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Gains in Children's Dental Health Differ by Socio-Economic Position: Evidence of Widening Inequalities In Southern Brazil

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SUMMARY

Background—Oral health inequalities are the measures by which equity in oral health is tracked. Despite widespread improvement in children's dental health globally, substantial socio-economic disparities persist and may be worsening.

Aims—Quantify 10-year changes in child caries occurrence by socio-economic position in a Southern Brazilian city and compare oral health inequalities over time.

Design—Representative surveys of dental caries in children (age <6 years) in Canoas, Brazil, were conducted in 2000 and 2010 following standardized methods. For each survey year, we calculated disparities by socio-economic position (maternal education and family income) in age- and sex-standardized caries occurrence (prevalence: dmft>0; severity: mean dmft) using absolute measures (difference and Slope Index of Inequality) and relative measures (ratio and Relative Index of Inequality).

Results—Comparing 2010 to 2000, caries occurrence was lower in all socio-economic strata. However, reductions were more pronounced among socio-economically advantaged groups, yielding no improvement in children's oral health disparities. Some disparity indicators were consistent with increasing inequality.

Conclusions—Overall, dental caries levels among children in Canoas improved, but inequalities in disease distribution endured. Concerted public health efforts targeting socio-economically disadvantaged groups are needed to achieve greater equity in children's oral health.

INTRODUCTION

Health disparities, often termed health inequalities, are differences in health status that negatively impact groups marked by social or economic disadvantage.[1] Widening or

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persistent health disparities, particularly when such inequalities can be considered unfair, unjust, and avoidable, raise social justice concerns regarding the distribution of opportunities and/or barriers to achieving optimal health between members of underprivileged segments of society and their more advantaged counterparts.[1–3] Monitoring disparities over time is essential for tracking progress toward or away from health equity in populations[1] and can help to identify needs for concerted efforts to elevate the health status of vulnerable subgroups.

Untreated dental caries affects more individuals than any other adverse health condition worldwide,[4] yet the distribution of caries, strikingly and near universally, follows a social gradient, with the greatest concentration of disease among the least socially or economically advantaged groups.[5,6] Children's oral health disparities contribute directly to disparities in oral pain and quality of life[7] and carry lasting effects on later dental health.[8] Multiple reports have called for greater attention on oral health inequalities both in research and public health action.[3,9] Rather than emphasizing behavior modification of individuals in oral health promotion, these reports underscored "upstream" structural and environmental risks,[9] which may simultaneously serve as common causes for a variety of unfavorable health outcomes.[3,10]

While the global disease burden of untreated primary tooth decay has decreased in recent decades, not all world regions experienced improvement.[4] Within populations, as well, widening socio-economic disparities in children's dental health have been reported, despite reductions disease occurrence overall.[11] In other settings, however, improvements in overall disease levels have been coincident with inequality reduction, albeit not elimination.[12] This study examines the oral health status of children in two separate cross-sectional surveys conducted in a Southern Brazilian city, 10 years apart. The principal objectives were: 1) to quantify changes in child caries prevalence and severity over time according to two commonly used markers of socio-economic position (maternal education and household income), and 2) to compare socio-economic disparities in child oral health at each time point using relative and absolute measures.

MATERIAL AND METHODS

Study design

This study drew data from two cross-sectional epidemiological surveys of oral health among preschoolers, conducted in the city of Canoas, state of Rio Grande do Sul, Brazil in 2000 (Oral Health Canoas 2000) and 2010 (Oral Health Canoas 2010).[13,14] The population of Canoas was approximately 300,000 inhabitants in 2000 and 324,000 in 2010; the third largest population in the state and 53rd largest in Brazil.[15] The population exclusively inhabits an urban area. The public water supply is fluoridated at 0.8 ppm. Although Canoas ranks 31st nationally by gross domestic product, the city ranks only 553rd among 5,565 Brazilian municipalities in Human Development Index (HDI).[15] However, the HDI of Canoas increased to 0.750 in 2010 from 0.665 in 2000, with the highest gains in absolute terms achieved in education, income, and longevity.[15]

