

Do socio-economic disparities in dental treatment needs exist in Lithuanian adolescents?

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SUMMARY

The objective. To explore disparities in needs for dental treatment which arise from individual and area-based socio-economic determinants. Research design. A cross-sectional study conducted in 22 randomly selected Lithuanian areas. Setting. In each of the pre-selected areas, one secondary school was randomly chosen. Participants. A total of 885 15-16-year-olds participated. Outcome measures. Dental treatment need was evaluated following the WHO guidelines and a Quantitative Summative Dental Treatment Needs Index (QSDTNI) was used to calculate the total burden of needs. The information about socio-economical determinants was obtained from a structured questionnaire and national statistics database. Individual socio-economic status (SES) measures were: parents' occupation, family structure, family income and affordability to have holiday used as a proxy measure for income. The area-based SES estimates were: unemployment, average household income, educational attainment, natural increase/decrease of population in an area and net migration rate. Data was analyzed by bivariate and multivariate analyses. Results: None of significant bivariate associations between individual socio-economic variables and the QSDTNI were detected. Among area-based variables natural increase/decrease of population in an area and net migration rate were significantly related to the QSDTNI. Two individual and two area-based factors were extracted and introduced into Linear Multiple Regression Analysis (LMR). The LMR model was significant, but only one factor, i.e. area demographics, significantly contributed to this model. Conclusion: There are no clear social disparities in dental treatment needs in Lithuanian adolescents.

Key words: dental treatment needs, individual SES, area-based SES.

INTRODUCTION

The WHO identified social deprivation as a major contributor to unequal health outcomes in populations (1). It is well recognized that individuals from socially deprived backgrounds are more likely to experience dental caries (2-4). Consequently, they are more likely to have an unmet treatment need (5) and are the least likely to have a regular source of dental care (6). Consideration needs to be given to the fact that oral health problems are not self-limiting; rather, they progress if left untreated. Moreover, delays in dental treatment create barriers because dental prob-

lems become more complicated and more expensive to treat as time progresses (7). It has been suggested that health policy needs to target people as well as places (8). Since the resources for community-based programs are usually limited, it has been recommended that these be targeted at populations in greatest need (9).

Research on social stratification and its impact on human health has tended to focus on individuals rather than on the environments to which individuals are exposed (10). However, substantial differences across geographic areas have been reported (6). Moreover, it has been shown that social characteristics of neighborhoods were better predictors of health than characteristics of individuals or households (11). The underlying assumption behind the use of area-based measures is that households within a given area are homogeneous with respect to socio-economic status (SES) (12). It has been suggested that individual-level data on health and neighborhood-level data must be analyzed simultaneously to determine whether liv-

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Table 1. Measurements of socio-economic status

Measurement	Operationalization	
<i>Individual socio-economic indicators</i>		
Father's occupation	<ul style="list-style-type: none"> • Full time job • Part time job • Jobless • Unknown 	
Mother's occupation		
Family income		<ul style="list-style-type: none"> • My family is supported by social assistance institutions • Income from one of parents • Income from both parents • Other incomes (please specify)
Affordability to have a holiday		
Family structure	Number of adults in the family Number of children in the family	
<i>Area-based socio-economic indicators</i>		
Natural increase/decrease of population in an area	The difference between numbers of those born alive and those who died	
Net migration rate	The difference of immigrants and emigrants of an area in a period of time per 10 000 inhabitants	
Educational attainment	The number of inhabitants with higher education per 10 000 inhabitants	
Unemployment indicators	The total unemployment rate (%) in an area	
	The unemployment ratio – the percentage of unemployed out of all working age adults	
Average household income	The average income per individual in a household	
Availability of dental service	Number of dentist per 10 000 inhabitants in an area	

ing in a deprived neighborhood increases the risk of poor health above the effect of individual factors (13).

Lithuania is one of the countries where health care has experienced dramatic changes during the last two decades. Before regaining independence in 1991, the Lithuanian society was rather homogenous with regards to material living standards. Health care, including oral care, was only public and free except for prosthodontic treatment. The majority of schools had dental offices where children were given an annual mandatory check-up and treated, if needed. After 1991, the transition towards a Western-oriented economy brought substantial social changes to the country and led to a social stratification. The wide establishment of private dental practices occurred and the school-based dental care was gradually discontinued.

