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Inequalities in oral health: are schoolchildren receiving the *Bolsa Família* more vulnerable?

ABSTRACT

OBJECTIVE: To evaluate the association between being a recipient of the *Bolsa Família* program and oral health conditions in Brazilian schoolchildren.

METHODS: A cross-sectional study was conducted with 1,107 schoolchildren aged between eight and 12 years from 20 public and private schools in Pelotas, RS, Southern Brazil. A list of all children receiving the *Bolsa Família* program was provided by the participant schools. Demographic, socioeconomic and oral hygiene information were assessed using a questionnaire completed by the schoolchildren and their parents. Dental exams were performed to assess the presence of dental plaque and prevalence of dental caries. Data were analyzed by Chi-square test, Chi-square test for linear trend and multivariate Poisson Regression (prevalence ratio; 95% confidence interval).

RESULTS: Schoolchildren from non-nuclear families, with a DMFT ≥ 1 and who had never visited a dentist were associated with receiving the *Bolsa Família*. Final model showed that caries prevalence was twice as high (PR 2.00; 95%CI 1.47;2.69) in schoolchildren benefiting from the *Bolsa Família*. It was also showed that schoolchildren benefiting from the program presented greater severity of dental caries compared to school children from private schools (RR 1.53; 95%CI 1.18;2.00). After final adjustments, the prevalence of schoolchildren who have never visited a dentist was six times higher in children who received the government benefit (PR 6.18; 95%CI 3.07;12.45) compared to those from private schools.

CONCLUSIONS: Schoolchildren benefiting from the *Bolsa Família* program experienced more caries lesions and have less frequently accessed dental care services, which suggest the need to include oral health in the program.

DESCRIPTORS: Child. Dental Health Services, utilization. Socioeconomic Factors. Health Vulnerability. Oral Health. Cross-Sectional Studies.

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Received: 12/12/2012

Approved: 7/21/2013

INTRODUCTION

In oral health, the main health problem is dental caries, a chronic, avoidable disease, which is cumulative, and is considered a significant cause of toothache⁴ and tooth loss in its most advanced stage.^{19,20} The etiology of dental caries is composed of a complex interaction between biological environmental and social conditions.²¹ Although the prevalence of dental caries has decreased in Brazil over the last few decades, there are still large inequalities in its distribution.¹⁵ This phenomenon, named polarization of the disease, means that it is in the poorest segments of the population where almost the entire disease load is concentrated.¹²

The relationship between socioeconomic position and health conditions is clearly explained in the literature. Individuals with higher positions in the social hierarchy have better health conditions than those below, showing a social gradient in morbidity and mortality.^{9,10} Oral health is a strong socioeconomic and behavioral indicator²¹ and can be taken into consideration when studying social inequalities in health care.

Access to, and use of, dental services are also related to socioeconomic inequalities, one of the main obstacles both collectively and individually.¹⁴ Although use of dental services has increased at all levels of society in Brazil, this use is still very uneven, as the proportion of individuals who have never visited a dentist is eight times higher among the poorest.¹⁴

The *Bolsa Família* Program (BFP) is a Brazilian government program that directly transfers income to households living in poverty and extreme poverty. Receiving this benefit is linked to the authorities and to the household undertaking to fulfil certain conditions, increasing these households' access to their basic social rights, such as health care, education and social assistance.^a The BFP had three dimensions: promoting the immediate alleviation of poverty by direct transfer of income, reinforcing the exercise of basic social rights in the area of health and education and coordinating complementary programs, so that the households manage to overcome their situation of vulnerability and poverty.

Programs to transfer income have positive impacts on the health indicators of those who benefit from them.^{6,13,18} However, some studies have failed to confirm this positive impact or were inconclusive on their influence on children's health.^{2,11}

There are no studies that link distribution of income by the *Bolsa Família* Program with oral health problems,

or which show the need to prioritize oral health care in the recipients.

The aim of this study was to analyze the association between receiving the BFP and oral health conditions in schoolchildren.

METHODS

A cross-sectional observational study was carried out with 1,107 children aged between eight and 12, enrolled in schools in the urban zone of Pelotas, RS, Southern Brazil, in 2010. The city has around 340 thousand inhabitants and is located in the south of the state of Rio Grande do Sul, Brazil.⁷

Of the 50,467 pupils enrolled in primary education in 2010 (44.7% in municipal schools, 43.1% in state schools and 12.2% in private schools), 25,628 were in the age band studied. The sample was obtained using a two-stage cluster sampling technique. The primary units (schools) were randomly selected manually, weighted according to the number of pupils enrolled in each school in 2009 and the size of the network (public and private). Twenty schools were selected, guaranteeing variety in the characteristics analyzed.³ There were nine municipal schools, six state schools and five private schools, reflecting the proportion of types of schools in the municipality. The pupils, the secondary sampling units, were selected from each school year, between 2nd and 6th grade, considering the age range studied.