Population

The population eligible for surveys comprised all children less than 6 years of age enrolled in all Canoas public preschools in 2000 and 2010 with ≥1 primary teeth but without any erupted permanent teeth. In Oral Health (OH) Canoas 2000, of 1745 potentially eligible children in 28 preschools, 1565 children with parent/caregiver informed consent and interview data were present on the examination date (89.7%). A further 78 were excluded for being predentate or having permanent teeth, leaving an analytic sample of 1487 (85.2% of the total preschool population). In OH Canoas 2010, there were 1731 potentially eligible children in 31 preschools, of whom 1559 children with parent/caregiver informed consent and interview data were present on the examination date (90.6%). Additionally, 219 children were excluded for lack of teeth or presence of permanent teeth and 35 children for behavior that precluded examination, yielding 1306 children for analysis (75.4% of the total preschool population).

Data collection

Data collection consisted of a parent/guardian interview and a child dental examination. Each field team included a previously trained and calibrated dentist examiner, a dental student for data entry, and support staff. OH Canoas 2000 featured five field teams; for OH Canoas 2010, there were six teams.

A structured questionnaire for parents (or guardians) was administered at the schools. Questionnaire items included demographic variables (child's sex and age) and socioeconomic variables (maternal education: years completed, dichotomized as ≤8 years and >8 years; and family income: including income from all household residents during the previous month, divided into quintiles, separately for the 2000 and 2010 populations). Education was dichotomized, because relatively few individuals would have been classified in the upper- and lowermost education categories if finer divisions had been selected. Income was not adjusted for the number of adults and children in the household, because this information was not available in the year 2000 dataset. We checked the sensitivity of the inequality measures in the year 2010 dataset to income equivalization for household size,[11] and the results were largely unchanged.

In both survey waves, children were examined in a classroom lying on ordinary desks under natural light. Teeth were first cleaned and dried with gauze before visual examination, aided by a dental mirror and tongue depressor. Biosafety measures and criteria for the diagnosis of decayed, missing and filled teeth (dmft) established by the World Health Organization (WHO) were applied,[16] with the modification that initial carious lesions (white spots) were also included in the “d” component. Caries prevalence was defined as the percentage of children with dmft>0.

Each wave, examiner reliability was estimated during two calibration exercises, 10 days apart. For OH Canoas 2000, kappa values for intra-examiner agreement ranged from 0.65 to 0.92 and for inter-examiner agreement from 0.75 to 0.92. In 2010, intra-examiner agreement ranged from 0.93 to 1.00, and inter-examiner agreement ranged from 0.83 to 1.00.[13,14]

Data analysis

Caries prevalence (dmft>0) and mean dmft index were calculated for each survey wave, overall and by each category of child sex, age, and family socio-economic position. To compare caries measures across survey waves, age- and sex-standardized caries values were obtained via direct standardization, where stratum-specific weights for each category of age and sex were based on the age and sex distribution of the total sample (i.e. both survey waves combined). The change in caries measures from 2000 to 2010 by each level of maternal education and family income was calculated as the relative reduction in the standardized caries measure, expressed as a percentage. For example, a change in caries prevalence from 40% to 20% would correspond to a relative prevalence reduction of 50% (i.e. (0.4 - 0.2)/0.4 × 100%).[17] A change in mean dmft from 3.0 to 2.0 would represent a relative dmft reduction of 33% (i.e. (3 - 2)/3 × 100%)). Additionally, the absolute reductions in standardized caries outcomes were computed. In the examples above, the absolute prevalence reduction would be 20% (i.e. 40% - 20%), or 20 per 100 population, and the absolute dmft reduction would be 1.0 (i.e. 3 - 2). To compare caries measures by socio-economic position within survey waves, relative comparisons (prevalence ratio, dmft ratio) and absolute comparisons (prevalence difference, dmft difference) were calculated using age- and sex-standardized values, where the caries value in the category of most advantaged socio-economic position was taken as the reference value.

