

Inequalities in preventive and restorative dental services in England, Wales and Northern Ireland

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In brief

Demonstrates that the least educated individuals and those at the bottom of social hierarchy are less likely to seek/receive dental services that require asymptomatic visits.

Suggests that indirect cost of use of dental services such as cost of transportation, taking time off work and waiting time at the office are potential barriers for the use of preventive/restorative services.

Highlights that changes in the oral healthcare delivery system and at societal level could possibly promote asymptomatic dental visits to seek preventive care by those at the lower end of social hierarchy.

Aims The objective of this study is to assess socioeconomic inequalities in the use of selected dental procedures.

Methods Data is from the Adult Dental Health Survey 2009, a nationally representative cross-sectional survey of England, Northern Ireland and Wales. Overall, 6,279 participants were included in the analysis. Occupational classification and education were used to assess variations in the use of preventive, restorative services and tooth extraction using a series of logistic regression models, adjusting for age, sex, ethnicity, DMFT, self-reported oral health, dental visits and country.

Results There were clear socioeconomic variations in the utilisation of preventive and restorative services. In the fully adjusted model those with no educational qualification were less likely to report ever having preventive services than those with a degree (OR 0.48, 95%CI: 0.36,0.65). Similarly, individuals in routine/manual occupation were significantly less likely to report ever having preventive services than those in managerial/professional occupation (OR 0.58, 95%CI: 0.46,0.74) in the fully adjusted model. **Conclusion** The findings imply that despite relatively equitable access and higher use of dental services in UK, the least educated and those at the bottom of social hierarchy are less likely to have preventive and restorative dental services.

Introduction

Socioeconomic inequalities in general and oral health have been repeatedly documented.¹⁻⁵ Equitable access and use of health care systems is implicated as one of the major causes of inequality in general and oral health.⁶⁻⁸ Inequality in the use of medical services has been demonstrated in most industrialised countries even where a public health care system exists^{5,9,10} with the least educated, least affluent and ethnic minorities less likely to use specific medical and preventive services.^{7,11} On the other hand literature addressing inequalities in use of dental services has mainly focused on the frequency and type of visits.¹²⁻¹⁵ One known study examined the uptake of preventive and

restorative dental services among 50 years and older Europeans, but did not account for clinically assessed dental needs.¹⁶

Variations in the cost of dental procedures, particularly in countries where the oral health care system is mainly privatised such as USA, could explain inequalities in the use of specific dental services, particularly those services of preventive nature. In the United Kingdom despite the existence of the National Health Service (NHS) which provides a universal and relatively equitable coverage of health services, there is evidence of variations in the uptake of specific medical services.^{7,11} Dental care is also covered by the NHS, with co-payments at a much lower rate than the cost of private services, leading to higher use of dental services and relatively more equitable access to care compared to other countries. Given the inequality in the use of preventive medical services in the UK, it is hypothesised that a publicly funded dental care system with relatively low co-payment might not eliminate inequality in the use of specific dental treatment.

This study aims to assess socioeconomic variations in the use of selected dental procedures in a nationally representative sample of England, Wales and Northern Ireland using the Adult Dental Health Survey of 2009. The objectives of this study were to assess socioeconomic variations in the use of preventive, restorative dental services and dental extractions and to explore if such variations exist, and whether they are independent from needs indicated by perceived and clinically assessed dental health.

Material and methods

Study population

This study was based on secondary analysis of the Adult Dental Health Survey (ADHS) 2009, a cross-sectional oral health survey of a nationally representative sample of England, Northern Ireland and Wales. The ADHS included 11,380 individuals who were interviewed, out of which 6,479 individuals were further clinically examined.¹⁷ In our study 6,279 participants who had complete data were included. In the original survey, a two-stage cluster sampling was used

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comprising of 253 primary sampling units (PSU) across England and Wales, and a further 15 PSUs in Northern Ireland. Two postcode sectors with 25 addresses were sampled from each PSU giving a total sample of 13,400 addresses. The postcode sectors were eventually paired together to reduce the effects of clustering and to increase the diversity of the population. Further detailed description of the survey and the sampling frame were reported elsewhere.^{17,18}

Measurements

The dentists who took part in the ADHS were appropriately trained to undertake dental examinations using calibrated exercises, computer assisted training and practice examinations using volunteer subjects. The clinical examination included a basic examination of the condition of teeth and the coronal surfaces. Diagnostic criteria for dental caries were underlying dentine shadow with non cavitated dentin.^{17,19} Interviewer feedback sessions were conducted for appropriate training of the interviewers. ADHS included questions on oral health-related behaviours, socio-demographic factors and ethnicity.

