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Cost-effectiveness models for dental caries prevention programmes among Chilean schoolchildren

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Aim: This study aims to estimate the cost-effectiveness from a societal perspective of seven dental caries prevention programmes among schoolchildren in Chile: three community-based programmes: water-fluoridation, salt-fluoridation and dental sealants; and four school-based programmes: milk-fluoridation; fluoridated mouthrinses (FMR); APF-Gel, and supervised toothbrushing with fluoride toothpaste. ***Methods:*** Standard cost-effectiveness analysis methods were used. The costs associated with implementing and operating each programme, using a societal perspective, were identified and estimated. The comparator was non-intervention. Health outcomes were measured as dental caries averted over a 6-year period. Costs were estimated as direct treatment costs, programmes costs and costs of productivity losses as a result of each dental caries prevention programme. Incremental cost-effectiveness ratios were calculated for each programme. Sensitivity analyses were conducted over key parameters. ***Results:*** Primary cost-effectiveness analysis (discounted) indicated that four programmes showed net social savings by the DMFT averted. These savings encompassed a range of values per diseased tooth averted; US$16.21 (salt-fluoridation), US$14.89 (community water fluoridation); US$14.78 (milk fluoridation); and US$8.63 (FMR). Individual programmes using an APF-Gel application, dental sealants, and supervised tooth brushing using fluoridated toothpaste, represent costs for the society per diseased tooth averted of US$21.30, US$11.56 and US$8.55, respectively. ***Conclusion:*** Based on cost required to prevent one carious tooth among schoolchildren, salt fluoridation was the most cost-effective, with APF-Gel ranking as least cost-effective. Findings confirm that most community/school-based dental caries interventions are cost-effective uses of society's financial resources. The models used are conservative and likely to underestimate the real benefits of each intervention.

Key words: *Fluoride, cost-effectiveness, dental caries prevention, Chile*

Introduction

Economic evaluations (EE) are widely used in health and have acquired great importance in health-care decision-making. Health service managers, programmers and planners are required to select interventions with the highest impact, based on evidence, while prioritising high-risk groups. Economic evaluation is an integral component of the process of decision-making with any preventive programme (Murray *et al.,* 2000). Analyses of this type assist decision-makers in determining which intervention (or combination of interventions) maximises results in oral health terms given the available resources.

Despite this, and although EE have received more popularity in the last few years, their application in dental programmes appears to be less common. The application of EE in dentistry remains limited and, with the exception of water fluoridation and dental sealants, the majority have targeted clinical interventions. Despite this, there are indications that EE will become more important in dentistry in the future (Buck, 2000).

The oral health policy of the Ministry of Health in Chile emphasises prevention and oral health promotion. In addition to funding clinical programmes comprising largely of a restorative service, the Chilean government has supported the development and implementation of several population-based dental caries preventive programmes. In Chile, water fluoridation remains the cornerstone of strategies for dental caries prevention and control. This measure covers 72% of the Chilean population (Ministerio de Salud de Chile, 2008). Consequently, additional programmes for the prevention of dental caries have been implemented (e.g., milk-fluoridation, supervised tooth brushing, oral health education programmes, pit and fissure sealants).

Several economic evaluations have been conducted on dental caries prevention worldwide, however, with the exception of studies on fluoridated milk (Mariño *et al.,* 2007; 2011), no economic evaluations of dental caries prevention programmes exist in Chile.

As no economic evaluations for the full range of dental caries prevention programmes exist in Chile, no data can be used as a reference for national programmes. The data from other jurisdictions that do exist may not be comparable (Buck, 2000). This is largely because many, if not all economic evaluations, are so context specific that they do not readily translate to other populations (Murray *et al.,* 2000). In particular, costs do not transfer well due often to differences in health and economic systems. Thus their relevance is often limited to the specific countries in which they were derived. Threats to transferability include: a, differences in price for resources; b, variability in willingness to pay for health care; c, variations in prices of health consequences; d, variation in approaches to treatment and resource use.

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Cost-effectiveness analysis (CEA) is a type of economic evaluation that examines both the costs and benefits of alternatives interventions with a common health outcome (Drummond *et al.,* 2005). This study aims to establish the cost-effectiveness from a societal perspective of seven dental caries prevention programmes among schoolchildren in Chile. In this way, conclusions will reflect local uses and practices and not those of developed countries. The programmes comprised two community-based programmes (water-fluoridation and dental sealants), and four school-based programmes (milk-fluoridation, fluoridated mouthrinses (FMR), APF-Gel, and supervised tooth brushing with fluoride toothpaste). Additionally, even though not available in Chile, this economic analysis included salt fluoridation (the predominant modality of public health fluoridation in Latin America).

