The Social Gradient in Oral Health: Is There a Role for Dental Anxiety?

Eduardo BERNABÉ[1]; Gerry HUMPHRIS[2]; Ruth FREEMAN[3]

[1] Division of Population and Patient Health, King's College London Dental Institute at Guy's, King's College and St. Thomas' Hospitals, London, United Kingdom

[2] Health Psychology, School of Medicine, University of St Andrews, St Andrews, United Kingdom

[3] Dental Health Services Research Unit, School of Dentistry, University of Dundee, Dundee, United Kingdom

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Corresponding Author:

Dr. Eduardo Bernabé,

Division of Population and Patient Health

King's College London Dental Institute

Denmark Hill Campus

Bessemer Road, London SE5 9RS, United Kingdom

Tel: +44 (0) 20 3299 3022

Email: eduardo.bernabe@kcl.ac.uk

ABSTRACT

Objective: To evaluate the contribution of dental anxiety to social gradients in different oral health outcomes and whether social gradients in oral health persist once dental anxiety is removed from the population examined.

Methods: Data from 9035 British adults were analysed. Participants' socioeconomic position (SEP) was measured through education and household income. Dental anxiety was measured with the Modified Dental Anxiety Scale. Poor subjective oral health, oral impacts on quality of life and edentulism among all adults and the number of teeth, DMFS and sextants with pocketing among dentate adults were the oral health outcomes. The contribution of dental anxiety to absolute and relative social inequalities in each oral health outcome (measured with the Slope and Relative Index of Inequality [SII and RII], respectively) was estimated from regression models without and with adjustment for dental anxiety and quantified with the percentage attenuation. Interactions between each SEP indicator and dental anxiety were used to test what would happen if dental anxiety were removed from the whole population.

Results: The largest contribution of dental anxiety to explaining oral health inequalities was found for education gradients in perceived outcomes (11-13%), but dental anxiety explained <4% of social gradients in edentulism. Among dentate adults, dental anxiety accounted for <5% and <7% of education and income gradients, respectively. Only four of the 24 interactions tested were statistically significant. Hence, the education- and income-based SII and RII for oral impacts were non-significant among anxiety-free adults but were significant at higher levels of dental anxiety.

Conclusions: Little support was found for the role of dental anxiety in explaining social inequalities in various perceived and clinical oral health measures. Oral health inequalities were found among both non-dentally anxious and anxious participants.

INTRODUCTION

Dental anxiety was first defined as a fear of the unknown and conceptualised as an anticipatory anxiety[1] and more recently in terms of fears of 'unpredictable events'[2], vulnerability[3], shame and loss of control[2,3]. The aetiology of dental anxiety is said to be multifactorial with frightening dental treatment experiences playing a part in the overall causation[4,5]. Research has suggested that dental caries is a marker of social deprivation[6] and it is known that larger numbers of children from lower compared with higher socio-economic groups experience more frightening dental treatments such as dental general anaesthesia for the treatment of their caries[7,8]. Therefore, it may be proposed that a social gradient may exist for dental anxiety due to dental caries and the effect of frightening dental treatment experiences in childhood. Moreover, since dental anxiety is an independent predictor of opportunistic and declining dental visiting patterns in adulthood[9], it may be proposed that dental fears persisted across the life course[10,11].

Theorising in this way, suggests that a social gradient may exist with those from lower socio-economic groups experiencing more dental anxiety and hence more dental caries. Therefore, it is of little surprise that earlier research, reports of associations between dental anxiety and various perceived and clinical oral health measures after controlling for socio-demographic factors[12-14], however more recent research, by Donaldson et al.[15], found something different. Donaldson et al.[15] showed that the number of permanent sound teeth was not influenced by dental anxiety but was explained by socio-economic position (SEP) and dental attendance[15]. Baker[16] agreed and reported that dental anxiety (as an enabling resource) was one of many factors mediating the association between predisposing factors (defined as a latent variable including indicators for education, household income and social class) and subjective oral health status among British adults. Therefore, while there is evidence that a link between dental anxiety and oral health exists, once this link has been controlled for SEP, the association was diminished[17].

