

TRENDS IN SOCIOECONOMIC DISPARITIES IN ORAL HEALTH IN BRAZIL AND SWEDEN.

Paper prepared for the EqualSoc and ECSR joint Summer School, Trento 2008:

“Social inequalities in contemporary societies. New empirical evidence and
methodological innovation”

First Draft

Roger Keller Celeste¹

Center for Health Equity Studies (CHESS)
Stockholm University/Karolinska Institute
Sveavägen 160, Sveaplan
SE-106 91 STOCKHOLM

e-mail: rk_celeste@chess.su.se

phone: +46 08 162584

¹ Exchange PhD student in Epidemiology from Instituto de Medicina Social (Universidade do Estado do Rio de Janeiro) at the Center for Health Equity Studies.

Swedish tutor: Johan Fritzell (Center for Health Equity Studies).

Brazilian tutor: Paulo Nadanovsky (Instituto de Medicina Social).

Abstract: It has been suggested that new interventions, as the time goes by, may initially increase socioeconomic inequalities to decrease afterwards, the so called inverse equity hypothesis. The dynamics of trends in inequalities is not well understood yet. Our objective was to describe and explore trends in socioeconomic gaps in oral health in Brazil and Sweden. This study is a time trend analysis of cross-sectional studies designed to assess the prevalence of oral health and other population characteristics. In Sweden we have data available for the years 1968, 1974, 1981, 1991 and 2000. In Brazil data was available for 1986 and 2002. Trends in complete or partial edentulism are shown, as well as trends in no missing/good teeth. There was on average an annual decline in absolute disparities of 0.5% (95% CI= 0.1-0.8) in Brazil and 0.7% (95% CI= 0.5-0.9) in Sweden. Results concerning no missing teeth (Brazil) / teeth in good conditions (Sweden) were mixed. In Brazil the absolute and relative disparities in the prevalence of no missing teeth has increased, while in Sweden there was a statistically non significant decrease in disparities in the prevalence of those with teeth in good conditions. At least, since 1991 in Sweden and 2002 in Brazil, we found that, in the age group of 35-44, there are no significant socioeconomic disparities in edentulism either in absolute or relative terms. However, lower socioeconomic groups have not reached the same level of oral health as richer groups. This dynamics may suggest that, when major improvements in edentulism started in the lower economic groups, the majority of people in the richer groups had already improved their oral health and reached good oral health first.

1 INTRODUCTION

In 2003, the Federation Dentaire Internationale (FDI) and the International Association for Dental Research (IADR) revised the goals for oral health proposed in 1982¹. One of their goals is a reduction in socioeconomic disparities in oral health by the year 2020 within and across countries². Monitoring socioeconomic disparities in health is important because it is a way of guiding and evaluating whether health promotion activities and public health policies, or other, are achieving their goals^{3, 4}. Nonetheless, different ways of measuring changes in disparities over time - absolute versus relative differences - can bring opposite results. Therefore, it has been suggested that trends in this regard to be presented in both ways⁵. A further question concerns the dynamics of the trends in inequality. Phelan and Link⁶ have argued that, once prevention is available, the better-off will take it and, accordingly, the socioeconomic gap will increase. It has been suggested that new interventions, as the time goes by, may initially increase socioeconomic inequalities to decrease afterwards, the so called inverse equity hypothesis^{7, 8}. However, there is also those who claim that trends in socioeconomic inequalities are not related to trends (i.e. improvements) in average health⁹.

Reductions in the prevalence and severity of dental caries have been consistently reported for different age groups since the 1970's in industrialized countries¹⁰ and since the 1980's in Brazil¹¹. Although some evidence shows that this trend has led to a polarization of dental caries in small risk-groups¹¹⁻¹³, little is known about whether these improvements in oral health, and the polarization effect, reduced or increased the disparities between the poor and the rich. We

found no study either in Brazil or in Sweden that tried to address this question. In Norway the gap between two educational groups increased in the absolute and relative number of filled or decayed surfaces from 1983 to 1994¹⁴; however it decrease in absolute terms for all age groups, while increasing in relative terms among the elderly, when the outcome was edentulism¹⁵. In the United States of America, the absolute difference in prevalence of edentulism between the poor and the rich remained the same from 1972 to 2001, whereas the relative difference increased¹⁶. It has also been reported a decrease in the socioeconomic gap regarding edentulism in Finland¹⁷.

Comparing countries with differences in social, economical, cultural and health care systems is always a difficult task. The list of potential explanations, if a difference is found, is long. However, looking at similarities may be a fruitful exercise. This is the case of Brazil compared to Sweden, countries with many differences. Therefore, the objectives of the present study are to describe and explore dynamics of trends in socioeconomic gaps in oral health in Brazil and Sweden.

2 METHODS

This study is a time trend analysis of cross-sectional studies designed to assess the prevalence of oral health and other population characteristics. In Sweden we have data available for the years 1968, 1974, 1981, 1991 and 2000. In Brazil data was available for 1986 and 2002. For the sake of comparability between the two countries we restrained the analysis to the 35-44 year-old.

SWEDISH LEVEL OF LIVING SURVEYS

The Swedish Level of Living Surveys (LNU) is a national representative survey of people residing in Sweden conducted by the Swedish Institute for Social Research (for a thorough presentation see e.g. Fritzell and Lundberg 2000¹⁸; 2007¹⁹). The survey has been conducted in five sweeps: the first one in 1968 and follow-up studies in 1974, 1981, 1991 and 2000. The first survey included a sample of around one per 1 000 in the ages 15 to 75. In each follow-up survey people in the original sample is retained as long as they are 75 years of age or younger, but the inclusion of younger age cohorts and newly arrived immigrants means that each cross-sectional sample simultaneously is representative for the Swedish population within the age brackets (the lower age bracket has in later waves increased to first 18 then 19). The sample size has in each survey been around 6 000 individuals. The survey is conducted by face-to-face interview and aims generally at studying various dimensions of welfare and living conditions, including a broad section on health status. Although the longitudinal structure of the database makes analyses of individual level change possible, we will here for comparative analysis with the Brazilian data use the data to study repeated cross-sectional age-specific groups along the years.

