

## The potential financial impact of oral health problems in the families of preschool children

O potencial impacto financeiro dos problemas bucais na família de pré-escolares

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**Abstract** *The aim of the study was to evaluate the perception of parents/caregivers regarding the financial impact of oral health problems on the families of preschool children. A preschool-based, cross-sectional study was conducted with 834 preschool children in Campina Grande, Brazil. Parents/caregivers answered the Early Childhood Oral Health Impact Scale. "Financial impact" was the dependent variable. Questionnaires addressing socio-demographic variables, history of toothache and health perceptions were administered. Clinical exams were performed by three dentists previously calibrated (Kappa: 0.85-0.90). Descriptive statistics were performed, followed by logistic regression for complex samples ( $\alpha = 5\%$ ). The frequency of financial impact due to oral health problems in preschool children was 7.7%. The following variables were significantly associated with financial impact: parental perception of child's oral health as poor, the interaction between history of toothache and absence of dental caries and the interaction between history of toothache and presence of dental caries. It is concluded that often parents/caregivers reported experiencing a financial impact due to seeking treatment late, mainly by the presence of toothache and complications of the clinical condition.*

**Key words** *Parents, Child, Preschool, Dental caries, Tooth injuries*

**Resumo** *O objetivo do estudo foi avaliar a percepção dos pais/responsáveis quanto ao impacto financeiro dos problemas de saúde bucal na família de pré-escolares. Um estudo transversal, foi realizado com 834 crianças pré-escolares, em Campina Grande, Brasil. Pais/responsáveis responderam ao Early Childhood Oral Health Impact Scale (B-ECOHIS). O item "impacto financeiro" foi a variável dependente. Questionários de variáveis sociodemográficas, histórico de dor de dente e percepções de saúde foram administrados. Os exames clínicos foram realizados por três dentistas previamente calibrados (Kappa: 0.85-0.90). Estatística descritiva foi realizada, seguida de regressão logística para amostras complexas ( $\alpha = 5\%$ ). A frequência de impacto financeiro devido a problemas de saúde bucal em pré-escolares foi de 7,7%. As seguintes variáveis foram significativamente associadas com o impacto financeiro: percepção ruim dos pais sobre saúde bucal, a interação entre histórico de dor de dente e ausência de cárie dentária e interação entre histórico de dor de dente e presença de cárie dentária. Pode-se concluir que na maioria das vezes os pais/responsáveis relatam impacto financeiro em decorrência da procura por tratamento tardio, principalmente pela presença de dor e complicações no quadro clínico.*

**Palavras-chave** *Pais, Filhos, Pré-escolar, Cárie dentária, Traumatismos dentários*

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## Introduction

Oral health problems can affect family structure due to the impact on activities of daily living as well as both social and financial aspects<sup>1,2</sup>. Dental caries and tooth injuries are the main oral health problems that affect preschool children. Dental caries is the main cause of pain and tooth loss<sup>3-5</sup>. Traumatic dental injury (TDI) occurs unexpectedly and requires immediate care<sup>6</sup>. Moreover, the treatment of these oral health problems can be costly and exert a financial impact on the family.

Oral health problems can result in emergency care, hospitalisation, dental appointments and the prescription of medications. In addition to treatment-related expenses, there are also indirect costs in the form of transportation and absenteeism from work and school<sup>7</sup>. These factors contribute to the increasing cost of oral health care<sup>8,9</sup>. Moreover, little importance is given to the primary dentition, which can lead to oral health problems of greater severity when treatment is eventually sought<sup>10</sup>.

Despite the importance of estimating the costs of oral health problems and dental treatment, scarce recent data has been generated from studies employing a representative sample. Some studies have addressed the financial impact of systemic diseases on families<sup>7,11</sup>, but little is known regarding the financial impact on the families of preschool children with oral health problems<sup>12-15</sup> and, to best of our knowledge, no previous study has investigated factors associated with this financial impact.

The analysis of parents/caregivers' perceptions regarding financial aspects of oral health problems can help public administrators understand the overall disease burden in the population rather than merely clinical aspects. Parents' perceptions of their child's oral health could influence oral health decisions and patterns of health care<sup>16</sup>. Moreover, oral health should take a larger part in discussions addressing health policies aimed at investing in programs and services that correspond to the needs of the target population and are directed at diminishing the resulting oral health problems that impact the family<sup>17,18</sup>. To gain a better understanding of this issue, the aim of the present study was to investigate the perceptions of parents/caregiver regarding the financial impact of oral problems in a preschool-based sample.

