Community Dental Health (2019) **36,** 17–21
Received 2 May 2018; Accepted 29 August 2018

doi:10.1922/CDH_4388Ravaghi05

Socioeconomic Variation in the association between Malocclusion and Oral Health Related Quality of Life

Vahid Ravaghi[1], Sarah R Baker[2], Philip E Benson[2], Zoe Marshman[2] and Alexander J Morris[1]

[1]*School of Dentistry, University of Birmingham, 5 Mill Pool, Birmingham B5 7EG, UK;* [2]*School of Clinical Dentistry, University of Sheffield, Claremont Crescent, Sheffield S10 2TA, UK*

Objectives: Oral health related quality of life (OHRQoL) has been linked to malocclusion. We aimed (a) to investigate the association between malocclusion and OHRQoL among children, and (b) to examine whether this association varied by socioeconomic status. ***Methods:*** Cross-sectional analysis of data for 4,217 children aged 12 & 15 years, who participated in the 2013 Children Dental Health Survey (CDHS); a nationally representative survey of children in England, Wales, and Northern Ireland. Malocclusion was determined using the modified Index of Orthodontic Treatment Need (IOTN). OHRQoL was measured using the Child Oral Impacts on Daily Performance (Child-OIDP). For socioeconomic status, we used the pupils' eligibility for free school meals (FSM) and Index of Multiple Deprivation (IMD). Adjusted marginal effects were estimated controlling for confounding variables. Separate analyses were carried out for the two age groups. ***Results:*** Malocclusion was associated with 6% and 15% increases in the probability of reporting negative impact of OHRQoL for 12- and 15-year olds respectively, which was significant for 15-year olds (marginal effect=0.15, 95% CI=0.08-0.22). Malocclusion was associated with the prevalence of oral impacts for 12 year olds (marginal effect=0.1, 95% CI=0.02-0.17) and 15-year olds (marginal effect=0.2, 95% CI 95%=0.13-0.28) not eligible for FSM and for 15-year olds in the most (marginal effect=0.2, 95% CI=0.1-0.29) and least (marginal effect=0.26, 95% CI=0.13-0.4) deprived IMD quintiles. ***Conclusions:*** Malocclusion was associated with impacts on OHRQoL for 15-year olds. There was evidence of a relationship between SES, malocclusion and OHRQoL.

Keywords: *Impact, malocclusion, oral health related quality of life, orthodontics, socioeconomic status, children*

Introduction

Several reviews have summarised the findings of studies relating malocclusion to poorer oral health-related quality of life (OHRQoL) (Kragt *et al.*, 2016; Liu *et al.*, 2009). In general, these studies support the assertion that malocclusion impacts adversely on people's daily lives. A recent meta-analysis estimated that children with a malocclusion are 1.74 times more likely to have reported an impact (Kragt *et al.*, 2016).

Quality of life (QoL) is a dynamic construct shaped by a range of factors, many non-clinical. Individuals with similar clinical status may not report the same impact on their daily lives. The relationship between clinical state and QoL is influenced by determinants, such as individual experiences and expectations (Carr *et al.*, 2001). Although numerous cross-sectional studies have found that malocclusion is associated with negative impact on OHRQoL, many of these studies did not take into account factors which may influence such a relationship (Kragt *et al.*, 2016).

The impact of oral disorders, such as malocclusion on OHRQoL is influenced by both environmental and individual characteristics. Some known factors that modify the impact of malocclusion on OHRQoL are age (Kragt *et al.*, 2016), gender (Lawrence *et al.*, 2008) and psychological well-being (Agou *et al.*, 2011). Socioeconomic status (SES) is another factor which may play a role in the interrelationship between malocclusion and OHRQoL. Lower SES is linked to worse OHRQoL (Kragt *et al.*, 2017; Alwadi *et al.*, 2017; Benson *et al.*, 2015) after controlling for the effect of other dental conditions. Previous studies have shown that the negative impact of clinical conditions on OHRQoL varies according to socioeconomic status (Chaffee *et al.*, 2017; Locker, 2007). The interrelationship between clinical signs and symptoms, SES and OHRQoL could be explained in different ways. Researchers have described direct (e.g. access to services) and indirect mediating relationships (e.g. through psychological resources) (Benson *et al.*, 2015; Locker, 2007). Psychological factors such as optimism, coping strategies and life satisfaction vary according to SES and are related to health outcomes (Taylor *et al.*, 1999). Social inequalities in life expectancy may have narrowed in England over the past decade (Buck *et al.*, 2017); however, social inequalities in other aspects of health remain a major public health issue. Although the relationship between malocclusion and OHRQoL has been studied extensively, to our knowledge no previous study has investigated the SES variation in this relationship using nationally representative data.

