Associations between health promoting schools' policies and indicators of oral health in Brazil

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SUMMARY

No detailed analyses have been undertaken on the effects of Health Promoting Schools on oral health status. The objective of this study was to assess whether the oral health of 12-year-old children in supportive schools, where health promoting policies had been developed, was better than that of children in non-supportive schools. A sample of 1823 12-year-old children in 33 public (government-funded) schools were selected in deprived areas of Curitiba, Brazil. Principal component analysis, multiple regression, meta-analysis and meta-regression were used in the data analysis. Schools with a comprehensive curriculum were more likely to have a higher percentage of caries-free children (β = 6.27, p = 0.02) and fewer children with dental trauma (β = –5.04, p = 0.02). The commitment towards health and safety at school was strongly associated with dental trauma, as 9.7% fewer children had dental trauma (p = 0.00) in schools that demonstrated a commitment towards health and safety. At the school level, mother's education and family income were independently associated with children's caries experience and dental trauma, respectively. Children in supportive schools had better oral health than those in non-supportive schools. Our results suggest that some benefit can be obtained for the improvement of the oral health of children living in deprived areas if they attend supportive schools.

Key words: dental trauma; Health Promoting Schools; inequalities in health; oral health promotion

INTRODUCTION

Schools are considered appropriate settings for health promotion for children, since the school may provide an environment for improving health, self-esteem, behaviours and life skills. For many years, school-based health promoting programmes were implemented as traditional health education, but they had minimal and short-term effects (Lynagh *et al.*, 1997; Nutbeam, 1997). Extensive reviews on oral health education programmes showed that the school-based programmes were relatively ineffective (Brown, 1994; Schou and Locker, 1994; Sprod *et al.*, 1996; Kay and Locker, 1998).

The systematic reviews suggest that health promotion in schools, if conducted in a comprehensive way, might benefit the oral health status of students (Sprod *et al.*, 1996). Tones and Tilford (Tones and Tilford, 1996) suggested a model to express the broad perspective that health promotion in schools could assume. Activities developed in the formal curriculum should be reinforced by all other elements that involve the school as a health promoting institution. It encompasses the informal curriculum, the hidden curriculum, the pastoral system developed by the school, the parallel curriculum and the general environment of the school. For Perry *et al.* (Perry *et al.*, 1993), a key element in making a school a positive learning and living environment appears

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to be developing a setting that explicitly supports students' physical, emotional and social well-being in addition to their academic achievement.

A model for health promotion in schools, known as Health Promoting Schools (HPS), emerged from discussions during the 1980s under the auspices of the World Health Organization (WHO) (Nutbeam *et al.*, 1987; Young and Willians, 1989; WHO, 1996). A HPS was defined as 'a school constantly strengthening its capacity as a healthy setting for living, learning and working' (WHO, 1998). It improves the health of the school's community, engages health and education officials and the school's community in efforts to make the school a healthy place, provides a healthy environment, and implements policies and practices that support individuals' self-esteem and provides multiple opportunities for health.

Intermediate and health promotion outcomes related to educational and process implementation have provided positive support for the strategy (Smith *et al.*, 1992; Rowling, 1996; Williams *et al.*, 1996; Bowker *et al.*, 1998; Rogers *et al.*, 1998; Stears, 1998; Thomas 1998; Lister-Sharp *et al.*, 1999; Moon *et al.*, 1999). Quasi-experimental designs, using quantitative and qualitative methods, were used in the two published evaluations on the impact of HPS (Jamison *et al.*, 1998; Moon *et al.*, 1999). There is no published research focusing on the impact of HPS on children's oral health.

As with other aspects related to the health of children, oral health is determined by a variety of activities associated with relationships, self-esteem and opportunities to make healthier decisions. All of them are part of the HPS concept. The main objective of this study was to assess the impact of HPS in deprived areas of Curitiba, Brazil, on the oral health of 12-year-old children.