Outcome variables

Three outcome variables reflecting lifetime treatment history were: ever used preventive services, ever used restorative services and ever had tooth extraction. The variable regarding prevention was based on questions pertaining to ever having had scaling/polishing and ever having had fluoride treatment in the past. Similarly, an aggregate variable for restorative services was computed from questions asking whether the participant ever had fillings, crowns or bridges. Finally, tooth extraction was based on a question asking whether the participant ever had a tooth extracted with the exception of wisdom teeth.

Explanatory variables

To assess the socio-economic status, social class and education were used as key indicators. The NS-SEC 3 Class version²⁰ includes three categories of occupational classifications: 1) managerial/professional, 2) intermediate and 3) routine or manual jobs; the fourth group in this variable included those who had never worked. Educational attainment was computed from two questions indicating whether the participant had any educational qualification, and whether the qualification was above or below a degree. The computed education variable used in the analysis included three groups: 1) having a degree, 2) educational qualification without a degree, and 3) no educational qualification.

Covariates

These included age (16–24, 25–44, 45–64 and 65+), sex, ethnicity (White, Asian, Black and other) and country (England, Northern Ireland and Wales). We also included the number of decayed, filled and missing teeth (DMFT) as assessed by clinicians and self-reported oral health: good (very good and good) versus poor (fair, bad and very bad) to account for treatment needs. Furthermore, we also included a separate variable indicating the number of decayed teeth. Finally, frequency of dental visits included three groups: 1) every six months, 2) once a year/every 2 years, and 3) for emergency.

Statistical analysis

Survey command in STATA was used throughout the analysis accounting for examination weight. Only those cases with complete data were included in the analysis. First we assessed the distribution of all the variables included in the study, namely age, sex, country, ethnicity, self-reported oral health, frequency of dental visits, DMFT, number of decayed teeth and frequency of dental visits. Secondly, the distribution of the main outcomes (use of services), clinical and subjective indicators of oral health were analysed within socioeconomic groups.

For each of the three outcomes indicating lifetime treatment, four logistic regression models were constructed. The first model was adjusted for social class (occupational classification) and DMFT, the second model was adjusted for education and DMFT, the third and fourth models were adjusted for DMFT, age, gender, country, frequency of dental visits, self-reported oral health and ethnicity and consecutively for social class or education. Given that the outcomes indicate lifetime treatment we opted to adjust for DMFT rather than decayed teeth. However, we conducted a sensitivity analysis for the fully adjusted model replacing DMFT by number of decayed teeth.

Results

Table 1 shows the demographic and socioeconomic characteristics of the 6,279 participants included in the analysis. The majority of the population analysed were whites and from England in the age group of 25–64 years. Overall, 50.8% of participants reported visiting a dentist every six months.

While lifetime use of preventive dental services was highest among those with a degree (87.6%) and lowest among those with no

educational qualification (81%), tooth extraction was highest among the latter education group (85.1%) and lowest among the former (67%). Use of preventive and restorative services was highest among persons with managerial/professional occupations (Table 2). On the other hand, DMFT and mean number of decayed teeth were highest among the least educated and those in routine/manual occupations (Table 2).

Table 3 shows socioeconomic variations in the use of preventive and restorative dental services. In the fully adjusted model, those with no educational qualification were significantly less likely to ever receive preventive or restorative services than those with a university degree with odds ratios 0.48 (95%CI: 0.36, 0.65) and 0.56 (95%CI: 0.38, 0.83) respectively.

Participants with routine/manual occupations were significantly less likely to ever have preventive service (OR 0.58, 95%CI: 0.46, 0.65) and more likely to ever have tooth extraction (OR 1.26, 95%CI: 1.05, 1.52) than those with managerial/professional occupations (Table 3).

When a sensitivity analysis was conducted adjusting for number of decayed teeth rather than DMFT, similar education and occupational classification inequalities were observed.

