

Deprivation and access to dental care in a socially diverse metropolitan area

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Background: Primary Care Trusts (PCTs) in England have a responsibility to ensure that the oral health needs of their residents are addressed. This will involve monitoring the uptake of primary dental care and developing services to address local needs and demands. **Objective:** To examine the relationship between dental registration, age, gender and deprivation at ward and borough level within a socially diverse metropolitan area. **Methods:** This retrospective, cross-sectional ecological study was conducted using ward level registration data for residents of south east London from the Dental Practice Board, population data from the Office of National Statistics and the Index of Multiple Deprivation (IMD) from the Office of the Deputy Prime Minister. Registration rates were calculated at ward level for the population as a whole and for specific age bands. The correlation with deprivation was examined using Pearson's correlation co-efficient and the data mapped. **Results:** Registration varied by gender (40% females registered compared with 35% males) and age (children aged 6-12 years (62%) were most likely to be registered and 0-2 year-olds least likely (11%). There was a strong negative correlation between deprivation (IMD) and registration in the 0-5 year ($r=-0.82$; $p<0.001$) and 6-17 year ($r=-0.81$; $p<0.001$) age-bands across the sector and similarly within each borough. The negative correlation was most marked in the most affluent borough ($r=-0.87$; $p<0.001$). **Conclusion:** Analysis of registration for dental care across a socially diverse area reveals a strong negative correlation between NHS service uptake and deprivation status amongst children only. Inequalities in service utilisation by children were most marked within affluent boroughs, compared with deprived boroughs.

Keywords: Access, dental caries, social deprivation

Introduction

Access to dental care is a key issue for the public and policy makers. Under the Health and Social Care Act (UK Parliament, 2003) each National Health Service (NHS) Primary Care Trust (PCT) in England and Health Board in Wales must, "to the extent that it considers necessary to meet all reasonable requirement, exercise its powers so as to provide primary dental care services within its area, or secure their provision". Current dental reforms mean that local commissioning of dental care will evolve from April 2006 onwards. It is thus important for health organisations to monitor the need, supply and demand for care. This is further reinforced in the white paper for *out of hospital services* 'Our health, our care, our say' (Department of Health, 2006), which emphasises the importance of access to primary health care in general.

The concept of 'registration' with a dentist was introduced over a decade ago as part of a previous significant reorganisation of primary dental care in England and Wales (Department of Health, 1991). Registration, provides the opportunity for an ongoing relationship between the dental provider and patient, albeit time limited, as well as for health organisations to monitor service uptake in a more refined manner than merely the total number of courses of care. Information on registration levels has been provided by the Dental Practice Board on a regular basis, initially in paper form and latterly via

its organisational website (Dental Practice Board, 2005). Patients have historically had the freedom to access NHS dental care wherever they wish.

Registration lasted 15 months for both children and adults in general dental services (GDS) by the mid 1990's whilst under Personal Dental Services (PDS) from 1998 onwards registration periods could be extended. Within the Dental Practice Board (DPB) database, registration status is linked to patient age, gender and reported address whilst held separately from treatment and cost data. Registration for dental care provides an indication of access and/or service uptake; however, traditionally published registration rates were calculated on the assumption that the local population was registered with local practitioners for care and did not take account of patient flows across organisational boundaries.

Reported barriers to the uptake of dental care are well recognised (Finch *et al.*, 1988; Kelly *et al.*, 2000). Adult patients have to pay for dental care unless they fall into the specific categories that are exempt charges. The latter includes people on income support, thus the most deprived people in society, if they are interacting with the social care system, may be partially or completely exempt from charges for dental care. However, access in its widest public health sense includes the need for services to be more acceptable, appropriate, accessible, accommodating and affordable (Penchansky and Thomas, 1981). In a socially and ethnically diverse area such as south east

London barriers can also include language and culture (Newton *et al.*, 2001). Registration data only provide a crude indicator of dental service uptake at any point in time and do not reveal whether patients have completed care, whether their oral health status has benefited from dental attendance, or how often they have attended for a dental examination during that period. Nonetheless, they permitted some degree of comparison of local data within a health service area or with the national picture to inform local planning and provision of care.

The association between low social status and poor oral health is well accepted. Furthermore, dental service use and patient social factors are related, with irregular dental attendance more commonly associated with lower social classes (Morris *et al.*, 2004; Kelly *et al.*, 2000), thus compounding inequalities.