The aim of this study was to investigate the relationship between malocclusion, OHRQoL and SES in young people aged 12 & 15 years, who participated in a recent large national representative survey undertaken in England, Wales, and Northern Ireland (Children Dental Health Survey 2013). The specific research questions were:

Do the data from this survey confirm the relationship between the presence of malocclusion and worse OHRQoL?

If so, does this relationship vary according to socioeconomic status?

Correspondence to: Dr Vahid Ravaghi; Email: v.ravaghi@bham.ac.uk, Telephone: +44 (0)121 466 5523

Methods

We used the data from the fifth Child Dental Health Survey (CDHS) undertaken across England, Wales and Northern Ireland in 2013. The survey dataset were obtained from the UK Data Archive (2013). The CDHS was a cross-sectional representative survey of 9,866 children aged 5, 8, 12 and 15 years attending state and independent schools in England, Wales and Northern Ireland. The overall response rate was 72% and varied between ages (12-year-olds: 83%; 15-year-olds: 74%). Full details of this survey, its sampling methods and related protocols can be found elsewhere (Anderson *et al.*, 2015). In this study, we excluded 5- and 8-year olds as they were neither clinically examined for orthodontic conditions, nor were they required to complete OHRQoL questionnaires. Out of 4,950 children aged 12 and 15, 677 (14%) were undergoing orthodontic treatment at the time of the survey, 64 pupils (1%) had missing data for OHRQoL and 16 children did not participate in the orthodontic examination (<1%). After excluding these, we analysed the data for 4,217 children aged 12 and 15 years.

The CDHS measured orthodontic treatment need clinically, using a modified IOTN (Index of Orthodontic Treatment Need) (Burden *et al.*, 2001). This index determined orthodontic needs based on two components: dental health (DHC) and an aesthetic component (AC). DHC assesses five aspects, missing/impacted teeth, overjet, crossbite, displacement of contact points and overbite. DHC scores of 4 or 5 indicate definite need for treatment. The AC score was based on an assessment of the participant against ten photographs showing different levels of dental attractiveness. Training and calibration of the orthodontic examination were carried out before data collection. The reliability test indicates moderate levels of agreement (kappa score= 0.623). Detailed information regarding the orthodontic condition of the children has been reported (Rolland *et al.*, 2016). In the present analysis malocclusion was said to be present if the participant had a DHC score of 4 or 5 or an AC score of 8 or greater.

The measure of OHRQoL included in the 2013 CDHS was the Child Oral Impacts on Daily Performance (OIDP) (Gherunpong *et al.*, 2004). The Child-OIDP has been validated for the UK population (Yusuf *et al.*, 2006) and focuses on eight key aspects of daily life, each scored 0–3 (Not all=0, a little=1, a fair amount=2 and a lot=3). We used a dichotomous indicator of OHRQoL based on the reporting of at least one impact.

Indicators of socioeconomic status were individual child eligibility for free school meals (FSM) and Indices of Multiple Deprivation (IMD) based on pupils' postcode of residence. In 2013, a free school meal was a statutory benefit available only to school aged children from families who received other qualifying benefits (such as Income Support). In addition to eligibility for free school meals, the 2013 CDHS also reported country specific Index of Multiple Deprivation (IMD) quintiles. The CDHS used the most recent indices for each country at the time, which included the 2010 data for England, the 2011 data for Wales and the 2010 Northern Ireland Multiple Deprivation Measure (Anderson *et al.*, 2015). For this study, we merged the IMD quintiles from England, Wales, and Northern Ireland to indicate relative deprivation, children ranked in the most deprived area in all three countries were consequently classed in the same quintile.

