advanced practice nurses (APNs) at a hospital-based inner-city clinic in Missouri. Those in the experimental group participated in an educational session, received dental supplies, and were scheduled for an oral care appointment. The educational intervention comprised watching a 5-min section of a DVD about periodontal disease and preventive strategies. The DVD, produced by the Educational Video Network (Huntsville, TX), included several graphic pictures of advanced periodontal disease and reviewed the proper techniques for brushing and flossing teeth. After watching the DVD, a nurse or research assistant discussed an information sheet that was targeted to oral health and pregnancy issues and distributed a toothbrush, a tube of fluoridated toothpaste, and dental floss for personal use. In addition, an appointment was scheduled for an oral health check-up at a neighbourhood health centre or other facility acceptable to the participant. Reminder postcards were sent to participants 1–2 weeks prior to the scheduled appointment. In the experimental group, post intervention knowledge scores showed a small positive trend while favourable self-perception of oral health increased significantly. This group also had a significant

increase in frequency of brushing and flossing teeth, reduction in intake of high sugar drinks, and reported more than twice as many visits for a dental check-up than the control group. Significant barriers to obtaining oral health services were identified. The major barriers encountered were by the participants trying to keep their appointments, these included long waiting times for appointments, cancelled appointments, provider confusion about Medicaid coverage for oral care, transportation issues, and childcare difficulties. A lack of participant knowledge about access to dental services and the inclusions under dental insurance during pregnancy was identified also. The findings of this study show that preventive oral hygiene practices, utilization of oral health services, and oral health in low-income inner-city women can be markedly improved with an APN-directed program of care delivered early in pregnancy. Knowledge scores reflected a trend in the right direction but also revealed evidence of a knowledge deficit related to oral health and pregnancy. The authors recommend that oral health education be included universally in preconception and prenatal care.

This randomised trial by Lepore et al. (61), examined the effectiveness of a Behavior Change Goal-Setting Action Plan intervention with children. Participants in the intervention group received an oral health action plan that included: 1. child's current caries-risk status; 2. identified issues of concern; and 3. one "goal" to improve on for the next visit-jointly chosen by parent and dentist. Participants in both groups received intraoral and extraoral examinations, a dental prophylaxis and a topical fluoride application by one trained dentist examiner. In all six oral hygiene and diet behavior reported measures there was a statistically significant improvement in both control and intervention groups. In the control group, there were no statistically significant changes seen in any of the biologic markers. However, in the intervention group, the *S. mutans* levels, plaque scores and gingival health showed statistically significant improvement when compared to baseline examination data, with statistically significant changes in biological and clinical factors. Given the improvements in both the intervention and control groups, these results suggest that providing patients with an oral health action plan specifying one particular goal does not necessarily increase patient and parent understanding of the dentist's recommendations compared to verbally dispensed instructions, but it does improve compliance with those suggestions.

Lin et al (62) examine the influence of the *Healthiest Babies Possible Program* with a before–after evaluation of a non-probability convenience sample of women undertaken over 1 year (2005–2006). Participants were seen at the routine two clinic visits and were asked to return for a postnatal visit. Post intervention, there were improvements in behaviours, skills, knowledge and gingival health. Clinical indices of gingival health improved significantly while there was also significant reductions in plaque and increases in the proportion of the women's other children receiving professional dental care. Oral health knowledge also improved and the women expressed satisfaction with the program. The participants' enhanced skills, together with the program's modest clinical intervention (superficial periodontal debridement), likely led to the women's improved gingival health. Their improved tooth cleaning technique was thought to be related to a combination of the recommendation of a smaller, easier-to-use toothbrush, one-to-one oral hygiene instruction and decreased gingival sensitivity to brushing after debridement.

Meyer et al (58) report on the impacts of a long-term prevention program on dental and oral health of teenagers at the age of 13 to 14 years. This is Phase IV of a long term prevention program. Phase I comprised an individual preventive care during pregnancy ("primary primary prevention"); phase II assessed mothers and their young children until the age of 3 years ("primary prevention"); and in phase III, mothers and children at the age of 6 years were investigated. All phases consisted of an examination, education about oral health care, and treatment based on the concept of an early oral health care promotion. The adolescents of the prevention group received a professional oral hygiene treatment including chlorhexidine mouth rinsing and topical fluoride varnish application. The control group consisted of randomly selected adolescents at the same age-and they received no

treatments. The data of phase IV demonstrated that more teenagers in the prevention group were caries free and had a significantly lower DMFT than those in the control group, suggesting an early oral health care promotion starting during pregnancy may cause a sustained and long-term improvement of the oral health of children. These results provide evidence that an intense early intervention using early preventive strategies or programs starting during pregnancy can be efficient with respect to the prevention of oral diseases, specifically caries. This approach however requires close interdisciplinary collaboration between gynaecologists, paediatricians, midwives, and dentists. Further, the authors recommend that dental examinations be included routinely during pregnancy, and incentives should be implemented to motivate young mothers to see their family dentist with their infant after the eruption of the first tooth.

Frazao (6) reports on a randomized double-blinded controlled community intervention trial which examined the influence of teaching the bucco-lingual technique within a school-based supervised tooth brushing program on preventing caries. The study was conducted in a Brazilian low-income fluoridated area. Children in the control group received oral health education and dental plaque dyeing followed by tooth brushing with fluoride dentifrice supervised directly by a dental assistant four times per year. At the remaining school days the children brushed their teeth under indirect supervising of the teachers. In the intervention group, children additionally underwent a professional cross-brushing on surfaces of first permanent molar rendered by a specially trained dental assistant five times per year. The modified program therefore was applied every about 45 days from February to November while the conventional program was carried out about every 60 days in the same period. Results showed gendered effects of the intervention, with the modified program being effective among the boys independently of the variation of their caries experience and their age. Incidence rate was 50% lower in the test group compared to the control group. Differences in the incidence rates were observed among the caries-free participants of both genders compared to the others however no significant difference was observed in girls. The authors suggest that due to the short term nature of the follow-up, and similarities in the exposures of the control and intervention groups in relation to fluoride (through water and dentifrice) it was difficult to find differences.

**Summary:** the interventions grouped here involved screenings across various settings (dental practice, hospitals, and maternal-Child health services). They provide some evidence of impacts on knowledge and oral hygiene skills, particularly in relation to tooth brushing technique, although intervention intensity, duration and number of accompanying clinical and non-clinical strategies influences the outcomes achieved. The long term prevention trial with strategies implemented during pregnancy and having outcomes measured when the children are adolescents provides promising results and highlights the importance of a multi-disciplinary approach to oral health promotion.

