VERIFIABLE CPD PAPER

IN BRIEF

- As of 1 April 2006, PCTs have the responsibility for commissioning a reasonable level of NHS dental services. PCTs should assess local needs and plan services accordingly.
- Traditionally dentists and orthodontists have set up practice where demand rather than need is greatest, which has led to inequalities in access to services.
- This paper describes orthodontic service use, which is in part related to access, across five geographically linked PCTs.
- Uptake of services was found to be related to deprivation and rurality.
- PCTs need to ensure that children from deprived and rural communities have adequate access to all primary care dental services to reduce inequalities.

Inequality in uptake of orthodontic services

C. S. Drugan,[1] S. Hamilton,[2] H. Naqvi[3] and J. R. Boyles[4]

Objective The purpose of this ecological study was to investigate the relationship between uptake of orthodontic services and factors that might influence receipt of care at a population level.

Method The dental practice board supplied data on claims for courses of active orthodontic treatment from April 2001 to March 2002 for children from the former county of Avon. These data were analysed in relation to deprivation, living in an urban/rural setting and the proportion of the population from a black or minority ethnic group (BME).

Results In Avon, children from deprived and rural areas were significantly less likely to be undergoing an active course of orthodontic treatment. Children from an area with a high proportion BME were significantly more likely to be undergoing treatment.

Conclusion This research demonstrates that children from more deprived and rural communities in Avon are less likely to receive orthodontic treatment. This has important policy implications for primary care trusts that have a responsibility to ensure equal access to care for all of their children.

INTRODUCTION

It is known that the prevalence and severity of malocclusion in children is reasonably evenly distributed throughout the population.[1] The need for orthodontic treatment to correct malocclusion can be measured by the index of orthodontic treatment need (IOTN). With this index a subject can be assessed as in need of treatment either on aesthetic grounds, dental health grounds or both.

Using this index, the child dental health survey of 2003 found that 35% of 12-year-old children were considered to be in definite need of orthodontic care.[1] This figure did not vary by gender, socio-economic classification, ethnicity or where the child lived.[1] By the age of 15 years the percentage of children who still had a definite need as identified by the IOTN had fallen to 21%. However, by this age significantly more boys and more children from deprived schools were still in need of orthodontic treatment than their female and more affluent counterparts.[1]

It has been suggested that the uptake of orthodontic care by children may be influenced by both consumer factors such as perceived need, socio-demographic characteristics and dental attendance patterns, and provider factors such as the availability of specialist orthodontic care and of general dental services.[2] Previous studies, using questionnaire surveys and/or examinations on selected populations of children, have investigated the relationship between the receipt of orthodontic care and barriers to care.

The results from these studies are contrasting. Whist socio-demographic characteristics do not appear to influence a child's perception of need for orthodontic treatment or aesthetic appearance, research indicates that boys and children from minority ethnic groups are less likely to receive care.[3-6] The influence of social deprivation on the uptake of services is less clear. Some studies have linked social deprivation and access to treatment with children from lower socio-economic groups being less likely to receive care,[3,6-8] whereas other research has found no relationship between relative deprivation and the uptake of orthodontic services.[4,9]

Other factors, which may be important, include dental registration rates and access to services. Children who visited the dentist regularly and whose mother attended regularly were more likely to have better dental health and be referred for orthodontic treatment.[9] The relationship between living in a rural/urban environment and the uptake of orthodontic services is less certain. Bergstrom *et al.* found that in Sweden children from rural areas were less likely to receive treatment.[10] However, Jenkins *et al.* found that

[1]*Specialist in Dental Public Health, [2]Specialist Trainee in Public Health, [3]Public Health Analyst, [4]Consultant in Dental Public Health, Public Health Directorate, Bristol Primary Care Trusts, King Square House, King Square, Bristol, BS2 8EE
*Correspondence to: Dr Caroline Drugan
Email: caroline.drugan@btinternet.com

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distance travelled for treatment was not a factor in the uptake of services in Scotland.[7]

This is the first ecological study to investigate the relationship between the uptake of orthodontic services by children and factors that might influence receipt of care at a population level. The purpose of the study was to determine whether there was a relationship between the proportion of children having orthodontic appliance therapy in a particular area and the level of deprivation, the rurality and the proportion of people from minority ethnic groups living in the area. One of the important priorities for primary care trusts (PCTs) is to reduce inequalities. Knowledge of deprivation and its relationship to inequalities is vital, however data relate to local/unitary authorities rather than National Health Service areas.