## Methods

### Sample characteristics

A cross-sectional study was carried out involving a random sample of 834 male and female children aged three to five years enrolled in private and public preschools in the city of Campina Grande, Brazil. The participants were selected from a total population of 12,705 children in this age group. Campina Grande (population: 386,000) is an industrialised city in northeastern Brazil and is divided into six administrative districts. The city has a Human Development Index of 0.72<sup>19</sup>. Data collection was performed between October of 2011 and April of 2012.

The percentage distribution of three-to-five-year-old preschool children in each administrative district was calculated from information provided by the municipal Board of Education. To ensure representativeness, the sample was stratified according to administrative district and type of preschool (two-phase sampling method). Preschools were randomly selected from each administrative district in the first phase and preschool children were randomly selected from each preschool in the second phase. The sample distribution was proportional to the total population enrolled in private and public preschools in each administrative district of the city. The sample size was calculated based on a 4% margin of error, a 95% confidence level and a correction factor of 1.2 to compensate for the design effect<sup>20</sup>. A 50% prevalence rate of financial impact due to oral health problems was considered to increase the power and also because this value gives the largest sample regardless of the actual prevalence<sup>21</sup>. Eighteen of the 127 public preschools and 15 of the 122 private preschools were randomly selected. The minimum sample size was estimated at 720 preschool children, to which an additional 20% was added to compensate for possible losses, giving a total sample of 864 preschool children.

### Eligibility criteria

To be included in the study, the children needed to be between three and five years of age, enrolled in a preschool and free of systemic diseases (based on the reports of the parents/caregivers). Only reports of parents/caregivers were considered for systemic disease; no systemic examination was conducted. The exclusion criteria were the presence of one or more erupted

permanent teeth, a history of orthodontic treatment and parents/caregivers not fluent in Brazilian Portuguese.

### Training and calibration exercises

Training and calibration exercises consisted of two steps (theoretical and clinical). The theoretical step involved a discussion of the criteria for the diagnosis of dental caries and TDI. A specialist in paediatric dentistry (gold standard in this theoretical framework) coordinated this step, instructing three general dentists on how to perform the examination. The clinical step was conducted at a randomly selected preschool that was not part of the main sample. Each dentist examined 50 previously selected children between three to five years of age. Data analysis involved Cohen's Kappa coefficient on a tooth-by-tooth basis. Inter-examiner agreement was tested by comparing each examiner with the gold standard ( $K = 0.85$  to  $0.90$ ). A seven-day interval was respected between clinical examinations for the determination of intra-examiner agreement ( $K = 0.85$  to  $0.90$ ). As Kappa coefficients were very good<sup>22</sup>, the examiners were considered capable of performing the epidemiological study.

### Pilot study

A pilot study was conducted to test the methodology and comprehension of the questionnaires. To perform this step, two pre-schools were randomly selected, one public and one private. Twenty pairs of children/caregivers from each school were analysed. Parents/caregivers signed a statement of informed consent and answered the questionnaires proposed by the research. Preschool children were examined at the pre-schools and diagnosed for dental caries and TDI. Participants from the pilot study ( $n = 40$ ) were not included in the main sample. As there were no misunderstandings regarding the questionnaires or the methodology, no changes to the data collection process were deemed necessary.

### Non-clinical data collection

The collection of the non-clinical data involved one item on the family function subscale of the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS) and questionnaires addressing socio-demographic data, health perceptions and history of toothache. Parents/caregivers were previously con-

tacted to attend a meeting at the preschools, at which they were informed of the objectives of the study. Parents/caregivers who agreed to participate signed a statement of informed consent and were then asked to answer the questionnaires. For the B-ECOHIS, the parents/caregivers were instructed to consider the child's entire lifetime experience of oral health conditions and treatment. All questionnaires were completed by the parents/caregivers and returned at the end of the meeting.

The B-ECOHIS addresses the perceptions of parents/caregivers regarding the impact of oral health problems on the quality of life of preschool children and their families. This scale is divided into two sections (Child Impact and Family Impact), containing six subscales and thirteen items. The financial impact due to oral health problems was evaluated using the family function subscale<sup>23,24</sup>. The item "How often has your child had dental problems or dental treatments that had a financial impact on your family?" demonstrated satisfactory internal consistency and reliability. For statistical purposes, financial impact was dichotomised as absent (when the response option "never" was marked) or present (remaining response options: "hardly ever", "sometimes", "often" and "very often"). "Don't know" responses were not counted.