*Professional training in oral health for clinicians, paediatricians, lay health-workers, professionals from children's services (37-40)*

The study by Chin (40) discusses how Head Start and Early Head Start (HS/EHS) programs have partnered with the American Academy of Pediatric Dentistry to promote oral health and increase access to dental homes. HS/EHS are federally funded programs that provide grants to local public and private agencies to provide economically disadvantaged children with child development and health services, including oral health. HS/EHS staff have unique access to underserved populations for whom they can promote healthy lifestyles and help overcome dental access barriers using a holistic, respectful, and culturally sensitive approach to those they serve. HS/EHS staff are also trained to assist families to navigate and establish a connection with a wide range of social and medical services, including access to a dental home. Preparing HS/EHS staff for issues related to paediatric oral health is expected to improve the effectiveness of this collaboration. This study

describes the Columbia Head Start Oral Health Program (C-HSOHP) and examines changes in HS/EHS staff paediatric oral health knowledge and competencies after participating in C-HSOHP. HS/EHS performance standards specifically require that a health care professional determine within 90 days of enrolment whether a child is up to date with appropriate preventive dental care. Results from this study demonstrate that C-HSOHP was effective in improving HS/EHS staff self-confidence and self-perceived preparedness in teaching parents about oral health, applying oral health knowledge to HS/EHS programs, communicating with dental professionals, and improving access to paediatric dental services.

The study by Macintosh et al (39) is related to the *Healthy Smile Happy Child* (HSHC) initiative in Manitoba, Canada. The goal of HSHC is to develop sustainable oral health promotion that can be used throughout Manitoba. The three underlying pillars of the initiative are: (1) community identification and relationship building; (2) oral health promotion; and (3) research and evaluation. This study examines the oral health awareness and knowledge levels of service providers and community members exposed to the HSHC project, evaluating the effectiveness of a capacity-building workshop provided by HSHC community facilitators on changes in their knowledge, attitudes, and behaviours. A pre-post design was used with follow-up data collected one month after attending the workshop. The community capacity building workshops were designed to equip participants with knowledge on early childhood oral health (ECOH) and early childhood caries (ECC) prevention. It was delivered to individuals working with infants and preschool children. Ten workshops held in different Winnipeg locations and in 2 rural communities ranged from 1 to 2 hours in length, and consisted of: an interactive Power Point presentation; a video on ECC developed by a Manitoba First Nations community; a group discussion about project resources; and how participants could use these resources. The ultimate goal of each workshop was for participants to incorporate key ECOH promotion messages in their daily practice. Evaluation data showed that overall there was a 16% increase in the proportion of correct answers from the pre-workshop questionnaire to the post questionnaire although the proportion of correct answers in the pre-workshop questionnaire was relatively high to begin with. Despite this the greatest improvement in knowledge was learning that children should have their first dental visit by 12 months of age. The next greatest improvement in knowledge related to the concept that children should be supervised while brushing until 8-years-old, because children younger than this generally do not have the manual dexterity to effectively brush their teeth. The study's results also indicated that the vast majority of the participants claimed they had changed behaviour as a result of what they learned. This study also utilised non dental professionals in delivering the workshop, suggesting that health professionals without formal dental training, but who possess health promotion skills, can share basic yet important information that can lead to improved awareness and knowledge of oral health among other service providers and community members.

Strippel (37) reports on an intervention comprising a structured comprehensive oral health education (SC-OHE) supported by written information which was performed by 36 clinicians in all of the 30 specialist paediatric practices. All of the paediatricians in the intervention area attended two all-day SC-OHE training courses. The course consisted of lectures and role play by dentists, a physician, a pharmacist and a social scientist. The paediatricians received a carefully designed and phrased model script for each SC-OHE, adapted to the respective child age. In this trial clinicians were contractually obliged to mention seven to eight oral prevention topics at each appointment and to spend at least 15 minutes for SC-OHE. Verbal information giving in SC-OHE was planned to be supported by showing and explaining illustrative materials (eg tooth-brushes and fluoride salt packages) and parents were to be given information leaflets that reflected the contents of the verbal information. The paediatricians were asked to recommend the use of fluoride salt or dispense fluoride supplements. Children were directed to a dentist if diagnosis needed clarification or treatment deemed necessary. An additional fee was paid to clinicians for SC-OHE. Process evaluation data recorded that control group paediatricians provided 2.1 information items at each

child examination whereas the intervention group provided 3.8 items. Impact data demonstrated that parental knowledge increased by 23%, self-efficacy and attitudes remained unchanged and a significantly larger proportion of 7-month-olds in the control group received baby bottles with cariogenic content during daytime compared to those in the intervention group, although bottle use at night was unchanged. Parents in the intervention group were also less likely to add sugar to pureed baby food of the 7-month-olds. In 24-month-old children, the frequent consumption of cariogenic beverages in the daytime decreased significantly but only by a small amount, however five other nutritional behaviours, fluoride use and tooth brushing remained unchanged. These results suggest that primary care providers can be trained to perform SC-OHE that improves parental oral health knowledge; however it appears that the intervention alone was insufficient for influencing crucial oral health behaviours in such a way that prevents ECC.

Vichayanrat et al (38) reports the effects of a pilot multi-level oral health intervention on caregivers' oral health practices and their determinants. The effectiveness evaluation design was quasi-experimental, pretest-posttest with a comparison group. The intervention comprised three components: home visits by lay health workers (LHWs), enhancing oral health education and services at health centres, and community mobilization. The intervention was developed based on the Social Ecological Model (SEM) and targeted factors at intrapersonal, interpersonal, organizational and community levels. The one-year intervention demonstrated a positive effect on tooth brushing, using toothpaste, and fluoride supplements, however other behaviours remained unchanged (eg bottle feeding and snack consumption among children). The intervention also had no effect on dental caries, with caries increasing in both groups. Post-intervention the knowledge, attitudes, outcome expectations, and self-efficacy of caregivers were significantly increased in the experimental group. This group also reported receiving greater social support by LHWs and health centre staff than those in the control group. The program also appears to have had an impact on integrating oral health services at health centres and community participation in children's oral health. These findings support the important influence of multi-level factors on oral health. At the organizational level, changes in health centre services were thought to explain the effects on caregiver behaviour in increasing tooth brushing and use of fluoride supplements. This was demonstrated through both caregiver reports on the support they received and also the direct effect of caregiver intrapersonal factors and their behaviour. However, the authors identify that creating organisational change is difficult and requires support from the community and administration, and that the involvement of local organizations is critical to maintain oral health activities at health centres and in communities. They also identify the importance of policies to regulate and reinforce oral health preventive services at health centres

**Summary:** Professional training can effectively increase knowledge and confidence and in some circumstances change practices and intentions of both those who have been trained and also the clients of the professional services. The ability for professional training and capacity building to create organisational change requires support and engagement both within the organisations and from community members and local organisations. The education sessions do not need to be delivered by dental professionals.