The question remains how the interrelationship between dental anxiety, SEP and oral health may be understood? Businelle et al.[18], for instance, explored the relationship between psychological stress, socio-economic status and mental health and showed that "*the number of stressful life events experienced . . . mediated the relationship between socio-economic status and mental health status three years later*"[18]. Is it possible that dental anxiety could act in a similar fashion? Could dental anxiety influence the association between SEP and oral health and if so does dental anxiety attenuate or exacerbate oral health inequalities, and thus,

contribute to the social gradient in oral health? To answer this question and fill the gaps in knowledge, a study based on a planned secondary analysis of existing population data was conducted. The primary aim of the study was to evaluate if dental anxiety contributed to the social gradients in the different oral health outcomes mentioned and the secondary aim was to explore whether the social gradients in oral health would persist once dental anxiety was removed from the population examined.

METHODS

Data source

We used data are from the 2009 Adult Dental Health Survey, which recruited a representative sample of adults, aged 16 years and over, in England, Wales and Northern Ireland. The sample size for the survey was 13400 households, distributed as follows: 1150 in every of the 10 Strategic Health Authority in England, 1150 in Wales, and 750 in Northern Ireland. A two-stage cluster sampling was used. In the first stage, countries were divided into homogeneous areas containing 2 postcodes sectors. In the second stage, 25 addresses were sampled from each primary sampling unit. Overall, 13509 adults were invited to home interviews and 11380 (84%) agreed. Of them, 813 (7%) were edentate and thus excluded from the examination. From the remaining 10567 respondents, 6469 (61%) were clinically examined[19].

Two analytical samples were created. The first consisted of 9035 interviewed adults (dentate and edentate) with complete data on relevant variables. The second consisted of 5530 dentate adults who were clinically examined and had complete data on relevant variables. They represented 79% and 85% of participating adults and dentate adults, respectively.

Variables selection

Data on demographic characteristics, SEP indicators, dental anxiety, subjective oral health and dental behaviours were obtained during interviews. Three SEP indicators were measured in the survey. We preferred education and income over socioeconomic classification (based on employment relations and conditions) because they are not specific to the UK but appeal to a more international audience. In addition, socioeconomic classification is only applicable to those in employment (~90% of participants), meaning that those who had never worked, were in long-term unemployment or not classified for other reasons would have been excluded. Education was determined as the highest qualification achieved. Weekly household income was derived through a battery of questions and recoded into quintiles (<£0-199, £200-

399, £400-599, £600-899, £≥900). Dental anxiety was measured with the Modified Dental Anxiety Scale (MDAS), a 5-item scale that ranks participants' anxiety to the prospect of a dental visit, when in the waiting room, receipt of drilling, scaling and a local anaesthetic injection. Responses ranged from not anxious (1) to extremely anxious (5). Items were summed to generate a total score, ranging from 5 to 25[20]. Cut-off values of 5/6 and 18/19 were used to classify participants as non-anxious, slight/fairly and very/extremely anxious[21]. Dental behaviours were attendance pattern, toothbrushing frequency, smoking status and sugars intake frequency. Participants were asked their usual reason to go to the dentist (a regular check-up, an occasional check-up or only when having trouble with teeth/dentures), how often they clean their teeth nowadays (>2/day, 2/day, 1/day, <1/day, never). Participants' responses on whether they have ever smoked a cigarette (yes/no) and whether they smoke cigarettes at all nowadays (yes/no) were used to classified them as current, former and never smokers. Sugar intake frequency was derived from responses to 3 sugary items and later classified as <1/day, 1/day and 2+/day. Poor oral health was defined as a bad/very bad response on the single global oral health item (very bad, bad, fair, good and very good). Oral impacts were measured using the Oral Health Impact Profile (OHIP-14) that gathers information on the frequency of impacts due to teeth, mouth and dentures during the preceding 12 months. Responses ranged from never (0) to very often (4). We estimated the proportion of participants who reported oral impacts 'fairly often' and 'very often' (codes 3 and 4)[22]. Participants also reported if they were edentulous or had some natural teeth.

Dentate participants were invited to a clinical oral examination. Examinations were based on 32 teeth. Dental caries was diagnosed at the caries into dentine threshold and recorded at surface level. The periodontal examination consisted of measurement of periodontal pocket depth (PD) and loss of attachment (the latter was only for adults over 55 years) at mesio-buccal and disto-buccal sites for maxillary teeth, and mesio-lingual and disto-lingual for mandibular teeth; and then the worst score per sextant was recorded[19]. We chose the number of teeth, the DMFS index and sextants with PD≥4mm as the outcome measures for dentate adults.