METHODS

Study location and sampling design

Curitiba, in the south of Brazil, was selected for the study. In Curitiba, the State and Municipal Education Sectors have developed a range of specific projects at local schools related to health promotion. They are associated with the principles of HPS. None of the schools had a formal dental health education programme. The city has a fluoridated water supply.

The sample was drawn by multi-stage sampling. First, a dimensional sampling method (Robson, 1997) was used to incorporate various dimensions important to the study in the sampling procedure. Ten city wards were selected to represent the population of 12-year-old children with low socio-economic status in peripheral Curitiba. A second stage, termed one-round cluster sampling, was conducted, considering all public (government-funded) schools within each selected deprived ward. A total of 52 public schools were identified in the selected wards. Of the 52 schools, 17 were excluded because they had <20 12-year-olds. Another two schools were eliminated because >60% of their children were at that school for <2 years and would not have been influenced by HPS. Therefore, 33 schools constituted the sample of schools in this study. In the third stage of sampling, a random sample of the 12 years-old children was taken from the selected schools. For this procedure, schools were first divided according to size, using the British Association for the Study of Community Dentistry criteria (BASCD, 1997).

In this study, the ultimate objective was to test the hypothesis that the oral health outcomes from populations in supportive schools, qualified in terms of implementation of health promoting strategies, were better than those in non-supportive schools. The level of significance considered in all calculations was 5% and the power of the test was 90%. The final sample size included 1823 children distributed in 33 schools, which represented a response rate of 96.6% for the original sampling design.

The criterion for an HPS was a school that had the following components and indicators proposed by Tones, WHO, and WHO/Pacific and WPRO (Tones, 1996; WHO, 1996; WHO/Pacific and WPRO, 1996).

- A school health policy, encompassing directions that influence the school's actions and allocation of resources in areas that promote health. Indicators: policies on food, smoking, alcohol, drugs, medication, first aid, safety, HIV/AIDS, information, and responsibility for health education/health promotion at school.
- The physical environment of the school, including buildings, grounds, equipment for both indoor and outdoor activities, and areas surrounding the school. Indicators: traffic hazards and accidents control, environmental projects, and physical conditions of the school.

- The school social environment, as a combination of the relationships between staff, between students, and between staff and students. Indicators: violence, relationships between members of the school community, drop-out rate and failing exams.
- Community relationships, including connections between the school and students' families, and key local groups who support and promote health. Indicators: parental involvement, community activities at school, linking projects and health services.
- Personal health skills developed through the formal and informal curriculum, where health issues are approached in a coherent, holistic and realistic way. Indicators: health topics, practical information, educational approach, community participation in curriculum issues, and teacher training.

The clinical data on dental outcomes were based on BASCD procedures (Pitts and Evans, 1997). Children's individual covariates were obtained using a questionnaire. These covariates included: (i) a demographic factor (gender); (ii) social factors (family background, father's employment, mother's employment, family income, mother's level of education); (iii) self-concept factors (level of self-esteem and self-assessment of healthy lifestyle); (iv) oral health-related factors (access to water fluoridation, fluoridated toothpaste and mouth rinses, and frequency of dental attendance); and (v) school-related factors (time at school and school grade).

Three main distinctive stages were used in the data analysis: first, an individual-level analysis was conducted to explore the predictive value of covariates potentially associated with oral health outcomes, with special attention given to oral health-related factors such as access to fluorides. Multiple logistic regression technique was used. This stage of data analysis will not be described here and is outlined elsewhere (Moysés, 2000). However, the significant covariates identified at this stage were included through the aggregate analysis developed in the Results section.

Secondly, a principal component analysis (PCA) was developed to identify a relatively small number of factors or components that could be used to represent health promotion dimensions at school. Five sets of explanatory variables were constructed using the results of the PCA. The first one, a continuous variable, was built to express the overall level of the school's support

for health promotion based on the sum of values (components' score coefficient) obtained by each school in each component of health promotion identified in the PCA. Final scores of the schools' levels of support ranged from –3.1 to 4.4. The more positive the figures, the more supportive the schools. Considering the mean overall score as a cut-off point, a dichotomous variable was constructed, classifying schools as either supportive or non-supportive. A supportive school was one where the development of health promotion components was above the mean, while a non-supportive school was the reverse, i.e. below the mean. The other four sets of variables were constructed for each component of health promotion at school, identified in the PCA analysis. They represent the schools' scores obtained in each component (continuous variable), and the implementation or not of the health promotion component at school (dichotomous variable). They were: comprehensive curriculum, commitment to health and safety, social relationships, and socially and environmentally friendly school.