METHOD

The Dental Practice Board (DPB) supplied data on all claims for orthodontic care from April 2001 to March 2002 for patient postcodes starting with BA and BS. The BA and BS postcodes cover 98.5% of postcodes in the former county of Avon, now the unitary authorities (UAs) of Bath and North East Somerset, City of Bristol, North Somerset and South Gloucestershire and some small areas of neighbouring unitary authorities.

The City of Bristol is divided into several administrative and geographical areas that are used to plan and deliver public health. These include two PCTs, 35 electoral wards, 252 super output areas (SOAs) and 61 GP practices. Bristol UA has a population of approximately 391,500. Thirty-five (14%) of Bristol SOAs rank within the most deprived 10% of SOAs nationally. Bath and North East Somerset, South Gloucestershire and North Somerset unitary authorities are co-terminus with their PCT. Bath and North East Somerset is a generally affluent area that has 169,040 residents. None of its SOAs are classified in the 10% most deprived wards nationally. South Gloucestershire has just over 250,000 residents. There is little deprivation as none of its SOAs are in the nationally most deprived 10% of SOAs. 188,564 people are resident in North Somerset. Five of North Somerset's SOAs rank within the most deprived 10% SOAs nationally.

Data were extracted from this dataset for claims relating to active orthodontic treatment that had a valid postcode. For the purposes of this analysis, active orthodontic treatment was defined as upper or lower removable, simple fixed, multiband and functional appliances. It was possible to further analyse these data with respect to the courses of treatment supplied rather than the appliances prescribed. This enabled a comparison of the number of children who had received a course of active treatment regardless of the number of appliances that were involved in that care.

The data were collated at lower layer SOA, which are areas defined by the Office for National Statistics. The lower layer SOAs are areas of similar socio-economic mix with a mean population of 1,500 and were devised for the analysis of the 2001 census. This is the smallest unit for which the Indices of Deprivation 2004 are available.

For each lower layer SOA in Avon, information was obtained about:

- The urban/rural classification. The proportion of census output areas defined as urban in each lower SOA was calculated. Census output areas (COA) are building blocks of SOAs. Each COA has been classified into urban, a settlement with 10,000 or more people, or rural by the Office of the Deputy Prime Minister
- The Income Deprivation Affecting Children Index, a supplementary component of the Indices of Deprivation 2004 produced by the Office of the Deputy Prime Minister
- The total number of children aged 10-17 obtained from the 2001 census
- The proportion of the population from a black or other ethnic minority group (%BME) obtained from the 2001 census
- The total number of course of treatment claims made to the DPB.

As the DPB does not distinguish between orthodontic treatment carried out by a specialist or by a general dental practitioner, we classified practitioners based upon the volume of work they had undertaken in that year. We defined generalists as general dental practitioners (GDPs) who had completed up to nine courses of active treatment in one year, dentists with a special interest in orthodontics (DwSI) had completed between 10-99 courses of treatment and specialists had completed over 100 appliances.

To analyse the data, rates of course of treatment claims (ie the number of courses of orthodontic treatment/1,000 children) for each lower SOA were calculated. Each lower SOA was grouped into deprivation quintiles, and the quintiles were examined by unitary authority and by urban (lower SOA with >50% of COAs classified as urban) and non-urban areas within unitary authority.

Three variables were analysed by a multiple regression model (Stata version 8) with an F-test for significance:

- Income Deprivation Affecting Children Avon rank
- % black and other ethnic minority population, grouped into quintiles
- SOA classified as urban or rural.

RESULTS

The DPB received 37,419 orthodontic claims between April 2001 and March 2002 for children living in the BA and BS postcode areas. Of these, 11,693 (31.2%) were for upper or lower active orthodontic appliances. There were 3,785 claims related to a course of treatment for the areas included in the study. Of these 1,467 were in Bristol, 984 in South Gloucestershire, 668 in Bath and North East Somerset and 666 in North Somerset.

The rate of the number of courses of treatment per 1,000 children aged between 10 and 17 years of age was highest in Bath & North East Somerset (41.1) and lowest in North Somerset (35.5; Table 1). The rate varied according to deprivation quintile and rurality. Figure 1 demonstrates that the rate of uptake of orthodontic treatment in each of the unitary authorities was lower in the most income deprived areas for children than in the most affluent areas. However, the difference was only significant in the City of Bristol and North Somerset.

Urban rates of active courses of treatment were higher than rural rates in all unitary authorities, although the difference was only significant in South Gloucestershire UA (Fig. 2).