Data analysis

All analyses were run in STATA 13 (StataCorp LP, College Station, TX) using analytical weights and accounting for the complex survey design. We first present crude gradients in poor oral health, oral impacts and edentulism among all adults and number of teeth, DMFS

and sextants with PD≥4mm among dentate adults, by education, income and dental anxiety. The above six outcomes covered both clinical and perceived measures of oral health for which clear social gradients have been previously reported in the UK[23,24].

The Slope and Relative Index of Inequality (SII and RII) were used to measure absolute and relative oral health inequalities, respectively. These regression-based indices relate health outcomes to a measure of SEP that takes into account the different proportions in each category rather than only comparing the two most extreme groups[25]. The SII represents the absolute difference in prevalence (or mean) of the outcome between the two extremes of the SEP indicator. RII can be interpreted as the odds (or rate) ratio of the outcome in the lowest SEP group compared with the highest. SII values higher than 0 and RII values higher than 1 indicate larger inequalities[25,26]. The education- and income-based SII and RII for dichotomous outcomes were estimated from linear and logistic regression models, respectively, adjusting for sex, age groups, country of residence and the other SEP indicator. The corresponding SII and RII for count outcomes were estimated from negative binomial and linear regression models, respectively, using the same set of confounders.

To address the primary aim of this study, the contribution of dental anxiety to social gradients in oral health was estimated from regression models without (and with) adjustment for dental anxiety (Models 1A/1B for education gradients and 2A/2B for income gradients). As a control, we also explored the contribution of dental behaviours to social gradients (Models 1C/2C). Four dental behaviours were included in all models, except smoking status for DMFS and sugars intake frequency for sextants with PD≥4mm. The contribution of each factor to explaining absolute and relative inequalities in oral health was estimated using the percentage attenuation in the regression coefficient for SEP: $100\times[\beta_{\text{ref model}}-\beta_{\text{ref model+factor(s)}}]/[\beta_{\text{ref model}}]$.

To address the secondary aim of the study, we compared social gradients in oral health according to levels of dental anxiety to illustrate what would happen to the social gradients in oral health if dental anxiety were removed from the population. It was assumed that if dental anxiety played a strong role in explaining social gradients in oral health there would be no social gradients among anxiety-free participants compared to those slightly/fairly and very/extremely anxious. We tested the significance of the statistical interaction between each SEP indicator and dental anxiety in models adjusting for sex, age groups, country of residence and the other SEP indicator. A non-significant interaction implied that the contribution of dental anxiety to social gradients in that oral health outcome was similar

across dental anxiety groups. Stratified analysis was carried out to visualise the pattern of significant interactions.

RESULTS

The two analytical samples are described in Table 1. Participants with complete data were younger, more educated, wealthier and more dentally anxious than those with missing values. They were also more likely to report brushing their teeth more often, visiting a dentist regularly for check-ups and never having smoked. Clear gradients favouring the most educated and wealthiest were found in all oral health measures (Table 2). Significant monotonic trends in oral health were also found with increasing dental anxiety, although not for all measures. Poor oral health and oral impacts were more common among dentally anxious adults. Contrarily, dentally anxious individuals were less likely to be edentulous and had more teeth and lower DMFS than non-anxious adults.

The largest absolute inequalities (SII) were observed for oral impacts and the smallest in edentulism whereas for relative inequalities (RII) the opposite trend was found (Table 3). For interpretation, the education-based SII for oral impacts implies that the proportion of adults reporting oral impacts was 13% higher in those with no qualifications than in those with higher education. In addition, the income-based RII for edentulism suggested that the probability of being edentulous in the wealthiest group was 8.74 times the probability in the poorest group. The largest contribution of dental anxiety to explaining oral health inequalities was found for education gradients in perceived outcomes (Models 1B-2B). Dental anxiety explained, statistically, up to 13% of education gradients and up to 7% of income gradients in perceived outcomes. On the other hand, it explained less between 1% and 4% of social gradients in edentulism. Among dentate adults, dental anxiety accounted for up to 5% and 7% of education and income gradients, respectively. Dental behaviours accounted for more of the social gradients among all adults (30-56% for education and 25-58% for income) and dentate adults (19-37% for education and 22-32% for income) than did dental anxiety (Models 1C-2C).