Finally, an aggregated level analysis was developed, exploring the impact of the aforementioned contextual components of health promotion on the studied outcomes. In this stage, correlation statistics, followed by meta-analysis and meta-regression, were used (Spector and Thompson, 1991; Hardy, 1995; Greenland, 1998). Statistical techniques applied to meta-analysis have been established for the purpose of combining various forms of experimental data. These methods have also been applied to combine the results of completely separate studies, including observational studies (Greenland, 1994; Hardy and Thompson, 1998; Blettner *et al.*, 1999). Meta-analysis may be used to analyse single trials with multiple centres. In this case, individual trials may be analysed in such a way by considering each centre as a 'trial', allowing for the possibility of variations in treatment effect across centres. The analysis conducted in the present study followed similar procedures as a multicentre trial analysis, with each school being considered as a trial.

RESULTS

A PCA was used to construct the variable related to the schools' levels of support for health promotion. Four components related to different dimensions of health promotion activities at

schools were defined. By summing up the values obtained for each component, a score variable expressing the overall support for health promotion by the schools was constructed. The four components were the underlying dimensions of the schools' performances on specific health promotion activities.

Ten variables were loaded on Component 1, corresponding to the development of a comprehensive curriculum. The component encompassed particular policies, such as: (1) food policy; (2) smoking policy; (3) the inclusion of health topics in the formal curriculum; (4) use of participative educational approaches; (5) the involvement of the school's community on curriculum issues; (6) the physical environment of the school that makes it a healthy environment; (7) the development of projects focused on improvements to the school's environment; (8) cleaning projects; (9) linking projects to promote health at school; and (10) the delivery of a variety of health services to the school's community.

Component 2 comprised four variables and describes the commitment of the school towards health and safety. It is composed of variables related to: (1) the presence of an assigned person at school responsible for health education and health promotion; (2) the strategies applied by the school to involve parents in school issues; (3) the frequency of accidents registered at the school; and (4) the safety strategy developed by the school.

Component 3 expresses the social relationships within the school. The variables loaded on this component include: (1) the relationships between students; (2) the relationships between students and teachers; (3) the support children seek at school in critical situations; and (4) the registered percentage of pupil drop-out.

Finally, Component 4 encompasses variables associated with the socially and environmentally friendly characteristic of the school. They described: (1) the physical environment of the school; (2) the openness for the active participation of the Parent–Teachers Association; and (3) the support sought by children in critical situations.

Component 1 explained 26.6% of the variance, while Component 2 explained 13.3%, Component 3 explained 12.8% and Component 4 explained 9.5%. These four components explained 62.2% of the variables' variance.

Each school was assigned a value, using the score coefficients matrix, for each component described above. A final score obtained by the sum of component values, describing their level of support for health promotion, was also obtained. Grouping the schools by their level of support, a total of 13 schools (39.4% of the schools sample) were classified as supportive schools. Twenty schools (60.6%) were classified as non-supportive schools.

The analysis of aggregated data by schools was conducted in order to observe the contextual influence of the schools on children's oral health. For this analysis, outcome variables and covariates were continuous variables, representing group percentages by school. The explanatory variables were the school's final score, representing their level of support for health promotion, and scores for each component identified by the previous PCA, representing dimensions of health promotion at school.

Significant relationships were found between the outcomes and some singular components representing the dimensions of health promotion in the schools. A moderately positive correlation was found between component 1, 'the development of a comprehensive curriculum by the school', and the mean percentage of caries-free children ($r = 0.40$; $p = 0.02$). A higher percentage of caries-free children was related to a more comprehensive curriculum.