The following socio-demographic data were analysed: child's sex, child's age, mother's schooling, age of parent/caregiver and household income (classified based on the monthly minimum wage in Brazil, which was equal to US\$312.50).

Parent's/caregiver' perceptions regarding their child's general and oral health status were evaluated based on answers to the following question: In general, how would you describe your child's general health/oral health? The response options were 1) very good, 2) good, 3) fair, 4) poor and 5) very poor. For statistical purposes, these answers were dichotomised as good (codes 1 and 2) or poor (codes 3, 4 and 5)<sup>14</sup>.

### Clinical data collection

After the return of the questionnaires, three dentists who had undergone the training and calibration exercise performed the clinical exams. Prior to the exam, the children cleaned their teeth under the supervision of the examiner. For such, each child received a kit containing a toothbrush, toothpaste and dental floss to remove bacterial plaque from the tooth surfaces and facilitate the diagnosis. The children were

examined at the preschools in a sitting position in front of the examiner. Lighting was provided by a portable headlamp (Petzl Zoom head lamp, Petzl America, Clearfield, UT, USA). The dentists used individual protection equipment, a sterile mouth mirror (PRISMA®, São Paulo, SP, Brazil), sterile Williams probe (WHO-621, Trinity®, Campo Mourão, PA, Brazil) and dental gauze to dry the teeth.

Dental caries was diagnosed using the International Caries Detection and Assessment System (ICDAS II)<sup>25</sup>. This index has codes ranging from 0 (absence of dental caries) to 6. Due to the epidemiological nature of the present study, code 1 was not used, as drying of the teeth was performed with gauze rather than compressed air. Code 2 is used for white spots and codes equal to or greater than 3 determine different degrees of cavitation. Codes 3 and 4 denoted low severity caries, whereas codes 5 and 6 denoted high severity caries<sup>25</sup>.

TDI was classified as enamel fracture, enamel + dentin fracture, complicated crown fracture, extrusive luxation, lateral luxation, intrusive luxation and avulsion<sup>26</sup>. A visual evaluation of tooth coloration was also performed. TDI was recorded as present when any type of injury or tooth discoloration was diagnosed. After the exam, a fluoridated varnish was applied to all teeth and children with dental caries or other dental needs were sent for treatment.

### Statistical analysis

Descriptive statistics were performed for the characterisation of the sample. The frequency distribution of the data was determined, considering the design effect correction. The dependent variable was financial impact due to oral health problems of the children (dichotomised as yes/no). Logistic regression considering the design effect in sampling weights for complex samples was conducted for each dependent variable ( $p < 0.05$ ). Independent variables with  $p$ -values  $< 0.20$  were incorporated into the multiple logistic regression model using the backward stepwise procedure. The interaction factor was tested for history of toothache and dental caries. The goodness of fit of the model was evaluated by the McFadden test (pseudo R square). Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS for Windows, version 18.0, SPSS Inc, Chicago, IL, USA).

### Ethical considerations

The present study received approval from the Human Research Ethics Committee of the State University of Paraíba (Brazil) in compliance with Resolution 196/96 of the Brazilian National Health Council. All participants' rights were protected. Parents/guardians read and signed a statement of informed consent prior to the children's participation.

### Results

A total of 837 pairs of preschool children and their parents/caregivers participated in the study; this corresponds to 96.5% of the total determined during the calculation of the sample size. The loss of 30 pairs was due to a lack of cooperation on the part of the child during the clinical exam ( $n = 6$ ), incomplete questionnaires ( $n = 11$ ), absence from preschool on the days scheduled for the clinical exams ( $n = 4$ ) and "don't know" responses on the B-ECOHIS item addressing financial impact ( $n = 9$ ).

Table 1 displays the socio-demographic and clinical characteristics of the sample, considering the design effect correction. A total of 64.5% of the children were diagnosed with dental caries and 35.6% had suffered some type of TDI. A total of 11.2% of the parents/caregiver reported a financial impact on the family due to the oral problems of their children.

In the bivariate analysis, the following variables were associated with financial impact: mother's schooling  $\leq 8$  years, household income  $\leq$  minimum monthly salary, parents'/caregivers' perception of their child's oral health as poor, history of toothache, dental caries and high severity of dental caries (Table 2). However, only the interaction between history of toothache and absence of dental caries (OR = 22.587; 95% CI: 4.838 to 105.448), the interaction between history of toothache and presence of dental caries (OR = 15.256; 95% CI: 3.167-73.482) and parents'/caregivers' perception of their child's oral health as poor (OR = 2.025; 95% CI: 1.016 to 4.034) remained in the final model (Table 3).