Interactions between each SEP indicator and dental anxiety were used to test what would happen if dental anxiety were removed from the whole population. Of the 24 interactions tested (education by dental anxiety and income by dental anxiety for RII and SII, respectively, in each oral health outcome), only the 4 for oral impacts were statistically significant (Table 4). Larger absolute (SII) and relative inequalities (RII) in oral impacts were

found with increasing levels of dental anxiety. Hence, the education- and income-based SII and RII for oral impacts were non-significant among anxiety-free adults but were significant at higher levels of dental anxiety, especially for income gradients. On the other hand, the 20 non-significant interactions suggested that absolute and relative inequalities in poor oral health, edentulism, number of teeth, DMFS and sextants with PD≥4mm existed and were fairly similar across the three anxiety groups.

Sensitivity analysis showed that findings were robust to the definition of dental anxiety used (MDAS as continuous score or a dichotomous variable with a cut-off at 18/19) and dichotomising clinical outcomes (having 20 teeth or more, DMFS>0 or any sextant with PD≥4mm).

DISCUSSION

Previous work connecting dental anxiety with oral health status suggested that a more complex relationship existed when SEP was included as an additional explanatory factor. Work from mental health[18] informed a research question that dental anxiety could act as a mediator between SEP and oral health outcome and contribute to the social gradient in oral health outcomes. Therefore, our aim was to evaluate the contribution of dental anxiety to social gradients in different oral health outcomes and explore if the social gradient persisted once dental anxiety had been removed from the population.

This study first found that crude gradients existed in dental status and subjective oral health by income, education and dental anxiety but not for periodontal pocketing. Only income and education were associated with periodontal pocketing. While possible explanations for the absence of an association between dental anxiety and periodontal pocketing may be related to an earlier loss of teeth[28] the fact that dentally anxious adults had more teeth suggested that dental anxiety might act in a different way. An alternative explanation is the confounding role of age as the prevalence of periodontal disease increases with age[29] while dental anxiety tends to decline in later life[21,30]. In addition, periodontal diseases are often silent and likely to remain unnoticed for a long period of time. This argument implies that periodontal treatment may not be sought by both dentally and non-dentally anxious adults.

Dental anxiety is associated with both SEP and oral health, which makes it a potential psychosocial factor explaining oral health inequalities. Our results also showed that dental anxiety compared with dental behaviours (set as a control) contributed significantly less to the absolute and relative measures of inequality for all the oral health outcomes examined.

While the contribution of dental anxiety to the education and social gradients was low, the contribution of dental health behaviours to explain social inequalities, as noted in previous research[31], was considerable. In addition, an examination of non-significant interactions suggested that inequalities in oral health existed, irrespective of dental anxiety status except in relation to oral health impacts. Our findings showed that absolute and relative inequalities in oral impacts on quality of life were larger at higher levels of dental anxiety. Thus the contribution of dental anxiety to modify, attenuate or exacerbate the social gradient in the physical oral health outcomes examined was not apparent. Dental anxiety, nevertheless, did have an effect on the oral health impact gradient. A possible explanation for this finding may be due to the shared association in the equivalence between some of the dental anxiety and oral health impact items with regard to an overlapping construct e.g. negative affectivity. Clark and Watson[32] proposed in their tripartite model when distinguishing the components of anxiety and depression that the apparent overlap would be explained by the personality trait termed negative affectivity. This was also referred to as 'general psychological distress'[33] which would appear to be a plausible way to view the links between dental anxiety and oral health impacts.

What value are these findings for a dental public health community, which aims to reduce health inequality by altering the social gradient? First, there must be the recognition that dental anxiety contributed little to the social gradient in objective oral health outcomes whereas the contribution of behaviours was significant. It is now recognised that health behaviours are proximal determinants of health, being influenced distally by SEP[34,35]. Using such theoretical models[35], it may be suggested that that this secondary analysis highlights the importance of SEP and the need, therefore, to adopt health promotion strategies that are couched within proportionate universalism. This strategy will enable a reduction in childhood caries[36] and the potential for reducing distressing dental experiences[8] and the dental anxiety consequences. Doing so will, in addition, reduce any residual effects of dental anxiety upon oral health outcomes, and in particular oral health impacts, while attenuating education and income inequalities by fostering cognitive and psychosocial skill sets to stimulate health learning capacity[37,38].