The EpiInfo 6.0 program was used to calculate sample size. As this was a multi-disciplinary study⁷ with different oral health outcomes being studied, the different prevalences of oral health problems reported in the literature were considered when calculating the sample. The minimum sample necessary ($n = 922$) was obtained using the following estimates and parameters: estimated prevalence of the health problem 10.0%, acceptable error of three percentage points, 95% confidence interval, extra 20.0% to cover losses and refusals, and design effect estimated at 2.0. Pupils aged eight to 12 years in the 20 selected schools, in total 1,744 eligible pupils, were invited to participate in the study. Of this total, 24.0% did not take part and 6.7% were absent from school on the days data were collected, giving a response rate of 69.3% (1,211 children). Two public schools in the study did not provide an up-to-date list of pupils receiving the BFP and these children were excluded from the analysis. Thus, the total number studied was 1,107 children (63.5%).

^a Brasil. Lei Ordinária nº 10.836 de 9 de janeiro de 2004. Cria o Programa Bolsa Família, altera a lei nº 10.689, de 13 de junho de 2003, e dá outras providências. *Diário Oficial Uniao*, 12 jan 2004. p. 1.

The parents or guardians of the pupils completed a questionnaire on the socioeconomic characteristics of the household (maternal schooling and income) and use of dental services. The pupils were interviewed, with the aim of verifying demographic (sex, age, household structure) and behavioral factors. The schoolchildren also underwent a clinical examination, carried out by six previously calibrated dental surgeons and graduate students acting as note takers, which took place in the classrooms using the school chairs and using individual protective equipment (gloves, masks and aprons), artificial light from a head lamp, dental mirror and CPI dental probe. Inter-examiner concordance for dental caries (DMFT index) was evaluated per tooth, using the weighted Kappa coefficient, and the mean value found was equal to 0.74 (range = 0.62-0.79).

Dental caries was verified using the DMFT and dmft indexes,¹ assessing all of the teeth in the individuals' mouth. Two categories were used in analyzing the data: prevalence of dental caries in permanent teeth (DMFT \geq 1) and severity of caries in mixed dentition (DMFT + dmft). The clinical exam identified the presence of visible plaque on six teeth (four primary molars and central incisors in diagonal quadrants), selected before the examination collected using the Visible Plaque Index (VPI).¹⁶

The use of dental services by the child was collected using the questionnaire sent to the parents or guardians, from the question "has the child ever been to the dentist?" If responded to in the affirmative, there were further questions on the time elapsed since the most recent visit (more or less than one year).

Receiving the *Bolsa Família* was verified using the lists provided by the schools participating in the study. The variable was divided into three categories: private school pupils, public school pupils not receiving the BFP and public school pupils receiving the BFP.

Socioeconomic data were obtained from the questionnaire sent to the parents and guardians. Maternal schooling was collected as continuous data, in years of study, and classified into four categories (12 and over; from 9 to 11; from 5 to 8, 4 or fewer). Household income was reported in *reais* and categorized into quartiles. In the interview with the pupils, data were obtained concerning sex (male or female), age (8 to 12 years), and type of school (public or private). Fear of the dentist was identified using the question "Are you afraid of going to the dentist?" (yes: no).

The data collected were double entered into the EpiData program (The EpiData Association, Odense, Denmark) and evaluated for consistency. The analyses were carried out using the Stata 11.0 program (StataCorp, College Station, TX, EUA).

Descriptive analysis was carried out estimating absolute and relative frequencies in order to analyze distribution for the total sample and for recipients of the BFP. The Chi-square test and Chi-square test for linear trend were used to verify association of the variables studied with receiving the benefit.

Poisson multivariate regression models with robust variance analysis were used to test the association between receiving the BFP and the exposure and outcome variables. The method used to select the variables was stepwise, with backward elimination. Variables with $p \leq 0.05$ were included in the final model, the prevalence ratios and their 95% confidence intervals were estimated. The rate ratios (RR) were estimated for the outcome severity of dental caries.

