Inequalities in dental services utilization among Brazilian low-income children: the role of individual determinants

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Keywords
health services accessibility; dental care for children; oral health; inequalities in health.

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Received: 3/21/2010; accepted 8/20/2010.

doi: 10.1111/j.1752-7325.2010.00201.x

Abstract

Objectives: To assess the role of the individual determinants on the inequalities of dental services utilization among low-income children living in the working area of Brazilian's federal Primary Health Care program, which is called Family Health Program (FHP), in a big city in Southern Brazil.
Methods: A cross-sectional population-based study was performed. The sample included 350 children, ages 0 to 14 years, whose parents answered a questionnaire about their socioeconomic conditions, perceived needs, oral hygiene habits, and access to dental services. The data analysis was performed according to a conceptual framework based on Andersen's behavioral model of health services use. Multivariate models of logistic regression analysis instructed the hypothesis on covariates for never having had a dental visit.
Results: Thirty one percent of the surveyed children had never had a dental visit. In the bivariate analysis, higher proportion of children who had never had a dental visit was found among the very young, those with inadequate oral hygiene habits, those without perceived need of dental care, and those whose family homes were under absent ownership. The mechanisms of social support showed to be important enabling factors: children attending schools/kindergartens and being regularly monitored by the FHP teams had higher odds of having gone to the dentist, even after adjusting for socioeconomic, demographic, and need variables.
Conclusions: The conceptual framework has confirmed the presence of social and psychosocial inequalities on the utilization pattern of dental services for low-income children. The individual determinants seem to be important predictors of access.

Introduction

Dental caries, the most prevalent type of oral disease, occurs more often in disadvantaged children than in others. Children from low-income families are also less likely to receive dental care and more likely to have unmet dental needs than children from higher income families (1-4). In Brazil, preschool children, like older people, represent a segment of the population with less access to dental care. The results of a National Household Survey (PNAD), carried out in 1998, showed that 18.7 percent of Brazilian people had never had a dental visit, with a higher proportion in lower income populations and based on extremes of age (1). This survey showed that 77 percent of children ages 0 to 6 years had never visited a dentist and that rich children were five times more likely to have recently had dental appointments than poor ones.

The Brazilian National Health System, established by the Constitution of 1988, institutionalized the right of universal access to health services. In the last decades, the main government effort to improve primary health care (PHC) is considered to be the Family Health Program (FHP). Since 1994, the FHP has been providing a broad range of health services, which is delivered by a team composed of one physician, one nurse, one nurse assistant, and some community health workers (ACS). Each team is assigned to a geographical area and is then responsible for enrolling and monitoring the

health status of the population living in this area (5). Since the year 2000, the municipalities have the possibility of inclusion of oral health professionals in the FHP. This improvement, added to the current programmatic guidance proposed by the recent National Oral Health Policy (Brazil Sorridente), aimed to break with the traditional model of public dental services delivery, which had always been centered on emergency care or targeted to priority groups (school-aged children). Theoretically, this new organization should increase access and promote the regular use of dental services for the low-income population living in the FHP coverage areas, minimizing the unmet demand (6).

Despite the large countrywide expansion of the FHP facilities with dental workers (from 2,200 in 2001 to 15,700 in 2007), the last PNAD, conducted in 2008 (7) showed that the lack of access to dental health services still remained an issue, with about 12 percent of the population relating that they had never had a dental visit, and only 40 percent of them relating recent use of the services. The results also showed that, despite the low rate of dental services utilization among preschool children, there was a reduction in the proportion of children under 4 years old who had never had a dental visit as compared with the results from the 1998 survey (from 85.7 to 77.9 percent).

The factors that affect the use of and access to health services have been demonstrated through many frameworks (8-11), but the one most studied is the Andersen's model (8,9). According to Andersen, access to health care depends on who people are (their individual characteristics) and where they live (community characteristics). The author suggests that the utilization of health services can be viewed as a type of individual behavior (8), that is influenced by societal determinants, both directly and through the health services system. Thus, the use of services is a result of the interaction of individual factors, the health system, the social context at play, and past experience with using services.

The behavioral model postulates that the use of health services is a function of the individual's predisposition to use them (which is itself influenced by sociodemographic characteristics, preferences and expectations regarding oral health, and knowledge of the dental care delivery system), the level of need (perceived health status, severity of disease, limitations of activity), and the presence of factors that enable or facilitate the utilization of the services (income, social network, access to a regular source of care) (8,9).