Additionally, we calculated the Slope Index of Inequality (SII) and Relative Index of Inequality (RII)[18] for OH 2000 and OH 2010 in order to capture gradients across the range of socio-economic position. The SII represents the slope of the best-fit line for age- and sex-adjusted caries outcomes (dmft or prevalence) by socio-economic position. The SII is a measure of absolute inequality that takes into account the cumulative proportion of individuals in ordered socio-economic categories. A negative value indicates decreasing disease occurrence with rising socio-economic position. The RII is a relative measure of inequality that can be calculated via two approaches.[18,19] The RII(mean) is the SII divided by the mean value of the disease outcome in the population; the RII(ratio) compares disease at the theoretical minimum level of socio-economic position relative to disease at the theoretical maximum.

Furthermore, we obtained two measures of the distribution of caries experience in 2000 and 2010, independent of socio-economic position. The Gini coefficient is obtained from a Lorenz curve for the cumulative distribution of dmft.[20] The value of the Gini coefficient for dmft approaches 1 as caries experience across the population becomes concentrated in a smaller number of individuals. Finally, following the methodology of Blair, et al,[12] we calculated the Significant Caries Index (SiC)[21] within each decile of caries experience in 2000 and 2010, using the upper 33% cutpoint to determine SiC.

Bootstrap re-sampling (5000 iterations) was used to estimate non-parametric 95% confidence intervals (95% CI). Reductions in caries prevalence or in mean dmft across survey waves from 2000 to 2010 were considered statistically significant if 95% confidence intervals excluded the null value, as was the case for comparisons of caries measures by socio-economic position within each survey wave. Analysis was completed using statistical software (SPSS 16.0 and R 3.1.1).

Ethical considerations

The Committee of Ethics and Research at the Lutheran University of Brazil (ULBRA) approved the OH Canoas 2000 and 2010 epidemiological surveys under numbers 255-99 and 2010-056H, respectively. All parents or guardians of participating children granted written informed consent.

RESULTS

The analytic sample consisted of 2,793 children under age 6 years: 1487 assessed in OH Canoas 2000 and 1306 in OH Canoas 2010. The distribution of children by age and sex was similar in both survey waves; however, the proportion of mothers with at least 8 years of formal education was greater in 2010. Overall, caries prevalence (dmft>0) and mean dmft were lower in 2010 than 2000 (Table 1). In both survey waves, caries prevalence and mean dmft increased with greater child age and with lower maternal education and lower household income (Table 1).

The observed reductions in population-wide dental disease from 2000 to 2010 were not distributed equally by socio-economic position. On both the relative and absolute scale, whether categorized by maternal education or family income, the least socio-economically advantaged population segments were associated with smaller reductions in age- and sex-standardized caries prevalence and dmft (Table 2). In the top quintile of family income, however, in which disease levels were initially the lowest, caries prevalence and dmft reductions on the absolute scale were not as great as for the third- and fourth-highest quintiles, which demonstrated the most pronounced improvements. Regardless, disease reductions on the relative scale were greater for the three uppermost income quintiles and the higher education category than for those groups defined by lower incomes or less educational attainment. Reductions in mean dmft from 2000 to 2010 were not statistically significant for children of mothers with less educational attainment or living in lower income households (Table 2).

Unequal reductions in dental disease by socio-economic position contributed to a widening of children's oral health inequalities from 2000 to 2010. For both maternal education and family income, both the relative and absolute disparities in age- and sex-standardized caries prevalence and dmft (Table 3) between the least advantaged and most advantaged groups were greater in 2010 than they were in 2000, although disparities between the mid-to-upper quintiles and the top quintile of family income narrowed. The Slope Index of Inequality and Relative Index of Inequality, which are calculated considering disease distribution across the total population, were both consistent with widening disparities over time (Table 4).

Independent of socio-economic position, the overall decrease in caries experience in Canoas from 2010 to 2000 was evident in a decline in caries severity, as measured using the Significant Caries Index (SiC), which decreased to 3.4 in 2010 from 4.4 in 2000. Figure 1 presents the year 2000 and 2010 SiC scores in each decile of the population ranked by dmft. While reductions in caries severity (SiC score) were evident among caries-affected children within lower deciles of caries experience, there was negligible improvement in SiC scores among children in the top decile of caries experience (Figure 1). Thus, regardless of socio-

economic position, improvement in caries severity over the preceding decade was least pronounced among the 10% of children with the greatest caries experience. Gini coefficients for dmft likewise indicated a greater concentration of caries experience among a smaller number of individuals in 2010 (Gini=0.84) than in 2000 (Gini=0.77).