Some study limitations need to be addressed. First, our analysis was based on cross-sectional data and unable to test for causal relationships. This is particularly important when testing for mediators between SEP and oral health, where a clear temporal sequence is required. Second, this study was based on secondary analysis of national data which was not purposely

collected to test our hypothesis. Using existing data allowed exploring our research questions rapidly while maximising the use of publicly funded surveys, but our analysis may have been constrained by data availability (selection of variables). Third, the fact that our study samples represented 79-85% of survey participants may raise concerns about representativeness and the impact of missing data on the results. Participants included in the study were younger, more educated, wealthier and reported higher dental anxiety and more favourable behaviours. Therefore, we report valid relationships between the variables of interest but our findings may not be generalizable beyond the study samples. Fourth, we used the MDAS which is widely quoted but only one of a number of instruments available in the literature to assess dental anxiety [37]. The present findings await corroboration from longitudinal studies in different populations using alternative assessment approaches of SEP and dental anxiety.

CONCLUSION

This study provides little support for the role of dental anxiety in explaining social inequalities in various perceived and clinical oral health measures. Compared to dental behaviours, the contribution of dental anxiety to the social gradient in oral health was relatively modest. In addition, oral health inequalities were found across all levels of dental anxiety.

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Table 1. Characteristics of the sample of adults (n=9035) and dentate adults (n=5530) with complete information on relevant variables

Variables	Groups	All adults (dentate and edentate)		Dentate adults	
		n[a]	%	n[a]	%
Sex	Male	4041	48.6	2520	48.8
	Female	4994	51.4	3010	51.2
Age groups	16-24 years	879	15.5	560	15.8
	25-34 years	1306	17.2	821	17.4
	35-44 years	1772	19.8	1149	20.7
	45-54 years	1697	17.1	1056	17.4
	55-64 years	1528	14.3	973	14.8
	65-74 years	1070	8.9	633	8.6
	75+ years	783	7.3	338	5.3
Country	England	7667	91.5	4789	91.6
	Wales	779	5.4	367	5.4
	Northern Ireland	589	3.1	374	3.1
Education	No qualifications	1638	16.0	800	13.4
	Below degree level	5258	59.2	3263	59.7
	Degree level or above	2139	24.9	1467	26.9
Income	1st quintile (lowest)	1659	17.3	894	16.0
	2nd quintile	2274	23.8	1275	22.2
	3rd quintile	1550	16.9	981	17.2
	4th quintile	1641	18.8	1043	18.9
	5th quintile (highest)	1911	23.3	1337	25.7
Dental anxiety	Not anxious	1814	19.2	1018	17.4
	Slight/Fairly	6053	67.9	3853	70.2
	Very/Extremely	1168	12.9	659	12.4
Toothbrushing Frequency	Once a day or less often	2416	26.7	1399	25.8
	Twice a day	5480	61.6	3431	62.5
	More than twice a day	1139	11.7	700	11.7
Smoking Status	Never smoker	4065	45.6	2507	45.6
	Former smoker	3008	31.4	1910	33.1
	Current smoker	1962	23.0	1113	21.3
Dental attendance pattern	When in trouble	2541	30.4	1267	26.4
	Regularly for check-ups	6494	69.6	4263	73.6
Sugars intake frequency	Less often than daily	3894	41.1	2348	40.8
	Once a day	3960	44.4	2454	44.4
	Twice or more a day	1181	14.5	728	14.8

[a] Counts are unweighted

Table 2. Crude gradients in dental anxiety by education and income and crude gradients in oral health by education, income and dental anxiety