BRAZILIAN ORAL HEALTH SURVEYS

Data on the number of decayed, missing, and filled permanent teeth (DMFT) for the year 1986 was obtained from the first Brazilian national oral health survey carried out in 1985-1986 conducted by the Ministry of Health. That survey was designed to assess prevalence and severity of oral diseases in 16 Brazilian state capitals. The sample consisted of 10,398 adults – 15-19, 35-44 and 50-59

year-old - and 15,009 school-children chosen in a multi-stage sampling manner. The report did not describe quality control regarding data collection, examiners agreement, and response rate. It did mention examiners training previously to the fieldwork. A full description of the sampling procedures can be obtained elsewhere²⁰. Adults were clinically examined by dentists during home visits and interviewed with a questionnaire. Examiners were trained according to Klein and Palmer (1937) DMFT diagnostic criteria.

Data for the year 2002 was obtained from the second national oral health survey carried out between May 2002 and October 2003 by the Ministry of Health. That survey assessed prevalence and severity of dental caries and other oral conditions in six age groups. The sample size consisted of 127,939 individuals chosen in a multi-stage sampling from 250 municipalities. Examiners all around the country were trained according to WHO diagnostic criteria²¹. A full description of the sampling procedures was described elsewhere²². Adults were also interviewed with specific questionnaire regarding socioeconomic conditions and access to dental care. For the present study, only data from the same state capital evaluated in 1986 were used.

ORAL HEALTH DATA

In Sweden, self-reported oral health data was obtained from the following question: "Which of the following alternatives best describes the condition of your teeth?". The five alternatives were: 1-no teeth or mere remains; 2- Dentures, whole or part; 3- own teeth but in bad conditions, many missing; 4- own teeth but many fillings or bridgework; 5- own teeth in good conditions, no or few fillings. The Brazilian measure was the number of missing teeth obtained from clinical exams.

Both datasets were dichotomized and two trends are shown. They correspond to trends in complete or partial edentulism and teeth in good conditions. In Sweden, edentulism trend was obtained summing as cases alternatives 1 and 2 and for the trend in teeth in good condition alternative 5 was adopted. In Brazil, the trend for complete or partial edentulism was done considering as cases people with more than 30 missing teeth, while the trend for teeth in good conditions considered as cases those with no missing teeth.

INCOME MEASURE

In both countries, an income based measure was used to dichotomize the sample. The LNU question was “If a situation suddenly arose where you had to come up with ____kr, could you manage it? Yes/no”. The amount of Swedish crowns (kr) has been updated for inflation since the first edition of the survey, so it should represent the same amount of money. In Brazil, the first survey collected data on disposable household income according to Brazilian Minimum Wage (MW) in three categories (0-2 MW; 3-4 MW; +4 MW). The second survey collected data on income as a continuous variable (disposable household income), so we categorized this data as in the 1986. Then, people were classified as earning ≤ 2 MW or more than this.

STATISTICAL ANALYSIS

Crude prevalence of complete or partial edentulism was reported by sex, age, time since last dental visit and income. Binomial confidence intervals were constructed.

Sex and age adjusted prevalence were obtained from direct standardization using the overall population as a reference. Once the difference between crude

and adjusted prevalence were, on average, less than one percentage point and three points at maximum, we choose to present only crude estimates. Prevalence ratios were obtained using Poisson regression with log-link and robust variance²³. Prevalence differences we used Poisson regression with identity link and robust variance. However, when models did not converge, we applied Ordinary Least Squares (OLS) with Huber-White variance, also called Modified Least Squares (MLS)²⁴. We compared prevalence estimates from MLS with estimates from direct standardization and the methods usually yield the same results.

The significance of the trends from 1986 to 2002 in Brazil and from 1968 and 2000 in Sweden was tested in the regressions using an interaction term between the income and year. To assess differences in the slope of trends between two countries, a third-order interaction term was added with income, year and country. Tests for linear trends were performed for absolute and relative differences.

3 RESULTS

The number of participants in the age group of 35-44 in each country and year is presented in Tables 1 and 2. The sample size varied slightly around 1,000 people each year, apart from the survey in 1986 which had a sample bigger than 3,000. Response rate for the LNU was 90.8% in 1968, but has been declining since then¹⁸. In the 2000 edition the response rate was 76.6%. None of the Brazilian surveys reported response rates. However, in 2002-2003, it was reported that 85% of the planned sample size was achieved. Refuses were not supposed to be substituted. Selection bias is, therefore, a concern. On the other hand, as both Brazilian surveys were conducted in similar ways, they may still be regarded as comparable.

The Swedish sample has had a consistent number of women in every year, around 50% and the age structure has not changed considerable. The proportion of respondents visiting a dentist last year increased from 64% (1968) to 82% (1991) and then declined to 72% (2000). Yet, the Brazilian sample has overrepresented women, as they are more likely to be found at home for interviews. In 1986 and 2002 respectively the percentage of females was 76.3% and 67.7%. Those visiting a dentist last year comprised 44% of the sample in 1986 and 45% in 2002.

Table 1 and 2 about here

Overall oral health in both outcomes showed improvement. There has been a remarkable decline in edentulism in Brazil and in the percentage of people in Sweden reporting having lost all or almost all teeth (Tables 1 and 2). Following the same trend, in Sweden, the percentage of people reporting having teeth in good

conditions raised from 36.1% (95% confidence interval (CI) 33.0 - 39.2) in 1968 to 49.7% (95% CI 46.6 - 52.8) in 2000. In Brazil the figures for those not missing any tooth raised from 5.1% (95% CI 4.4 - 5.9) to 8.2% (95% CI 6.5 - 9.8).