It has been suggested that children are first to be affected by social changes and privatization of dental practice (14). The social disadvantage may be cumulative across a life span and lead to a poorer overall health in adulthood (15).

The study hypothesis was that individual and area-based socio-economic factors related to variations in dental treatment needs in Lithuanian adolescents.

MATERIAL AND METHODS

The study was performed after receiving permission from the Bioethical Committee of the Minis-

try of Health and Ministry of Education of Lithuania. The consent was also obtained from both adolescents and their parents.

Lithuania has ten districts and in each of these districts, one urban and one rural area were randomly chosen. In each of these pre-selected areas, one secondary school was randomly chosen. In each school, two or three classes of 15-16-year-olds were invited to participate. Only children who had consent forms, signed by themselves and by their parents, were included in the study and a total of 885 children participated.

Because of the obligatory nature of school attendance for children under 16 years of age, the present sample can be considered as a representative sample of 15-16-year-old Lithuanians.

Assessment of dental treatment need

The clinical data for the present study were collected following the general principles for Basic Oral Health Surveys of the World Health Organization (WHO) (16). Examinations were performed by one examiner (VB). The intra-examiner agreement was estimated by means of the Kappa index calculated from the double clinical recordings of 50 participants taken three days apart. The intra-examiner reliability (Kappa value of 0.89) was considered satisfactory.

Dental treatment needs were assessed using the Quantitative Summative Dental Treatment Needs Index (QSDTNI) (17), which was calculated for each

Table 2. Dental treatment needs regarding individual socio-economic variables†

Variable	N	QSDTNI* Mean ± SD	P value
Affordability to have holiday			
At home	317	19.2 ± 26.7	0.239
Local countryside	176	15.8 ± 22.5	
At the local resort area	295	15.7 ± 21.8	
Abroad	93	19.2 ± 32.2	
Father's occupation			
Full time job	428	17.1 ± 24.3	0.627
Part time job	125	15.3 ± 18.2	
Jobless	96	16.6 ± 23.8	
Unknown to child	123	19.2 ± 25.5	
Mother's occupation			
Full time job	392	16.5 ± 22.1	0.232
Part time job	186	15.5 ± 25.4	
Jobless	201	20.2 ± 28.8	
Unknown to child	53	19.4 ± 31.1	
Family income			
My family is supported by social assistance institutions	45	19.4 ± 35.0	0.614
Income from one parent	303	18.2 ± 27.4	
Income from both parents	529	16.7 ± 22.5	
Family structure (number of adults)			
One parent	254	16.8 ± 23.3	0.772
Both parents	549	17.3 ± 25.4	
Family structure (number of children)			
1 – 2 children	516	15.9 ± 23.1	0.358
3 or more children	210	17.6 ± 25.1	

† One-Way ANOVA Post Hoc Bonferroni test.

* Quantitative Summative Dental Treatment Need Index.

subject. This index was based on the relative differences in monetary costs (relative ratios) of diverse dental treatment services. The QSDTNI for each individual was calculated by summing the relative ratios of the specific necessary treatments.

Measurements of socio-economic status

Multiple rather than single social indicators related to both individual and area-based SES measurements were sought. Indicators of SES used for adults were reported to be inappropriate for use in research on adolescents (18). As collecting data on SES from children may be problematic, the final choice of individual social indicators was determined by practical considerations.

The SES variables used in this study are presented in Table 1. The individual SES factors were: father's and mother's occupation, number of adults in the family with income and the structure of the family. Given actual individual incomes were unattainable, a self-reported affordability to have a holiday was chosen as a proxy measure for family income. This measure was assumed to be reflective of the family wealth, e.g. the ones who have higher incomes can afford to have a holiday abroad, while the ones with limited resources have to spend a holiday at home.

Information about area-based SES indicators was obtained from the Department of Statistics of the Government of the Republic of Lithuania (19). The following area-based indicators were used: natural increase/decrease of population, net migration rate, educational attainment, unemployment indicators, average household income and availability of dental service.