### Discussion

There has been little investigation regarding parents/caregivers' perceptions of the financial impact of dental treatment for oral health prob-

**Table 1.** Socio-demographic and clinical characteristics of sample considering the design effect correction.

Variable	Frequency	
	n	%
Sex		
Male	433	53.4
Female	401	46.6
Age		
3 years	273	29.9
4 years	332	41.2
5 years	229	28.9
Mother's schooling*		
≤ 8 years of study	382	41.5
> 8 years of study	449	58.5
Monthly household income*		
≤ minimum salary	435	49.3
> minimum salary	360	50.7
Age of parent/caregiver*		
≤ 30 years	419	47.0
> 30 years	397	53.0
Perception of general health*		
Good	675	81.4
Poor	155	18.6
Perception of oral health*		
Good	557	66.7
Poor	276	33.3
Toothache*		
Yes	261	32.6
No	558	67.4
Dental caries		
Absent	281	35.5
Present	553	64.5
Caries severity		
Absent	281	35.5
White spot	158	18.6
Low severity	69	8.0
High severity	326	37.9
TDI**		
Absent	549	64.4
Present	282	35.6
Type of TDI**		
Enamel fracture and without trauma	684	80.8
Enamel + dentin fracture	42	7.0
Avulsion and/or luxation	11	1.2
Discoloration	94	11.1
Financial impact		
Absent	770	88.8
Present	64	11.2
Total	834	100.0

\* 3 interviewees did not provide information on mother's schooling, 39 did not provide information on monthly household income, 18 did not provide information on age of parent/caregiver, 4 did not provide information on perception of general health, 1 did not provide information on perception of oral health and 15 did not provide information on toothache. \*\* n < 834 for TDI (n = 831) due to tooth loss and/or destruction that rendered the diagnosis impossible.

lems. Only a few studies have analysed the frequency of parents/caregivers' perceptions of the financial impact due to oral health problems in preschool children<sup>12-15</sup>. The prevalence rate of financial impact of 11.2% concurs with previous studies, which have reported prevalence rates ranging from 2.3%-11.9%<sup>12-15</sup>. The differences found might have occurred due to socioeconomic differences between samples. Nonetheless, in addition to the frequency, it is necessary to investigate factors associated with the perception of this impact in order to assist in the development of new public health policies. The present findings indicate that according to parents/caregiver's perceptions, a history of toothache and parental perceptions of their child's oral health status as poor are associated with a financial impact on the family. These results may help governments in the elaboration of new oral health policies aimed at reinforcing preventive actions and reducing the costs and the family impact of oral health problems, especially the conditions that result in painful symptoms, due to the low use of dental services by pre-school children<sup>27</sup>.

The prevalence rates of dental caries, TDI and report of toothache were high. However, they are in agreement with other studies performed with pre-schoolers. The index used to diagnose dental caries detects the early changes (white spots). Investigations that have used the same index reported even higher prevalence rates of dental caries (95.6% to 100.0%)<sup>3,28</sup>, perhaps because in those studies pre-schoolers were examined in a clinical setting and were from under-privileged areas. The prevalence rate of TDI (35.6%) is similar to previous studies carried out with the same age bracket<sup>29,30</sup>. Regarding toothache, the high frequency precisely reflects the high prevalence rates of oral health problems diagnosed and is in agreement with other studies<sup>31,32</sup>. A previous study highlights that children with caries experience had a higher prevalence rate of toothache than did those that were caries free<sup>32</sup>. It is noteworthy that oral health problems may be influenced by contextual and individual factors.

For the analysis of dental caries, an interaction factor with a history of toothache was used. Dental pain independent of dental caries was significantly associated with parents/caregivers' perception of the financial impact on the family. This means that only dental caries with a pain component or pain stemming from another oral health problem exerts a financial impact. Indeed, a large portion of the Brazilian population does not seek dental care unless experiencing pain or

**Table 2.** Bivariate logistic regression for complex samples regarding financial impact and independent variables among children aged three to five years.