Discussion

While the majority of literature on the use of dental services focuses on number of visits to a dentist, and type of visit (regular, emergency, symptomatic),^{12,16} the current study moves one step further to examine inequality in the type of dental service provided accounting for clinically assessed and subjective oral health status. Overall, the results showed clear education and social class inequalities in the use of preventive and restorative dental services in a nationally representative sample of England, Northern Ireland and Wales. Participants with manual occupations, those who never worked and the least educated were consistently less likely to ever have preventive or restorative dental services than those at the top of occupational classification and the highly educated. Interestingly, the same groups at the bottom of socioeconomic hierarchy were more likely to ever have tooth extractions than those at the top. This observation suggests that the least educated and those on highly demanding, low paying jobs tend to have more definitive dental treatment rather than treatment that might require appointments and repeated visits to the dentists.

The clear social class gradient in use of preventive services in this study was consistent with findings from previous studies examining a similar relationship between preventive medical and dental service use and social status.^{16,21} Interestingly the least educated and those with manual occupations had the highest rates of

poor self-rated oral health, the highest DMFT and number of decayed teeth indicating they had genuine need for preventive and restorative services. The fact that they were less likely to have these type of treatment and more likely to have extraction supports the theory that they are inclined to have a one visit/decisive treatment.

To the best of our knowledge this is the first study that used a nationally representative sample of England, Wales and Northern Ireland to assess socioeconomic variations in the use of restorative, preventive dental treatment and tooth extraction. Studies conducted in the past have examined patterns of dental visits identifying socioeconomic and cultural barriers in use of services.^{12,13,15,16} Similar studies examined the relationship between socioeconomic status, neighbourhood deprivation levels and use of services by older people in England and suggested that use of dental services in this age group was confined only to symptomatic needs.¹⁴ The underlying hypothesis of the aforementioned studies is that once a patient visits a dentist the services will be provided equitably. Hence, none of these studies focused on individual services such as preventive, restorative and having had teeth extracted.

The current study is unique in studying these specific dental procedural variations using a large nationally representative sample of the dentate adult population of England, Wales and Northern Ireland. Furthermore, the analysis highlights the fact that more equitable access to dental services, as is the case under the NHS in the UK, does not guarantee equitable use of services, even after accounting for needs indicated by clinically assessed and subjective oral health status and dental visits.

One study assessed socioeconomic variations in the use of preventive, operative and combined services among older adults in the European countries. However, they did not account for clinically assessed and self-reported oral health.¹⁶

A possible reason for variations in preventive and restorative treatment could be primarily related to financial constraints. Although the NHS provides relatively equitable dental services compared to other countries, standardised co-payment exists for specific services.²² The added co-payments might influence decisions regarding use of particular services such as crowns and bridges by the least affluent and least educated.¹²⁻¹⁵ However, given the similarity of co-payment for extractions and restorations, it is unlikely that the variations in these two services observed in this study are related to direct costs. One might speculate provider-related causes or patients preference to a specific service due to lack of time and repeated visits. A previous study on the use of preventive medical services has suggested that men on low incomes, belonging

Table 1 Demographic and socioeconomic characteristics of participants of the ADHS, England Wales and Northern Ireland 2009, (N = 6279)

		Characteristics	N (6,279)	Percentage /mean (95% CI)
Age		16–24	607	15.3% (14.2-16.5)
		25–44	2,124	36.3% (34.9-37.7)
		45–64	2,304	32.0% (30.8-33.3)
		65 and over	1,244	16.3%(15.4-17.3)
Gender		Male	2,856	48.7% (47.3-50.1)
		Female	3,423	51.3% (49.9-52.7)
Country		England	5,459	91.8% (91.2-92.4)
		Wales	404	5.2% (4.7-5.7)
		Northern Ireland	416	3.0% (2.7-3.3)
Education		No qualification	1,432	21.1% (20.0-22.2)
		Qualification, no degree	3,255	52.9% (51.5-54.3)
		Degree	1,592	26.0% (24.7-27.3)
Occupational classification (NS-SEC 3)		Managerial/ professional	2,323	35.0% (33.6-36.3)
		Intermediate occupations	1,308	20.0% (19.0-21.2)
		Routine/manual occupations	2,215	36.1% (34.7-37.5)
		Never worked	433	8.9% (8.0-9.8)
Ethnicity		All Whites	5,792	89.2% (88.1-90.2)
		All Asians	279	5.9%(5.2-6.8)
		All Blacks	88	2.2%(1.7-2.7)
		Other	120	2.7% (2.2-3.3)
Self-reported oral health		Poor	1,816	29.4% (28.1-30.7)
		Good	4,458	70.6% (69.3-71.9)
Frequency of dental visits		When in trouble	1,230	22.3% (21.1-23.5)
		Once a year/every 2 years	1,625	26.9% (25.6-28.2)
		Every 6 months	3,424	50.8% (49.4-52.3)
Self-reported use of service	Preventive	No	835	16.7% (15.6-17.9)
		Yes	5,444	83.3% (82.1-84.4)
	Restorative	No	493	10.8% (9.8-11.8)
		Yes	5,786	89.2% (88.2-90.2)
	Extractions	No	1,411	26.5% (25.2-27.8)
		Yes	4,868	73.5% (72.2-74.8)
Mean DMFT			14.27 (14.0-14.5)	
Mean decayed teeth			0.96 (0.91, 1.01)	