Statistical analyses

The Statistical Package for the Social Sciences (SPSS 15.0, Chicago, IL, USA) was used. One-Way ANOVA with Post-Hoc Bonferroni adjustment was used to compare means in treatment needs regarding the individual socio-economic variables. Correlations were used to assess the relationships between dental treatment needs and a number of area-based SES variables.

Two multivariate analyses, Factor Analysis and Linear Multiple Regression, were employed to evaluate the joint associations between different SES variables and variations in dental treatment needs. Factor Analysis was used to study the relationships among interrelated variables in terms of a few conceptually-meaningful and independent factors (20).

Common factors were extracted employing the Confirmatory Factor Analysis by applying the Princi-

Table 3. Socio-economic factors and their indicators (Confirmatory Factor Analysis*)

Socio-economic Factors	Indicator (variable)	Indicator loading
<i>Individual Factor 1</i> Family socio-economic status	Father's occupation	0.708
	Mother's occupation	0.745
	Family income	0.802
	Affordability to have a holiday	0.497
<i>Individual Factor 2</i> Family structure	Number of adults in the family	0.788
	Number of children in the family	0.669
<i>Area-based Factor 1</i> Education and living standard	Educational attainment	0.921
	The total unemployment rate	0.954
	The unemployment ratio	0.929
	Average household income	0.865
<i>Area-based Factor 2</i> Area demographics	Availability of dental service	0.837
	Natural increase/decrease	0.980
	Net migration rate	0.965

* Principal Component Analysis, Eigen value >1.

Table 4. Linear multiple regression model for dental treatment need regarding individual and area-based socio-economic factors

Factors	Standardized Coefficients Beta	Significance	Collinearity Statistics (Tolerance)
Family socio-economic status	0.031	0.461	0.995
Family structure	0.008	0.849	0.993
Education and living standard	0.085	0.059	0.867
Area demographics	0.134	0.003	0.869

Model summary: P = 0.038, Adjusted R square = 0.011

pal Component Analysis with Eigenvalue >1 set as a default value. Factor scores were calculated and further introduced into Linear Multiple Regression.

The statistical significance for all analyses was considered at $P < 0.05$.

RESULTS

Dental treatment needs varied substantially among participants with a minimum QSDTNI of 0.0, maximum of 235.7 and a mean \pm SD of 17.4 ± 25.0 .

The variation in QSDTNI with regards to different individual SES variables is illustrated in Table 2. There were some patterns, although none of them reached statistical significance. For example, the treatment need was higher in adolescents from families supported by social assistance institutions compared to adolescents from families where both parents had income. Similarly, individuals from families with more children tended to have higher treatment needs than their counterparts from smaller families.

Among area-based SES variables, only two variables, "natural increase/decrease of population in an area" (Pearson correlation coefficient 0.075; $P = 0.026$) and "net migration rate" (Pearson correlation coefficient 0.080; $P = 0.018$), were significantly related to the QSDTNI.

The Confirmatory Factor Analysis was used to extract factors for both individual and area-based SES domains. Two factors were obtained in each domain.

Table 3 presents factors and their corresponding indicators with loadings. The factor loading indicates a correlation of a variable to its corresponding factor.

The Individual Factor 1 related to family socio-economic status and comprised of information from four variables, namely "father's occupation", "mother's occupation", "family income", and "affordability to have a holiday" (Table 3). The contribution of the variable "affordability to have a holiday" was the smallest among the indicators. The Individual Factor 2 consisted of two indicators, both related to family structure.

The area-based Factor 1 consisted of four and the Factor 2 of two indicators. The first factor related to levels of education and living standards in an area and the second one to the demographics of the area.

The combined effect of different SES factors was tested by means of Linear Multiple Regression (LMR) (Table 4). Although the regression model was significant ($P = 0.038$), the total explained variance in the model was low, i.e. 1.1%. Overall, four factors had only minor contributions in the model and only the contribution from the area-based Factor 2 was statistically significant.

DISCUSSION

Both a theoretical basis and strong empirical evidence for a causal impact of social relationships on

health has been established (21). However, our study did not confirm a similar pattern for dental treatment need in adolescents. Seemingly in Lithuania, there are no clear associations between dental treatment needs and individual or area-based socio-economic domains. The only significant relationship found was between demographic characteristics such as “natural increase/decrease of population in an area” and “net migration rate” and dental treatment needs, although it was very weak.