Also, a slightly significant association was found between the component 2, related to 'the commitment of the school towards health and safety', and the mean percentage of children with dental trauma, the correlation coefficient being $r = -0.45$ ($p = 0.01$). This negative relationship suggested that more commitment towards health and safety at school was associated with a lower percentage of children with dental trauma.

Meta-analyses were performed using pooled data for variables related to oral health by schools. Pooled estimates and tests for heterogeneity were calculated for the whole sample of schools ($n = 33$). Fixed and random effects methods were used to calculate the combined estimates. The results are presented in Table 1.

Graphic presentation of pooled estimates and confidence intervals by schools, ordered by their level of support for health promotion, and the combined estimate obtained by the random effects method shows that there was considerable heterogeneity (Figure 1). However, a more homogeneous pattern of distribution of estimates existed for the group of supportive schools compared with non-supportive schools. The precision

Table 1: Estimates of overall percentage and 95% confidence intervals (95% CI) for oral health status with pooled data by schools (*n* = 33)

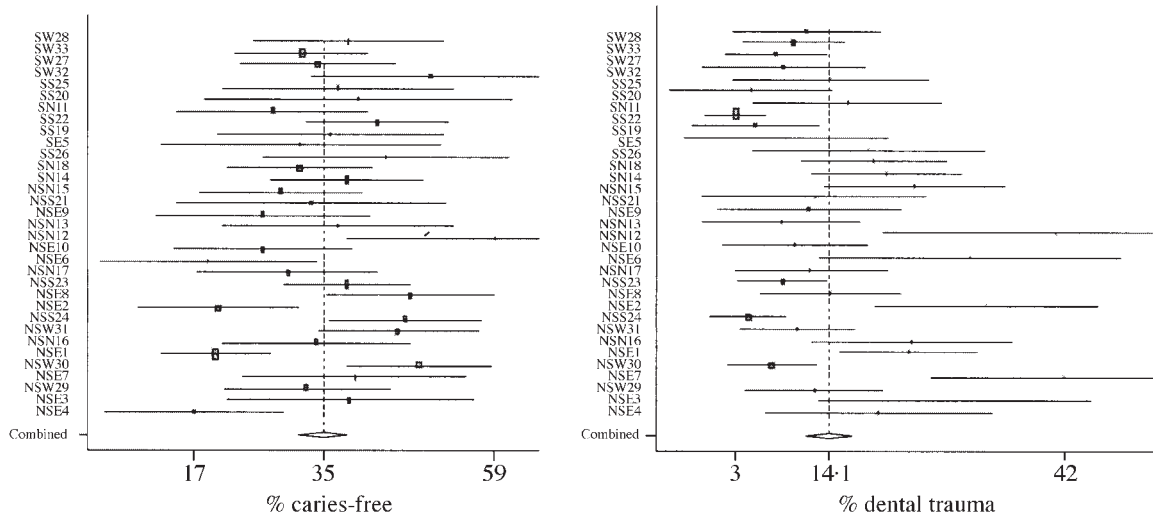| Method	Estimate of overall percentage	95% CI	Test of heterogeneity	
			Q (χ^2)	Significance
Caries-free				
Fixed	34.5	32.4–36.7	72.7	0.00
Random	35.0	31.7–38.4		
Dental trauma				
Fixed	10.7	9.4–12.1	110.5	0.00
Random	14.1	11.4–16.9		

Fig. 1: Pooled estimates and confidence intervals, by schools, ordered by their level of support for health promotion and the combined estimate obtained by the random effects method in the study of caries-free children and dental trauma. Dashed lines represent combined estimates. S and NS indicate supportive and non-supportive schools, respectively, which are identified by the letters S (south), E (east), N (north) and W (west), and also an ordered number. For example, the first school in the figure is supportive school 28 in the south of Curitiba. Rectangles in estimate lines represent the weight given for each school in the calculation of combined estimates.

of each estimate was also more variable in non-supportive schools, illustrated by the greater variation in the width of the confidence intervals. The amount of information each school contributed to the fixed effect estimate (Figure 1, rectangles), representing the weight allocated to each school in the calculation, differed across outcomes. An almost even spread of weight across schools can be observed in the study of caries-free status. However, schools NSS23 and SS22 were the most informative schools in the study of dental trauma. A more equal allocation of weights across schools was used in the calculation of effect using the random effects method.