Methods

To measure programme effectiveness, two hypothetical populations were used in the analyses. The first population comprised 80,000 12-year olds living in a large city. The other population was a rural community consisting of 6,000 children also aged 12-years. The justification for this dichotomous grouping is that programmes such as water and salt fluoridation and dental sealants are being used in large cities, while the others (milk fluoridation, APF-Gel, FMR, tooth brushing) are used in Chilean rural communities.

Two non-intervention or status quo communities were used, one equivalent to the hypothetical city (but without the intervention of water and salt fluoridation) and another for rural communities. In the case of dental sealants, the non-intervention community was a water-fluoridated community without dental sealants. For the sealants programme only first permanent molars were included in the calculations.

These hypothetical population cohorts enter the analysis at 6 years of age and are followed for 6 years.

In CEA, costs of alternative programmes are measured as economic costs and outcomes are valued in units of effectiveness of the interventions (Drummond *et al.,* 2005). CEA requires a common measure of programme outcomes or consequences. The unit of effectiveness used in this study was Decayed, Missing and Filled Teeth (DMFT). The comparisons were each intervention group (i.e., water fluoridation, dental sealants, milk-fluoridation, etc.) with the non-intervention (or '*status quo*') group.

There are several study formats in CEA; prospective, retrospective and models. This study uses the "model" format. This modelling was based, as much as possible, on real data, and real values. When this was not possible, we made some assumptions. These assumptions were the basis of the sensitivity analysis.

Both cost and benefits were calculated and assessed from a societal perspective. Drummond *et al.,* (2005) suggest three categories of costs to be taken into account: a, dental health care resources costs, which include cost of organising and operating that programme; b, patients and family resources costs, which include out-of-pocket payments (traveling expenses, treatment costs, time lost to work) and c, costs borne by sectors other than the health care sector (e.g. in the case of supervised tooth brushing programme, the cost of teacher-time).

All costs were priced using 2009 market costs in Chile, as well as from the programmes' budgets. Costs expressed in Chilean Pesos were converted into US Dollars (US$) for the base year reported in the study (1 US$ = RCH $600). Costs were adjusted to the base year using the consumer price index and discounted to their present value using an annual discount rate of 3% (Drummond *et al.,* 2005). Outcomes were not discounted.

Consumable supply costs for most programmes were calculated as bulk costs in appropriate physical units, i.e. weight of chemicals used,. The costs of these materials were allocated to the preventive procedure and then to regimens in proportion to the number of children who consumed them. The exceptions were water fluoridation and dental sealants. For water fluoridation, consumable costs were calculated using the charge authorised by the Ministry of Economy to water supplies using the cost applied to a medium income municipality (Ministerio de Economía, Fomento y Reconstrucción, 2006). For more details on this calculation see (Mariño *et al*. 2011). In the case of dental sealants, the application fee was obtained from the public services. That fee was assumed as the theoretical value for this preventive action (Ahovuo-Saloranta *et al*., 2008).

A programme coordinator would be required to manage and run each programme with duties to include the analyses of program supplies distribution at the community health centres/schools; the evaluation of the consistency of programme delivery across the community; overview quality control analyses; and managing and supervising the overall functioning of the programme. It was assumed that coordinators would work part-time, varying depending on the programme. For the milk, water and salt fluoridation programmes, 4 hours every week (0.1 full time equivalent, FTE) was assumed. For the gels and sealant programmes, a programme coordinator working 0.1 FTE for two months every year was assumed and for the FMR and tooth brushing programmes, a programme coordinator was assumed to work 0.10 FTE for 3½ months every year.

For the FMR and tooth brushing programmes, resources also included the cost of training supervising classroom teachers to ensure that they dispensed toothpaste and the rinse properly, and teacher's time supervising the children was also included.

Overhead costs were estimated based on the usual office rent in the area where the programme took place in addition to the expected costs for power, telephone, cleaning and other services.

Regarding biological surveillance, the Chilean Ministry of Health's epidemiological surveillance guidelines for community fluoridation protocols establish that a dental examination should be conducted once every 5 years (Ministerio de Salud de Chile, 1998). The cost of the oral clinical examination was computed on the basis of the monthly wage for the dentist and dental assistant, who would act as recorder. The Chilean National Guidelines for sampling establishes that in any fluoridated community, periodical monitoring of children's fluoride metabolism through urine fluoride-excretion checks should be undertaken at regular intervals. Consequently, samples (n=20) should be taken every 6 months (Instituto Nacional de Normalización, 1994).