Tables 3 about here

Trends in socioeconomic inequalities in edentulism were presented in three ways and can be seen in Table 3 and Figures 1-A, 1-B and 2-A, 2-B. Firstly, it is shown trends in the group of lower income. These data (Table 3) show large improvements in both countries and the annual decrease rate in edentulism was similar for Brazil and Sweden, 1.1 percentage points per year. Secondly, trends in the absolute difference between the poorer and the richer was presented. Not only was the gap decreasing in both countries, but also the trend is monotonic. In Sweden, since 1991 the absolute difference between the lower income and higher income is not statistically significant and since 2002 in Brazil. However, Sweden is closing the gap at higher speed, 0.3 ($p=0.037$) percentage points faster yearly than Brazil. Thirdly, we presented the relative trends. This relation was not monotonic, but on average there was a slight non-significant yearly increase in the relative gap. Although the first and the last years had similar gaps (Table 3), in more recent years they became statistically non significant due to small number of cases. The comparison between countries was statistically non significant ($p=0.86$).

Figures 1 and 2 about here

Trends in socioeconomic inequalities on the other extreme of oral health, that is, no missing tooth (Brazil) or teeth in good health (Sweden) were different from edentulism. Results in three ways of assessing inequalities are presented in Table 4 and Figures 1-C, 1-D and 2-C, 2-D. Firstly, trends in the proportion of

people in lower income group with good teeth increase in both countries; although very small and non significant in Brazil. Secondly, trends in absolute gap diverge remarkably between countries. In Brazil the gap has been increasing, while in Sweden it has been declining. Regarding the relative gap, the results were similar to those of absolute difference.

Tables 4 about here

4 DISCUSSION

Our study gives no simple answer to the question: “Are inequities [in oral health] increasing or decreasing?”. We, however, would like to highlight that socioeconomic inequalities in edentulism, in Sweden since 1991 and in Brazil since 2002, are very small in absolute terms and statistically non significant. Despite the good news, the lower income group has not yet reached the same good level of oral health of their richer counterparts. Absolute disparities in the percentage of people with teeth in good conditions (no missing tooth in Brazil) are still substantial in Sweden and they have been increasing in Brazil.

The fact that some trends are widening while others are narrowing, and also the fact that relative and absolute trends can lead to different conclusions, may be consistent with the Inverse Equity Hypothesis⁸ (IEH). Nonetheless, these two issues must be discussed in a broader framework, so to fit into IEH.

Firstly, Victora’s et al hypothesis may be split in two parts. In the first part, it states that improvements in the health of the richer group are initially steeper than in the poorer group, so the inequality would increase. In the second part, after the richer group having reached almost the best health possible, the health of the poorer group would improve at a faster speed than the rich; therefore the gap would decrease. Although they argue in favor of using rate ratios instead of rate

differences, their analysis of both trends would converge to the same conclusions. Our analysis, on the contrary, gives more support to the absolute trends. For example, Figure 1-A shows a pattern similar to the second part of the hypothesis. The improvement in the poorer group was faster than in the richer and because of this the absolute gap was closing down (Figure 2-A). On the other hand, the relative gap showed an inconsistent increase in inequalities (Figure 2-B). Despite many studies reporting trends in inequality by socioeconomic group in dental health¹⁴⁻¹⁷ and other health outcomes²⁵⁻³¹ the issue of using absolute or relative disparities, or even not summarizing disparities (looking at both trends separately) has been untouched. The use of sophisticated measures to summarize inequalities by socioeconomic groups (e.g., Slope Index of Inequality, Relative Index of Inequality or Concentration Curves) prevents researches from looking separately to the each trend (poor versus rich). Although we acknowledge that such inequity indexes share a great deal of statistical advantages, they may not be suitable to show the dynamics of health inequities.

Secondly, ups and downs in health inequality by socioeconomic groups are predicted by the IEH depending on the timing. At the beginning, of such transition, disease levels are high and socioeconomic gap is small. When population health starts improving, socioeconomic inequalities start increasing. We cannot be sure when the decline in edentulism started, but it probable began before 1968 in Sweden and before 1986 in Brazil³². Regarding edentulism, a big socioeconomic gap had already been set in both countries, so our analyses may be showing only the decline in the gap that followed a non described increase. Interesting, looking at the prevalence of people with no missing tooth in Brazil, we can see high levels of disease (overall only 5% had no missing tooth) and a small gap (Figure 1-D). In

Sweden the percentage of people reporting teeth in good conditions was higher than in Brazil, 36%, and the gap was larger (Figure 1-C). While in Brazil inequalities increased, in Sweden they decrease. If the IEH is correct, we may forecast a further increase in the gap regarding the number of people with no missing teeth in Brazil until a high number of rich people achieve this condition.

A final consideration concerns the driving forces behind socioeconomic inequality in oral health. Sweden and Brazil are different in many ways, but our results showed a compatible pattern, so it is easier to concentrate in their similarities. Nonetheless, this does not make it an easy task. Trends in potential candidates should be plotted by each socioeconomic group, but such trends have not yet been produced. Furthermore, the core question to be answer is: why did the richer group get such health promoting factors at an earlier stage? Although our study is not designed to answer this question, it has an interesting hint regarding fluoride. Fluoride is known as a major effective and preventive intervention for dental caries regardless of the vehicle used to deliver it³³⁻³⁷. It is, indeed, a potential candidate to explain inequities. Dentifrices are widespread in Brazil and Sweden since long ago. However, fluoridated water is implemented only in some Brazilian capitals (9 out of 16 in 2002). Therefore, considering a similar trends in both countries, water fluoridation cannot be the major responsible for the trends described or it may have the same effect as toothpastes.