DISCUSSION

In the Southern Brazilian city of Canoas, we identified a socio-economic gradient in the occurrence of caries in children. Disease prevalence and severity concentrated among the least advantaged groups and generally lessened with rising levels of socio-economic position in each of two survey waves, one decade apart. This reaffirms the findings of prior cross-sectional studies from Brazil[22] and worldwide.[5,6,23] To our knowledge, the present study is the first to track within-population trends in children's oral health inequalities over time in a Brazilian context. Although we found significant temporal improvements in caries status overall, inequalities remained.

The strength and global pervasiveness of the association between markers of socio-economic position childhood dental disease is in accordance with the fundamental role of environmental, political, and community factors in shaping oral health from an early age.[9] Without explicit focus on social determinants in oral health promotion - above and beyond the traditional focus on individual behaviors - substantial gains in oral health equity cannot be expected.[9,10]

Overall, early childhood caries prevalence in Canoas was lower by approximately one-third in 2010 than in 2000, reflecting a continuation of the broader trend in childhood caries reduction experienced across Latin America and the Caribbean during the closing decades of the 20th Century.[24] The development and expansion of public health programs in Brazil, whether or not directly targeting oral health, may have contributed to nation-wide reductions in dental disease.[25] Significant declines in caries prevalence have been reported for Brazilian children nationally from 1980 to 2005[26] and regionally, for example, near São Paulo from 1997 to 2008 from children ages 1 to 4 years.[27] Notwithstanding, untreated carious decay has remained common, potentially concentrated among a smaller proportion of severely affected individuals,[28,29] as corroborated by the increasing Gini coefficient for dmft observed in this study.

Within this context of declining caries burden, we detected increases in socio-economic disparities in children's oral health, which were particularly pronounced on the relative scale. Mathematically, increases in relative inequality will necessarily occur when disease distribution is initially inequitable and absolute reductions in prevalence are equal across socio-economic groups. Here, there was indication that inequality increased on both the relative and absolute scales, notably when comparing children by categories of maternal education or comparing children in the two lower family income quintiles to children in the third and fourth quintiles. In departure from a perfect gradient, however, dental health improvements in the fifth income quartile were less than those in the third and fourth quintiles, particularly on the absolute scale. We speculate that in the fifth quintile there was less "opportunity" for pronounced improvement due to the already-lowest absolute levels of

disease in 2000. Nonetheless, relative disease reductions in the fifth income quintile significantly exceeded those observed for the lowest two quintiles, contributing to greater relative inequality between the lowest and highest income groups from 2000 to 2010.

Drawing data from two surveys of Australian children in 1992/93 and 2002/03, Do et al[11] likewise reported increased income-related caries disparities within a context of declining prevalence overall. In contrast, data from Scottish 5-year-olds collected over repeated survey waves from 1993/4 to 2007/08 did not demonstrate a marked rise in inequality.[12] Further study of region-specific experiences would provide insight into the genesis of oral health inequalities and how disparities might be reduced or eliminated.

To our knowledge, no longitudinal study has evaluated large-scale Brazilian public health programs for dental caries impacts in Brazil. Two decades ago, the national primary care system was significantly reorganized, followed by substantial expansion over the past ten years, helping to lower infant mortality.[30] Incorporation of oral health teams to public health centers greatly expanded access to preventive and restorative oral care, coinciding with an emphasis on increasing fluoridation coverage and utilization of oral health services.[25] However, the use of dental services, as well as perceived treatment needs, remain marked by striking inequities in Brazil,[31] potentially contributing to the uneven distribution of dental health improvements observed in Canoas.

Victora, et al[32] notably introduced the “inverse equity hypothesis,” posing that successful public health interventions will initially increase inequality if programs or interventions are at the start most effective among more privileged groups before gaining traction among the less advantaged. To avoid unintended departures from equity, it has been advocated that public health efforts follow a pattern of “proportionate universalism,” in which interventions simultaneously target all segments of society but with increasing intensity at each level of greater socio-economic disadvantage.[33] The overall dental health gains in Canoas are laudable, but dedicated and sustainable efforts to ensure that progress is equitably distributed may be needed.