The difference between patterns of distribution in supportive and non-supportive schools led to a further assessment by partitioning the groups of schools, where overall estimates were calculated separately for supportive and non-supportive schools. The purpose was to investigate for whom, and for what type of school, was the impact on children's oral health status the best. In addition, we could investigate whether heterogeneity could be explained by supportive/non-supportive school type.

Table 2 presents the differences between supportive and non-supportive schools for the outcomes analysed. The crude summary measure

Table 2: Differences in the results for outcomes between supportive and non-supportive schools

Group (*n*)	Crude value[a] % of subjects (95% CI)	Amount of heterogeneity		Estimate of between-schools variance
		Q/df	*p* value	
Caries-free				
Supportive (13)	36.3 (32.8–39.9)	0.7	0.73	0.00
Non-supportive (20)	34.0 (29.0–39.1)	3.3	0.00	87.4
Dental trauma				
Supportive (13)	10.8 (7.3–14.3)	2.4	0.00	22.0
Non-supportive (20)	16.7 (12.7–20.7)	3.9	0.00	55.3

[a]Random effects method.

(percentage and confidence intervals) for each group, together with the amount of heterogeneity, was still observed in supportive and non-supportive schools' groups and the estimate for between-schools variance. For both oral health outcomes, supportive schools had better results than non-supportive schools. The fact that the outcomes in the comparisons were in the same direction added support to the existence of an impact of the type of school, even though some differences were not large.

Values ≤2.0 for the amount of heterogeneity indicates low heterogeneity. Non-supportive schools had higher heterogeneity, summarized by Q/degrees of freedom (df), when compared with supportive schools. As non-supportive schools' values indicated, the test for heterogeneity was statistically significant ($p \geqslant 0.00$) for the outcomes, suggesting that other reasons, rather than the type of school, were related to the heterogeneity within this group. This was true in supportive schools in the studies of dental trauma ($p = 0.00$). Considering the between-schools variance, it is reasonable to assume that not all heterogeneity could be explained by differences in the overall support for health promotion provided by the schools. Nevertheless, only supportive schools were a genuinely homogeneous group when caries-free status was considered as an outcome.

The next step was to improve the exploration of potential sources of heterogeneity between schools. Multiple aspects related to the features of the group population in each school in relation to socio-demographic features and oral health-related factors could be associated with the amount of heterogeneity observed. Meta-regressions were used to obtain an estimate of differences in outcomes between supportive and non-supportive schools, and also in an attempt to identify significant relationships between the level of the school's support for health promotion and possible confounders of interest in the context of the schools.

The results of meta-regression analysis are presented in Tables 3 and 4. They display the regression coefficients with their confidence intervals and significance, together with the estimates of between-schools variance before and after adjusting for schools' support and specified confounders for each outcome. Confounders, which include mainly socio-demographic and oral health-related variables, such as access to appropriate levels of fluorides, were selected from the results of the individual level analysis as described previously (Moysés, 2000). Here, the coefficient values expressed the differences between supportive and non-supportive schools, having the constant value (pooled-effect estimate for non-supportive schools calculated using the random effects method) as a reference.

The study of the percentage of caries-free children in schools is shown in Table 3. Although non-significant, the coefficient for the 'overall schools' support for health promotion' suggested a higher probability of percentage of caries-free children in supportive schools. The coefficient became stronger after adjusting for other factors. However, the best singular predictor of percentage of caries-free status was the development of a comprehensive curriculum by the school. An increase of almost 6.3% could be expected in the percentage of caries-free children in schools that were developing a comprehensive curriculum in terms of health promotion ($p = 0.02$).