#### *Dental managed care program implemented through public health service (44)*

Milgrom et al (44) examined the influence of a community-based public health program to provide a dental home for women covered by the Oregon Health Plan (Medicaid) in Klamath County, Oregon USA. In this small study, children in Klamath and comparable non-program counties were examined in their second year of life to determine if benefits accrued to the offspring of the mothers in Klamath County. Two groups of children were examined: one group (the intervention group)

comprised a sample of offspring of mothers in Klamath County who were eligible for the counselling program and received dental care during pregnancy or within two months of delivery. The second group of children comprised a sample drawn from other comparable non-program counties. The results demonstrate significant effects of the program, with a higher proportion of children caries free and fewer teeth with any decay in the intervention sample. This provides evidence that intervention during pregnancy can benefit the child. Currently a randomized clinical trial involving four additional counties in Oregon is underway which will provide more definitive conclusions to be drawn.

## Children and adolescents

### *Oral health screening, treatment and education (14, 21)*

Amalia et al (14) assessed the effectiveness of a school based dental programme (SBDP) in controlling caries by measuring the relationship between the SBDP performance and caries experience in children aged 12 years in Yogyakarta Province, Indonesia (cross sectional survey, n=1906 children participating in the SBDPs, four SBDPs were chosen by good and poor performances in urban and rural areas). The SBDP provides dental screening and treatment, oral health education for children and training for teachers. Children participating in good performing SBDPs had lower caries experience than children in poor performing SBDPs. However, path analysis revealed that the performance of SBDP had no relationship with caries experience and shows that the difference of caries experience in SBDPs was most likely caused by social factors such as residence, mothers' education and gender rather than by relation to oral health service activities.

The report by Simmer-Beck et al (21) assesses a comprehensive preventive oral health program established between the University of Missouri–Kansas City School of Dentistry, the Olathe School District and an Extended Care Permit I dental hygienist to provide school–based services to disadvantaged children using the community collaborative practice oral health model and tele–dentistry. The “Miles of Smiles” clinic was assembled in 4 elementary schools using portable dental equipment and dental hygiene students supervised by a dental hygiene faculty member provided comprehensive preventive oral health care (prophylaxis, radiographs, sealants, fluoride varnish, oral health education and nutritional counselling) to unserved and underserved children. Through the Miles of Smiles program, 63% of the children who had active decay were referred to a local dentist, care was provided to a total of 339 of the 389 children who were enrolled during the first year of the program (2008 to 2009 academic year) and 11% of the children had begun the transition process of seeking restorative care at a safety net clinic or from a local dentist. This multifaceted school based oral health model, using dental hygienists with expanded scopes of practice to provide preventive oral health services and referrals, can overcome barriers and help reach vulnerable children that desperately need oral health care.

**Summary:** Oral health services delivered in school settings and accompanied by educational strategies was associated with better oral health outcomes for children, although the direct relationship between the intervention components and the outcomes was not always clear and may be related to social and economic factors.

*Oral health education delivered by a professional or via lectures in the curriculum, slideshow, DVD with and without follow up, support or counselling (8, 9, 13, 15, 23-25, 28, 66) and via SMS(29)*

This 36 week duration study reported by Shenoy and Sequeira (23) was conducted in Mangalore, India to assess if school dental health education (DHE) delivered at three-week intervals for 18 weeks was more effective than DHE delivered at six-week intervals for 18 weeks in improving oral health knowledge, practices, oral hygiene status and gingival health in 12-13 year old school children. Six schools were randomised into crossover design and at each time point two schools received intervention and four were comparison (study included 415 children belonging to two different socio economic classes (class I and V). Findings suggested significant reductions in plaque and gingival score in intervention schools and these were not influenced by the socio economic status. Evaluation of oral health knowledge showed highly significant changes in intervention schools and more significantly in schools receiving more frequent interventions. The socioeconomic status influenced the oral hygiene aids used and the frequency of change of toothbrush. Controls showed no significant changes throughout. The authors concluded that that school DHE program conducted at three-week intervals was more effective than that conducted at six-week intervals in improving oral health knowledge, practices, oral hygiene status, and gingival health of schoolchildren. However, it was inferred that further studies are needed to confirm the long term value of improvements observed as improved oral hygiene in children may have existed only during the program or for a short period thereafter.

Tubert-Jeannin et al. (24) report on a school based oral health promotion program to reduce oral health inequalities. The program was implemented in 2005 involving 3-5 year old children with high to moderate caries levels, attending schools situated in deprived or semi-deprived areas in the city of Clermont-Ferrand, France. This study evaluated the impact of this school based oral health promotion programme on the dental status of 5-year-old children in 2009; the changes in children's dental status between 2003- 2009; and the impact of the oral health promotion program on school children since 2005 (the study included 5 year old children (n=478) attending twenty one schools). Results showed that dental health of 5-year-old children improved in four deprived schools benefiting from the OHP program compared with other schools with no program. The improvement in the dental status in these schools was not directly related to the duration of participation in the OHP program. Findings suggest that there were important variations regarding the time trend of dental status from one school to another during the study period. In schools with the OHP program, dental status improved or stayed stable irrespective of the school deprivation area. Except for the number of increase in filled teeth, no major differences were observed between 2003 and 2009. Results showed that dental status appeared to have worsened among preschool children between 2003 and 2009, particularly in schools with no program. Authors note that although the dental status improved in four schools, the OHP program may not have reduced inequalities. Individual school's deprivation, social characteristics and individual household indicators were more important determinants of oral health outcomes.

This study by Anttonen et al (15) was conducted in Finland and examined the effect of a dietary intervention lasting one academic year on schoolchildren's (n=739) eating habits and consequently on laser fluorescence (LF) values of their teeth. The study compared the association of LF values of the teeth of those children who were in the dietary intervention only group with those who were in the dietary intervention group and received oral hygiene instruction (OHI) and with those in the control group. The one year dietary intervention had favourable effects on certain eating and drinking habits with notable improvements in consumption of water instead of juice/soft drink for quenching thirst at school and reduced sweet consumption. Neither the dietary nor oral hygiene intervention had a clear effect on teeth mineralisation as measured by LF, although some remineralisation was seen in the teeth of children attending schools with dietary intervention only.