The research project was submitted to the Research Ethics Committee of the Faculty of Orthodontics, *Universidade Federal de Pelotas* (UFPel – Record no.160/2010). The parents/guardians signed consent forms.

RESULTS

The proportion of pupils benefitting from the program increased with age, lower household income, lower maternal schooling and higher presence of dental plaque. Pupils from non-nuclear families, with DMFT \geq 1 and who had never made use of dental services were associated with receiving the BFP. Of those pupils who had visited a dentist at least once in their lives, the prevalence of receiving the BFP was higher in those whose most recent visit was more than a year before, compared with those who had seen one within the year preceding the study (Table 1).

The final model, adjusted for age and the presence of plaque, showed that the prevalence of caries was two times higher (PR 2.00; 95%CI 1.47;2.69) in pupils receiving the BFP compared with those in private schools. Pupils in public schools not receiving the BFP had a higher prevalence of caries (PR 1.76; 95%CI 1.32;2.34), although less severe, compared with those receiving the BFP (Table 2). The final model for the outcome severity of dental caries (Table 3) shows that pupils receiving the BFP had more severe forms of the disease than those in private schools (MR 1.53; 95%CI 1.18;2.00), and those in public schools not receiving the BFP (MR 1.48; 95%CI 1.17;1.87). In the multivariate model, the prevalence of pupils who had never visited a dentist was more than six times higher among children receiving the BFP (PR 6.18; 95%CI 3.07;12.45), compared with those in private schools, after adjusting for maternal schooling, fear of the dentist and presence of dental caries (Table 4). Pupils in public schools not receiving the benefit showed lower use of services (PR 5.01; 95%CI 2.54;9.88), although with lower effect size compared with those who benefitted from the BFP (Table 4).

Table 1. Description of the sample according to receiving the benefit and to socioeconomic, household, oral health and dental service use factors. Relative (n) and absolute (%) frequencies. Pelotas, RS, Southern Brazil, 2010. (N = 1,107)

Independent variable	<i>Bolsa Família</i>		Total
	n	%	
Sex			
Male	122	23.1	529
Female	141	24.4	578
Age (years) ^a			
8	34	19.8	172
9	61	21.5	284
10	59	22.5	262
11	64	26.7	240
12	45	30.2	149
Household income (quartiles) ^a			
0 to 510.00 BRL ^a	116	46.4	250
511.00 to 740.00 BRL	79	37.1	213
744.00 to 1.200.00 BRL	36	14.7	245
> 1,200.00 BRL	2	0.8	238
Maternal schooling (years) ^a			
12 or more	2	1.5	136
9 to 11	48	14.3	335
5 to 8	156	21.3	225
≥ 4		40.5	385
Family structure ^b			
Nuclear	147	21.6	680
Non-nuclear	116	27.3	425
Dental plaque index (terciles) ^a			
First (0 to 2)	82	20.5	400
Second (3 to 5)	77	22.3	346
Third (6 to 20)	104	28.8	361
DMFT ^a			
0	153	20.7	741
≥ 1	109	29.9	365
Use of dental services during life ^b			
Yes	164	19.6	839
No	96	36.9	260
Use of dental services in last year ^b			
Yes	92	16.4	561
No	72	26.1	276

BRL: *Reais* (R\$) Brazilian currency at the time of research

^a p value < 0.001 Chi-square test for linear trend.

^b p value < 0.001 Chi-square test.

DISCUSSION

The schoolchildren who received the benefit are those who have the highest prevalence and experience of dental caries and those who use dental services less, compared

with those in private schools and other pupils in public school not receiving the BFP. This is the first study to investigate the association between oral health conditions and receiving, or not, the BFP, which highlights the relevance and originality of these findings.

Table 2. Crude (PR_c) and adjusted (PR_a) prevalence ratios for the prevalence of dental caries, recipients of *Bolsa Família* and other independent variables in schoolchildren aged from eight to 12 years. Pelotas, RS, Southern Brazil, 2010. Poisson regression analysis. (N = 1,107)