Variable	Financial impact		Bivariate		Size effect
	Yes n(%)	No n(%)	p-value	Unadjusted OR 95% IC	
Sex					
Male	37(12.4)	396(87.6)	0.359	1.301(0.741-2.286)	0.03
Female	27(9.8)	374(90.2)		1.00	
Age of child					
3 years	19(9.2)	254(90.8)	0.859	1.00	0.04
4 years	22(9.8)	310(90.2)		1.065(0.530-2.140)	
5 years	23(15.1)	206(84.9)		1.754(0.873-3.521)	
Mother's schooling					
≤ 8 years of study	40(15.6)	342(84.4)	0.010	2.105(1.192-3.717)	0.09
> 8 years of study	24(8.1)	425(91.9)		1.00	
Monthly household income					
≤ minimum salary	43(15.0)	392(85.0)	0.024	1.981(1.096-3.580)	0.08
> minimum salary	20(8.2)	340(91.8)		1.00	
Age of parent/caregiver					
≤ 30 years	30(11.5)	389(88.5)	0.937	1.023(0.585-1.789)	0.02
> 30 years	34(11.3)	363(88.7)		1.00	
Perception of general health					
Good	49(10.1)	626(89.9)	0.130	1.00	0.04
Poor	15(15.8)	140(84.2)		1.661(0.862-3.201)	
Perception of oral health					
Good	25(6.3)	532(93.7)	< 0.001	1.00	0.17
Poor	39(21.0)	237(79.0)		3.979(2.244-7.053)	
Toothache					
Yes	50(28.5)	211(71.5)	< 0.001	14.162(7.084-28.311)	0.30
No	12(2.7)	546(97.3)		1.00	
Dental caries					
Absent	11(5.2)	270(94.8)	0.003	1.00	0.10
Present	53(14.4)	500(85.6)		3.080(1.469-6.456)	
Caries severity					
Absent	11(5.2)	270(94.8)	< 0.001	1.00	0.16
White spot	8(7.4)	150(92.6)		1.465(0.527-4.068)	
Low severity	2(6.3)	67(93.7)		1.230(0.254-5.965)	
High severity	43(19.6)	283(80.4)		4.449(2.084-9.496)	
TDI					
Absent	39(10.8)	510(89.2)	0.993	1.00	0.02
Present	23(10.8)	259(89.2)		1.003(0.554-1.814)	
Type of TDI					
Discoloration	9(13.3)	85(86.7)	0.434	1.394(0.606-3.211)	0.07
Avulsion and/or luxation	1(20.2)	10(79.8)		2.298(0.283-18.675)	
Enamel + dentin fracture	6(16.0)	36(84.0)		1.730(0.625-4.793)	
Enamel fracture and without trauma	46(9.9)	638(90.1)		1.00	

discomfort<sup>33,34</sup>. Moreover, although dental caries is relatively prevalent, it does not affect a child's ability to perform activities of daily living in the early stages of decay<sup>35</sup>. In general, only pain and infection caused by the complications of dental caries motivates parents/caregivers to seek ur-

gent care for their children<sup>33,36,37</sup>. It is possible that seeking care only in such cases is due to the low degree of resolution in public healthcare services for this age group and the need for specific knowledge of paediatric dentistry<sup>38,39</sup>. Moreover, a previous study demonstrated that public



**Table 3.** Multiple logistic regression for complex samples regarding financial impact and independent variables among children aged three to five years.

Variable	N(%)	p-value	Multiple Adjusted OR (95%CI)*
Interaction factor			
Toothache (no)'dental caries (no)	232(30.4)		1.00
Toothache (yes)'dental caries (no)	44(5.1)	< 0.001	22.587(4.838-105.448)
Toothache (no)'dental caries (yes)	326(37.0)	0.400	1.922(0.419-8.821)
Toothache (yes)'dental caries (yes)	217(27.5)	0.001	15.256(3.167-73.482)
Perception of oral health			
Good	557(66.7)		1.00
Poor	276(33.3)	0.045	2.025(1.016-4.034)

Variables incorporated into multivariate model ( $p < 0.20$ ): child's age, mother's schooling, monthly household income, perception of general health, perception of oral health, dental caries severity and history of toothache'dental caries interaction. \* McFadden test (pseudo R square): 0.225.

primary care is focused on children aged six to 12 years, giving priority to the permanent dentition<sup>40</sup>, which could lead parents/caregivers of preschool children to seek care in an expensive private practice.