There are several studies, undertaken in Brazil and other countries that seek to explain the individual determinants of dental care utilization using the Andersen's behavioral model (12-15). According to them, females, people who are between 5 and 24 years of age, and those with higher rates of income and schooling tend to use dental services more frequently and/or tend to use them on a regular basis. The main barriers to the utilization of dental services include cultural factors and a low perception of dental treatment needs (16).

In Brazil, the nature of access to and utilization of dental services among young people are seldom reported. Seeking to expand our understanding of this subject, the objective of this study was to assess the individual determinants of non-utilization of dental services by low-income children living in areas served by the PHC program (FHP) in a big city in Southern Brazil.

Methods

This study was part of a broad household survey, which aimed to identify disparities in the access and utilization of dental care in the working area of the FHP in Ponta Grossa, a city with about 311,000 inhabitants, located in the State of Parana, South of Brazil. The population registered for the program in 2005, the year when the survey was designed, corresponded to 32.7 percent of the total population of the city, and was composed of people who lived in its poorest areas. There were 29 family health teams (FHT) with their 14 corresponding dental teams working in those areas.

Using a stratified multistage sampling method, a probabilistic sample of this population was selected for this broad study ($n = 747$), that was representative of four age subgroups about which information was available in official databases, specifically the Primary Health Care Information System: babies and preschool children, school children and adolescents, adults and elderly people. The target population, selected for the present study, was the group of babies and preschool children (0 to 6 years of age) and school children and adolescents (ages 7 to 14 years old) of the broad survey, corresponding to 350 individuals.

The sample size was calculated considering a degree of accuracy of 5 percent, a confidence interval of 95 percent, and the size of the population of interest enrolled in the FHP in the city. The prevalence of utilization of the FHP's dental services (12 percent) was calculated based on the proportion of patients seen by the dental teams during the year 2004, in relation to the total population registered in this program, according to official reports of the municipal health department.

The selection of participants observed a complex sample design, according to information collected during the registration of families by the ACS, and included all people living in the coverage areas; even those not registered at the FHP facilities. In the first stage, eight FHP dental teams' coverage areas (encompassing between 4,000 and 8,000 registered persons each) were randomly selected. For each FHT, two to four ACS predefined working areas were randomly selected and, for each of them, 50 households. All individual dwelling in the selected households were invited to participate in the study; those who agreed to participate signed an informed consent. The methodology was first tested in a pilot study. Because of the low response rate observed during the pilot

study (about 50 percent), mainly attributed to the difficulty of access to randomly selected subjects (persons absent during the time of data collection, high turnover of families in the homes and, to a lesser extent, geographic limitations and risk of violence) the sample drawn was twice the one calculated for each age group.

The data for the total broad study were collected between August 2007 and June 2008. The selected people were interviewed at home by 10 Dental and Nursery students of the State University of Ponta Grossa, who were trained to gather the data, and were supervised by the main researchers. Interviewers were supported by the ACS, who were responsible for leading them to the selected households and introducing them to their residents. The company of the ACS at all times of the research was a requirement of the City Health Department, concerned about the safety of the research team. If the selected persons were not located at home during the visit, one additional attempt was made on a subsequent day and a different time.

The individuals answered to a structured questionnaire on socioeconomic conditions, oral hygiene habits, perceived needs, and access to dental services, which was previously pretested. The questions were adapted from those of the PNAD/2003 (17) and from a questionnaire developed by the Department of Epidemiology and Public Health of the University of London (18). For children younger than 11 years old, the mother or other guardian answered to the questionnaire.

The chosen dependent variable was "never had a dental visit," which has been used as the main indicator of lack of access to dental services in Brazil. The conceptual framework used to select independent variables was based on the individual determinants of health services utilization from Andersen's behavioral model (6).

The independent variables were selected in order to achieve the three dimensions of the model.

The predisposing factors were grouped into two dimensions:

1. Sociodemographic: a) unmodifiable: age and gender; b) modifiable: educational level of the mother or caregiver, and ownership of the family's house.

2. Health beliefs and attitudes: a) frequency of toothbrushing; b) would visit a dentist regularly or only in case of pain.

In terms of enabling factors, the chosen variables were: a) family monthly income (cut point of one Brazilian minimum wage, which is a measure of income distribution regularly used by the official research institutes); b) school attendance; c) having one's health condition regularly monitored by the FHP team (as a regular source of care). The need for health care was assessed according to the perception about the children's need for oral health care, the perception of their oral health condition and related oral health problems. This variable was obtained by asking the caregivers about the presence of oral problems and, if so, inviting them to specify the problem. Children with at least one report were categorized as having oral problems.