All adults (n=9035)	Poor oral health		Oral impacts		Edentulism	
	%	[95% CI]	%	[95% CI]	%	[95% CI]
Education						
No qualifications	12.6	[10.68, 14.42]	19.8	[17.64, 21.99]	15.8	[13.89, 17.69]
Below degree level	7.7	[6.90, 8.55]	16.5	[15.35, 17.62]	2.7	[2.24, 3.11]
Degree level or above	3.8	[2.85, 4.78]	9.9	[8.51, 11.39]	0.3	[0.11, 0.51]
P value for trend		*<0.001*		*<0.001*		*<0.001*
Income						
1st quintile (lowest)	10.9	[9.16, 12.57]	21.8	[19.57, 24.05]	9.9	[8.43, 11.38]
2nd quintile	9.3	[7.90, 10.69]	18.8	[16.97, 20.67]	7.6	[6.45, 8.74]
3rd quintile	8.5	[6.90, 10.04]	14.5	[12.53, 16.44]	2.5	[1.72, 3.25]
4th quintile	6.0	[4.65, 7.32]	12.6	[10.77, 14.43]	0.8	[0.41, 1.20]
5th quintile (highest)	3.8	[2.77, 4.79]	10.0	[8.50, 11.57]	0.4	[0.11, 0.70]
P value for trend		*<0.001*		*<0.001*		*<0.001*
Dental anxiety						
Not anxious	5.0	[3.9, 6.2]	10.7	[9.1, 12.2]	9.1	[7.8, 10.5]
Slight/Fairly	6.1	[5.5, 6.9]	14.2	[13.2, 15.2]	3.0	[2.5, 3.4]
Very/Extremely	18.3	[15.8, 20.8]	28.9	[26.0, 31.8]	3.2	[2.2, 4.2]
P value for trend		*<0.001*		*<0.001*		*<0.001*
Dentate adults (n=5530)	**Number of teeth**		**DMFS**		**Sextants with PD≥4mm**	
	Mean	**[95% CI]**	**Mean**	**[95% CI]**	**Mean**	**[95% CI]**
Education						
No qualifications	21.8	[21.3, 22.4]	68.8	[65.6, 72.1]	1.6	[1.5, 1.8]
Below degree level	26.0	[25.8, 26.2]	48.4	[47.2, 49.6]	1.2	[1.1, 1.3]
Degree level or above	27.5	[27.3, 27.7]	41.5	[39.9, 43.2]	0.9	[0.9, 1.0]
P value for trend		*<0.001*		*<0.001*		*<0.001*
Income						
1st quintile (lowest)	24.1	[23.6, 24.6]	58.3	[55.4, 61.2]	1.4	[1.3, 1.6]
2nd quintile	24.3	[24.0, 24.7]	56.6	[54.3, 58.9]	1.4	[1.3, 1.6]
3rd quintile	25.9	[25.6, 26.3]	50.0	[47.6, 52.3]	1.2	[1.1, 1.3]
4th quintile	26.8	[26.5, 27.1]	44.8	[42.7, 46.8]	1.1	[1.0, 1.2]
5th quintile (highest)	27.6	[27.4, 27.8]	40.3	[38.7, 41.8]	0.9	[0.8, 1.0]
P value for trend		*<0.001*		*<0.001*		*<0.001*
Dental anxiety						
Not anxious	24.9	[24.5, 25.3]	57.6	[55.1, 60.1]	1.3	[1.2, 1.5]
Slight/Fairly	26.2	[26.0, 26.3]	47.2	[46.1, 48.4]	1.1	[1.1, 1.2]
Very/Extremely	25.4	[25.0, 25.9]	49.3	[46.4, 52.1]	1.3	[1.2, 1.5]
P value for trend		*0.010*		*<0.001*		*0.771*

[a] P value for trend was derived from unadjusted logistic and negative binomial regression models for binary and count outcomes, respectively.

Table 3. Change in absolute and relative measures of inequalities in oral health, attributed to dental anxiety and dental behaviours