The diagnosis of TDI in preschool children was not significantly associated with parents/caregivers' perception of the financial impact on the family. This may be explained by the fact the mild types of TDI are most often diagnosed in epidemiological studies and do not cause long periods of pain for the child, which translates into a low frequency of seeking treatment<sup>41</sup>. However, a study involving children and adolescents found that the degree of TDI severity has an impact on both direct and indirect costs for patients and caregivers<sup>42</sup>. On the other hand, most parents/caregivers do not consider TDI to be a disease<sup>2,43</sup>. Thus, there is no concern regarding this condition and many do not seek the necessary treatment.

Parents'/caregivers' perception of their child's oral health status as poor was associated with parents/caregivers' perception of the financial impact. Adequate oral health care and visits to the dentist are influenced by parents'/caregivers' perceptions<sup>10,44</sup>. The perception of poor oral health is generally associated with clinical conditions and dental treatment needs in preschool children<sup>16,44,45</sup>. Seeking this type of treatment requires time and money, thereby causing a financial impact.

The lack of an association between the report of financial impact and socioeconomic conditions should be highlighted. Some studies show

that socioeconomic conditions may influence family functioning<sup>12,14</sup>. However, other investigations reported the absence of a relationship between these variables<sup>13,46</sup>. This finding suggests that it is likely that oral health problems have an impact on family functioning, regardless of socioeconomic status.

The present study was conducted with a representative sample and it is therefore possible to extrapolate the findings. However, despite the use of validated questionnaires and the execution of a pilot study, the present investigation has the limitations inherent to cross-sectional design and some degree of information bias may have occurred. Moreover, this study reflects parents'/caregiver's perceptions of the financial impact and not the report of the financial impact, as variables such as use of health services and medications, type of service used and time spent out of work were not collected. In addition, some outcomes had a large confidence interval in the multiple logistic regression; this may be a limitation of the study. The broad confidence intervals may have been due to the heterogeneity of the sample<sup>47</sup>. However, there may be enough precision to make decisions regarding the usefulness of an intervention. Longitudinal studies are needed to assist in the establishment of new public health programs aimed at reducing the financial impact of oral health problems. The evaluation of financial impact stemming from oral health problems can contribute to improving public health strategies directed at preschool children, as it is evident that there is a lack of planning of the health actions directed towards the child group<sup>48</sup>.

## Collaborations

GL Ribeiro was responsible for the conception and study design, acquisition and interpretation of data. MC Gomes helped with the statistical analysis and drafted the manuscript. KC Lima was responsible for the analysis and interpretation of the data. CC Martins performed data acquisition and drafted the manuscript. SM Paiva performed the analysis, interpretation of the data and a critical review of the manuscript. AF Granville-Garcia was responsible for the conception design, analysis and interpretation of the data and a critical review of the manuscript.

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## References

1. Locker D, Jokovic A, Stephens M, Kenny D, Tompson B, Guyatt G. Family impact of child oral and oro-facial conditions. *Community Dent Oral Epidemiol* 2002; 30(6):438-448.
2. Bendo CB, Paiva SM, Abreu MH, Figueiredo LD, Vale MP. Impact of traumatic dental injuries among adolescents on family's quality of life: a population-based study. *Int J Paediatr Dent* 2014; 24(5):387-396.
3. Amorim RG, Figueiredo MJ, Leal SC, Mulder J, Frencken JE. Caries experience in a child population in a deprived area of Brazil, using ICDAS II. *Clin Oral Investig* 2012; 16(2):513-520.
4. Leal SC, Bronkhorst EM, Fan M, Frencken JE. Untreated cavitated dentine lesions: impact on children's quality of life. *Caries Res* 2012; 46(2):102-106.
5. Trentesaux T, Delfosse C, Rousset MM, Hervé C, Hamel O. Social vulnerability in paediatric dentistry: an overview of ethical considerations of therapeutic patient education. *Cult Med Psychiatry* 2014; 38(1):5-12.
6. Goursand D, Paiva SM, Zarzar PM, Pordeus IA, Allison PJ. Family Impact Scale (FIS): psychometric properties of the Brazilian Portuguese language version. *Eur J Paediatr Dent* 2009; 10(3):141-146.
7. Pagano E, Baldi I, Mosso ML, di Montezemolo LC, Fagioli F, Pastore G, Merletti F. The economic burden of caregiving on families of children and adolescents with cancer: a population-based assessment. *Pediatr Blood Cancer* 2014; 61(6):1088-1093.
8. Seirawan H, Faust S, Mulligan R. The impact of oral health on the academic performance of disadvantaged children. *Am J Public Health* 2012; 102(9):1729-1734.
9. Harford J, Chrisopoulos S. Productivity losses from dental problems. *Aust Dent J* 2012; 57(3):393-397.
10. Camargo MBJ, Barros AJD, Frazão P, Matijasevich A, Santos IS, Peres MA, Peres KG. Predictors of dental visits for routine check-ups and for the resolution of problems among preschool children. *Rev Saude Publica* 2012; 46(1):87-97.
11. Warner EL, Kirshhoff AC, Nam GE, Fluchel M. Financial burden of pediatric cancer for patients and their families. *J Oncol Pract* 2014; [Epub ahead of print].
12. Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bonecker M, Raggio DP. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. *Community Dent Oral Epidemiol* 2011; 39(2):105-114.
13. Kramer PF, Feldens CA, Ferreira SH, Bervian J, Rodrigues PH, Peres MA. Exploring the impact of oral diseases and disorders on quality of life of preschool children. *Community Dent Oral Epidemiol* 2013; 41(4):327-335.
14. Scarpelli AC, Paiva SM, Viegas CM, Carvalho AC, Ferreira FM, Pordeus IA. Oral health-related quality of life among Brazilian preschool children. *Community Dent Oral Epidemiol* 2013; 41(4):336-344.
15. Viegas CM, Paiva SM, Carvalho AC, Scarpelli AC, Ferreira FM, Pordeus IA. Influence of traumatic dental injury on quality of life of Brazilian preschool children and their families. *Dent Traumatol* 2014; 30(5):338-347.