The statistical analyses were carried out using the software Statistical Package for Social Sciences (SPSS) for Windows, 15.0 (SPSS Inc., Chicago, IL, USA). Initially, the independent associations between "never having had a dental visit" and the explanatory variables were assessed by qui-square test. Subsequently, multivariate logistic regression analysis was performed in order to obtain the best adjusted explanatory model for the lack of utilization of dental care, according to the individual level of Andersen's behavioral model (8,9). At this stage, all variables that were independently associated to the outcome in the bivariate analysis, with $P < 0.10$, were fitted in the model. Results were reported as non-adjusted and adjusted odds ratios with 95 percent confidence intervals. Intervariable correlations were examined for potential multicollinearity between the included variables.

The study was approved by the Research Ethics Committee of the State University of Ponta Grossa. The individuals had guaranteed full freedom to avoid participating, and they were also provided of the principles of anonymity and privacy of information.

Results

The final sample was composed of 350 children residents of the poorest areas of the city, whose parents or caregivers were interviewed at home. Their descriptive characteristics are demonstrated in Table 1. Although 79 percent of the children's families have the ownership of their houses, the mean per capita monthly income was US$84.00 (±US$63.30), which is above the Brazilian poverty line (half the official minimum wage per capita per month), and 19 percent of the sample was considered "very low income," with a family's total income of one minimum wage or less per month (US$191.00 or R$ 415.00, at the end of the gathering of data). This group showed a mean per capita monthly income lower than US$60.00. About 60 percent of the children were enrolled in a school (98 percent of the school-aged ones) or kindergarten (23 percent of the preschool-aged ones); and 94 percent of them were registered with the FHP's services, although only 65 percent of them had their health condition regularly monitored by the FHT.

Table 1 shows that most of the parents considered their children's oral health to be good or very good (72.5 percent), but 46 percent of them related that their children needed dental treatment and 57.6 percent could identify the presence of at least one oral problem, with dental caries being the most cited one. For most of the children, parents recalled a dental visit in the year before the survey (47 percent) or at least in the 2 years prior (18 percent), but 31 percent of children had never been to the dentist (non-tabulated data).

Table 1 Descriptive Characteristics of the Sample. Children and Adolescents 14 Years Old or Younger: Ponta Grossa, Paraná, Brazil, 2007-08 (n = 350)

Variable	*n*	%
Predisposing factors		
Socio-demographic		
Age group		
0 to 6 years old	184	52.6
7 to 14 years old	166	47.4
Gender		
Girls	180	51.4
Boys	170	48.6
Ownership of the family's house		
Yes	271	79.0
No	72	21.0
Educational level of the mother or caregiver		
Incomplete high school or more	114	40.1
Elementary school completed or less	170	59.9
Health beliefs and attitudes		
Frequency of daily toothbrushing		
Twice or more	251	71.9
Once or less	98	28.1
Would visit a dentist only in case of pain		
No	288	84.0
Yes	55	16.0
Enabling factors		
Family monthly income		
Low (more than one Brazilian minimum wage*)	267	81.4
Very low (one Brazilian minimum wage or less)	61	18.6
Go to school/kindergarten		
Yes	202	58.4
No	144	41.6
Have the health condition regularly monitored by the FHP's team		
Yes	206	64.8
No	112	35.2
Need factors		
Reported oral diseases		
No	148	42.4
Yes	201	57.6
Need dental care		
No	166	54.4
Yes	139	45.6
Perception of the child's oral health condition		
Very good/good	250	72.5
Bad/very bad	95	27.5

* One Brazilian minimum wage corresponded to US$ 191.00 at the time of the data collection (US$ 1.00 = R$ 2.25 in 2008 November).

Table 2 provides information about the individual determinants associated with "having never been to a dentist." Most of the children who never had a dental visit were shown to be very young and to have poor oral hygiene habits. Most of the parents believed that the children did not need dental care and that their oral health condition was good or very good. It was observed that about 19 percent of them reported their children need some kind of dental care or rated their oral condition as poor or very poor. Among the children who had never visited a dentist, 18 percent had some reported oral problems and are without access to dental services.

The bivariate analysis in Table 2 also demonstrates that, besides gender and the educational level of the mother or guardian, all the predisposing factor associated with "never been to a dentist," including the statement that the child would go to the dentist only in case of pain, which was within the limit of statistical significance of 5 percent. Going to school and having the FHP as a regular source of health care were the enabling determinants statistically associated with "never been to a dentist."

Table 3 presents the explanatory model obtained by logistic regression analysis. Once we identified multicolinearity between age and school attendance (OR 0.008; 95 percent CI 0.003-0.021), we excluded the first variable from the multivariate analysis. The adjusted model indicated that the statement that the child would go to the dentist only in case of pain, a predisposing factor related to health beliefs, and the absence of perception of dental care need, were shown to be important predictors for "never been to a dentist." On the other hand, the enabling factors related to the family's level of social support such as going to school and having one's health condition regularly monitored by the FHP team, were shown to be protective factors for the outcome.