This study featured a repeated cross-sectional design and, as a limitation, could not track changes in the dental health of individuals longitudinally. Although socio-economic disparities in children’s oral health were identified, this study did not directly elucidate mechanisms through which these disparities were generated. Advantageously, the two survey waves both included the vast majority of the preschool population in Canoas and together allow examination of trends in oral health over time. Socio-economic position and dental caries were each measured in two manners, and diverse indicators of inequality, both relative and absolute, were calculated.

Although the various indicators of health inequality differ in interpretation,[12] considered together, the results of this study suggest no reduction in caries inequalities in this population from the year 2000 to 2010. In fact, despite meaningful improvements in oral health status at every level of the socio-economic spectrum, the gap between the oral health of children at the least and most advantageous social positions, particularly on the relative scale, has widened. Continued efforts to sustain recent declines in dental disease among all

children are much needed. Ensuring that such public health improvement also yields greater equity in health is similarly critical.

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BULLET POINTS

Why this paper is important to pediatric dentists

- Even in a context of decreasing caries occurrence among children overall, health inequity can increase if oral health gains disproportionately favor socio-economically advantaged groups.
- Reduced caries prevalence at the population level does not assure lessened disease experience among the most severely affected individuals. Specific strategies for caries prevention among children at highest risk may be a necessary complement to broader efforts targeting entire communities.
- To achieve equitable improvements in children's oral health greater emphasis on upstream socio-structural determinants of oral health at the policy level are needed to create better access to health promoting environments and preventive care.