The results of the multiple regression revealed that the deprivation rank and urban/rural classification were significantly associated with the rate of courses of treatment

(p <0.01). The multiple regression analysis also revealed a statistically significant variance (p <0.05) according to the proportion of the population from a BME group within the SOA, with an increase in the percentage of BME population associated with an increase in the rate of orthodontic treatment (Table 2).

The majority of courses of treatment were completed by specialists (86.1%), dentists with a specialist interest completed 12.1% of cases and general dental practitioners accounted for less than 2% of the cases. The profile of the types of orthodontic procedures undertaken by specialists, DwSIs and general dental practitioners varied considerably, the proportion of removable to fixed appliances completed by general practitioners being much greater than for either the DwSIs or specialists.

While there was no further data available at a lower SOA level to explain the variations, data at UA level on possible contributory factors failed to indicate possible reasons for the variations. There is no obvious association between the child dental registration rates, dentist to population ratio and average DMFT score, and orthodontic procedure rates by unitary authority, although the possibility of an association at lower SOA level cannot be excluded.

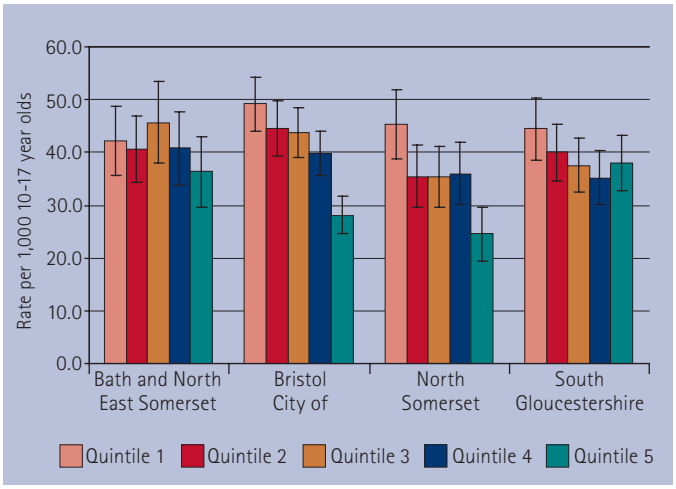

Fig. 1 Orthodontic procedure by deprivation quintile for each unitary authority

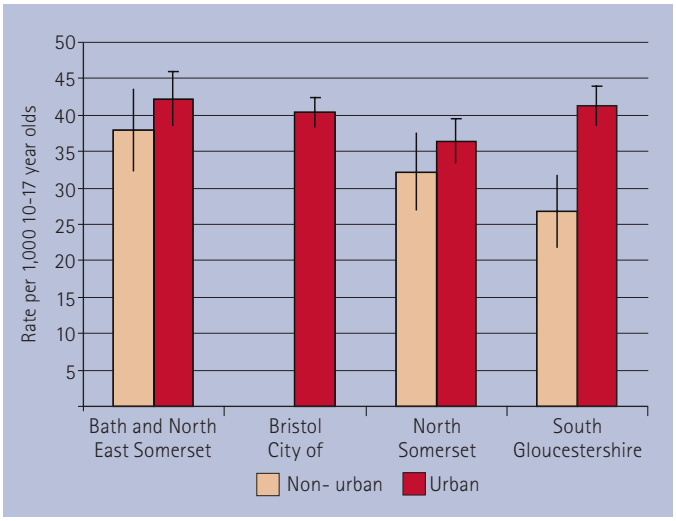

Fig. 2 Orthodontic procedure rates for urban and rural communities by unitary authority

DISCUSSION

This is the first study to examine at an ecological level, the relationship between orthodontic treatment rates in primary dental care and rurality, deprivation and ethnicity. The findings demonstrate that deprivation is significantly associated with the uptake of orthodontic care. These data support findings from the latest child dental health survey that indicate an inequality in need for orthodontic treatment amongst 15-year-old children from lower socio-economic groups despite having the same need for all children at age 12.[1] This study also demonstrated that children from rural areas received less active orthodontic treatment than those living in urban areas.

It is interesting to speculate why children from some communities do not have the same uptake of orthodontic treatment. Despite orthodontic care being free for all children, financial barriers may still exist. If a provider of orthodontic treatment is at some distance from the patient's home transport costs may be prohibitive.[11] All local specialist orthodontic practices are located within urban areas and specialists provide the majority of orthodontic care. The time involved in attending appointments may also result in lost pay for an accompanying parent or carer and family pressures, for example caring for siblings, may also incur expense and/or organisational difficulties.[11]

Lack of access to primary care might also be a factor; because over 70% of referrals are initiated by the child's general dental practitioner, those patients who do not attend may not be

Table 1 Rates of orthodontic courses of treatment per 1,000 10–17 year olds for Avon