Discussion

Children in low-income families are among the most disadvantaged, yet little is known about individual barriers to care for them. This study provides preliminary insight into the determinants of dental care utilization by children in the FHP's coverage areas in Ponta Grossa, Brazil. The main implication is that the increasing knowledge about the factors that influence dental services utilization may lead to more effective policies.

The Brazilian Health System provides free health and dental care to all people. This study demonstrated that, in spite of the government's effort to minimize barriers to access through the implementation of the FHP, inequalities in the utilization of general health and dental services persist. It was demonstrated that some children do not access the FHP services as a regular source of health care, and some of them have never been to a dentist, despite of the presence of oral health problems.

The main results of this study were related to the role of the social network in increasing poor children's opportunities to access dental care, as represented by the enabling variables. In Brazil, elementary school attendance is free and compulsory for all children from 6 to 14 years of age. Younger children have free access, even though not compulsory, to public nurseries and kindergartens. Our results showed that children who were not enrolled in a school or kindergarten were about

Table 2 Bivariate Analysis of the Individual Determinants for "Never Having Had a Dental Visit." Children and Adolescents 14 Years Old or Younger: Ponta Grossa, Paraná, Brazil, 2007-08 (n = 350)

Variables	Had at least one dental visit	Never had a dental visit	Never had a dental visit (%)	*P*-value
Predisposing factors				
Socio-demographic				
Age group				
0 to 6 years old	91	93	50.5	<0.001
7 to 14 years old	152	14	8.4	
Gender				
Girls	128	52	28.9	0.482
Boys	115	55	32.4	
Ownership of the family's house				
Yes	198	73	26.9	0.005
No	40	32	44.4	
Educational level of the mother or caregiver				
Incomplete high school or more	70	44	38.6	0.504
Elementary school completed or less	111	59	34.7	
Health beliefs and attitudes				
Frequency of daily toothbrushing				
Twice or more	191	60	23.9	<0.001
Once or less	52	46	46.9	
Would visit a dentist only in case of pain.				
No	210	78	27.1	0.056
Yes	33	22	40.0	
Enabling factors				
Family monthly income				
Low (more than US$ 191.00)	185	82	30.7	0.292
Very low (US$ 191.00 or less)	38	23	37.7	
Go to school/kindergarten				
Yes	179	23	11.4	<0.001
No	61	83	57.6	
Have the health condition regularly monitored by the FHP's team				
Yes	150	56	27.2	
No	67	45	40.2	0.018
Need factors				
Reported child's oral health problems				
No	77	71	48.0	<0.001
Yes	165	36	17.9	
Need dental care				
No	85	54	38.8	<0.001
Yes	134	32	19.3	
Perception of the child's oral health condition				
Very good/good	165	85	34.0	0.007
Bad/very bad	77	18	18.9	

seven times more likely to have never been to a dentist than the enrolled ones. This could be explained both by the presence of dentists in several public schools in the municipality and by the performance of the dental teams of the FHP in the educational institutions in the working areas. In addition, the utilization of the FHP as a regular source of health care also increases the odds of having a dental visit at least once. These results are consistent with other research conducted with children, adolescents and adults demonstrating the importance of a regular source of care in ensuring the receipt of health services (13,15,19). According to Ryan *et al.* (15), the ability to identify a regular source of care demonstrates the presence of longitudinality and represents the existence of a kind of linkage between the individuals and the primary health team. Some researches suggest that social networks play a role in promoting the utilization of dental care (19). In the United States, Nahouraii *et al.* (20) identified that social support was associated with greater use of dental care among Latino children. Although not significantly associated with the outcome, in the multivariate model of the present study,

Table 3 Logistic Regression Analysis – Better Adjusted Multivariate Model for Never Having Had a Dental Visit. Children and Adolescents 14 Years Old or Younger: Ponta Grossa, Paraná, Brazil, 2007-08 (n = 350)

Variables	OR_{unadj}	95%CI	*P*	OR_{adj}	95%CI	*P*
Predisposing factors						
Ownership of the family's house						
Yes	1.0		0.005			0.076
No	2.17	1.27-3.71		1.98	0.93-4.22	
Would visit a dentist only in case of pain.						
No	1.0		0.056	1.0		0.001
Yes	1.79	0.99-3.27		4.34	1.84-10.23	
Enabling factors						
Go to school/kindergarten						
Yes	1.0		<0.001	1.0		<0.001
No	10.59	6.14-18.27		11.17	5.65-22.09	
Have the health condition regularly monitored by the FHP's team						
Yes	1.0		0.018	1.0		0.007
No	1.80	1.11-2.93		2.48	1.28-4.83	
Need factors						
Reported child's oral health problems						
No	1.0		<0.001	1.0		<0.001
Yes	0.24	0.15-0.38		0.25	0.13-0.49	
Nagelkerke R Square = 0.47						

the ownership of the family's house, which indicates an absence of residential mobility, reinforces these findings.