There was evidence of an interaction between age and malocclusion ($F(3,84)=28.66$, $p<0.001$). Therefore, analyses were carried out for 12- and 15-year olds separately. Bivariate analyses, reported the proportions reporting at least one impact on oral health for those with and without malocclusion, across SES categories. Unadjusted odds ratios (ORs) and related confidence intervals (CIs) for reporting at least one impact on oral health were reported. Multivariate regression models were adjusted for demographic and clinical variables. The demographic variables consisted of gender (male/female) and country (England/Wales/Northern Ireland). The clinical conditions were adjusted for dichotomised indicators of oral health: (1) good overall oral health and (2) self-reported absence of symptoms. The category 'good overall oral health' combines an absence of obvious decay experience, no calculus and no tooth surface loss into dentine. 'Absence of symptoms' referred to absence of five clinical conditions in the past 3 months: sensitive tooth, mouth ulcers, bad breath, toothache, bleeding or swollen gum, and broken teeth. For each age group, we estimated average marginal effects after adjusting for confounders. Marginal effects represent the difference in the adjusted predicted probabilities of reporting any impact on daily performance between those with and without malocclusion. For example, a marginal effect of 0.10 implies that the probability of reporting oral health impact would be 10% higher among those with malocclusion. All estimates were calculated accounting for the sample weight and complex sampling design. Data analyses were carried out using STATA 13. Less than 5% of the schoolchildren had missing values for SES (FSM=238, IMD=188). There was no statistically significant difference in the prevalence of reporting impact between the sample and those with missing values for the indicators of SES. Two other variables (i.e. self-reported absence of symptoms & OHRQoL) had fewer missing values (<1%).

Results

The frequencies and weight adjusted proportions for each variable are reported in Table 1. Of 4,217 children aged 12 and 15, 52% were male and one in five were eligible for free school meals (FSM). Approximately one third had 'good oral health' with no oral symptoms. Altogether, 28% malocclusion and half reported at least one impact on oral health.

To address our first study research question, we examined whether oral impacts varied according to the presence of malocclusion. Bivariate analyses in Table 2 show that proportionately more 12-year olds reported an impact on oral health than 15-year olds (57.2% v 43.4%). Although the proportion of 12-year olds reporting at least one impact on oral health was higher in the malocclusion group compared with the non-malocclusion group (61.6% v 54.7) this relationship was not significant [OR=1.32, 95% CI=0.99-1.78). In contrast, among 15-year olds the probability of reporting at least one impact was significantly greater in those with malocclusion (OR=1.95, 95% CI=1.43-2.65).

Table 1. Characteristics among 4217 children

	%	(95% CI)
Sex		
Male	52	(46.2-57.8)
Female	48	(42.2-53.8)
Age		
12 year olds	50.8	(47.1-54.6)
15 year olds	49.2	(45.4-52.9)
Country		
England	90.9	(87.3-93.6)
Wales	5.5	(3.4- 8.8)
Northern Ireland	3.6	(2.6- 4.8)
Free School Meal		
Non Eligible	81	(77 -84.4)
Eligible	19	(15.6-23)
IMD		
Least Deprived	13.9	(9.1-20.7)
2	17.8	(13.3-23.5)
3	15.3	(11.5-20)
4	21	(17 -25.6)
Most Deprived	32	(23.8-41.4)
Malocclusion		
No	71.1	(66.6-75.2)
Yes	28.9	(24.8-33.4)
Had missing permanent teeth		
No	94.5	(93.1-95.6)
Yes	5.5	(4.4- 6.9)
Good Oral Health		
Good	31.4	(26.8-36.5)
Poor	68.6	(63.5-73.2)
Any Symptom		
No	32.3	(29.9-34.8)
Yes	67.7	(65.2-70.1)
Impact		
No impact	50.5	(47.8-53.1)
At least one impact	49.5	(46.9-52.2)

The second research question was whether the effect of malocclusion on OHRQoL varied according to SES categories. Table 2 shows the distribution of reporting any oral impacts according to the presence/absence of malocclusion across the categories of SES indicators. For both age groups, malocclusion was associated with impact among those not eligible for FSM, whereas the relationship was not significant in the non-eligible group. Considering the IMD, malocclusion was only associated with impact among the least and most deprived quintiles for 15-year olds.

In multivariate regression models the marginal effects for reporting at least one oral impact were 6% and 15% higher for those with malocclusion among 12- and 15-year olds respectively. In other words, adjusting for all confounders, malocclusion increased the probability of reporting oral impact by 6% and 15% which was statistically significant for 15-year olds. Estimation of the marginal effects for different categories of both SES indicators replicated the findings of the bivariate analyses. The adjusted predicted probabilities of reporting an impact were higher in those not eligible for FSM (10% for 12 year olds, 20% for 15 year olds).