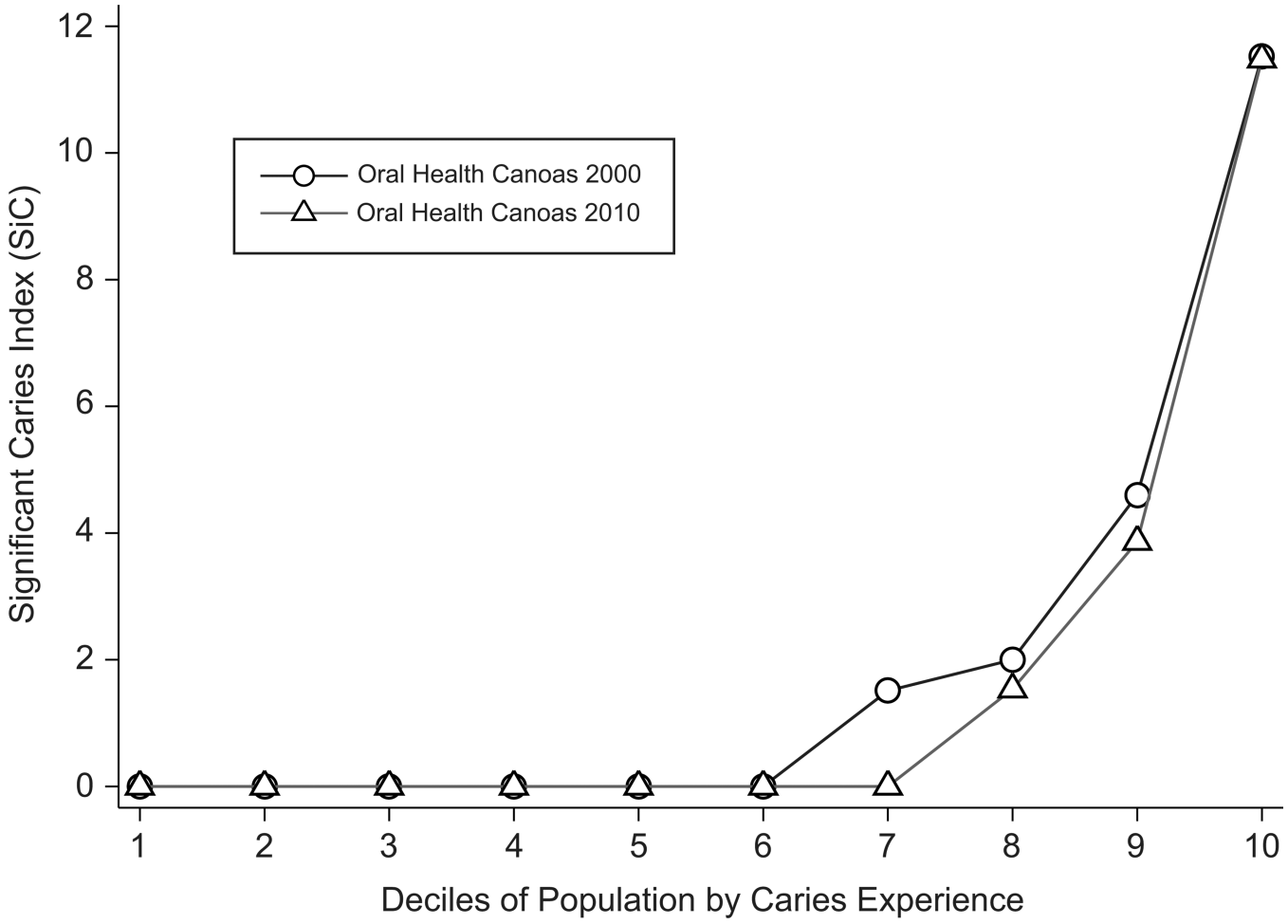

Figure 1. Significant Caries Index (SiC) by deciles of caries experience in 2000 and 2010 (Canoas, Brazil)

The Significant Caries Index (i.e. the mean decayed, missing, filled tooth index in the upper 33% of population by dmft) within each decile of caries experience is shown for the years 2000 (circles) and 2010 (triangles) in the Oral Health Canoas surveys. Despite overall improvements in caries status from 2000 to 2010, the SiC score was no lower in 2010 than in 2000 among those children belonging to the worse-off decile of the population by caries experience.

Table 1

Caries prevalence and dmft by survey year, sex, age, maternal education, and family income (Canoas, Brazil)

Variables	Oral Health Canoas 2000									Oral Health Canoas 2010								
		initial lesions included				initial lesions excluded					initial lesions included				initial lesions excluded			
		dmft>0		dmft		dmft>0		dmft			dmft>0		dmft		dmft>0		dmft	
	N*	n	%	mean	SD	n	%	mean	SD	N*	n	%	mean	SD	n	%	mean	SD
Total	1487	589	39.6	1.53	2.75	435	29.3	1.00	2.21	1306	338	25.9	1.13	2.62	295	22.6	0.93	2.28
Sex																		
Male	787	324	41.2	1.57	2.82	241	30.6	1.02	2.25	681	192	28.2	1.30	2.85	171	25.1	1.06	2.44
Female	700	265	37.9	1.49	2.67	194	27.7	0.98	2.16	625	146	23.4	0.95	2.32	124	19.8	0.79	2.10
Child age (years)																		
0	45	0	0.0	0	0	0	0.0	0	0	27	0	0.0	0	0	0	0.0	0	0
1	183	32	17.5	0.42	1.11	8	4.4	0.10	0.61	167	9	5.4	0.28	1.58	4	2.4	0.17	1.43
2	271	84	31.0	1.08	2.22	40	14.7	0.36	1.10	235	28	11.9	0.46	1.74	21	8.9	0.31	1.22
3	340	146	42.9	1.64	2.80	100	29.4	1.01	2.25	318	91	28.6	1.07	2.34	76	23.9	0.86	1.99
4	353	168	47.6	1.87	2.94	141	39.9	1.28	2.27	343	124	36.2	1.61	2.91	116	33.8	1.38	2.59
5	295	159	53.9	2.34	3.39	146	49.5	1.98	3.03	216	86	39.8	2.00	3.53	78	36.1	1.70	3.15
Maternal education (years)																		
≤ 8	701	307	43.8	1.76	2.93	233	33.2	1.19	2.40	461	156	33.8	1.61	3.18	139	30.2	1.33	2.78
> 8	325	112	34.5	1.21	2.34	70	21.5	0.63	1.64	812	170	20.9	0.86	2.21	147	18.1	0.69	1.91
Family income																		
1st quintile (lowest)	279	123	44.1	1.85	3.03	103	36.9	1.29	2.48	243	75	30.9	1.42	3.01	65	26.7	1.17	2.70
2nd quintile	268	115	42.9	1.66	2.96	77	28.7	0.99	2.27	294	92	31.3	1.31	2.76	80	27.2	1.09	2.48
3rd quintile	280	109	38.9	1.50	2.69	79	28.2	1.01	2.25	216	51	23.6	0.90	2.06	47	21.8	0.79	1.91
4th quintile	270	111	41.1	1.53	2.72	75	27.8	0.93	2.14	259	51	19.7	0.91	2.47	46	17.8	0.75	2.07
5th quintile (highest)	297	87	29.3	1.08	2.29	63	21.2	0.67	1.65	205	39	19.0	0.78	2.07	29	14.1	0.59	1.78