	Bath & North-East Somerset	City of Bristol	North Somerset	South Gloucs
Overall rate	41.1	40.4	35.5	39.0
Urban rate	42.3	40.4	36.4	41.4
Rural rate	38.0	Not applicable	32.3	26.8
Rate quintile 1– least deprived	42.2	49.1	45.4	44.5
Rate quintile 5 – most deprived	36.3	28.1	24.5	38.0

Table 2 Baseline* variance in rates of orthodontic treatment (per 1,000 population) by deprivation, BME proportion and rurality

		Coefficient	t value	95% C.I.	p-value
Deprivation	1 - most affluent	0	-	-	0.000
	2	-3.27	-1.39	-7.91-1.35	
	3	-5.29	-2.26	-9.88--0.69	
	4	-6.35	-2.68	-11.00--1.70	
	5 - most deprived	-16.71	-6.93	-21.45--11.98	
BME proportion	1 - low BME	0	-	-	0.034
	2	1.74	0.72	-3.01-6.49	
	3	4.19	1.70	-0.66-9.05	
	4	6.81	2.67	1.79-11.81	
	5 - high BME	6.63	2.56	1.55-11.71	
Rurality	1 - rural	0	-	-	0.002
	2 - urban	7.81	3.08	2.83-12.79	

*Baseline for the deprivation variable: 1 = most affluent; for BME concentration: 1 = low BME; for rurality: 1 = rural.

referred at an appropriate age.[2] Patients may not be considered suitable for orthodontic care by either the general practitioner or the specialist provider if they are irregular attenders or if their oral health and hygiene is poor.[6,9] Furthermore, research indicates that children from lower socio-economic groups are more likely to have discontinued orthodontic treatment than children from less deprived communities.[12]

Social and cultural factors may impact upon the willingness of children to undertake a course of orthodontic treatment. For example, in a survey of patients undergoing orthodontic treatment, over half of the children had been teased about their appliance although only 12% reported anxiety about the teasing.[11] Furthermore, in a group of children from Northern Ireland, familiarity with orthodontic appliances among a child's peer group was found to have a greater influence on the uptake of treatment than either social class or gender.[13]

What is surprising perhaps, is the relationship between the proportion of the population from a black or minority ethnic group and the rate of orthodontic treatment. The quintiles with the highest proportion of the population from black and minority ethnic groups had significantly higher uptake rates than the quintile with the lowest proportion. This finding may be the result of local confounding, but not tested, variables of dental registration rates and proximity to specialist orthodontic providers. In this area the majority of the SOAs with high proportions of people from black and minority ethnic groups are located in inner-city Bristol. Whilst these areas are relatively deprived, they are in locations of easy access to NHS dental services and are adjacent to a number of specialist practices. In contrast, deprived areas with very low proportions of black and minority ethnic groups are located some distance from the city centre and have poor access to NHS dentistry.

The three variables tested only explained in part the relationship between orthodontic uptake and orthodontic need, and it is clear that other variables are also important. Unfortunately it was not possible to demonstrate a relationship between rates of uptake of care and other variables (decay levels, registration rates, dentist to population ratio) by lower layer SOA, as these data are not currently available. Dental registration rates are also provided according to the postcode of the practice rather than the patient and therefore only provide a crude measure of registration in a particular area.

This study is limited, as the relationship between uptake of orthodontic care and the variables examined were at an ecological level only. It is important to understand this relationship at the individual level and further research in this area is needed.

Our findings highlight that children from more deprived or rural communities in the unitary authorites studied are less likely to receive orthodontic treatment in primary care, although we can assume that they have the same need as their more affluent or urban counterparts, as shown by the Child Dental Health survey 2003.[1] This has important policy implications for the commissioners of these services, the primary care trusts, who are co-terminus with the UAs, who have a responsibility to ensure equal access to care for all of their children. Whilst many of the factors identified as being potentially important barriers to orthodontic care are outside of the control of local NHS commissioners of care, there are some factors that could influence uptake of care.

With the advent of the new dental contract in April 2006 and the shifting of commissioning responsibility to the PCTs, primary dental care services can for the first time be developed according to need. PCTs can ensure that there is adequate access to primary dental care for children from more deprived communities by contracting with dentists to provide the services in areas where access has been demonstrated to be poor. It would be possible for the PCTs to contract with specialists or dentists with an interest in orthodontics to provide care in communities that currently under-utilise existing services. In addition, the PCTs will restrict NHS orthodontic care to those children who can be demonstrated to have a need for treatment based upon an assessment of their occlusion by means of the IOTN.

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