to lower socioeconomic status, unemployed or less educated in the UK were least likely to use preventive services.²³ Other studies on the use of NHS mental health services demonstrated racial and socioeconomic discrimination.^{9,10} It is possible that similar provider-related factors

could explain some of the current findings in the use of services. Furthermore, one might assume that visits to a dentist by the least affluent and less educated could be limited only to symptomatic treatment rather than regular visits.¹⁴

On the other hand, system barriers in the form of scheduling difficulties, work conflicts and transportation costs have been noted in previous studies⁸ along with certain other barriers such as anxiety and cultural misunderstanding, which could be linked to such

Table 2 Distribution of lifetime use of service, clinical and perceived dental health within socioeconomic groups, England Wales and Northern Ireland 2009 (N = 6,279)

		Lifetime use of dental services			Mean DMFT (95% CI)	Mean decayed teeth (95% CI)	Self-reported poor oral health (95%CI)	Frequency of dental visits (emergency only) (95%CI)
		Preventive service (95%CI)	Restorative service (95%CI)	Extractions (95%CI)				
Education	With degree	87.6	89.1	67	12.8	0.67	23.5	19.3
		(85.5-89.7)	(87.0-91.1)	(64.2-69.7)	(12.4-13.2)	(0.59, 0.74)	(21.1-26.1)	(16.9-21.8)
	Qualification, no degree	82	88.3	72	13.5	1	28.8	22.3
		(80.4-83.6)	(86.9-89.7)	(70.1-73.8)	(13.2-13.8)	(1.08, 1.35)	(27.1-30.6)	(20.6-24.0)
	No qualification	81	91.5	85.1	17.9	1.22	37.9	26.1
		(78.5-83.5)	(89.7-93.3)	(82.9-87.4)	(17.4-18.4)	(1.08, 1.35)	(35.1-40.8)	(23.6-28.8)
Occupational Classification (NS-SEC 3)	Managerial/ professional	90.1	92.1	72.9	14.4	0.78	26.4	17.8
		(88.6-91.6)	(90.6-93.5)	(70.7-75.0)	(14.0-14.7)	(0.71, 0.85)	(24.3-28.5)	(15.9-19.8)
	Intermediate	88.8	92.4	78.3	15.5	0.88	28.4	19.1
		(86.6-91.0)	(90.4-94.3)	(75.6-81.0)	(15.0-16.0)	(0.78, 0.98)	(25.7-31.2)	(16.6-21.8)
	Routine and manual	79.3	88.3	76.2	14.4	1.19	33.4	28.1
		(77.3-81.3)	(86.7-90.0)	(74.1-78.3)	(14.0-14.9)	(1.08, 1.20)	(31.2-35.6)	(26.0-30.4)
	Never worked	40.3	73.9	53.8	10.2	0.93	27	59.6
		(35.2-45.7)	(69.2-78.7)	(48.5-59.1)	(9.4-10.9)	(0.73, 1.12)	(22.5-32.0)	(54.3-64.9)

Table 3 Logistic regression analysis showing the associations between socioeconomic position and lifetime use of preventive, restorative dental services and dental extractions, England, Wales and Northern Ireland 2009 (N = 6,279)