Chachra et al (13) evaluated the effectiveness of delivering preventive oral health strategies through dental and non-dental professionals to improve the oral health status of school children (n=972, age group 5-16years Chandigarh and Panchkula, India). Four schools were randomised to no intervention and intervention groups. The intervention groups received oral health preventive package and oral health education kit through direct intervention by dentist, teacher trained by dentist and teacher trained by members of a social organisation. Evaluation of the program showed caries reduction in all groups with most reduction in the dentist intervention group. Significant improvements in knowledge, attitude and oral hygiene practices were observed in all groups. Direct intervention delivered through dentist was most effective compared to interventions delivered through non-dental personnel. Although the intervention delivered by the dentist was most effective, the sustainability of dentist led oral health preventive approach in the long run is questionable.

Children (n=600, grade 1) in four health promoting schools in rural Uganda participated in an evaluation reported by Macnab and Kasangaki (8) which included year one pre-intervention and annual end-of-year quantitative and qualitative measures. The intervention components included inclusion of health topics by teachers in regular classroom activities; health education delivered by an university team to reinforce key educational concepts; and daily in-school tooth brushing to develop healthy practices. Findings at the end of four years showed an increase in brushing frequency, improved oral health knowledge, oral hygiene practices and children complained of less bad breath, pain and absences from school due to emergency dental treatment. On a school level, a change in the schools health culture, children sharing new health knowledge and advocating for health practices learned and an evolution of health promotion activities was observed. This program demonstrates that the school based oral health promotion model provided opportunities for communities to take ownership of their health problems and increased their confidence to take care of their problems.

The study by Tolvanen et al 2010 (9) examined the associations between changes in tooth brushing behaviour, knowledge and attitudes related to oral health in children (n=1691, 11-12 year old, Pori, Finland) who were exposed to two different interventions, either to oral health promotion (OHP) alone or to both OHP and experimental regimen of randomised clinical trial (RCT). Children in the experimental group were offered an individualized regimen for caries control, whereas those in the control group received the ordinary dental care provided in Finland for schoolchildren. Data was collected before (Fall 2001), during (spring 2003) and after (spring 2005) the OHP and RCT. Tooth brushing frequency, oral health related knowledge and attitudes improved among the same children during the study, with the changes usually taking place in the same time-period. That is, if knowledge improved during the first time period of the study, attitudes and behaviour also tended to improve during the same time period. At different time periods different children's tooth brushing and oral health-related knowledge and attitudes improved. The strength of this study is the large sample size and long follow-up periods. The study findings support the theory underlying the knowledge-attitudes-behaviour model of changing behaviours among children.

The study by Tolvanen et al., 2010 (25) assessed the individual stability and stage transitions of behaviour among school children (n=1691, 11-12 yrs, Pori, Finland) who were exposed to two different interventions, either to oral health promotion (OHP) alone or to both OHP and experimental regimen of randomised clinical trial (RCT). Behaviour variables were dichotomised into good and poor and behaviour data was assessed for tooth brushing with fluoride toothpaste, use of xylitol products, soft drinks, candies, and sports drinks. Children who were exposed only to oral health promotion, stage transitions for tooth brushing, use of xylitol products, and consumption of candies, soft drinks, and sports drinks showed that, on average, children improved their behaviours. In general, girls had better behaviour than boys and girls with poor behaviour tended to improve their behaviours more than did boys with poor behaviours.

The study by Binkley et al (66) assessed the effects of a dental care coordinator intervention on increasing dental care utilization by Medicaid-eligible children who had not been receiving routine dental care, compared with a control group (n=136 children enrolled in Medicaid aged 4 to 15 years who had not had Medicaid claims for 2 years, were randomly assigned to intervention or control groups for 12 months). Children and care givers in the intervention group received oral health education, assistance in locating a dentist and support in scheduling and keeping dental appointments by dental care coordinators through home visits or phone calls. Regardless of whether the services were provided in person or telephone, dental utilisation rate was significantly higher in the dental care coordinator intervention group compared with similar children who received routine Medicaid member services. Maximum effect was observed among children living in households well below the Federal poverty level. Although such interventions prove to be expensive, the results add to the knowledge of proven interventions to reduce oral health inequalities.

D’Cruz et al (28) assessed the effectiveness of an oral health education (OHE) programme on oral hygiene knowledge, practices, plaque control and gingival health of school children (13- to 15-year-old, Bangalore, India) Three schools were randomly assigned to intervention group I (n= 141) which received OHE lecture through power point presentation, intervention group II (n= 143) which received OHE lecture through power point presentation along with tooth brushing and a control group (n= 284 ) which received no intervention. Nine months post intervention showed large improvements in oral hygiene knowledge, practices with substantial reductions in plaque index and gingival scores in both experimental groups. It was observed that intervention group II performed better compared to intervention group I and despite control group not receiving any intervention, showed some improvement in oral hygiene knowledge and practices. It can be noted that active engagement of school children with OHE reinforcement improves oral hygiene knowledge and practices.

Communication between patients and health care providers can take various forms, this study by Sharma et al (29) in Belgaum, India compared the effectiveness of two media approaches, text messages and pamphlets containing oral health messages in imparting health education to mothers of preschool children (mothers and children randomised into two groups; pamphlet group n=72 and text message group=71). There was a small effect on plaque status in the children studied, however significant improvements were noticed in oral health knowledge, attitude and practices in both groups. Larger improvements were observed in the text messaging groups compared to pamphlet group. Due to a relatively small sample comprising of preschool children and their mothers, the study does not sufficient power in establishing the effectiveness of this intervention.

**Summary:** A range of school based behavioural interventions have been trialled with mixed results. Components included education, tooth brushing, mouth rinsing and flossing programs, and the components have been delivered by various professionals and in a variety of modes. Modest impacts on a range of practices, behaviours, knowledge and skills have been reported although the sustainability of impacts and feasibility of continued or larger scale implementation is questionable in some cases. Importantly where impacts against SES have been measures, the important influence of social and economic factors on outcomes has been demonstrated.

### *Motivational Interviewing and goal setting (16)*

The Pakpour et al (16) study examined the validity of the three factor structure (intention, action and coping planning) and predictive power of the theory of planned behaviour measures of action planning and coping planning for tooth brushing behaviour (adolescents n= 721, Iran). It was noted that intention to brush, perceived behaviour control, action planning and coping planning were

associated with increased tooth brushing behaviour. Female adolescents brushed their teeth more often and significantly so, than male adolescents. Testing theory of planned behaviour, attitude, intention and planning would lead to improvement in brushing habits over time. The study relied on self-reported measures on tooth brushing habits which could have introduced bias.