Patients and family resource costs were compiled as expenses accrued by the patients (time for treatment and time for travel to and from the community health centre).

The market price of the dental treatment was taken as the theoretical value for that action (Ahovuo-Saloranta *et al.,* 2008) and estimated by multiplying the annual incremental change (which occurred throughout the 6-year period) in the individual component of the DMFT index by the mean charge for each procedure according to the Ministry of Health fee schedule for primary care. These fees tend to be lower than other dental fee schemes in Chile. However, Chilean law stipulates that these cost estimations have to be reviewed periodically by external assessors to ensure validity (Ministerio de Salud de Chile, 2009). In any case, public costs represent the lower end of dental treatment costs. It should be noted that the majority of people, in particular those living in rural areas, can only access public dental care.

Transportation and time costs were calculated assuming that in all dental visits an adult would accompany the child. To calculate family resources used in dental treatments (i.e., transport and productivity losses), we assumed that the mean loss in work time due to dental visits was 1.5 hours per decayed tooth surface and per extraction, plus the cost of public transportation to and from the community health centre. The cost of adult time was estimated as the value of production losses, assumed equivalent for all parents and calculated as the minimum wage for 2009. The cost of time spent by children was was not included in this study.

In Chile, dental caries preventive programmes vary by region depending on local circumstances. Thus, this analysis was framed under those local circumstances. For example, supervised toothbrushing, and milk fluoridation programmes are only used in rural areas of the country and not urban ones. Therefore for each intervention, the status quo varies between the two populations. Thus, separate analyses were undertaken for each of the seven programmes. Cost categories included in the analysis are summarised in Table 1.

For water fluoridation, the effectiveness was based on data collected for 12 year old children from Santiago-Chile before and after the introduction of water fluoridation (Soto *et al.,* 2007). Nonetheless the range of effectiveness was taken from the literature (Centers for Disease Control and Prevention, 2001). In the case of milk fluoridation, data on effectiveness of the programme was taken also from Chilean data (Mariño *et al*., 2007), but the range of effectiveness was taken from Yeung and his collaborators (2005). In the case of FMR, data on effectiveness of the programme was taken also from Chilean data (Molina *et al*., 1987), but as in the previous cases, the range of effectiveness was taken from the literature (Marinho *et al.,* 2003). For salt fluoridation, AFP-gels and dental sealants, the preventive effects and their ranges were obtained from the literature (Estupiñan, 2005; Marinho *et al.,* 2002; Ahovuo-Saloranta *et al.,* 2008, respectively). Table 2 presents the mean effectiveness, as a percentage reduction in dental caries increment, and the reported range of this reduction, for each preventive modality.

Caries reduction rates over a 6-year period were calculated by multiplying the mean caries experience at 12 years of age in a non-fluoridated setting (e.g. before the introduction of the water scheme) by the effectiveness of each of the programme. The extremes in effectiveness, taken from the literature, were used in the sensitivity analysis.

Table 1. Summary of total programmes costs, in 2009 US$, over six-years associated with the community-based and school-based dental caries prevention programmes

	Community-based programmes			*School-based programmes*			
	Water-F US$	*Salt-F US$*	*Sealants US$*	*APF-Gel US$*	*FMR US$*	*Milk-F[1] US$*	*Tooth brush*
Salaries							
Programme coordinator	6,614	6,614	179	1,102	1,929	6,614	1,929
Dentist examiner	846	846	846	846	846	846	846
Dental assistant	214	214	214	214	214	214	214
Data analysis	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Dentist programme operator			403,138	84,802			
Dentist Assistant programme operator			100,784	21,201			
Oral health induction							8,201
Laboratory services							
Urine excretion analysis	1,929	1,929				1,929	
Milk analysis						1,350	
Water analysis	964						
Salt analysis		1,350					
Consumables							
Cordinator's office rent and services	1,213	1,213	202	202	354	1,213	354
Coordinator's office expenses	551	551	92	92	161	551	161
Dental instruments	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Examination expenses	93	93	92	93	93	93	93
Dentist/ Child travel expenses			17,033	12,720			
Programme consumables	97,353	2,101	1,823,869	12,720	32,987	1,536	98,488
Total	112,177	17,311	2,348,850	143,219	38,983	16,746	112,686

[1]Mariño *et al.,* 2011.