Strengths and limitations

Strengths of this study include the possibility to assess jointly the trends in two distinct countries. The sample size was large so it had enough statistical power to compare trends between countries. In Sweden the sample was nationally representative and we were able to produce trends with 5 points in time, so to

assess linearity of the trends. In Brazil, clinical data from an objectively outcome was used. In both countries, the income measure has been adjusted for inflation, so comparisons across time are possible. Furthermore, we were able to evaluate the dynamics according to different socioeconomic groups using countries at different stages of disease levels and having two extreme points of the same outcome.

On the other hand, the comparison of distinct datasets is also a point of concern. Firstly, the quality of the data is not the same. The Brazilian sample is not countrywide and, apparently, not representative for the set of capitals included. Although we cannot be sure about validity of mean values, trends and relationships pointed to expected directions. The data seems robust for our purposes. Secondly, comparisons between countries were made, in spite of different outcomes. The Swedish self-reported oral health could include health dimensions not measured in the Brazilian clinical exams. However, self-reported number of remaining teeth has been validated against clinically reported number of lost teeth³⁸⁻⁴⁰. High levels of specificity and sensitivity have been reported, and the main disparities were due to underestimates of the number of remaining teeth from patients^{39, 40}. We believe that outcomes both countries are the result of the same disease process and, with caution, comparisons of trends may be appropriate. Finally, we were not able to investigate potential explanations for any specific upwards and downwards of the gap.

Conclusions

Since 1991 in Sweden and 2002 in Brazil, in the age group of 35-44, there are no significant socioeconomic disparities in edentulism either in absolute or relative terms. However, lower socioeconomic groups have not reach the same

level of good oral health as richer groups. Inequalities in the prevalence of teeth in good conditions still persist in Sweden and inequalities in the prevalence of no missing tooth have been increasing in Brazil. The dynamics described suggest that, when major improvements in edentulism started in the lower economic groups, the majority of people in the richer groups had already improved their oral health and reached good oral health.

References

1. FDI. Global goals for oral health in the year 2000. Federation Dentaire Internationale. *Int Dent J*. 1982 Mar;32(1):74-7.
2. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. *Int Dent J*. 2003 Oct;53(5):285-8.
3. Nunes A, Santos JRS, Barata RB, Vianna SM. *Medindo as desigualdades em saúde no Brasil: uma proposta de monitoramento*. 1a. ed. Brasília: OPAS/OMS: IPEA; 2001.
4. Braveman PA. Monitoring equity in health and healthcare: a conceptual framework. *J Health Popul Nutr*. 2003 Sep;21(3):181-92.
5. Keppel KG, Pamuk E, Lynch J, Carter-Pokras O, Kim I, Mays V, et al. Methodological issues in measuring health disparities. *Vital Health Stat Serie 2*. 2005 Jun(141):1-16.
6. Phelan JC, Link BG. Controlling disease and creating disparities: a fundamental cause perspective. *J Gerontol B Psychol Sci Soc Sci*. 2005 Oct;60 Spec No 2:27-33.
7. Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP. Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet*. 2003 Jul 19;362(9379):233-41.
8. Victora CG, Vaughan JP, Barros FC, Silva AC, Tomasi E. Explaining trends in inequities: evidence from Brazilian child health studies. *The Lancet*. 2000;356:1093-98.
9. Krieger N, Rehkopf DH, Chen JT, Waterman PD, Marcelli E, Kennedy M. The fall and rise of US inequities in premature mortality: 1960-2002. *PLoS Med*. 2008 Feb;5(2):e46.
10. Marthaler TM. Caries status in Europe and predictions of future trends. *Caries Res*. 1990;24(6):381-96.
11. Narvai PC, Frazao P, Roncalli AG, Antunes JL. [Dental caries in Brazil: decline, polarization, inequality and social exclusion]. *Rev Panam Salud Publica*. 2006 Jun;19(6):385-93.
12. Macek MD, Heller KE, Selwitz RH, Manz MC. Is 75 percent of dental caries really found in 25 percent of the population? *J Public Health Dent*. 2004 Winter;64(1):20-5.
13. Tickle M. The 80:20 phenomenon: help or hindrance to planning caries prevention programmes? *Community Dent Health*. 2002 Mar;19(1):39-42.
14. Schuller AA. Better oral health, more inequality--empirical analysis among young adults. *Community Dent Health*. 1999 Sep;16(3):154-9.

15. Holst D. Oral health equality during 30 years in Norway. *Community Dent Oral Epidemiol.* 2008 Apr 14.
16. Cunha-Cruz J, Hujoel PP, Nadanovsky P. Secular trends in socio-economic disparities in edentulism: USA, 1972-2001. *J Dent Res.* 2007 Feb;86(2):131-6.
17. Suominen-Taipale AL, Alanen P, Helenius H, Nordblad A, Uutela A. Edentulism among Finnish adults of working age, 1978-1997. *Community Dent Oral Epidemiol.* 1999 Oct;27(5):353-65.
18. Fritzell J, Lundberg O. The Swedish level of living survey: longitudinal research on life chances over the life course. In: Jonson C-G, editor. *Seven Swedish Longitudinal studies in behavioral sciences.* Stockholm: Swedish Council for Planning and Coordination fo Research (FRN); 2000. p. 172–90.
19. Fritzell J, Lundberg O. *Health inequalities and welfare resources: continuity and change in Sweden.* Health & society. Bristol: Policy; 2007.
20. Brasil. Ministério da Saúde. Levantamento Epidemiológico em Saúde Bucal: Brasil, zona urbana - 1986. In: Secretaria Nacional de Programas Especiais. Divisão Nacional de Saúde Bucal, editor. Brasília: Centro de Documentação do Ministério da Saúde; 1988. p. 137.
21. World Health Organization. *Oral health surveys: basic methods.* 4th ed. Geneva: World Health Organization; 1997.
22. Brasil. Ministério da Saúde. Projeto SB2000: Condições de Saúde Bucal da população brasileira no ano 2000. Manual do Coordenador. In: Departamento de Atenção Básica. Secretaria de Políticas de Saúde. Área Técnica de Saúde Bucal, editor. 1a ed. Brasília: Ministério da Saúde; 2001. p. 53.
23. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol.* 2003 Oct 20;3:21.
24. Cheung YB. A modified least-squares regression approach to the estimation of risk difference. *Am J Epidemiol.* 2007 Dec 1;166(11):1337-44.
25. Wamala S, Blakely T, Atkinson J. Trends in absolute socioeconomic inequalities in mortality in Sweden and New Zealand. A 20-year gender perspective. *BMC Public Health.* 2006;6:164.
26. Kunst AE, Bos V, Lahelma E, Bartley M, Lissau I, Regidor E, et al. Trends in socioeconomic inequalities in self-assessed health in 10 European countries. *Int J Epidemiol.* 2005 Apr;34(2):295-305.
27. Zere E, Moeti M, Kirigia J, Mwase T, Kataika E. Equity in health and healthcare in Malawi: analysis of trends. *BMC Public Health.* 2007;7(147):78.