16. Piovesan C, Marquezan M, Kramer PF, Bönecker M, Ardenghi TM. Socioeconomic and clinical factors associated with caregivers' perceptions of children's oral health in Brazil. *Community Dent Oral Epidemiol* 2011; 39(3):260-267.
17. Reisine S. The impact of dental conditions on social functioning and quality of life. *Ann Rev Public Health* 1988; 21(12):1-19.
18. Hayes A, Azarpazhooh A, Dempster L, Ravaghi V, Quiñonez C. Time loss due to dental problems and treatment in the Canadian population: analysis of a nationwide cross sectional survey. *BMC Oral Health* 2013; 13:17.
19. Brazilian Institute of Geography and Statistics. *First Results of the 2010 Census* [cited 2013 May 10]. Available from: <http://cidades.ibge.gov.br/xtras/home.php>
20. Kirkwood BR, Stern J. *Essentials of Medical Statistics*. London: Blackwell; 2003.
21. Browner WS, Newman TB, Hulley SB. Estimating sample size and power: applications and examples. In: Hulley SB, Cummings SR, Browner WS. *Designing clinical research*. 3<sup>rd</sup> ed. Philadelphia: Lippincott and Williams & Wilkins; 2007. p. 65-94.
22. Altman DG. *Practical statistics for medical research*. 2<sup>nd</sup> ed. London: Chapman and Hall; 2006.
23. Tesch FC, Oliveira BH, Leão A. Semantic equivalence of the Brazilian version of the Early Childhood Oral Health Impact Scale. *Cad Saude Publica* 2008; 24(8):1897-1909.
24. Scarpelli AC, Oliveira BH, Tesch FC, Leão AT, Pordeus IA, Paiva SM. Psychometric properties of the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS). *BMC Oral Health* 2011; 11:19.
25. Ismail AI, Sohn W, Tellez M, Amaya A, Sen A, Hasson H, Pitts NB. The International Caries Detection and Assessment System (ICDAS): an integrated system for measuring dental caries. *Community Dent Oral Epidemiol* 2007; 35(3):170-178.
26. Andreasen JO, Andreasen FM, Andersson L. *Textbook and color atlas of traumatic injuries to the teeth*. 4<sup>th</sup> ed. Oxford: Blackwell; 2007.
27. Rodrigues LAM, Martins AMEBL, Silveira MF, Ferreira RC, Souza JGS, Silva JM, Caldeira AP. The use of dental services among preschool children: a population-based study. *Cien Saude Colet* 2014; 19(10):4247-4256.
28. Cook SL, Martinez-Mier EA, Dean JA, Weddell JA, Sanders BJ, Eggertsson H, Ofner S, Yoder K. Dental caries experience and association to risk indicators of remote rural populations. *Int J Paediatr Dent* 2008; 18(8):275-283.
29. Feldens CA, Kramer PF, Ferreira SH, Spiguel MH, Marquezan M. Exploring factors associated with traumatic dental injuries in preschool children: a Poisson regression analysis. *Dent Traumatol* 2010; 26(2):143-148.
30. Granville-Garcia AF, Menezes VA, Lira PI. Dental trauma and associated factors in Brazilian preschoolers. *Dent Traumatol* 2006; 22(6):318-322.
31. Ferraz NK, Nogueira LC, Pinheiro ML, Marques LS, Ramos-Jorge ML, Ramos-Jorge J. Clinical consequences of untreated dental caries and toothache in preschool children. *Pediatr Dent* 2014; 36(5):389-392.
32. Ferreira-Júnior OM, Freire MD, Moreira RD, Costa LR. Contextual and individual determinants of dental pain in preschool children. *Community Dent Oral Epidemiol* 2015; 43(4):349-356.