The mother's education profile and the access to dental care also appeared to be important predictors of the percentage of caries-free children in the schools. As the percentage of children's mothers with no formal education increases,

Table 3: Results of meta-regression of the variables in the study of percentages of caries-free children

	Adjusted for school's support		Adjusted for schools' support and confounders		Estimate of between-schools variance	
	Coefficient (95% CI)	*p* value	Coefficient (95% CI)	*p* value	Overall	Adjusted for school's support and confounders
School's support						
Supportive	2.82 (–4.08 to 9.74)	0.42	4.40 (–3.01 to 11.8)	0.25	50.4	20.0
Time at school: ≥3 years (%)			–0.11 (–0.25 to 0.03)	0.13		
Mother's education: mothers with no education (%)			–0.42 (–0.77 to –0.0)	0.02		
Dental attendance: never went to the dentist (%)			0.50 (0.14 to 0.85)	0.01		
Constant	33.96 (29.70 to 38.2)	0.00	38.49 (31.68 to 45.3)	0.00		
Comprehensive curriculum						
Yes	7.76 (1.54 to 13.9)	0.01	6.27 (0.93 to 11.6)	0.02	50.4	13.3
Time at school: ≥3 years (%)			–0.07 (–0.18 to 0.03)	0.17		
Mother's education: mothers with no education (%)			–0.46 (–0.77 to –0.1)	0.00		
Dental attendance: never went to the dentist (%)			0.38 (0.03 to 0.72)	0.03		
Constant	31.45 (27.25 to 35.64)	0.00	38.00 (31.68 to 44.3)	0.00		

Table 4: Results of meta-regression of the variables in the study of dental trauma

	Adjusted for school's support		Adjusted for schools' support and confounders		Estimate of between-schools variance	
	Coefficient (95% CI)	*p* value	Coefficient (95% CI)	*p* value	Overall	Adjusted for school's support and confounders
Schools' support						
Supportive	–5.28 (–10.86 to 0.29)	0.06	–5.01 (–11.78 to 1.75)	0.15	41.4	38.1
Gender: males (%)			0.12 (–0.14 to 0.39)	0.36		
Time at school: ≥3 years (%)			0.02 (–0.13 to 0.16)	0.84		
Family income: high income (%)			0.85 (0.08 to 1.62)	0.03		
Constant	16.33 (12.71 to 19.95)	0.00	4.23 (–9.12 to 17.77)	0.53		
Commitment towards health and safety						
Yes	–9.28 (–13.71 to –4.85)	0.00	–9.72 (–13.89 to –5.55)	0.00	41.4	14.0
Comprehensive curriculum						
Yes	–4.87 (–9.28 to –0.47)	0.03	–5.04 (–9.32 to –0.77)	0.02		
Gender: males (%)			0.19 (–0.02 to 0.40)	0.08		
Time at school: ≥3 years (%)			–0.05 (–0.14 to 0.04)	0.30		
Family income: high income (%)			0.96 (0.38 to 1.54)	0.00		
Constant	20.82 (16.73 to 24.91)	0.00	8.25 (–2.22 to 18.71)	0.12		

a lower percentage of caries-free children is expected. On the other hand, confirming previous findings with individual data analysis, an increase in the percentage of children who never went to the dentist was associated with an increase in caries-free children. An important decrease in the between-schools variance estimates was observed with the inclusion of these variables in the model, even though unexplained random variation remained (from 50.4 to 13.3).

Although non-significant, the important coefficient value for the overall schools' support for health promotion may suggest an influence on dental trauma (Table 4). Regarding the singular components of health promotion, the commitment towards health and safety and

the development of a comprehensive curriculum at school, both were significantly related to dental trauma experience in children. Furthermore, the results obtained suggest that the commitment towards health and safety was the best predictor of dental trauma. An increase of 9.7% in dental trauma was expected when schools did not develop this aspect of health promotion.