Abbreviations: dmft = decayed missing filled primary tooth index; SD = standard deviation

*Number of observation may be less than total for some variables due to missing data

Table 2

Reductions from 2000 to 2010 in age- and sex-standardized caries prevalence and dmft according to socio-economic position (Canoas, Brazil)

	Caries prevalence (dmft>0), %					
	2000 Standardized caries prevalence	2010 Standardized caries prevalence	Relative prevalence reduction (% of total)	95% CI	Absolute prevalence reduction (per 100 population)	95% CI
Mother's education						
≤ 8 years	43.3	33.4	22.8	10.6, 33.7	9.9	4.4, 15.4
> 8 years	35.1	21.0	40.1	27.2, 50.9	14.1	8.2, 19.9
Family income						
1st quintile (lowest)	41.8	29.7	29.0	10.8, 44.2	12.1	4.1, 20.1
2nd quintile	41.8	31.0	25.7	7.8, 41.1	10.7	3.0, 18.8
3rd quintile	39.2	23.4	40.4	22.0, 56.0	15.8	7.8, 23.8
4th quintile	39.4	20.5	48.0	31.8, 61.6	18.9	11.4, 26.5
5th quintile (highest)	30.7	19.2	37.4	14.2, 56.4	11.5	3.8, 19.1
	Number of affected teeth (dmft)					
	2000 Standardized mean dmft	2010 Standardized mean dmft	Relative dmft reduction (% of total)	95% CI	Absolute dmft reduction (difference)	95% CI
Mother's education						
≤ 8 years	1.74	1.60	8.2	−12.8, 26.5	0.14	−0.21, 0.50
> 8 years	1.21	0.86	28.8	5.6, 45.9	0.35	0.06, 0.66
Family income						
1st quintile (lowest)	1.75	1.40	19.8	−10.9, 44.1	0.35	−0.17, 0.87
2nd quintile	1.62	1.32	18.3	−11.2, 41.6	0.30	−0.15, 0.78
3rd quintile	1.50	0.92	39.1	10.9, 60.0	0.59	0.14, 1.04
4th quintile	1.42	0.93	34.6	4.3, 56.9	0.49	0.05, 0.92
5th quintile (highest)	1.12	0.78	30.2	−6.5, 57.1	0.34	−0.06, 0.74

Abbreviations: CI = confidence interval; dmft = decayed missing filled primary tooth index (includes non-cavitated lesions)

Table 3

Inequalities in age- and sex-standardized caries prevalence and dmft according to socio-economic position in 2000 and 2010 (Canoas, Brazil)