### *Smoking prevention program education (22)*

Smoke- Free Class Competition (SFC) is a school based smoking prevention program implemented in Europe since 1997 with core components including commitment not to smoke, contract management and prizes as rewards. Isensee and Hanewinkel (22) reviewed and meta-analysed randomised controlled trials and controlled trials with follow up assessments that investigated the efficacy of SFC on current smoking at latest follow up in students (11-14 year olds) participating in SFC as compared to students who did not. A systematic review of the articles with no language or publication restrictions was carried out using Medline and the Cochrane library. Study types included controlled trials and randomised controlled trials with pre- and post-test with at least one follow up at least 6 months. Five studies from three European countries (Finland, Netherlands and Germany) with overall 16,302 students and covering follow-up periods up to 24 months were included in the meta-analysis. The meta-analysis showed that there was some evidence that SFC contributed to smoking prevention in adolescents (significant pooled risk ratio of 0.86 on current smoking at follow-up) and participation of one class in the competition helps prevent smoking in about 1 student for up to 2 years (number needed to treat was 23.4 in the meta-analysis of the five studies). The main limitations noted were the meta-analysis combined data across five different studies, the study population, design, follow up period, outcome assessment and implementation would have been different in each case. The studies relied on self-reports without biochemical validation and the analysis did not estimate the risk of bias and various forms of operationalisation, follow-up period, baseline rates and potential confounders.

### *Weekly oral health programs integrated into school program (eg Weekly Fluoride Mouthrinse Program (7), tooth brushing program (8, 11, 14), curriculum education delivered by teachers (8)*

Divaris et al (7) examined the impact of a school based weekly fluoride mouthrinse (FMR) program in preventing caries and determine if its effectiveness varied by school level caries risk (clinical and parent-reported data for 1,363 children in grades 1 through 5 from a probability sample of North Carolina (NC) schoolchildren, program participation was quantified using FMR years. For, caries risk estimate at program entry, children were matched with the North Carolina kindergarten surveillance data 2003-04). The overall caries preventive effectiveness of each FMR year was associated with weak reduction of caries prevalence in primary and mixed dentition. However, the study found a trend toward a larger caries preventive benefit among children in high-risk schools compared with those in low risk school. Although the study showed a sizeable FMR effect for long term participation in the high risk group, only a small number of children in the sample actually participated for the maximum exposure time. This study adopted a novel approach of matching public health surveillance data with large population survey to define risk strata.

Gowda (11) evaluated the short term impact of school based tooth brushing program implemented by teachers in a non- fluoridated, highly deprived, high risk rural Maori community (n=61 Tamariki children, 5-13 year old, Opononi, New Zealand). Data was collected at baseline, 6, 18 and 30 month intervals; clinical examinations and oral health education sessions were conducted by dental therapists and dental assistants along with teacher supervised toothbrushing sessions. Children who participated in the program showed improvement in dental cleanliness, oral hygiene and health of the gums along with substantial reduction in plaque and gingival index. The program helped promote routine toothbrushing using adult strength fluoride toothpaste however the study did not

collect caries prevalence data which limited its ability to show the beneficial effects of tooth brushing using fluoridated toothpaste on dental caries.

**Summary:** Taken together with the summary for behavioural school based interventions above, integrating mouth rinse and tooth brushing programs into schools can have positive impacts

*Professional training for teachers, school staff and school nurses in oral health and oral hygiene instruction (14, 24, 26)*

Nammontri et al (26) evaluated the effect of a school based, teacher delivered intervention to enhance sense of coherence (SOC) on oral health related quality of life (OHRQoL) (Cluster randomised trial n=257 children 10-12 years old, n=12 primary schools Khonkaen, Thailand; study assessed OHRQoL using child perceptions questionnaires (CPQ) and SOC with the 13 item SOC scale). Teacher delivered intervention sessions focussed on child participation and empowerment using didactic teaching, discussion, activities, games and working on healthy school projects. This school based intervention enhanced SOC and CPQ scores representing better OHRQoL at two weeks after the intervention and 3 month follow-up. Children in the intervention group reported greater SOC and lower impacts of oral health on their daily lives compared to children in the control group. The intervention promoted oral health by embracing a wide range of strategies including positive oral health education by facilitating components of SOC, improving child self-esteem, self-efficacy, coping strategies and empowering children to create healthy environments where they could adopt favourable behaviours.

*Oral health promotion integrated into a broader health promotion and prevention program implemented in schools (10)*

Muirhead and Lawrence (10) compared school oral health status of elementary schools participating and not participating in the “Healthy Schools” recognition program in 2007-08 in York region, Ontario and examined the effect of neighbourhood socio economic factors (n=243 elementary schools). Schools participating in “Healthy schools” program had significantly lower percentage of children with  $\geq 2$  decayed teeth and children requiring emergency dental treatment compared to non-participating schools. School participation/neighbourhood socio-economic factors interactions showed that a significantly lower percentage of children in low-income “Healthy Schools” had preventive and emergency dental treatment needs and  $\geq 2$  decayed teeth than in low-income non-participating schools. The study did not find differences between school oral health outcomes in schools participating in healthy-eating activities or any specific health-related activity, however better school oral health outcomes were observed for schools that participated in three or more health-related activities suggesting that the actual health-promoting school environment (reflected by the number of health-related activities) may be more important than any specific health-related activity.

### **Aboriginal & Torres Strait Islanders**

*Northern Territory Emergency Response (NTER) Child Health Check Initiative (CHCI) and Closing the Gap Program. Dental check and follow up services (preventive and treatment), broader preventative oral health promotion and education programs implemented in children’s settings and health services, training in oral health for health professionals (12)*

This report by Australian Institute of Health and Welfare (12) reports on the Closing the Gap (CtG) in the Northern Territory National Partnership Agreement (NPA) between the Australian and Northern Territory governments, whereby dental services were established in communities in prescribed areas of the Northern Territory. Subsequently, six Aboriginal Community Controlled Health Organisations (ACCHOs) were funded by the government to provide dental services to eligible children including children who had received referrals at their child health checks (CHC) through outreach teams of dental professionals. The multi component oral health promotion program included application of whole mouth fluoride varnish, school based tooth brushing programs, community based oral health education including ‘Lift the Lip’ assessment, and provision of dental services to children. Following program implementation, the proportion of Indigenous children with a dental referral from CHC that received a dental service can demonstrate how well services are reaching those in most need. Over 60% of children who had a dental referral from their CHC have since received a dental service. The highest proportion of children that received a dental service was in Central Australia (71%), while it was lowest in Arnhem (55%). A large component of the services provided was oral health education (60%). Treatment for previously untreated caries was provided to 52% of children who had a dental service, while 26% were given a dental hygiene treatment, including plaque removal and calcification. With approximately 2,368 children requiring follow-up care, 66% (1,570) were seen by a dental health professional. Although the program is achieving its best, the high mobility of Indigenous children in these areas presented a great challenge to provide follow-up services