Independent variable	PR _c	95%CI	p	PR _a	95%CI	p
Maternal schooling (years)			0.015			–
12 or more	1			–		
9 a 11	1.31	0.89;1.94				
5 a 8	1.81	1.23;2.66				
≥ 4	2.16	1.50;3.11				
Family structure			0.080			–
Nuclear	1			–		
Non-nuclear	1.16	0.98;1.36				
Sex			0.272			
Male	1			–		–
Female	1.10	0.93;1.29				
Age (years)			< 0.001			< 0.001
8	1			1		
9	0.98	0.70;1.35		0.94	0.68;1.29	
10	1.32	0.98;1.80		1.17	0.87;1.58	
11	1.67	1.24;2.24		1.48	1.11;1.96	
12	1.87	1.37;2.54		1.52	1.12;2.07	
Presence of plaque (terciles)			< 0.001			< 0.001
First	1			1		
Second	1.23	0.99;1.54		1.28	1.02;1.60	
Third	1.64	1.34;2.00		1.50	1.22;1.84	
Fear of dentist			0.119			–
No	1			–		
A little	1.26	1.03;1.54				
Yes	0.82	0.50;1.35				
Very much	1.06	0.73;1.53				
<i>Bolsa Família</i>			< 0.001			< 0.001
No (private school)	1			1		
No (public school)	1.95	1.47;2.59		1.76	1.32;2.34	
Yes	2.29	1.70;3.08		2.00	1.47;2.69	

According to the World Bank, income distribution is one of the causes of lessening social inequalities in Latin American countries.^b The BFP is responsible for many of the most disadvantaged in the Brazilian population being able to move out of poverty or extreme poverty. Among the conditions imposed by the BFP is the use of health care services and attending school. Verifying attendance is done directly by the school, which sends attendance reports of the recipients to the Brazilian Ministry

of Social Development. The health care conditions depend on access to health care services, as the recipients need to regularly visit their reference unit so that the growth and development of children under seven is monitored.²

Even after adjusting for risk factors for dental caries, such as maternal schooling and presence of visible plaque, pupils receiving the BFP have a higher prevalence and severity of dental caries, even when compared to students

^b Lustig N, Lopez-Calva LF, Ortiz-Juarez E. Declining inequality in Latin America in the 2000s: the cases of Argentina, Brazil, and Mexico. The World Bank; 2012. (Policy Research Working Paper, 6248). [cited 2013 Oct 24]. Available from: http://www-wds.worldbank.org/servelet/WDSContentServer/WDSP/IB/2012/10/23/000158349_20121023093211/Rendered/PDF/wps6248.pdf

Table 3. Crude (c) and adjusted (a) rate ratios (RR) for severity of dental caries (DMFT+dmft), recipients of *Bolsa Família* and other independent variables in schoolchildren aged 8 to 12 years. Pelotas, RS, Southern Brazil, 2010. Poisson regression analysis. (N = 1,107)

Independent variable	RR _c	95%CI	p	RR _a	95%CI	p
Maternal schooling (years)			< 0.001			< 0.001
12 or more	1			1		
9 to 11	1.93	1.38;2.71		1.49	1.03;2.14	
5 to 8	2.22	1.57;3.12		1.63	1.11;2.38	
≥ 4	2.71	1.95;3.76		1.95	1.34;2.84	
Family structure			0.372			–
Nuclear	1			–		
Non-nuclear	1.07	0.93;1.23				
Sex			0.272			–
Male	1			–		
Female	0.81	0.70;0.93				
Age (years)			< 0.001			< 0.001
8	1			1		
9	0.85	0.69;1.04		0.79	0.64;0.97	
10	0.70	0.56;0.87		0.66	0.53;0.82	
11	0.52	0.41;0.66		0.48	0.38;0.61	
12	0.56	0.43;0.73		0.46	0.35;0.31	
Presence of plaque (terciles)			< 0.001			< 0.001
First	1			1		
Second	1.43	1.19;1.71		1.38	1.15;1.67	
Third	1.65	1.40;1.95		1.57	1.32;1.87	
Fear of dentist			0.146			–
No	1			–		
A little	1.01	0.85;1.21				
Yes	0.69	0.44;1.08				
Very much	1.29	0.94;1.77				
<i>Bolsa Família</i>			< 0.001			0.007
No (private school)	1			1		
No (public school)	1.82	1.46;2.26		1.48	1.17;1.87	
Yes	1.95	1.55;2.47		1.53	1.18;2.00	

in public schools who do not receive the benefit. Studies have shown a strong association between socioeconomic factors and general and oral health conditions (including dental caries) in populations of similar age groups.^{16,17} If, on the one hand, the benefit is correctly provided to those on lower household incomes, these children have more dental caries as a consequence of lower income.