Effects were evaluated in terms of the change to the overall caries experience, that is, an increase/decrease in the DMFT index. The primary outcomes were the incremental cost per additional unit of effects due to the intervention compared with the comparator.

The total cost in the intervention group involved the resources expenditures associated with the dental caries prevention programme operation plus the cost of dental care for the children in this group. Total costs for the comparison groups (status quo) were those associated with dental care only. The cost of treatment in both study groups was estimated by multiplying the incremental change in the individual component of the DMFT index by public sector's fee for each procedure. Because for each programme the reported effectiveness (i.e., the reduction on each of the components of the DMFT index) is different, the cost of treatment for each programme also differ (See Tables 4-6).

The savings in costs of dental treatments due to reduced caries experience were calculated on the basis of restorations avoided in addition to extractions prevented (if any). The avoidance of dental procedures thus estimated was then costed using the current local rates for fillings and extractions. The savings in expenses for the family for treatment, in terms of production/wage losses avoided as well as transportation costs for traveling to the dental treatment facility, were also considered in the assessment of costs. In the case of dental sealants, the model only used those effects on first molars.

The CEAs were performed as primary analyses with the following assumptions:

- Dental caries increment was constant in each year, and the treatment costs associated with increases in the component of the DMFT score occurred in the year of the increment.
- All decayed surfaces will be restored. Our analyses did not incorporate the relationship between probability of disease and use of the health system.
- All effects accrued only to age 12 years.
- No restorations were replaced during the study period (Chadwick *et al.,* 1999).
- Each child had a constant risk for dental caries development.
- For the school-based programme, the inclusion of all 12-year olds and full compliance with the preventive schedule was assumed.
- For the dental sealants programme, it was assumed that:
  i, each child had their four first molars sealed;
  ii, 10% of the dental sealants would be replaced over a 6-year period (Guerrero and Galindo, 2007).

Table 2. Estimated effectiveness of the preventive programme

Programme	*Mean Effectiveness (%)*	*Range of Effectiveness (%)*
Community water fluoridation	40 Soto *et al.,* 2007	18–60 CDC[*], 2001
Community salt fluoridation	44 Estupiñan, 2005	34–53 Estupiñan, 2005
Dental sealants	50 Ahovuo-Saloranta *et al.,* 2008	37–69 Ahovuo-Saloranta *et al.,* 2008
APF-Gel	21 Marinho *et al.,* 2002	14–28 Marinho *et al.,* 2002
Fluoridated mouthrinses	26 Molina *et al.,* 1987	23-30 Marinho *et al.,* 2003
Milk fluoridation	53 Mariño *et al.,* 2007	31–78 Yeung *et al.,* 2005
Fluoridated toothpaste	24 Marinho *et al.,* 2007	21–28 Marinho *et al.,* 2007

[*]CDC: Centers for Disease Control and Prevention.
The sources of the data are cited.

Table 3. Incremental cost US$ per DMFT avoided

	Incremental cost, US$	*Range, US$*
Community-based programme		
Water-fluoridation	**(14.89)***	**(13.25 - 16.87)** [1]
Salt fluoridation	**(16.21)**	**(15.10 - 17.63)** [1]
Dental sealants	11.56**	26.11 - **(4.01)** [2]
School-based programme		
Milk-fluoridation	**(14.78)**	**(12.64 - 16.47)** [1]
Fluoridated mouthrinses (FMR)	**(8.63)**	**(5.36 - 10.27)** [3]
Supervised tooth brushing with fluoride toothpaste	8.55	13.06 - 4.73 [4]
APF-Gel	21.30	39.97 - **(1.50)** [5]

* Negative net costs, indicating costs savings, are shown in red bold and parenthesis.
** Positive net costs, indicating costs, are shown without brackets.
[1] Worst scenario and 0% discount rate; Best case scenario and 6% discount rate
[2] Worst scenario and 6% discount rate; Best case scenario and targeting
[3] Worst scenario; Best case scenario and 6% discount rate
[4] Worst scenario and 6% discount rate; Best case scenario and 0% discount rate
[5] Worst case scenario and 6% discount rate; and dental assistant and best case scenario

Table 4. Summary of costs estimates of dental treatment in water fluoridation and salt fluoridation and control communities per 80,000 children in each group after six years of programme