28. Burstrom B, Oberg L. The dialectics of childhood diarrhea mortality. *Int J Health Serv.* 2006;36(3):481-501.
29. Sastry N. Trends in socioeconomic inequalities in mortality in developing countries: the case of child survival in Sao Paulo, Brazil. *Demography.* 2004 Aug;41(3):443-64.
30. Fawcett J, Blakely T. Cancer is overtaking cardiovascular disease as the main driver of socioeconomic inequalities in mortality: New Zealand (1981-99). *J Epidemiol Community Health.* 2007 Jan;61(1):59-66.
31. Houweling TA, Kunst AE, Borsboom G, Mackenbach JP. Mortality inequalities in times of economic growth: time trends in socioeconomic and regional inequalities in under 5 mortality in Indonesia, 1982-1997. *J Epidemiol Community Health.* 2006 Jan;60(1):62-8.
32. Marthaler TM. Changes in dental caries 1953-2003. *Caries Res.* 2004 May-Jun;38(3):173-81.
33. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride mouthrinses for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2003(3):CD002284.
34. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride varnishes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2002(3):CD002279.
35. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride gels for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2002(2):CD002280.
36. Marinho VC, Higgins JP, Sheiham A, Logan S. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev.* 2003(1):CD002278.
37. From the Centers for Disease Control and Prevention. Achievements in public health, 1900-1999: fluoridation of drinking water to prevent dental caries. *Jama.* 2000 Mar 8;283(10):1283-6.
38. Unell L, Soderfeldt B, Halling A, Paulander J, Birkhed D. Oral disease, impairment, and illness: congruence between clinical and questionnaire findings. *Acta Odontol Scand.* 1997 Apr;55(2):127-32.
39. Pitiphat W, Garcia RI, Douglass CW, Joshipura KJ. Validation of self-reported oral health measures. *J Public Health Dent.* 2002 Spring;62(2):122-8.
40. Gilbert GH, Chavers LS, Shelton BJ. Comparison of two methods of estimating 48-month tooth loss incidence. *J Public Health Dent.* 2002 Summer;62(3):163-9.

Table 1 - Percentage of 35-44 year-old with more the thirty missing teeth according to some socio-demographic characteristics, in Brazil.

Variable	1986				2003			
	N	Percentage	95% CI Inf	95% CI Sup	N	Percentage	95% CI Inf	95% CI Sup
Total	3344	17.8%	16.5%	19.1%	1018	3.8%	2.7%	5.2%
Sex								
Males	793	12.9%	10.6%	15.4%	329	2.1%	0.9%	4.3%
Female	2551	19.3%	17.8%	20.9%	689	4.6%	3.2%	6.5%
Age (years)								
35	979	12.1%	10.1%	14.3%	168	2.4%	0.7%	6.0%
36	392	12.2%	9.2%	15.9%	87	5.7%	1.9%	12.9%
37	263	11.8%	8.2%	16.3%	98	5.1%	1.7%	11.5%
38	269	14.5%	10.5%	19.3%	107	1.9%	0.2%	6.6%
39	209	13.9%	9.5%	19.3%	80	0.0%	0.0%	4.5%
40	250	21.6%	16.7%	27.2%	87	3.4%	0.7%	9.7%
41	124	23.4%	16.3%	31.8%	78	1.3%	0.0%	6.9%
42	194	24.2%	18.4%	30.9%	99	2.0%	0.2%	7.1%
43	208	26.9%	21.0%	33.5%	90	5.6%	1.8%	12.5%
44	456	31.4%	27.1%	35.8%	124	9.7%	5.1%	16.3%
Income								
Higher	1745	13.4%	11.8%	15.1%	368	2.4%	1.1%	4.6%
Lower	1599	22.5%	20.5%	24.6%	620	4.5%	3.0%	6.5%
Missing	0	0.0%	0.0%	0.0%	30	6.7%	0.8%	22.1%
Dental visit last year								
No	1819	25.2%	23.3%	27.3%	527	5.9%	4.0%	8.2%
Yes	1481	7.9%	6.6%	9.4%	462	1.3%	0.5%	2.8%
Missing	44	40.9%	26.3%	56.8%	29	6.9%	0.8%	22.8%

Table 2 - Percentage of 35-44 year-old with many or all self-reported missing teeth according to some socio-demographic characteristics, in Sweden.