These findings are also explicable by the phenomenon known as polarization of dental caries, observed in Brazilian schoolchildren,¹² which consists of a lack of the disease in a considerable portion of the population, and a large number of cases concentrated in a small group of individuals.^{8,22} This polarization indicates that there is a distribution of lower disease loads, less uniformly, and increasing levels of inequality are noted.¹²

Recipients of the BFP make less use of dental services, even though they have greater need. Although there had been a significant increase in access to dental services in Brazil at all socioeconomic levels,¹⁴ there is a notable difference in use between groups with greater and lower purchasing power.⁵ The expansion of the *Estratégia de Saúde da Família* – Family Health Care Strategy and of *Equipes de Saúde Bucal* – Oral Health Care Teams, the creation of *Centros de Especialidades Odontológicas* – Specialist Dental Centers and increased income in Brazil may explain this increase in use of services.¹⁴ Even so, in Pelotas, there is a high number of pupils who never use dental services, especially among those receiving the BFP, among whom the prevalence of never having visited a dentist is six times higher than in pupils in private

Table 4. Crude (c) and adjusted (a) prevalence ratios for not using dental services, receiving the *Bolsa Família* and other independent variables in schoolchildren aged 8 to 12 years. Pelotas, RS, Southern Brazil, 2010. Poisson regression analysis. (N = 1,106)

Independent variable	PR _c	95%CI	p	PR _a	95%CI	p
Maternal schooling (years)			< 0.001			< 0.001
12 or more	1			1		
9 to 11	2.73	1.34;5.57		1.26	0.63;2.50	
5 to 8	4.23	2.09;8.58		1.71	0.84;3.47	
≥ 4	6.41	3.23;12.70		2.02	1.01;4.05	
Family structure			0.275			–
Nuclear	1			–		
Non-nuclear	1.12	0.91;1.37				
Sex			0.169			–
Male	1			–		–
Female	1.15	0.94;1.41				
Age (years)			0.319			–
8	1			–		
9	0.96	0.70;1.30				
10	0.99	0.73;1.35				
11	0.73	0.51;1.03				
12	0.89	0.61;1.28				
Presence of plaque (terciles)			0.118			–
First	1			–		
Second	0.92	0.71;1.18				
Third	1.18	0.94;1.49				
Fear of dentist	1	1.32;2.15	< 0.001			< 0.001
No	1.68	2.26;3.93		1		
A little	2.98	1.54;2.93		1.55	1.19;2.00	
Yes	2.13			2.56	1.90;3.45	< 0.001
Very much				1.77	1.27;2.48	
Dental caries	1	0.58;0.93	0.011			
No	0.74			1		
Yes				0.63	0.50;0.80	
<i>Bolsa Família</i>			< 0.001			< 0.001
No (private school)	1			1		
No (public school)	6.61	3.33;12.32		5.01	2.54;9.88	
Yes	9.30	4.97;17.44		6.18	3.07;12.45	

schools. Social determinants can exert such a strong differential that even when children have access to a universal public dental health system, these differences are not eliminated.⁵ The increase in the number of dentists in the public health care service in Brazil is still not sufficient to reduce inequalities in dental service use, as their focus does not reach the most vulnerable and susceptible individuals.¹² Presence of dental caries is associated with greater use of dental services. This raises the issue of the actual role of oral health care services, as their focus of action appears to be centered on the disease and not on

promoting health. In addition to increased access, the care philosophy also needs to change, such as strategies that deal with social determinants of health and promote tackling common risk factors.²³

The relationship between poor socioeconomic conditions and inequalities in health care is clear, and investigating the conditions that would enable this relationship, and, subsequently, social inequalities to decrease becomes a priority. Schoolchildren benefitting from the BFP have a higher disease load of dental caries and are those who make less use of dental services. These schoolchildren, in theory, attend health care services,

as monitoring their growth and development up to seven years of age is a key condition for continuing to receive the benefit. There are dentists in most, although not all, municipal primary health care networks in the country. Thus, it would be important to ask whether those oral health care services are really prepared to care for the sickest individuals and whether the door to these services is open to those who really need them.

Among the possibilities of the health care system, oral health care could be incorporated into the health care conditionalities of the BFP. Even if this monitoring was limited to preschool age children, it is in this age group that lifelong patterns of behavior concerning oral health can be established. These conditionalities should be considered by those who formulate public policy, aiming to decrease inequalities in oral health in Brazil.

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This study was supported by the *Ministério da Saúde/Conselho Nacional de Desenvolvimento Científico e Tecnológico* – Edital MCT-CNPq/MS-SCTIE-DECIT/MS-SAS/DAB no. 32/2008 Saúde Bucal (Process no. 402350/2008-1). The authors declare that there are no conflicts of interest.