The results indicate that, despite the universal characteristics of the Brazilian educational and health systems, some children lack access to them. According to Andersen (8,9), apart from the illness level (need factors) and the demographic variables, differences in the remaining subdomains of the behavioral model indicate the presence of inequalities. According to the authors, social structure, beliefs, family, and community resources should have a minimum influence on the distribution of health services. In this study, the socioeconomic variables were not associated with the outcome in the final multivariate model. The monthly income, an enabling variable related to the family, was not associated nor in the bivariate or in the multivariate analysis. The influence of income on access to dental care tends to be higher in countries where these services are predominantly private (21). For this study, the absence of statistical association between family income and the utilization of dental services could also be occurring because of the uniformity of the socioeconomic conditions of the population under investigation.

In agreement with the literature, it has also been shown that beliefs and perceptions about oral health are important individual barriers. The findings suggest that psychosocial factors, together with dental health status, can act as determinants of access to dental services for children. The results are consistent with those from Ismail and Sohn (22) and from Maserejian *et al.* (23), who demonstrated that the mere provision of universal and free dental care is insufficient to remove the disparities in utilization of the services or oral health status.

While this study provides important information about dental services utilization among low-income children, it does have limitations. Because of the design of the study, which is cross-sectional, these findings can be interpreted only as associations: they don't allow one to establish causal links. Another limitation is related to the possibility of response bias because the findings are based on self-reports. Children and caregivers may have related more recent dental visits or greater frequency of tooth brushing so as not to appear negligent. Some respondents may also have had difficulty remembering the requested facts.

According to Bostoen *et al.* (24), the current sampling methods have limitations for certain populations living in settings of difficult access, such as remote regions without easily available sampling frames, hidden and vulnerable population groups or urban slums. Paradoxically, these settings are those for which data are most lacking, and surveys are most needed to generate information about population health and lead to appropriate policies.

Although there was a very low rate of refusals to participate, it was impossible to survey the caregivers who were absent from the households or those living in areas with geographically limited access, what resulted in a relatively high non-participation rate (12 percent). Their children could represent a group with differing dental care use and access patterns. Therefore, we can't rule out selection bias in the current study.

During data collection, some areas were excluded because of unavailability of the ACS who should guide the research team, thus resulting in additional sampling loss. The main reasons for non-participation of ACS were: license for health treatment, vacation, or license to attend to compulsory preparatory courses. In the non-excluded ACS working areas, some individuals were not interviewed because they did not reside in the selected households anymore; a high residential mobility is usual in the poorest areas of the city. Although most of the selected subjects were interviewed, and in spite of absent discrepancies of socio-demographic characteristics between excluded and selected areas, special care is demanded to allow inference of these results for the total area of the FHP in the city.

Some evidence indicates that community-level factors are also related to health care use (25). The community level of the behavioral model was not assessed in this study. Once the FHP is targeted to the poorest areas of the city, which share similar socioeconomic and service delivery system characteristics, the sample was considered as homogeneous in relation to the community level. We suggest that further researches include people living in different community contexts.

In summary, it was demonstrated that both the public educational system and the primary health care program (FHP) seem to be protective determinants of low-income children's access to dental care. However, there are inequalities in the utilization of the public services that are connected to children's lack of access to school or to the FHP as a regular source of health care, and these barriers might be minimized. The findings indicated that, besides social support, the absence of perceived need was an important predictor of never having been to the dentist. Children whose mother or caregiver related no need of dental care were at higher odds of having had no dental visits. This highlights the need for FHP dental teams to develop inclusive educational and preventive activities in their working areas that are specifically geared toward young children and their parents. The conceptual framework has confirmed the presence of social and psychosocial inequalities on the utilization pattern of dental services for low-income children. The individual determinants seem to be important predictors of access to dental care.

Acknowledgments

We acknowledge the local government of the municipality of Ponta Grossa, Parana, Brazil, and especially the community health workers (ACS) of the FHP, for their assistance during the data collection. We also acknowledge the students of the State University of Ponta Grossa for their valuable contribution to the data collection. This study was supported by the Brazilian Council for Improvement of Research (CNPq409792/2006-3).

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