Discussion

The aims of this study were to investigate the relationship between malocclusion and OHRQoL among 12 and 15-year-old participants in the UK 2013 Child Dental Health Survey (CDHS) and whether or not this relationship varies by SES. In 15 year olds malocclusion was related to worse OHRQoL. More 12 year olds with malocclusion reported impacts, but this was not significant. The relationship between the presence of impact and the presence of malocclusion varied according to SES. For both age groups, malocclusion was associated with impacts on OHRQoL among the non-eligible for FSM but not among those eligible for FSM. This may suggest that malocclusion has greater impact on less deprived children. This finding however, was not entirely supported by the analyses using IMD as an indicator of SES, where malocclusion was associated with impact on OHRQoL for both the most and least deprived quintiles of 15 year olds.

In addition to SES variation, we also found age variation in the association between malocclusion and OHRQoL. For 12-year olds, malocclusion was not linked to reporting of oral impact while the association in 15 year olds was significant. This is not surprising; a recent meta-analysis showed the association between malocclusion and OHRQoL is less pronounced among younger children (Kragt *et al.*, 2016). One explanation could be that some 12-year olds may be in transition towards the permanent dentition, whereas the occlusion would be well-established and relatively stable in 15 year olds. The 15 year old participants might also be more generally concerned about their appearance. This may be important for policy formulation as children are often referred for orthodontic care around the age of 12 rather than 15. For example it might be that clinicians should be reminded that children might reject an offer of orthodontic treatment at the age of 12, but hold a different view a few years later.

Although the role of SES in modifying the impact of malocclusion is evident, it is difficult to explain why the findings of the two indicators yielded different results. Both SES indicators of this study measure material deprivation and have been widely used as proxy indicators for deprivation. The CDHS provided data on the pupil's FSM (i.e. eligibility of the individuals' family for FSM), as well as the schools' FSM based on the proportion of children eligible for FSM at each school. In this study, we used the former. The FSM, despite being commonly used in health research, has been described as imperfect in terms of identifying low income, and workless families (Hobbs *et al.*, 2007). "FSM eligibility" is a measure of claiming FSM, rather than of eligibility. With regards to the IMD, the number of individuals is not evenly distributed across categories of SES. Consequently we replicated the analyses with three broader categories of IMD, with the same finding of a significant effect for the most and least deprived groups.

In contrast to our findings, a Canadian study of children showed that malocclusion was associated with worse OHRQoL among more deprived groups only (Locker, 2007). Other studies, looking at other oral conditions have reported contradictory findings. For example, greater impact of dental caries on OHRQoL has been reported for higher (Chaffee *et al.*, 2017) and lower (Lawrence *et al.*, 2008) socioeconomic groups. The modifying effect of SES on the relationship between malocclusion and OHRQoL could be explained by variation in psychological

Table 2. Prevalence of oral impacts according to occlusal status across categories of SES indicators

12 Year olds		*Proportion reporting at least one OHRQoL impact*				
	N	*No Malocclusion %*	*Malocclusion %*	*Total %*	*Unadjusted ORs (95% CI)*	*Marginal effect (95% CI)*[a]
Total	2250	54.7	61.6	57.2	1.32 (0.99-1.78)	0.06 (-0.01-0.13)
FSM						
Non-eligible	1552	51.2	61.8	55	**1.53 (1.1 -2.14)**	**0.1 (0.02, 0.17)**
Eligible	581	65.7	54.8	61.1	0.63 (0.37-1.08)	-0.09 (-0.21, 0.02)
IMD						
Least Deprived	213	50.4	55.8	52.5	1.2 (0.65-2.22)	0.05 (-0.11, 0.2)
2	323	45.2	64.4	52.2	2.18 (0.99-4.59)	0.17 (-0.02, 0.35)
3	329	42.4	48.3	44.2	1.24 (0.55-2.81)	0.06 (-0.13, 0.24)
4	471	67	65.4	66.4	0.96 (0.6-1.53)	-0.01 (-0.12, 0.1)
Most Deprived	818	59.1	62.7	60.5	1.16 (0.68-1.99)	0.03 (-0.07, 0.14)
15 Year olds						
	N	*No Malocclusion %*	*Malocclusion %*	*Total %*	*Unadjusted ORs (95% CI)*	*Marginal effect (95% CI)*[a]
Total	1967	40.1	56.8	43.4	**1.95 (1.43-2.65)**	**0.15 (0.08- 0.22)**
FSM						
Non-eligible	1438	36.8	60.4	41	**2.59 (1.8 -3.74)**	**0.2 (0.13, 0.28)**
Eligible	408	53.4	45.3	50.8	0.73 (0.34-1.57)	-0.09 (-0.26, 0.08)
IMD						
Least Deprived	192	30.7	55.1	33.9	**2.79 (1.38-5.65)**	**0.26 (0.13, 0.4)**
2	281	36.6	53.4	38.8	1.9 (0.69-5.23)	0.13 (-0.13, 0.39)
3	281	35.5	46.7	37.2	1.59 (0.58-4.38)	0.1 (-0.12, 0.33)
4	424	48.3	48.5	48.3	1.02 (0.5 -2.05)	-0.05 (-0.21, 0.11)
Most Deprived	697	42.2	63.9	48.5	**2.37 (1.51-3.71)**	**0.2 (0.1, 0.29)**