Gender and time at school appeared not to be important in the aggregate level analysis in relation to dental trauma. However, a significant positive relationship existed between the percentage of children with dental trauma and the percentage of children's families earning more than 7 Brazilian Minimum Wage (greater than the mean for the studied population).

DISCUSSION

The results of the study partially confirm the hypothesis that there would be better oral health in schools where comprehensive HPS activities were developed compared with non-supportive schools. Supportive schools had better and more homogeneous oral health outcomes than non-supportive schools.

There is no published evidence that HPS differentially improves health in disadvantaged children or that it is particularly effective in disadvantaged areas. However, the Independent Inquiry into Inequalities in Health recommended the development of HPS as a strategy to reduce inequalities in England (Acheson, 1998). The basis of the recommendation was successful results of health promotion in schools in terms of increasing 'life skills', such as problem-solving, communication, decision-making and coping with emotions, which may improve many aspects of physical, mental and social health.

Statistically significant associations existed between the development of a comprehensive curriculum and the percentage of children with caries and dental trauma. The more comprehensive the curriculum applied at school, the greater the probability of more children being caries-free and having less dental trauma. These associations remained significant after adjusting for individual covariates (caries-free $\beta = 6.72$, $p = 0.02$; dental trauma $\beta = -5.04$, $p = 0.02$). Moreover, the commitment towards health and safety at school was also strongly associated with dental trauma ($\beta = -9.72$, $p = 0.00$). These findings suggest that some characteristics of the schools' health promotion approaches, such as comprehensive curriculum and commitment towards health and safety, explained some of the oral health outcomes.

There appears to be no research investigating whether education and health outcomes are better or worse in schools with a HPS approach in their curriculum than those that address health only through classroom-based instruction (St Leger, 1999). The possible benefits of a comprehensive focus, linking the curriculum with the school environment and external community and addressing a range of factors that affect student's health, rather than exploring health issues only through the formal classroom curriculum, have been stressed (Young and Willians, 1989; Towner *et al.*, 1993; Nutbeam, 1995; WHO/Pacific and WPRO, 1995; Tones, 1996; Lister-Sharp *et al.*, 1999).

Some studies focusing on specific health policies such as a smoking ban and food policies indicate that educational and health gains for children are more likely to occur if a comprehensive intervention is applied (Reid *et al.*, 1995; Vandongen *et al.*, 1995; Bowker *et al.*, 1998; Northrup *et al.*, 1998; Ani and Grantham-McGregor, 1999; McGlone *et al.*, 1999). Reviews on the impact of health education at schools on pupils' general skills and oral health gave better results where there was an emphasis on interaction and participatory learning methods, and on involving pupils in many activities outside the classroom and in the community (Towner *et al.*, 1993; Kalnins *et al.*, 1994; Schou and Locker, 1994; Sprod *et al.*, 1996; Kay and Locker, 1998; St Leger, 1999).

The commitment towards health and safety was associated with dental trauma. Injuries sustained by children in school are reported to be related to a lack of safe grounds/playgrounds, sport facilities and stairways (Lenaway *et al.*, 1992; Stark *et al.*, 1996; Maitra, 1997). The roles of teachers in health promotion and safety at school, as well as the advantages of school–parent links, have been explored in the literature (Young, 1992; Carter *et al.*, 1994; Denman, 1998; St Leger, 1998). Gains appear to be associated with the level of teacher's commitment, and parental and community participation.

Although school health promotion activities may explain some of the variance in dental caries and dental trauma, other independent variables, related to the school environment and individual characteristics, appear to be important factors associated with these outcomes.

CONCLUSIONS

Children in supportive schools, where health promotion activities had been developed, had better oral health than children in non-supportive schools in deprived areas of Curitiba. More inequalities in oral health were observed in non-supportive than in supportive schools.

The development of a comprehensive curriculum directed at health promotion at school is an important determinant of 12 year-old children's caries-free status and dental trauma. The more comprehensive the curriculum, the greater the probability that children will be caries-free and have less dental trauma.

A commitment towards health and safety at school was the best predictor of the probability of children having dental trauma.

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