	1968				1974				1 981				1 991				2 000			
	N	%	95% CI		N	%	95% CI		N	%	95% CI		N	%	95% CI		N	%	95% CI	
Total	928	19.1%	16.6%	21.8%	904	13.3%	11.1%	15.7%	1085	6.6%	5.2%	8.3%	1049	1.1%	0.6%	2.0%	1000	0.6%	0.2%	1.3%
Sex																				
Male	467	18.0%	14.6%	21.8%	440	13.9%	10.8%	17.4%	562	6.9%	5.0%	9.4%	521	0.6%	0.1%	1.7%	496	0.4%	0.0%	1.4%
Female	461	20.2%	16.6%	24.1%	464	12.7%	9.8%	16.1%	523	6.3%	4.4%	8.7%	528	1.7%	0.8%	3.2%	504	0.8%	0.2%	2.0%
Age																				
35	94	11.7%	6.0%	20.0%	98	8.2%	3.6%	15.5%	143	3.5%	1.1%	8.0%	94	1.1%	0.0%	5.8%	109	0.9%	0.0%	5.0%
36	85	15.3%	8.4%	24.7%	95	6.3%	2.4%	13.2%	126	4.8%	1.8%	10.1%	95	0.0%		3.8%	128	0.8%	0.0%	4.3%
37	98	12.2%	6.5%	20.4%	96	11.5%	5.9%	19.6%	117	5.1%	1.9%	10.8%	87	0.0%	0.0%	4.2%	104	0.0%	0.0%	3.5%
38	98	16.3%	9.6%	25.2%	87	9.2%	4.1%	17.3%	115	7.8%	3.6%	14.3%	90	0.0%	0.0%	4.0%	100	1.0%	0.0%	5.4%
39	94	18.1%	10.9%	27.4%	82	9.8%	4.3%	18.3%	118	5.9%	2.4%	11.8%	108	0.0%	0.0%	3.4%	107	0.0%	0.0%	3.4%
40	94	16.0%	9.2%	25.0%	85	7.1%	2.6%	14.7%	98	6.1%	2.3%	12.9%	112	0.9%	0.0%	4.9%	95	0.0%	0.0%	3.8%
41	77	19.5%	11.3%	30.1%	88	15.9%	9.0%	25.2%	89	3.4%	0.7%	9.5%	118	2.5%	0.5%	7.3%	90	1.1%	0.0%	6.0%
42	82	29.3%	19.7%	40.4%	85	21.2%	13.1%	31.4%	86	11.6%	5.7%	20.3%	107	1.9%	0.2%	6.6%	88	0.0%	0.0%	4.1%
43	104	26.9%	18.7%	36.5%	91	18.7%	11.3%	28.2%	95	6.3%	2.4%	13.2%	125	2.4%	0.5%	6.9%	91	0.0%	0.0%	4.0%
44	102	25.5%	17.4%	35.1%	97	24.7%	16.5%	34.5%	98	14.3%	8.0%	22.8%	113	1.8%	0.2%	6.2%	88	2.3%	0.3%	8.0%
Income																				
Higher	787	15.4%	12.9%	18.1%	792	10.9%	8.8%	13.2%	973	5.2%	3.9%	6.8%	937	1.0%	0.4%	1.8%	841	0.5%	0.1%	1.2%
Lower	141	39.7%	31.6%	48.3%	111	30.6%	22.2%	40.1%	109	19.3%	12.3%	27.9%	108	2.8%	0.6%	7.9%	156	1.3%	0.2%	4.6%
Missing	0	0.0%	0.0%	0.0%	1	0.0%	0.0%	97.5%	3	0.0%	0.0%	70.8%	4	0.0%	0.0%	60.2%	3	0.0%	0.0%	70.8%
Dental Visit																				
No	336	39.3%	34.0%	44.7%	257	28.4%	23.0%	34.3%	256	15.2%	11.1%	20.2%	193	3.6%	1.5%	7.3%	284	1.1%	0.2%	3.1%
Yes	592	7.6%	5.6%	10.0%	647	7.3%	5.4%	9.5%	829	4.0%	2.8%	5.5%	856	0.6%	0.2%	1.4%	715	0.4%	0.1%	1.2%
Missing	0	0%	0%	0%	0	0%	0%	0%	0	0%	0%	0%	0	0%	0%	0%	1	0.0%	0.0%	97.5%

Table 3 - Trends in socioeconomic inequalities in complete or partial edentulism in Brazil and Sweden.

		BRAZIL										Annual Linear Trend	
		1986					2002						
Prevalence (%) in the Lower Income Group	>30 missing teeth - 95% CI											-1.1	
		17.4 27.7					2.9 6.2					-1.3 -1.0	
		SWEDEN										Annual Linear Trend	
		1968		1974		1981		1991		2000			
Complete or partial edentulism - 95% CI		39.7		30.6		19.3		2.8		1.3		-1.1	
		31.6 47.8		22.1 39.2		11.9 26.7		0.9 8.5		0.3 5.1		-1.2 -0.9	
		BRAZIL										Annual Linear Trend*	
		1986					2002						
Absolute Difference (%) in Prevalence Lower-Higher income	>30 missing teeth - 95% CI											-0.4	
		-15.2 -3.2					-4.3 0.2					-0.2 -0.7	
		SWEDEN										Annual Linear Trend*	
		1968		1974		1981		1991		2000			
Complete or partial edentulism - 95% CI		-24.3		-19.8		-14.0		-1.80		-0.8		-0.7	
		-32.8 -15.9		-28.6 -10.9		-21.6 -6.5		-5.0 1.3		-2.6 1.0		-0.9 -0.5	
		BRAZIL										Annual Linear Trend**	
		1986					2002						
Relative Difference in Prevalence Lower/Higher income	>30 missing teeth - 95% CI											1.01	
		1.23 2.32					0.88 3.87					0.94 1.05	
		SWEDEN										Annual Linear Trend**	
		1968		1974		1981		1991		2000			
Complete or partial edentulism - 95% CI		2.58		2.82		3.68		2.89		2.70		1.01	
		1.99 3.35		2.00 3.98		2.30 5.87		0.79 10.53		0.50 14.6		0.99 1.03	