#### *School-based treatment services, health promotion and education (19)*

Parker et al (19) undertook an initial evaluation of the impact of an Aboriginal Children’s Dental Program (ACDP) which was established to address the oral health needs of aboriginal children in Port Augusta, Australia. The imperative for the culturally appropriate service arose from concerns of underutilisation of the mainstream School Dental Services (SDS) by the Aboriginal children. The ACDP included school-based health promotion programs and education sessions offered jointly by the Aboriginal health workers, dentists, dental students and dieticians comprising of a variety of health promotion components, demonstration of healthy cooking and snack alternatives, importance of oral health for pregnant women, people with diabetes and heart disease and dental service promotion to ensure children were familiar with health staff, the concept of dental visits and treatment. The success of this culturally appropriate service is demonstrated by the increased enrolments and increased participation rates of Aboriginal children, compared with figures under the mainstream only service. Just over half (54%) of the Port Augusta-based Aboriginal child population was enrolled in the mainstream SDS prior to implementation of the tailored ACDP, and after three and a half years of program’s operation, 70 percent of eligible children were enrolled, examined and recall assigned. Furthermore, the provision of transport for children to and from school to the dental service was effective however parents and carers were less likely to have accompanied children when transport was offered. This limited the opportunities for dental staff to provide oral health information to parents or guardians that encouraged preventative oral health practices at home.

*Community-based, multi-component interventions which include preventive oral health strategies (fluoride varnish, sealants) parent education, professional training, integration into children settings and services (41, 42)*

Roberts-Thomson et al (42) evaluated the impact of a community-oriented primary health care (CPHC) intervention on oral health behaviours of Indigenous preschool children living in remote communities of Australia's Northern Territory (community clustered randomised controlled trial, set in 30 remote Indigenous communities, 15 intervention communities received comprehensive primary health care intervention and 15 control communities did not, children were aged between 18-47 months). Children from intervention communities received a total of five visits which included oral assessments, screenings, fluoride varnish applications, oral health advice and health promotion education at an individual, family and community level. The study found no difference in either the self-reported oral health behaviours or clinical measures of oral hygiene between remote Indigenous communities who received a CPHC intervention and those that did not. Furthermore, the study did not attempt to counteract television advertising or other mass media influences that are very pervasive in remote Indigenous communities. Although the intervention was effective in reducing dental caries, the caries-preventive benefits of the intervention were largely due to the clinical application of varnish rather than change in the health behaviour. However, varnish alone cannot prevent caries without change in health behaviours as 90% of children developed caries over the two year period, both in intervention and control groups. The inability of the CPHC intervention to affect self-reported behaviour change at an individual level may be related to the overwhelming disadvantage Indigenous communities and children experience in terms of health and social circumstances.

Slade et al (41) examined the impact of a community-oriented primary health care (CPHC) intervention in reducing dental caries in pre-school children in remote Indigenous communities of Northern Territory (two year community clustered randomised controlled trial, set in 30 remote Indigenous communities and children aged between 18-47 months, 15 intervention communities received fluoride varnish was application to children's teeth, water consumption and daily tooth cleaning with toothpaste were advocated (baseline 666 children were examined; 543 of them (82%) were re-examined 2 years later). This preventive dental program of twice-yearly fluoride varnish application combined with community health promotion significantly reduced the average number of tooth surfaces, per child, that developed caries in a 2-year period compared to the level observed in control communities. The intervention reduced net d3mfs caries increment by 2.3-3.5 surfaces, per child. This represented 24–36% fewer tooth surfaces per child that developed dental caries over 2 years. The study promoted children's toothpaste which contains less concentration of fluoride (0.45 mg/g of fluoride), and given the evidence that adult strength fluoride (around 1 mg/g of fluoride) toothpaste is beneficial for high-risk children, there would have been further changes in caries rate in children by using adult strength fluoride toothpaste. However, the general shortage of dental treatment services for preschool children in these remote Indigenous communities emphasises the urgency and need of further preventive programs to help reduce the burden of dental disease.

**Summary:** Increasing access to fluoride and dental services through multi-component interventions improved the oral health of children.

## **Culturally and Linguistically Diverse communities**

### *Health promotion interventions related to smoking cessation, physical activity and healthy eating (51)*

A mixed methods evidence synthesis by Liu et al (51) identified, appraised and interpreted health promotion interventions for smoking cessation, increasing physical activity and improving healthy eating among ethnic minority groups (African, Chinese and South Asian origin populations). Review methods included mixed methods research that identified and separately analysed theoretical conceptual literature on adapted health promotion interventions on health topics; systematic reviews of adapted health promotion interventions for the ethnic minority populations; relevant primary studies investigating the effectiveness of adapted health promotion interventions and qualitative interviews. A diverse range of sources from 1950 to 2009 were searched and realist synthesis drew on data from seven group discussions with research and health service users attending specific conferences; 15 UK guidelines; 111 international systematic reviews; a review of 12 theoretical papers, seven systematic reviews and 107 empirical studies on adapted interventions; and a further 26 qualitative interviews to identify, test and explore realist insights of how adapted interventions work or do not work. Results showed that individual-centred behavioural approaches dominated the body of evidence identified. The strongest and most consistent evidence of effectiveness was for smoking cessation interventions, which tended to be individual-level strategies, such as resource provision and provider interactions, aiming to increase uptake of and compliance with pharmacological interventions. In contrast, the minimal evidence on activities and strategies associated with promoting physical activity and healthy eating were more likely to draw on population-level strategies, such as advocating environmental changes. It was noted that this difference in focus was related to the differing needs of interventions attempting to reduce a particular behaviour for a relatively short period of time (e.g. tackling the nicotine cravings associated with smoking cessation) compared with interventions seeking to stimulate particular behaviours (i.e. increasing physical activity and changing healthy eating) over a sustained period of time. None of the guidelines or systematic reviews reported sufficient evidence to determine whether recommended interventions were more or less effective for ethnic minority populations. The study was unable to determine from the evidence synthesis whether interventions of proven effectiveness and recommended for the general population are equally, more or less effective for ethnic minority populations.

## **People with special needs**

### *Oral health screening, risk assessment, treatment, education, supervised tooth brushing, flossing (63) and fluoride application and fissure sealants (20)*

Yuen et al (63) evaluated the effect of a multi-faceted oral health intervention for improving gingival health among adults with systemic sclerosis (SSc) (n=48 patients, aged >18 years old, USA). Intervention group received adaptive oral hygiene devices and orofacial exercises and control group received usual dental care through manual tooth brushing and dental flossing). Both groups showed significant reduction in gingival index scores at 6 months. Compared to the control group, the intervention group showed a significant and larger reduction in GI score. The multifaceted oral health intervention using powered toothbrush and adapted dental floss in conjunction with orofacial exercises showed an 8% reduction in gingivitis and was found to be superior to the usual dental care in improving gingival health at 6 months among adults with SSc. The overall improvement in the gingival index scores of the intervention group at 6 months was 20.8%. Results support the use of adaptive devices and orofacial exercise to improve gingival health in adults with SSc compared to the use of manual tooth brushing and finger-held flossing.