The Index of Multiple Deprivation 2004 (IMD 2004) is a measure of multiple deprivation at the small area level (Office of the Deputy Prime Minister, 2004). The model of multiple deprivation which underpins the IMD 2004 is based on distinct dimensions of deprivation which can be recognised and measured separately (Table 1).

The population of south east London is socially diverse with extremes of deprivation and wealth. Whereas the inner London boroughs are amongst the most deprived nationally, the outer boroughs are more diverse and many wards are more affluent (Table 1). Thus the six boroughs (co-terminus with 5 PCTs and 1 care trust) provide an area in which the association between deprivation and service uptake may be examined to inform the planning and commissioning of dental care. Based on national estimates, registration for NHS dental care was below average with 57% of children in south east London registered compared to 63% for England. For adults the south east London figure is 41% compared with 46% for England (DPB, 2006). Private dental care has always been more readily available to adults in the more affluent boroughs of the sector such as Bromley. This is demonstrated in the Healthcare Commission (2005) data where 42% of respondents in Bromley were on a dentist's list as non-NHS patients, compared with only 15% in Lambeth and Southwark. Local surveys of oral health co-ordinated through the British Association for the Study of Community Dentistry reveal that oral health in 5-year-old children in south east London is better than the national average with only 33.2% having experience of dental caries at d3 compared with 38.7% nationally, ranging from 27.3% in Bromley to 39.9% in Southwark (Pitts *et al.*, 2005).

Objectives

To examine the relationship between dental registration, age, gender and deprivation status at ward and borough level within and across a socially diverse metropolitan area and consider the implications for future planning and organisation of services.

The Null Hypotheses was tested for the population as a whole and age specific sub-groups in relation to deprivation status:

- there is no correlation between deprivation (IMD score) and the proportion of the local population registered for care.

- there is no correlation between deprivation (income score) and the proportion of the local population registered for care.

Method

Registration data relating to 30th September 2003 were obtained from the Dental Practice Board by gender, age-band and ward for the resident population of south east London, regardless of where they were registered in the country. Office of National Statistics (ONS, 2001) population data for the 2001 census were obtained at ward level. Deprivation scores (index of multiple deprivation and income domain scores), based on the 2001 census data, were calculated for ward level from the super output area data for London (ODPM, 2004). Ward level registration and population data were combined and analysed using SPSS. The correlation between deprivation scores (IMD and income score) was examined by PCT/borough and age-band and plotted. Pearson's correlation scores were calculated at borough level and for south east London as a whole. Registration and deprivation data for key age-groups were mapped using the geographic information system MapInfo v7.0 to provide a visual representation of registration compared with deprivation at ward level.

Results

Post-coded data on registrations with GDS/PDS in England and Wales reveal evidence of different registration patterns across and within the resident population of its six boroughs. Variations in age group and gender and levels of deprivation are described in turn. Deprivation is specifically considered starting with the total population and then moving through the age cohorts chronologically. Residents are most likely to attend services within their boundaries, followed by adjacent boroughs, with the majority receiving care within south east London, ranging from Lambeth residents up to 96% in Bexley and Greenwich.

There is wide variation in take up rate by age across the six boroughs with children in the 0-5 age range almost twice as likely to be registered for dental care if they live in Bexley than if they live in the more deprived Southwark. A similar pattern exists in school children (aged 6-17 years) with almost three quarters of the school age population of Bexley and Bromley registered for care and only half or less of Lambeth and Southwark's equivalent population as presented in Table 2.

A very different pattern emerges with adults where Bromley, an affluent borough, has the lowest adult registration rate for NHS dental care followed by Southwark. Bexley has the highest registration of adults and children.

Registration rates in older people are lower than for adults aged below 65 years. Whereas older people living in Bexley are most likely to be registered for care, those in Southwark are least likely to be registered.

Across south east London, resident females are more likely to be registered than males, with 40% females registered compared with 35% males overall and a south east London average of 38%. This pattern was consistent across the six boroughs as shown in Table 2 for the total

Table 1. Index of Multiple Deprivation, 2004: domain weights

<i>Local Authority</i>	<i>Average IMD Score¹</i>	<i>Rank of Average IMD Score</i>	<i>Rank of Income Scale¹</i>
Bromley	13.17	238 th	74 th
Bexley	15.01	212 th	87 th
Lewisham	28.55	57 th	23 rd
Greenwich	31.47	41 st	36 th
Lambeth	34.18	23 rd	15 th
Southwark	35.38	17 th	18 th