[a] Marginal effects estimated from multivariate regression models adjusted for sex, country, 'good overall oral health', and self-reported absence of symptoms

Bolded estimates: significant values at confidence level of 95% are bolded.

attributes. Psychological factors such as sense of control, perceived stress and satisfaction with life are reported to affect OHRQoL, with those having less psychological resources reporting worsened OHRQoL (Sanders *et al.*, 2005). When the effect of a clinical condition is more pronounced among more deprived population groups, one can infer a lack of psychosocial resources in less affluent social groups. The alternative argument is that those of higher social background have greater expectations of their appearance so may be more affected by malocclusion. This could explain the findings of our study. In the general health literature also, there is evidence for a modifying effect of socioeconomic status (SES) on the association between clinical conditions and health-related quality of life. For example, obese individuals with a low SES reported worse quality of life (Minet Kinge *et al.*, 2010).

Since the 1960s, the UK has continuously collected nationally representative data on the oral health of both children and adults. While recording malocclusion has been an important component of UK cross-sectional dental surveys of children, self-reported OHRQoL was added only to the 2013 survey. This permitted us to use the nationally representative data to investigate the association between malocclusion and OHRQoL. Efforts were made to adjust for the effect of clinical (e.g. decay and symptoms) and non-clinical confounders (e.g. gender and country). However, the effect of other confounding factors, such as enamel opacities could not be fully excluded. Also, this research is based on individual level data, without taking into consideration contextual factors, such as school or home environment, which can affect OHRQoL (Alwadi *et al.*, 2017). There is no gold standard approach for reporting the impact of OHRQoL; we used the reporting of at least one impact as an outcome. Other studies have reported OHRQoL differently (e.g. scores, number of impacts) and it is possible that we might have obtained different results had the OHRQoL indicator been analysed differently.

Orthodontic treatment comprises a significant proportion of the NHS annual spend on dentistry. The NHS reportedly spent £250m in 2015–2016 in England (Price *et al.*, 2017). Analyses of administrative data from NHS primary care orthodontic treatment reported substantial inefficiencies in the NHS orthodontic service with 7.6% of treatments being discontinued. Lower SES groups were more likely to discontinue treatment. One possible explanation for discontinuing orthodontic treatment is less impact of malocclusion on OHRQoL. An understanding of the relationship between SES and the impact of malocclusion is therefore potentially informative for both commissioners and providers of orthodontic treatment.

Conclusion

Malocclusion was associated with worse OHRQoL for older children (i.e. 15 year olds) but not younger children (12 year olds). The impact of malocclusion on OHRQoL seems to vary according to SES level and no clear linear relationship is apparent.

References

Agou, S., Locker, D., Muirhead, V., Tompson, B. and Streiner, D.L. (2011): Does psychological well-being influence oral-health-related quality of life reports in children receiving orthodontic treatment? *American Journal of Orthodontics and Dentofacial Orthopedics* **139,** 369-377.

Alwadi, M.A.M. and Vettore, M.V. (2017): Are school and home environmental characteristics associated with oral health-related quality of life in Brazilian adolescents and young adults? *Community Dentistry and Oral Epidemiology* **45,** 356-364.

Anderson, T., Thomas, C., Ryan, R., Dennes, M. and Fuller, E. (2015): Children's Dental Health Survey 2013. Technical Report: England, Wales and Northern Ireland, Avaialble at https://digital.nhs.uk/media/26576/CDHS-2013-Technical-Report/Any/CDHS2013-Technical-Report.