An overview of the literature shows that the link between health/disease parameters and socio-economic factors is inconsistent, i.e. some studies confirm this link, while others do not. For example, the highest dental caries experience was observed among children from low SES households who were also residing in low SES areas, and the least caries experience was apparent among those from high SES households in high SES areas (12;22). Similarly, individual and area deprivation were independently associated with poor self-rated health (23). By contrast, another study did not report an association between SES and oral health (24). Little or no impact of an area deprivation score on an individual's health was found once the extent of individual disadvantage was accounted for (25).

Without an explicit consideration of how the social characteristics are expected to influence health outcomes, it is no surprise that contrasting results have been obtained in different studies (26).

It is important to consider the findings of the present study in the context of the historical and economical development of Lithuania. Before the fall of the Soviet Union, similar to that in other Eastern European countries, the governments role in organizing and financing healthcare in Lithuania was strong, with central planning and rigorous control. Oral healthcare was provided free of charge for all citizens (27). After the regaining of independence in 1991, major changes in the Lithuanian healthcare system occurred with the gradual privatization of dental care. At present, children under the age of 18 are still entitled to free dental care but this care is a responsibility of their parents. It is important to note that these parents belong to a generation where healthcare for all was primarily the responsibility of the government. Possibly, the attitude of Lithuanian parents towards the dental healthcare of their children remained unchanged, i.e. the parents did not adopt complete responsibility for their children's oral health yet. It is also likely that the wide variation in dental treatment needs observed in Lithuanian adolescents is influenced by other factors not studied in the present work.

The present study used both objective area-based and subjective individual socio-economic measurements. Consideration has to be given to the fact that traditional individual SES indicators such as income and education were not used. This was done due to the suggestion that many indicators of SES used for adults are inappropriate for use in research on adolescents (18). In order to obtain information reflective of family income, a proxy measure such as the affordability to have a holiday was chosen. However, this measure might be not sensitive enough to discriminate among individuals with different socio-economic status.

Contrasting findings regarding SES indicators have been presented. For example, it was reported that whichever measure of deprivation was used, inequalities in children's health conditions could be detected (24). However, in another report, the nature of the relationship between social status and oral conditions differed according to the measure used for evaluating social status (2).

Given that social deprivation in dental treatment needs in Lithuanian adolescents does exist, such patterns should have been identified by at least some of the indicators used in the present study. Moreover, three levels of statistical analyses were employed, which should have been helpful in identifying trends and patterns, if they existed. Factor analysis produced a weighted summation of information about different interrelated SES indicators. Furthermore, linear multiple regression employing factor scores did not lose any of the information in multivariate analysis. However, despite all of these analytical attempts, no clear patterns were observed.

It is likely that the burden of dental treatment needs in Lithuania is not polarized, i.e. high risk groups do not exist. There are two main approaches in the prevention of a disease or a problem: the individual-based, i.e. high-risk approach, and the population-based approach. The first strategy seeks to identify high-risk individuals and to offer them some individual protection. In contrast, the population strategy seeks to control the determinants of incidence in the population as a whole (28).

For the prevention of caries or its consequences, a commonly adopted approach is the high-risk strategy. However, the latter approach does not seem to be appropriate to reduce dental treatment needs variations in Lithuanian adolescents as the burden of dental treatment need is not skewed towards high-risk individuals. Moreover, the problems of a high-risk strategy are increased by the low accuracy of methods used to identify the high-risk children (29). Seemingly, Lithuania needs a population-based approach where

attempts to reduce the burden of treatment need should be targeted to the population as a whole.

CONCLUSIONS

Despite the wide variation in dental treatment need and the social stratification in Lithuanian society, the expected socio-economic differences in dental treatment need in adolescents were not found.

The only one significant, although a very weak relationship was found between dental treatment need and the following area based-demographic char-

acteristics such as “natural increase/decrease of population”, “net migration rate”.

These findings may open a further scientific discussion to explore other, non-social factors, which could be responsible for the substantial variation in dental treatment need in Lithuanian adolescents.

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