33. VT, Magalhães AC, Pessan JP, Silva SMB, Machado MAAM. Urgency treatment profile of 0 to 15 year-old children assisted at urgency dental service from Bauru Dental School, University of São Paulo. *J Appl Oral Sci* 2005; 13(4):340-344.
34. Figueiredo N, Carnut L, Goes PSA. Evaluation of out-of-hours dental service, Recife, Brazil. *Int J Dent* 2010; 9(3):114-119.
35. Barbosa TS, Gavião MB. Evaluation of the family impact scale for use in Brazil. *J Appl Oral Sci* 2009; 17(5):397-403.
36. Moura-Leite FR, Ramos-Jorge ML, Bonanato K, Paiva SM, Vale MP, Pordeus IA. Prevalence, intensity and impact of dental pain in 5-years-old preschool children. *Oral Health Prev Dent* 2008; 6(4):295-301.
37. Tulip DE, Palmer NO. A retrospective investigation of the clinical management of patients attending an out of hours dental clinic in Merseyside under the new NHS dental contract. *Brit Dent J* 2008; 205(12):659-664.
38. Silva MCB, Silva RA, Ribeiro CCC, Cruz MCFN. Profile of public dental care for children and adolescents in São Luís, Maranhão State. *Cienc Saude Colet* 2007; 12(5):1237-1246.
39. Machado GC, Daher A, Costa LR. Factors associated with no dental treatment in preschoolers with toothache: a cross-sectional study in outpatient public emergency services. *Int J Environ Res Public Health* 2014; 11(8):8058-8068.
40. Duggal M. Carious primary teeth in children: Can or should they be left unrestored? *Faculty Dent J* 2011; 2(1):8-13.
41. Siqueira MB, Gomes MC, Oliveira AC, Martins CC, Granville-Garcia AF, Paiva SM. Predisposing factors for traumatic dental injury in primary teeth and seeking of post-trauma care. *Braz Dent J* 2013; 24(6):647-654.
42. Glendor U, Jonsson D, Halling A, Lindqvist K. Direct and indirect costs of dental trauma in Sweden: a 2-year prospective study of children and adolescents. *Community Dent Oral Epidemiol* 2001; 29(2):150-160.
43. Carvalho TS, Abanto J, Mendes FM, Raggio DP, Bönecker M. Association between parental guilt and oral health problems in preschool children. *Braz Oral Res* 2012; 26(6):557-653.
44. Wandera M, Kayondo J, Engebretsen IM, Okullo I, Astrom AN. Factors associated with caregivers' perception of children's health and oral health status: a study of 6- to 36-month-olds in Uganda. *Int J Paediatr Dent* 2009; 19(4):251-262.

45. Talekar BS, Rozier RG, Slade GD, Ennett ST. Parental perceptions of their preschool-aged children's oral health. *J Am Dent Assoc* 2005; 136(3):364-372.
46. Gomes MC, Pinto-Sarmento TC, Costa EM, Martins CC, Granville-Garcia AF, Paiva SM. Impact of oral health conditions on the quality of life of preschool children and their families: a cross-sectional study. *Health Qual Life Outcomes* 2014; 12:55.
47. Higgins JPT, Green S. *Cochrane handbook for systematic reviews of interventions version 5.1.0 [updated March 2011]*. The Cochrane Collaboration. 2011. [cited 2015 May 20]. Available from: <http://www.cochrane-handbook.org>.
48. Costa GD, Cotta RMM, Reis JR, Ferreira MLSM, Reis RS, Franceschini SCC. Evaluating child healthcare in the context of Family Healthcare in the city of Teixeira, Minas Gerais (MG, Brazil). *Cien Saude Colet* 2011; 16(7):3229-3240.

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