Treatment item	*Water-F* *US$ (2009)*	*Salt-F* *US$ (2009)*	*Status quo* *US$ (2009)*
Restorations	1,697,505	1,518,324	2,706,578
Extractions	27,177	58,237	100,944
Costs of travel to community health centre	480,960	452,668	805,029
Cost of productivity losses	305,371	287,408	511,129
Total costs	2,511,013	2,316,637	4,123,680

Table 5. Summary of costs estimates of dental treatment in a dental sealants of first permanent molars programme and a control communities per 80,000 children in each group after six years of programme

Treatment item	*Sealants* *US$ (2009)*	*Status quo* *US$ (2009)*
Restorations	1,044,909	1,769,178
Extractions	0	132,004
Costs of travel to community health centre	284,975	569,950
Cost of productivity losses	180,937	361,873
Total costs	1,510,821	2,833,005

Table 6. Summary of costs, in 2009 US$ estimates of dental treatment in an APF-Gel programme, a fluoride mouth rinse (FMR) programme, a milk fluoridation programme and a supervised tooth brushing using fluoridated toothpaste programme, and control communities per 6,000 children in each group after six years of programme

Treatment item	*APF-Gel* *US$*	*FMR* *US$*	*Milk-F* *US$*	*Brushing with F paste* *US$*	*Status quo* *US$*
Restorations	160,556	149,947	95,485	154,190	202,993
Extractions	6,115	5,533	3,494	5,824	7,571
Costs of travel to community health centre	47,839	44,560	28,356	45,910	60,377
Cost of productivity losses	30,374	28,292	18,004	29,150	38,335
Total costs	244,883	228,330	145,339	235,073	309,276

Sensitivity analyses were undertaken to test the robustness of estimated parameter values included in the primary analysis (Drummond *et al.,* 2005). Parameters were varied on their own (one-way analysis) and in combination (two-ways analysis) to illustrate the joint effect of changing the estimated parameters. The following assumptions were varied in the primary analysis:

- DMFT outcome at the highest and lowest effectiveness ranges for each programme.
- Discount rate at 0% and 6%.
- Employment of the programme coordinator at 0.05 FTE and 0.15 FTE
- For the dental sealants programme, a targeted programme was used, based on regional data (Pérez *et al.,* 2002), sealing only those first molars most likely to have caries.
- For the APF-Gel programme, the operator of the programme was changed (i.e., dentist vs. dental assistant/nurse).

Results

The different mean treatment costs for all 6 years, total treatment cost, using different discount rates, from a societal perspective, and incremental cost-effectiveness ratio (ICER) of per averted DMFT were determined. The primary analysis indicates the additional cost, produced by each intervention over the status quo (Table 3). Interventions ranged from those that were cost-saving to those which incurred costs to the society per unit of DMFT averted. The results of the primary cost-effectiveness analysis (discounted) indicated that of the seven prevention programmes, four showed a net social savings for a unit of DMFT averted. These savings ranged from US$16.21 per unit of DMFT averted in the case of salt-fluoridation to US$8.63 per a diseased tooth averted in the case of FMR. Alternatively, an APF-Gel programme, a dental sealants programme, and a supervised tooth brushing using fluoridated toothpaste programme, represent costs for the society per unit of DMFT averted of US$21.30, US$11.56 and US$8.55, respectively.Secondary analysis included the cost of treatment averted, and the cost of the preventive programme (See Tables 4, 5 and 6).

Sensitivity analyses were conducted and Table 3 also shows the extremes of the ranges of incremental costs for each of the programmes. Changing the employment base of the coordinator influences the results to a degree, but it is programme effectiveness that has the major impact. The results were also sensitive to the choice of discount rate, in particularly when assuming a 6% discount rate. Results from the two-way sensitivity analysis indicated that for water-fluoridation; salt-fluoridation, milk-fluoridation and FMR, cost saving programmes continued dominating under any combination of scenarios.

In the APF-Gel programme, the cost consideration for operator employment in the programme strongly influenced the result of the programme. For example, the total treatment cost would reduce to US$3.47 per DMFT saved when a dental assistant/nurse is employed as the operator. Furthermore, when this operator was combined with the best effectiveness scenario, the ICER attained a level of cost-effectiveness (a saving of US$1.50 per DMFT saved).

For dental sealants, if it is assumed that the programme is targeted to high risk children, there is an ICER of US$1.85 saved per averted DMFT. Additionally, when targeting is combined with the best effectiveness scenario, a sealant programme saves money when compared to the status quo (a saving of US$4.01 per DMFT averted).

In the supervised fluoridated toothpaste programme, no evidence of cost savings was established under any combination of parameters.