	Caries prevalence (dmft>0), %				
	Standardized caries prevalence (dmft>0), %	Prevalence ratio	95% CI	Prevalence difference	95% CI
Mother's education					
Year 2000					
≤ 8 years	43.3	1.23	1.05, 1.46	8.1	1.9, 14.2
> 8 years	35.1	1	ref	0	ref
Year 2010					
≤ 8 years	33.4	1.59	1.33, 1.90	12.4	7.5, 17.2
> 8 years	21.0	1	ref	0	ref
Family income					
Year 2000					
1st quintile (lowest)	41.8	1.36	1.09, 1.71	11.1	3.3, 18.8
2nd quintile	41.8	1.36	1.10, 1.71	11.1	3.3, 19.0
3rd quintile	39.2	1.28	1.02, 1.61	8.5	0.7, 16.3
4th quintile	39.4	1.28	1.03, 1.62	8.7	0.9, 16.6
5th quintile (highest)	30.7	1	ref	0	ref
Year 2010					
1st quintile (lowest)	29.7	1.54	1.12, 2.24	10.5	2.8, 18.2
2nd quintile	31.0	1.61	1.18, 2.31	11.8	4.4, 19.4
3rd quintile	23.4	1.21	0.84, 1.79	4.1	−3.5, 12.1
4th quintile	20.5	1.07	0.74, 1.58	1.3	−6.0, 8.5
5th quintile (highest)	19.2	1	ref	0	ref
	Number of affected teeth (dmft)				
	Standardized mean dmft	dmft ratio	95% CI	dmft difference	95% CI
Mother's education					

Year 2000					
≤ 8 years	1.74	1.44	1.13, 1.85	0.53	0.19, 0.85
> 8 years	1.21	1	ref	-	ref
Year 2010					
≤ 8 years	1.60	1.85	1.43, 2.37	0.74	0.42, 1.06
> 8 years	0.86	1	ref	-	ref
Family income					
Year 2000					
1st quintile (lowest)	1.75	1.56	1.14, 2.14	0.63	0.18, 1.04
2nd quintile	1.62	1.44	1.05, 2.01	0.50	0.06, 0.92
3rd quintile	1.50	1.34	0.95, 1.87	0.38	−0.06, 0.82
4th quintile	1.42	1.26	0.90, 1.76	0.29	−0.12, 0.70
5th quintile (highest)	1.12	1	ref	-	ref
Year 2010					
1st quintile (lowest)	1.40	1.79	1.15, 2.91	0.62	0.14, 1.11
2nd quintile	1.32	1.69	1.12, 2.72	0.54	0.12, 0.99
3rd quintile	0.92	1.17	0.73, 1.92	0.13	−0.26, 0.54
4th quintile	0.93	1.18	0.72, 1.99	0.14	−0.26, 0.57
5th quintile (highest)	0.78	1	ref	-	ref

Abbreviations: CI = confidence interval; dmft = decayed missing filled primary tooth index (includes non-cavitated lesions); ref = reference value

Table 4

Slope Index of Inequality and Relative Index of Inequality in age- and sex-standardized caries prevalence and dmft according to socio-economic position in 2000 and 2010 (Canoas, Brazil)

	SII	95% CI	RII(mean)	95% CI	RII(ratio)	95% CI
Caries Prevalence (dmft>0)						
By mother's education:						
OH Canoas 2000	−0.16	−0.28, −0.04	−0.40	−0.70, −0.09	1.50	1.10, 2.08
OH Canoas 2010	−0.25	−0.34, −0.15	−0.97	−1.35, −0.59	2.89	1.83, 5.21
By family income:						
OH Canoas 2000	−0.12	−0.21, −0.04	−0.32	−0.54, −0.09	1.38	1.10, 1.75
OH Canoas 2010	−0.16	−0.24, −0.07	−0.61	−0.95, −0.29	1.90	1.34, 2.87
Caries Severity (mean dmft)						
By mother's education:						
OH Canoas 2000	−1.06	−1.71, −0.38	−0.67	−1.08, −0.25	2.02	1.28, 3.35
OH Canoas 2010	−1.47	−2.12, −0.84	−1.29	−1.81, −0.74	4.76	2.14, 19.9
By family income:						
OH Canoas 2000	−0.73	−1.21, −0.24	−0.48	−0.80, −0.16	1.65	1.17, 2.38
OH Canoas 2010	−0.82	−1.36, −0.29	−0.74	−1.21, −0.27	2.21	1.31, 4.16

Abbreviations: CI = confidence interval; dmft = decayed missing filled primary tooth index (includes non-cavitated lesions); OH = Oral Health; RII = Relative Index of Inequality; SII = Slope Index of Inequality