Patil et al (20) assessed and evaluated a preventative program based on caries risk among mentally challenged children using the Cariogram model (n=54 children, 7-17 years old with mild to severe mental disability, Maharashtra, India). The risk assessment and risk management strategy comprised of systematically identifying various caries risk factors; analysing the risk factors to generate a caries risk profile; implementing the risk based preventive program and assessing the effectiveness of the program. The extensive 10 month preventive program which included fluoride program, diet counselling, health education, modification of oral hygiene habits, oral prophylaxis and restorative care contributed to a significant reduction in scores for *Mutans streptococci* and *Lactobacilli* count, frequency of sugar intake and plaque amount. The study noted a 57% increase in the number of subjects in lowest risk group for avoiding caries. The preventive program was effective in improving the caries risk factors and increasing the chance to avoid future caries.

*Dental clinic established in refugee camp, health workers trained in oral health, oral hygiene, and emergency dental care (43)*

Roucka (43) evaluated the sustainability of a training course in emergency dental care and health promotion developed and taught by a team of dentists from the United States to refugee camp health-care workers in two long-term refugee camps in Western Tanzania (establishment of a small dental clinic and two week training course in emergency dental care and health promotion to 12 refugee camp dental workers on community based dental health promotion). Evaluation of this program showed that at least some of the oral health needs of both camp populations as well as a small segment of the native population in the area were being addressed and ongoing. Various treatments were delivered successfully though the vast majority of patients (95.5%) received dental extractions and the incidence of post-operative complications were negligible (>1%). Patient visits were steady over time and a referral system was implemented for complex cases. This dental programme has been self-sustaining and provides some access to care where none existed previously.

*Oral hygiene integrated into the daily care of nursing home residents, nursing staff and aides trained in oral health and oral hygiene, resident receive individualised oral health assessments and care planning(45, 47)*

De Visschere et al (45) evaluated the long term effects of implementing an oral hygiene protocol on residents in long term care nursing home facilities in Belgium (Randomised controlled trial, n=2585; 36 nursing homes participated; intervention groups had an oral hygiene protocol implemented that aimed to integrate oral hygiene into the daily care of the residents and control groups continued to perform oral hygiene as usual). The results showed a positive short term effect of the intervention on denture plaque and a positive long-term effect on dental plaque. The implementation of the oral hygiene protocol in nursing homes resulted in less dental and denture plaque, but the obtained plaque levels were statistically and clinically insignificant. As long as the resident was able to adequately clean his or her own natural dentition, the problem of oral hygiene seemed minimal. But as soon as the resident became more vulnerable and care-dependent, oral hygiene of natural dentition failed rapidly and had to be taken over by the care givers. The actual final dental plaque levels (>1.5) and denture plaque levels (>2) reflected the large proportion of frail elderly people who were unable to brush their teeth or dentures adequately and who did not receive assistance. Yet, caregivers are generally able to clean residents' dentures but do not have sufficient knowledge, skills and experience to adequately clean residents' natural dentition which was mentioned during feedback moments in the intervention homes.

Le (47) assessed the efficacy of a mouth care education program presented to personal support worker (PSW) to improve the oral health of residents of long term care (LTC) homes in Toronto, Canada (single blind quantitative study, PSWs in the intervention group had their mouth care knowledge assessed at baseline (pre-test) prior to mouth care education, and then after the education (post-test) and reassessed at the 6-months follow-up; PSWs in the control group had their mouth care knowledge assessed at the conclusion of the study, prior to receiving their mouth care education). PSWs this study significantly increased their mouth care knowledge after receiving mouth care education. Their 6-month knowledge was not significantly different from their post-test knowledge. The results of this study show that mouth care education is effective in improving the mouth care knowledge of LTC support staff.

**Summary:** The long term impacts of the programs implemented in nursing homes are unclear although short term improvements in oral care and professional knowledge were demonstrated.

#### *Individualized oral hygiene instruction, with fluoride varnish and other preventive strategies (46)*

Tan et al (46) compared the effectiveness of four different methods of preventing new root surface caries in residential nursing homes in Hong Kong (n=306 elders were allocated to one of the four groups which included (1) only giving individualized oral hygiene instruction (OHI) every 3 months; (2) OHI and applications of 1% chlorhexidine varnish every 3 months; (3) OHI and applications of 5% sodium fluoride varnish (SFV) every 3 months; and (4) OHI and annual applications of 38% silver diamine fluoride (SDF) solution). The results showed that SDF solution, sodium fluoride varnish, and chlorhexidine varnish were more effective in preventing new root caries than giving OHI alone. These low cost treatment methods, in addition to improving oral hygiene, does not require expensive equipment or support infrastructure and can be applied by trained non-dental professionals, such as primary health-care workers to prevent the development of root caries in institutionalized elders.

#### *Oral health education, motivational interviewing and support (67)*

Bonevski et al (67) assessed the feasibility and acceptability of a novel, low-cost, telephone delivered program focussing on tobacco smoking and other health risk behaviours among homeless people (pre-post study, n=12 participants >18 years, receiving accommodation support from a homelessness outreach centre participated in a 'Phone for Health' program which provided personalised counselling about smoking cessation/reduction, fruit and vegetable consumption, alcohol use, physical activity and sun protection; clients and staff completed follow-up quantitative surveys, and clients completed qualitative interviews). Following program implementation, most participants reported some type of health behaviour change and participants who completed the program reported high levels of acceptability Telephone delivery of smoking cessation and other health behaviours intervention was acceptable and feasible. Due to a lack of fixed and permanent address, homeless people are a difficult to reach accessing participants through homelessness services and supported accommodation appears to be one of the most effective methods of involving them in health programs and research.

#### *Teacher supervised tooth-brushing program (27)*

Stefanovska et al. (27) evaluated the impact of a six months tooth brushing intervention program among mentally challenged children (n=100 school children, 9-16 years, teacher supervised and

assisted tooth brushing along with dental team visits). The tooth brushing program dramatically reduced the dental plaque, level of gingival inflammation and improved oral hygiene of children. It further encouraged and motivated children to brush their teeth. Over the long term, tooth brushing program proved cost effective and reduced the number of dental visits.