Outcome	SEP	Model[a]	SII	[95% CI]	% attn.[b]	RII	[95% CI]	% attn.[b]
Poor oral health (n=9035)	Education	M1A	11.10	[7.91, 14.29]***		7.36	[3.75, 14.46]***	
		M1B	9.66	[6.50, 12.82]***	13	5.91	[2.99, 11.66]***	11
		M1C	4.91	[1.84, 7.98]**	56	2.62	[1.34, 5.12]**	52
	Income	M2A	19.72	[12.52, 26.93]***		30.19	[7.15, 127.55]***	
		M2B	18.42	[11.26, 25.58]***	7	27.14	[6.27, 117.32]***	3
		M2C	10.37	[3.45, 17.28]**	47	9.43	[2.06, 43.11]**	34
Oral impacts (n=9035)	Education	M1A	13.43	[9.08, 17.78]***		3.20	[2.13, 4.82]***	
		M1B	11.98	[7.62, 16.34]***	11	2.86	[1.89, 4.32]***	10
		M1C	8.24	[3.87, 12.61]***	39	2.07	[1.37, 3.15]**	37
	Income	M2A	30.14	[19.89, 40.4]***		13.49	[5.12, 35.57]***	
		M2B	28.80	[18.55, 39.05]***	4	12.75	[4.77, 34.11]***	2
		M2C	21.23	[11.04, 31.41]***	30	7.00	[2.60, 18.89]***	25
Edentulism (n=9035)	Education	M1A	8.31	[6.82, 9.80]***		14.20	[5.66, 35.67]***	
		M1B	7.95	[6.46, 9.45]***	4	13.85	[5.756, 34.50]***	1
		M1C	4.22	[2.79, 5.65]***	49	6.41	[2.90, 14.17]***	30
	Income	M2A	8.74	[5.75, 11.72]***		35.48	[2.80, 448.90]**	
		M2B	8.36	[5.39, 11.34]***	4	33.20	[2.68, 411.29]**	2
		M2C	3.64	[0.50, 6.78]*	58	10.10	[1.22, 83.40]*	35
Number of teeth (n=5530)	Education	M1A	-3.37	[-3.95, -2.79]***		0.88	[0.86, 0.90]***	
		M1B	-3.24	[-3.82, -2.67]***	4	0.88	[0.86, 0.90]***	4
		M1C	-2.74	[-3.32, -2.15]***	19	0.90	[0.88, 0.92]***	19
	Income	M2A	-3.18	[-4.41, -1.94]***		0.89	[0.85, 0.93]***	
		M2B	-3.03	[-4.26, -1.80]***	5	0.90	[0.86, 0.94]***	5
		M2C	-2.20	[-3.44, -0.96]***	31	0.92	[0.88, 0.97]**	32
DMFS (n=5530)	Education	M1A	12.44	[8.93, 15.96]***		1.33	[1.22, 1.45]***	
		M1B	11.78	[8.27, 15.28]***	5	1.31	[1.21, 1.43]***	5
		M1C	9.45	[5.96, 12.93]***	24	1.25	[1.15, 1.37]***	21
	Income	M2A	15.00	[7.48, 22.52]***		1.37	[1.12, 1.67]**	
		M2B	14.29	[6.78, 21.80]***	5	1.34	[1.10, 1.64]**	7
		M2C	11.69	[4.24, 19.13]**	22	1.28	[1.05, 1.55]*	23
Sextants with PD≥4mm (n=5530)	Education	M1A	0.69	[0.43, 0.95]***		1.73	[1.35, 2.21]***	
		M1B	0.66	[0.40, 0.92]***	5	1.69	[1.31, 2.16]***	4
		M1C	0.49	[0.23, 0.76]***	28	1.41	[1.10, 1.82]**	37
	Income	M2A	1.55	[0.97, 2.13]***		5.20	[2.85, 9.49]***	
		M2B	1.52	[0.93, 2.10]***	2	5.02	[2.75, 9.16]***	2
		M2C	1.06	[0.48, 1.64]***	32	3.21	[1.77, 5.83]***	29

RII: relative index of inequality; SII: Slope index of inequality
*** p<0.05; ** p<0.01; *** p<0.001
[a] Model 1A/2A: adjusted for sex, age, country of residence, education and income; Model 1B/2B: Model 1A/2A plus dental anxiety; Model 1C/2C: Model 1A/2A plus dental behaviours (toothbrushing frequency, dental attendance pattern, smoking status and sugars intake frequency).
[b] Percentage attenuation in regression coefficient=$100\times[\beta_{\text{ref model}}-\beta_{\text{ref model+factor(s)}}]/[\beta_{\text{ref model}}]$

Table 4. Absolute and relative inequalities in oral impacts by levels of dental anxiety

SEP measure	Dental anxiety	SII[a]	[95% CI]	P value for interaction
Education	Not anxious	-0.53	[-9.17, 8.10]	
	Slight/Fairly	14.75	[9.66, 19.85]***	0.016
	Very/Extremely	16.47	[-1.04, 33.97]	
Income	Not anxious	11.39	[-11.56, 34.34]	
	Slight/Fairly	21.67	[9.78, 33.55]***	0.015
	Very/Extremely	98.73	[63.78, 133.68]***	
		RII[a]	**[95% CI]**	**P value for interaction**
Education	Not anxious	0.95	[0.36, 2.50]	
	Slight/Fairly	3.87	[2.31, 6.46]***	0.013
	Very/Extremely	2.50	[0.89, 7.02]	
Income	Not anxious	3.37	[0.25, 45.07]	
	Slight/Fairly	7.35	[2.26, 23.87]***	<0.001
	Very/Extremely	31.60	[8.01, 96.65]***	

RII: relative index of inequality; SII: Slope index of inequality
*** p<0.05; ** p<0.01; *** p<0.001
[a] SII and RII estimates were derived from regression models including sex, age groups, country of residence, education, income, and dental anxiety as explanatory variables.