Discussion

For any given setting, there are alternative dental caries prevention programmes. The crude cost and health benefits of a set of dental caries prevention interventions were evaluated for a Chilean situation. Although the cost-effectiveness of preventive measures may vary according to the size of the community, the overall results indicate a favourable trend in the assessment of dental caries prevention programme from a societal perspective. Overall, study's results indicate that most community/school-based dental caries interventions would be highly cost-effective uses of society's financial resources to provide benefits to the community. Based on our models, the cost required to avert one DMFT among schoolchildren, salt- fluoridation would be the most cost-effective, with APF-Gels ranking as least cost-effective.

For water-, salt-, and milk-fluoridation and FMR, the cost-effectiveness ratio of the programme dominated over the comparator, that is to say, there were savings even when restrictive and overly pessimistic assumptions were used for what might be considered a "typical case.". On the other hand, supervised toothpaste use, dental sealants placement and APF-Gel application, represent programmes that produced a cost, as opposed to a saving, to the society. Thus, under the conditions used in the primary analysis, the cost of these preventive programmes would be more than the cost of the corresponding restoring treatment, which would have occurred when the programme was absent. However, even though these programmes may represent a cost to the society, economic evaluation is only one criterion in decision making. Economic evaluation requires also a value judgment about whether additional spending to obtain additional benefits is worthwhile. There is always a need to balance efficiency concerns with other criteria, including the impact of the intervention on poverty, equity, implementation capacity, and feasibility.

In addition, the conclusion that a preventive oral heath care programme for the cohort aged 12 after 6 years is not cost-effective should be interpreted with some caution. The models used were:

1. Conservative and likely to underestimate the real benefits of each intervention, which would last for longer timeframes than those used in the analysis. For example, the long-term caries preventive effects of school-based FMR have been reported to continue well into adulthood (Neko-Uwagawa *et al.,* 2011);
2. Our study examined intermediate outcomes in dental health and was limited to the effects at 12 years of life. Effects on oral health beyond this analytic horizon were not included in the models;
3. Also, a typical CEA only includes the tangible benefits of an intervention (Drummond *et al.,* 2005). In fact, this is a common case in dentistry, where some outcomes cannot be quantified in monetary terms. Several authors have warned about the intangible benefits of preventive programmes in dentistry (Horowitz, 1986; Niessen and Douglass, 1984). In general, analysts include in the cost of prevention some of the visible costs of the programme, and assume that if a programme can reduce the cost of treatments other benefits are assured in that way (Weinstein and Stasson, 1977);
4. Importantly, it should also be noted that in calculating the costs of restorative treatments by charging public fees, we were deliberately favouring the restorative approach.

In evaluating the dental sealant programme, calculations were conducted assuming that sealants were placed on all four permanent molars of all children, regardless of their susceptibility to caries. Thus, the cost-effectiveness of such a programme would have been improved if policies targeting those at high-risk were in place. In this analysis, when a sealant programme is targeted in this manner, the results indicated a positive ICER for the programme, that is, savings. Targeting could have also been used for APF-Gel and supervised tooth brushing. For the APF-Gel and dental sealants applications, the operators' costs represented a high proportion of the overall costs. The sensitivity analyses indicated that combining the utilisation of an alternative clinical operator to a dentist and accepting the highest level of effectiveness produced a positive cost-effectiveness ratio.

In the present analysis, the models used were crude assessments of the cost-effectiveness of the programmes. For example, the analysis assumed no overlapping of preventive programmes. One would expect that the effectiveness of any of the programmes would be greater if recipients were exposed to a combination of preventive programmes (e.g., the combined use of fluorides with dental sealants). A further refinement of the analysis relates to compliance. It is possible that the assumption of 100% compliance in the sealants, FMR, and supervised fluoridated toothpaste programme favoured their effectiveness.

This is the first attempt to undertake an economic evaluation of dental caries prevention interventions in Chilean settings. We believe that, although incorporating some methodological limitations dictated by a range of assumptions from the existing literature, the model used in this evaluation, reflects the Chilean conditions more appropriately than analyses undertaken in other countries. However, not all the dental caries prevention programmes used in this analysis were operating in Chile as community programmes at the time of this evaluation. Nonetheless, their inclusion helps to put present results into perspective and allows for international comparisons using local costs. Present results will serve as an impetus for further discussion about the appropriateness of, and priorities for, dental caries prevention programmes in Chile and may provide a working model for other countries in the region. This information would increase present knowledge regarding the use of or introduction of preventive oral health programmes.

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