## Workplace settings and adults

### *Behaviour change interventions:*

#### *Peer-led (49)*

The systematic review by Webel et al (49) analysed 25 different studies to assess the effectiveness of peer-based interventions on health related behaviours in adults (participants older than 18 years, experimental studies, with no language or time restrictions, were searched between August and November 2007, using MEDLINE, CINAHL, EMBASE, PSYCHInfo, the Cochrane Library and grey literature). The review found that peer-based interventions facilitated important changes and significant effects in health related behaviours in particular it significantly aided in smoking reduction. However, the evidence was mixed, possibly because of the heterogeneity in methods, dose, and other variables between the studies. Most of the outcomes were determined by self-report. The nature of behaviour change renders it difficult to efficiently assess change by other methods, but self-reporting should be complemented with a direct measure of behaviour change whenever possible as these are desirable health outcomes that will positively affect the health of individual participants, their families, and the public health care system.

#### *Motivational interviewing and oral health education (52, 60)*

Jonsson et al (60) evaluated an individually tailored oral health educational program (ITOHEP) on periodontal health compared with a standard oral health educational programme (n=113 participants, Sweden; randomized, evaluator-blinded, controlled trial, randomly assigned participants to two different active treatments, ITOHEP was based on cognitive behavioural principles and motivational interviewing, control group was standard oral hygiene education (ST)). Following treatment, the ITOHEP group had lower plaque and bleeding on probing scores than the ST programme group. More individuals in the ITOHEP group reached a level of non-surgical treatment success and no difference between the two groups was observed for pocket closure and reduction of periodontal pocket depth. ITOHEP intervention in combination with scaling is preferable to the ST programme in non-surgical periodontal treatment.

An exploratory study conducted by Suresh et al (52) examined the effectiveness of an action-control behavioural intervention on adherence to dental flossing in patients with periodontal disease (n=73, Kuwait, single blind prospective trial) through responses to a standardized self-report measure. Participants were classified either as motivational (i.e., not ready to change) or volitional (i.e., contemplating change) with regard to dental flossing). Flossing frequency, dental plaque, and bleeding scores were measured before and at 4 weeks post intervention. Results showed that dental patients allocated to a simple self-monitoring intervention to improve dental flossing, reported more flossing and presented with reduced plaque and bleeding scores four weeks post intervention regardless of their behavioural stage of change. Flossing frequency, dental plaque, and bleeding scores improved in both stage-matched and stage-mismatched patients.

**Summary:** Measures associated with gum health were modestly improved through the use of motivational interviewing and educational interventions in adults.

### *Modified Cognitive Behavioural Therapy (CBT) model (56)*

Fjellstrom et al (56) tested a modified cognitive behavioural therapy (CBT) model as a method to improve adherence to oral hygiene instructions (n=4 participants, 20-30 years old divided into control group (traditional instructions) and CBT group (interventions group)). Results showed difference in plaque index (PI), gingival index (GI) and gingival bleeding index (GBI) between the groups. Participants in the CBT group showed a clear improvement in PI, GI and GBI levels compared to the control group. CBT group also showed increase in their knowledge and awareness about oral health. Although this pilot study showed an impact of the CBT on oral health improvements, the sample size was relatively small to demonstrate any significant outcomes.

### **Good Practice Case Study: North Carolina (54, 55)**

In the late 1990s policy makers in North Carolina recognised the urgency for addressing a growing need and looming public health problem in their community. North Carolina ranked close to the bottom among states in the supply of dentists per population and in their participation in Medicaid. In 2000, they developed and began the implementation of a state-wide plan for implementing the 23 specific recommendations suggested by the North Carolina Institute of Medicine (NCIOM) taskforce report for improving access to oral health care. The recommendations were organized into 5 general strategies:

- increasing dentist participation in the Medicaid program
- increasing the dental workforce supply
- expanding access to preventive dental services for young children
- expanding access to special care dentistry
- educating Medicaid recipients about the importance of ongoing dental care and removing nonfinancial barriers to using dental services

The North Carolina Plan involved implementing a comprehensive and innovative range of oral health initiatives for young people and improving their health outcomes. The initiatives focus on access to oral health care; assessing, educating, and building the dental workforce; new practice models and trends; insurance innovation; and patients with special needs.

A key plank to this program was Into the Mouths of Babies (IMB), a program that reimburses medical providers for dental screenings, parent counselling, and the application of fluoride varnish in children from birth to 3.5 years of age.

The following impacts have been identified after implementing this program for the past decade, mostly related to improving access to preventive oral health services for Medicaid children (54).

- Only 22% of children enrolled in Medicaid received any dental services in 2000. By 2010 that number had more than doubled to 48%, when approximately half a million children received some type of dental care.
- During the past decade, Medicaid participation rates among dentists in North Carolina increased from 16% to 45%. A decade ago, as many as 40 counties lacked a Medicaid enrolled dentist. Now, only 4 counties lack a dentist who submits claims for reimbursement to the program.
- According to the North Carolina Division of Medical Assistance, North Carolina ranked sixth among state Medicaid programs in 2009 for children who used preventive services and ninth for

children who received any dental services—a dramatic change in ranking from 44th place in 1999.

- The IMB program has reduced dental caries-related treatments such as restorations, nerve treatments, and tooth extractions among children enrolled in Medicaid who are 6 months to 6 years of age.
- The amount of dental caries that has occurred in the first 5 years of life for children in North Carolina has decreased, and the amount that is treated has increased, from slightly less than 50% to 64%

In addition, the oral health surveillance program for pre-school aged children (5-year-old children attending public schools in the state each year), reveals trends and effects from the exposure to interventions targeting pre-school aged children.

**Current activities and future directions:**

Over the past few years activity is underway to enhance the IMB program with the Carolina Dental Home initiative under the leadership of the Oral Health Section of the North Carolina Division of Public Health, and in collaboration with the medical and dental communities in 3 counties in eastern North Carolina. The specific objectives of this demonstration project, which was completed in 2010, were to enhance the ability of medical providers participating in IMB to provide risk-based dental referrals and to increase the availability of the dental workforce to meet the dental needs of preschool-aged children enrolled in Medicaid (54). This is supported by a decision support tool Priority Oral Health Risk Assessment and Referral Tool (PORRT), and referral guidelines, which were developed through consensus of local physicians and dentists in orderS to help prioritize dental referrals in medical offices. Adoption and implementation of PORRT and the referral guidelines is reported to have resulted in an increase in referral rates, specifically for those children younger than 3 years of age who have dental caries in its early stages.

Further, there is recognition of the importance of addressing the social determinants (eg poverty and educational attainment) before substantial progress in preventing dental disease and reducing oral health disparities can occur. This is required alongside changes in clinical care, individual education and counselling, and the environmental context in which people live and make decisions.

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