Source ODPM, 2004

Note

1. IMD includes seven domains: income deprivation (22.5%); employment deprivation (22.5%); health, deprivation and disability (13.5%); education, skills and training deprivation (13.5%); barriers to housing and services (9.3%); crime (9.3%); living environment deprivation (9.3%).
2. Income scale is joint first domain of the overall IMD score

Table 2. Registration by age-band, gender and borough within south east London, 30th Sept 2003

<i>Age-band</i>	<i>Borough</i>	<i>Population</i>	<i>Registered</i>	<i>% ALL registered</i>	<i>% females registered</i>	<i>% males registered</i>
0-5 years	South east London	119,808	33,501	28	28	28
	Bexley	16,126	6,112	38	38	38
	Bromley	22,281	7,739	35	35	35
	Greenwich	18,382	5,260	29	29	28
	Lambeth	21,353	4,561	21	23	20
	Lewisham	21,051	5,607	27	27	26
	Southwark	20,615	4,222	20	21	20
6-17 years	South east London	219,262	131,542	60	62	58
	Bexley	35,221	25,518	72	73	71
	Bromley	43,295	30,773	71	72	70
	Greenwich	33,741	19,630	58	61	56
	Lambeth	35,201	17,822	51	52	50
	Lewisham	37,463	21,384	57	60	55
	Southwark	34,341	16,415	48	50	46
18-64 years	South east London	959,622	343,290	36	40	31
	Bexley	132,450	53,472	40	46	34
	Bromley	180,110	57,826	32	37	27
	Greenwich	134,509	45,956	34	39	29
	Lambeth	184,990	69,350	37	42	33
	Lewisham	163,014	61,981	38	43	33
	Southwark	164,549	54,705	33	38	29
65+ years	South east London	189,389	51,670	28	26	28
	Bexley	34,503	10,902	32	30	34
	Bromley	49,802	12,764	26	25	27
	Greenwich	27,761	7,188	26	24	28
	Lambeth	24,612	6,779	28	27	28
	Lewisham	27,359	8,369	31	30	32
	Southwark	25,352	5,668	22	22	23
ALL	South east London	1,448,081	560,003	38	40	35
	Bexley	218,300	96,004	44	47	41
	Bromley	295,488	109,102	37	39	34
	Greenwich	214,393	78,034	36	39	34
	Lambeth	266,156	98,512	37	40	34
	Lewisham	248,887	97,341	39	42	36
	Southwark	244,857	81,010	33	36	30

Sources: ONS, 2001; DPB, 2003

population. In most age bands females are more likely to be registered than males. This is most marked in the 35-44 age-group where 34% of males are registered compared with 46% females. At the extremes of age registration rates are similar; however older men are slightly more likely to be registered than older women (28% males compared with 26% females).

Comparison of the registration data for the most and least deprived ward in each borough/PCT provides an interesting picture. When registration rates for the total population are plotted against the IMD score, there is a spread of rates across the 120 wards and only a very weak negative correlation with deprivation ($r=-0.31$). The same picture emerges when the correlation between registration and the income component of IMD is examined ($r=-0.26$). The results are presented in (Table 3)

The correlation between deprivation (IMD and income score) and registration for dental care is presented by age-band, starting with young children.

For 0-5 year olds there is a five-fold variation in registration across the sector at ward level from 9 to 45% and a strong negative correlation ($r=-0.82$; $p<0.001$) between deprivation as determined by IMD and registration as shown in Figure 1 and Table 3.

When individual PCTs are considered, Bromley, the most affluent borough in this sector shows a strong negative correlation ($r=-0.85$; $p<0.001$) between deprivation as measured by the IMD and dental registration in pre-school children. In contrast, there is less evidence of this negative correlation in the inner city boroughs such as Lambeth ($r=-0.28$; $p=0.22$) where deprivation is higher and the variation between wards less. Thus inequalities in uptake are evident in this group.

Young people aged 6-17 show the highest levels of dental service uptake overall but there is a wide variation in registration rates across the sector from 90% down to 30% at ward level. When analysed against deprivation score a strong negative correlation ($r=-0.81$; $p<0.001$) exists (Figure 2; Table 3). Consideration of individual PCTs shows a similar picture when Bromley ($r=-0.87$; $p<0.001$) at the more affluent end of the spectrum is compared with Lambeth ($r=-0.32$; $p=0.16$). Southwark, the most deprived borough, has a moderately strong negative correlation ($r=-0.69$; $p=0.001$); however one relatively affluent ward in Southwark has a very high uptake. The data for the sector are geographically mapped and presented in Figure 3.