* Difference between countries in annual absolute trends p=0.037

** Difference between countries in annual relative trend p=0.86

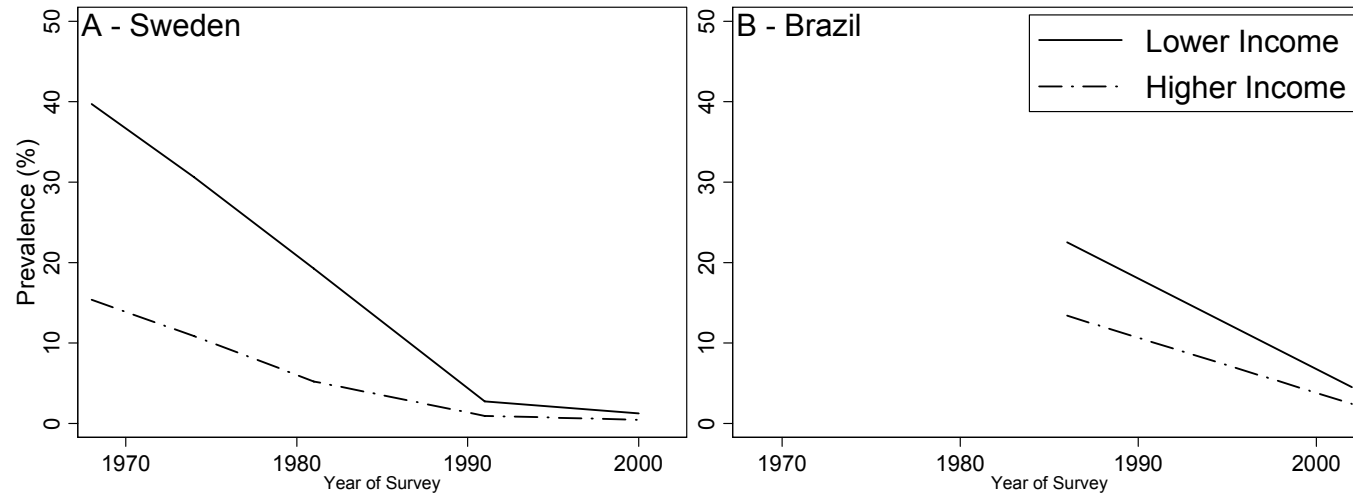
Table 4 - Trends in socioeconomic inequalities in prevalence of none/few missing teeth in Brazil and Sweden.

		BRAZIL										Annual Linear Trend	
		1986					2002						
Prevalence (%) in the Lower Income Group	No missing teeth - 95% CI	3.5					3.9					0.02	
		2.5	4.6				2.4	5.4				-0.09	0.13
		SWEDEN										Annual Linear Trend	
		1968		1974		1981		1991		2000			
Teeth in good condition - 95% CI		18.4		23.4		21.1		38.0		41.7		0.7	
		12.0	24.8	15.5	31.3	13.4	28.8	28.8	47.1	33.9	49.4	0.5	1.0
		BRAZIL										Annual Linear Trend*	
		1986					2002						
Absolute Difference (%) in Prevalence Lower-Higher income	No missing teeth - 95% CI	3.0					11.6					0.5	
		0.8	5.3				7.6	15.6				0.3	0.8
		SWEDEN										Annual Linear Trend*	
		1968		1974		1981		1991		2000			
Teeth in good condition - 95% CI		20.8		13.4		16.7		9.20		9.6		-0.3	
		13.6	28.1	4.9	22.0	8.5	25.0	-0.5	18.9	1.1	18.0	-0.6	0.02
		BRAZIL										Annual Linear Trend**	
		1986					2002						
Relative Difference in Prevalence Higher/Lower income	No missing teeth - 95% CI	1.86					4.00					1.05	
		1.27	2.74				2.53	6.33				1.01	1.09
		SWEDEN										Annual Linear Trend**	
		1968		1974		1981		1991		2000			
Teeth in good condition - 95% CI		2.13		1.57		1.79		1.24		1.23		0.98	
		1.49	3.05	1.11	2.23	1.24	2.60	0.97	1.60	1.01	1.5	0.97	0.99