Benson, P.E., Da'as, T., Johal, A., Mandall, N.A., Williams, A.C., Baker, S.R. and Marshman, Z. (2015): Relationships between dental appearance, self-esteem, socio-economic status, and oral health-related quality of life in UK schoolchildren: A 3-year cohort study. *European Journal of Orthodontics* **37,** 481-490.

Buck, D., and Maguire, D. (2017). Inequalities in life expectancy: Changes over time and implications for policy. *Available at* https://www.kingsfund.org.uk/publications/inequalities-life-expectancy (last accessed August 2018)

Burden, D.J., Pine, C.M. and Burnside, G. (2001): Modified IOTN: an orthodontic treatment need index for use in oral health surveys. *Community Dentistry and Oral Epidemiology* **29,** 220-225.

Carr, A.J., Gibson, B. and Robinson, P.G. (2001): Measuring quality of life - Is quality of life determined by expectations or experience? *British Medical Journal* **322,** 1240-1243.

Chaffee, B.W., Rodrigues, P.H., Kramer, P.F., Vitolo, M.R. and Feldens, C.A. (2017): Oral health-related quality-of-life scores differ by socioeconomic status and caries experience. *Community Dentistry and Oral Epidemiology* **45,** 216-224.

Gherunpong, S., Tsakos, G. and Sheiham, A. (2004): Developing and evaluating an oral health-related quality of life index for children; the CHILD-OIDP. *Community Dental Health* **21,** 161-9.

Hobbs, G. and Vignoles, A. (2007): Is free school meal status a valid proxy for socio-economic status (in schools research)? Centre for the Economics of Education, London School of Economics and Political Science.

Kragt, L., Dhamo, B., Wolvius, E.B. and Ongkosuwito, E.M. (2016): The impact of malocclusions on oral health-related quality of life in children-a systematic review and meta-analysis. *Clinical Oral Investigations* **20,** 1881-1894.

Kragt, L., Wolvius, E.B., Raat, H., Jaddoe, V.W.V. and Ongkosuwito, E.M. (2017): Social inequalities in children's oral health-related quality of life: the Generation R Study. *Quality of Life Research* **26,** 3429-3437.

Lawrence, H.P., Thomson, W.M., Broadbent, J.M. and Poulton, R. (2008): Oral health-related quality of life in a birth cohort of 32-year olds. *Community Dentistry and Oral Epidemiology* **36,** 305-316.

Liu, Z., McGrath, C. and Hagg, U. (2009): The impact of malocclusion/orthodontic treatment need on the quality of life. A systematic review. *Angle Orthod* **79,** 585-91.

Locker, D. (2007): Disparities in oral health-related quality of life in a population of Canadian children. *Community dentistry and Oral Epidemiology* **35,** 348-356.

Minet Kinge, J. and Morris, S. (2010): Socioeconomic variation in the impact of obesity on health-related quality of life. *Social Science and Medicine* **71,** 1864-71.

Price, J., Whittaker, W., Birch, S., Brocklehurst, P. and Tickle, M. (2017): Socioeconomic disparities in orthodontic treatment outcomes and expenditure on orthodontics in England's state-funded National Health Service: a retrospective observational study. *BMC Oral Health* **17**.

Rolland, S.L., Treasure, E., Burden, D.J., Fuller, E. and Vernazza, C.R. (2016): The orthodontic condition of children in England, Wales and Northern Ireland 2013. *British Dental Journal* **221,** 415-419.

Sanders, A.E. and Spencer, A.J. (2005): Childhood circumstances, psychosocial factors and the social impact of adult oral health. *Community Dentistry and Oral Epidemiology* **33,** 370-377.

Taylor, S.E. and Seeman, T.E. (1999): Psychosocial resources and the SES-health relationship. *Socioeconomic Status and Health in Industrial Nations* **896,** 210-225.

UK Data Archive, Children's Dental Health Survey, 2013, Avilable at https://discover.ukdataservice.ac.uk/catalogue/?sn=7774&type=Data%20catalogue

Yusuf, H., Gherunpong, S., Sheiham, A. and Tsakos, G. (2006): Validation of an English version of the Child-OIDP index, an oral health-related quality of life measure for children. *Health Qual Life Outcomes* **4,** 38.