For adults aged 18-64 years, the same analysis re-

Table 3. Statistical significance for IMD Domain and Income Domain

	<i>Borough/Area</i>	<i>Pearson Correlation</i>	<i>IMD p</i>	<i>N (wards)</i>	<i>Pearson Correlation</i>	<i>Income p</i>	<i>N (wards)</i>
Aged 0-5	ALL	-0.82	<0.001	120	-0.77	<0.001	120
	Bexley	-0.43	0.054	21	-0.42	0.056	21
	Bromley	-0.85	<0.001	22	-0.73	<0.001	22
	Greenwich	-0.63	0.007	17	-0.52	0.033	17
	Lambeth	-0.28	0.221	21	-0.28	0.225	21
	Lewisham	-0.48	0.044	18	-0.47	0.050	18
	Southwark	-0.71	<0.001	21	-0.61	0.003	21
Aged 6-17	ALL	-0.81	<0.001	120	-0.76	<0.001	120
	Bexley	-0.43	0.052	21	-0.28	0.216	21
	Bromley	-0.87	<0.001	22	-0.74	<0.001	22
	Greenwich	-0.61	0.009	17	-0.54	0.026	17
	Lambeth	-0.32	0.158	21	-0.32	0.158	21
	Lewisham	-0.34	0.162	18	-0.36	0.140	18
	Southwark	-0.69	0.001	21	-0.61	0.003	21
Aged 18-64	ALL	0.09	0.341	120	0.12	0.178	120
	Bexley	0.12	0.615	21	0.14	0.559	21
	Bromley	0.18	0.424	22	0.27	0.232	22
	Greenwich	0.50	0.040	17	0.62	0.008	17
	Lambeth	0.53	0.014	21	0.61	0.003	21
	Lewisham	0.18	0.471	18	0.12	0.622	18
	Southwark	-0.03	0.888	21	0.01	0.978	21
Aged 65+	ALL	-0.27	0.003	120	-0.25	0.006	120
	Bexley	-0.41	0.063	21	-0.38	0.090	21
	Bromley	0.04	0.846	22	0.10	0.658	22
	Greenwich	0.01	0.976	17	0.12	0.660	17
	Lambeth	0.01	0.980	21	0.08	0.733	21
	Lewisham	-0.42	0.086	18	-0.49	0.041	18
	Southwark	-0.27	0.245	21	-0.19	0.420	21
ALL ages	ALL	-0.31	0.001	120	-0.26	0.004	120

Sources: ONS, 2001; DPB, 2003; ODPM, 2004

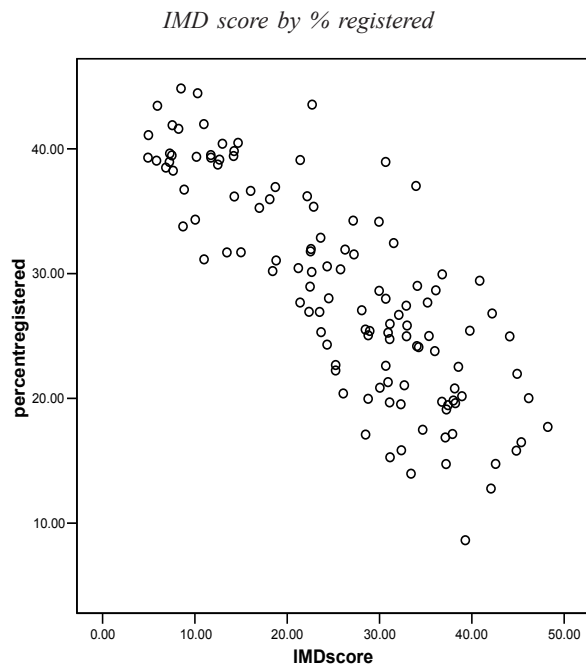
veals a rather different picture. There is little evidence of a clear relationship ($r=0.09$; $p<0.34$) between deprivation and dental service uptake (Figure 4). The level of dental uptake by ward is roughly similar, but there is some evidence that in wards with higher levels of deprivation, there is a slightly better uptake of dental care, particularly in PCTs such as Lambeth with respect to the IMD score ($r=0.53$; $p<0.014$) or income ($r=0.61$; $p=0.003$); thus, where a correlation exists it tends to be moderate and positive.

Amongst adults aged over 65 years dental service uptake is very low (Figure 5). Amongst the residents who do access care, there is little correlation ($r=-0.27$; $p<0.003$) between deprivation and uptake, with wards

having consistently low levels of service uptake across south east London.