		Preventive service		Restorative service		Extractions	
		Model 1 OR(95%CI)	Model 2 OR(95%CI)	Model 1 OR(95%CI)	Model 2 OR(95%CI)	Model 1 OR(95%CI)	Model 2 OR(95%CI)
Education	Degree	1 (Reference)					
	Qualification, no degree	0.60***	0.82	0.81	0.95	1.22*	1.24*
		(0.48, 0.75)	(0.64, 1.06)	(0.61, 1.06)	(0.71, 1.27)	(1.02, 1.46)	(1.03, 1.49)
	No qualification	0.37***	0.48***	0.46***	0.56**	1.62***	1.44***
(0.29, 0.49)		(0.36, 0.65)	(0.32, 0.68)	(0.38, 0.83)	(1.27, 2.07)	(1.12, 1.86)	
Occupational classification (NS-SEC 3)	Managerial/professional	1 (Reference)					
	Intermediate occupations	0.79	0.91	0.85	0.94	1.19	1.21
		(0.60, 1.06)	(0.68, 1.22)	(0.59, 1.22)	(0.64, 1.37)	(0.96, 1.47)	(0.97, 1.50)
	Routine and manual occupations	0.41***	0.58***	0.64**	0.79	1.18**	1.26*
		(0.33, 0.50)	(0.46, 0.74)	(0.48, 0.86)	(0.58, 1.07)	(1.07, 1.53)	(1.05, 1.52)
	Never worked	0.20***	0.43***	0.44***	0.61*	0.72*	0.78
(0.15, 0.27)		(0.31, 0.61)	(0.31, 0.62)	(0.40, 0.92)	(0.55, 0.95)	(0.57, 1.07)	

Model 1: Adjusted for DMFT. Model 2: additionally adjusted for age, sex, country, frequency of dental visits, self-reported oral health, DMFT and ethnicity.
 *** P <0.001, ** P <0.01, * P <0.05

variations in service use.¹⁵ While anxiety has been acknowledged as an important barrier to use of services in the UK,^{15,24} it does not explain inequality as there is no evidence that anxiety is higher among the least educated and those at the bottom of occupation classification. More importantly, anxiety does not explain differences in the use of a specific procedure (restorative, preventive or extraction) once on the dental chair. This implies that the taking of time off work, cost of transportation, lack of autonomy in access to services, opportunity cost and other indirect costs of seeking asymptomatic dental visits for prevention and restoration are the probable causes of these variations in the use of services.

This study is a secondary analysis of cross-sectional survey data with steps taken to adjust for covariates and the data being appropriately weighted to ensure representativeness of the sample. The study has some limitations; firstly the cross-sectional design does not support temporality. It is possible that the social class of some participants have changed overtime, which might impact on the association between social class and 'ever using a specific service'. In other words, individuals currently at the bottom of social hierarchy reporting ever using preventive services might have been at a higher status earlier in their lives. This actually implies that the analysis underestimates inequalities in preventive and restorative services. Unavailability of data on exemption from co-payment could have influenced the findings and clarified the issue of cost as a barrier for specific service use. Another limitation worth mentioning here is that the use of social class variables does not necessarily reflect material ability. However, it is an acceptable indicator of status in the UK and the findings were verified by using education as a globally more acceptable indicator of socioeconomic position. Finally, reliance on self-report of specific procedures is not as accurate as data directly extracted from dental records or insurance claims. Unfortunately, such data was not available in the survey.

This study has some important implications worth mentioning. Firstly, although the NHS provides relatively equitable dental services compared to other countries, and despite the fact that more than half of this nationally representative sample visited a dentist every six months, after accounting for dental treatment needs, variations existed in the use of specific services within socioeconomic groups. The study highlights the importance of the social determinants of health in relation to the use of specific dental services, particularly when repeated asymptomatic visits are needed.²⁵

Clear social class and education gradients were seen in the use of specific dental services, particularly preventive dental services in a population served by a publicly funded oral health-care system that provides relatively equitable dental care. On the other hand, tooth extraction appeared to be more common among the least educated. These observations were independent of dental health status and frequency of dental visits. While factors such as indirect cost of use of services and/or perception of the priority of asymptomatic visits to the dentist play a role in the aforementioned trend, changes in the oral health delivery system could reduce some of the system barriers for regular dental visits for prevention and restoration.

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