* Difference between countries in annual absolute trends p<0.001

** Difference between countries in annual relative trends p<0.001

Complete of Parcial Edentulism



Good/No Missing Teeth

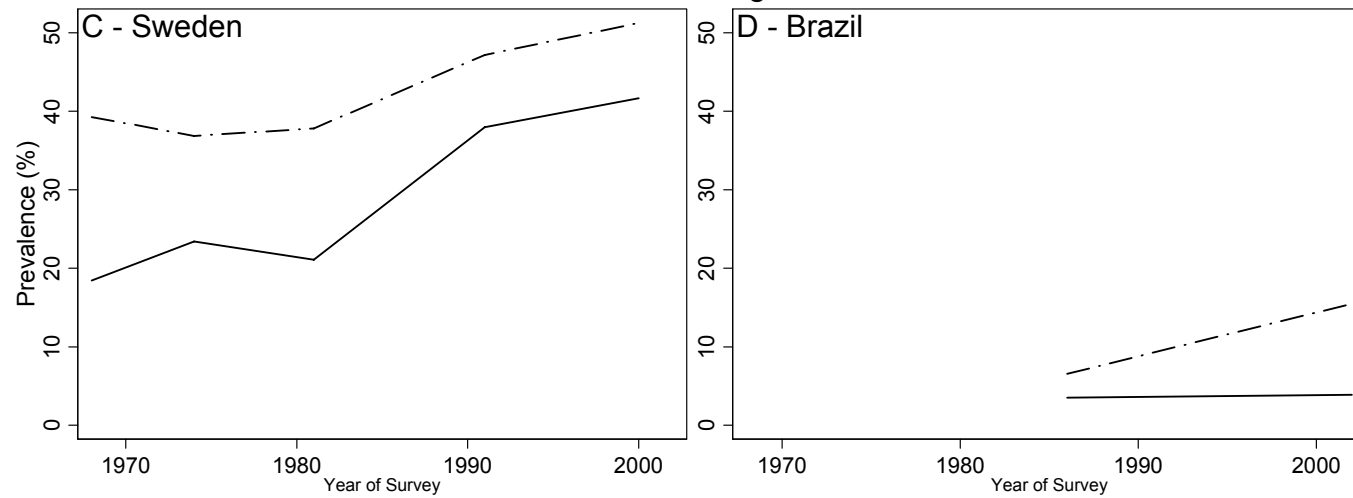
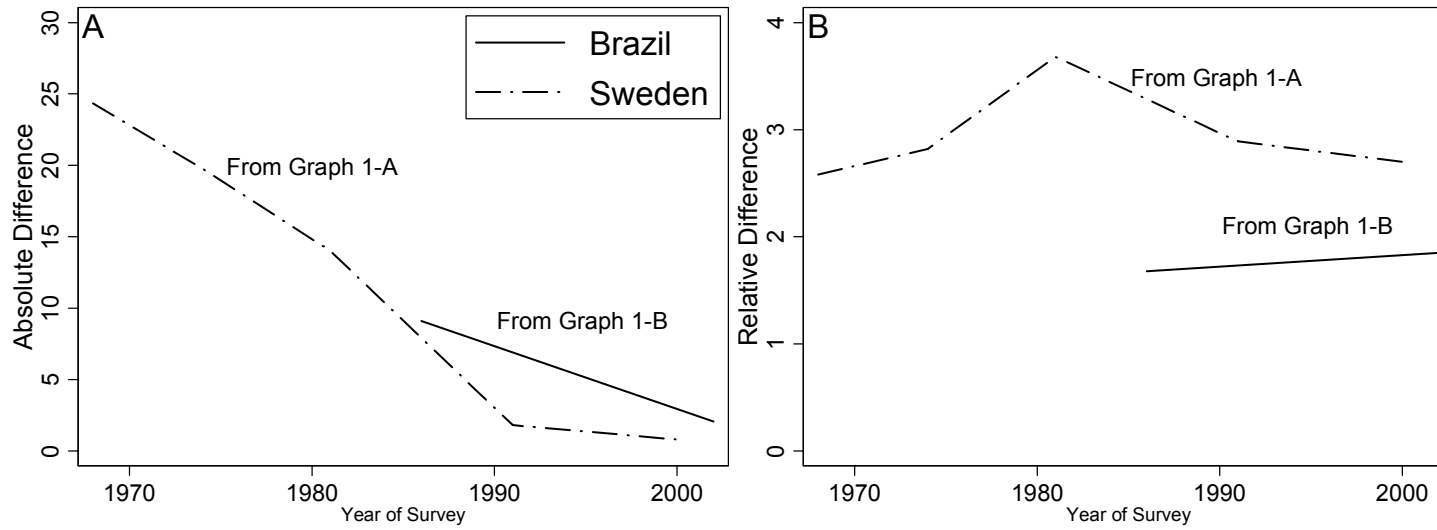


Figure 1 - Trends in Prevalence of oral health in two economic groups in Brazil and Sweden from 1968 to 2002.

Complete or Partially Edentulous



Good/No Missing Teeth

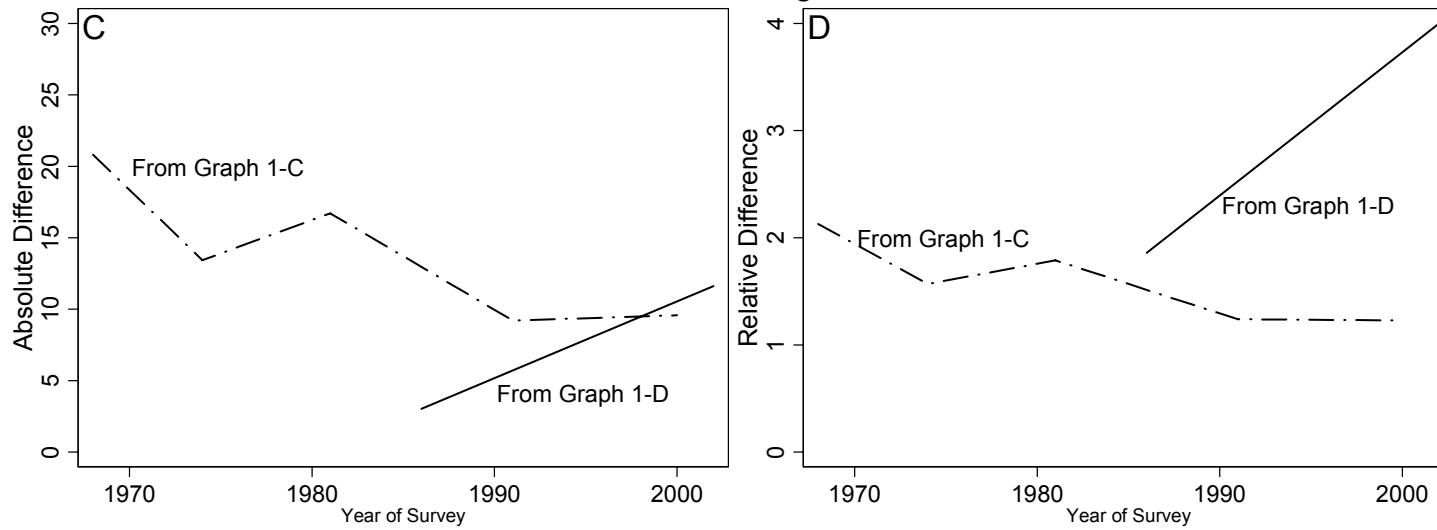


Figure 2 - Trends in the difference of oral health between two economic groups in Brazil and Sweden from 1968 to 2002.