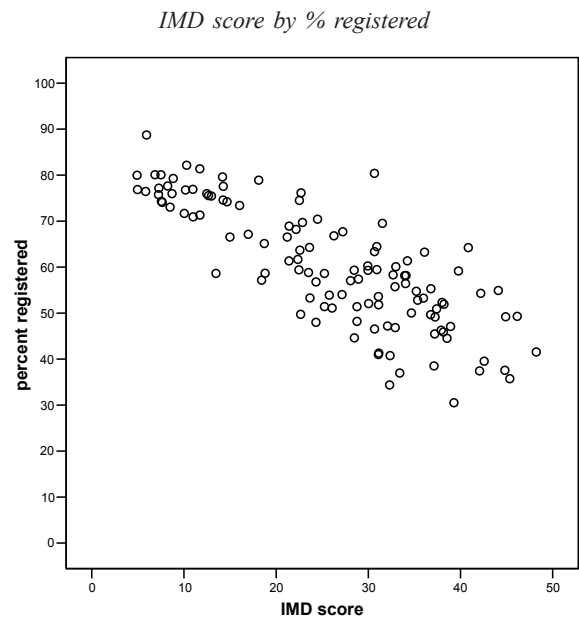
Discussion

This study, which examines the association between uptake of NHS primary dental care and deprivation in a socially diverse metropolitan area, contributes to the literature on inequity as well as demonstrating how analysis of available datasets can be utilised to inform future planning and provision of care. The findings reveal significant differences between children and adults in the association between the uptake of NHS primary dental care (GDS and PDS) and deprivation, both income-related



Sources: ONS, 2001; DPB, 2003; ODPM, 2004

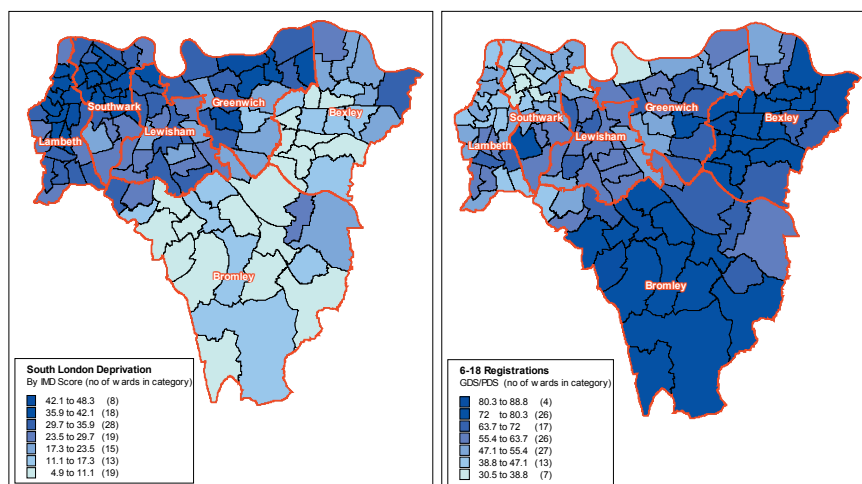
Figure 1. Percent of 0-5 year-old population registered at ward level by IMD and Income Score in south east London, 30th Sept



Sources: ONS, 2001; DPB, 2003; ODPM, 2004

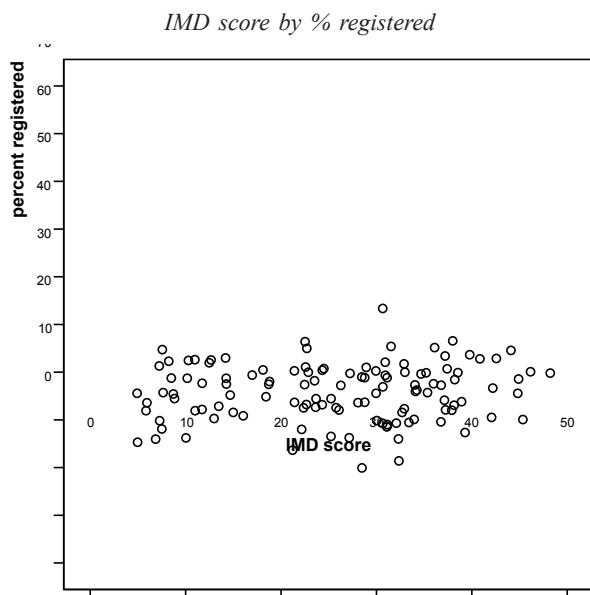
Figure 2. Percent of 6-17 year-old population registered at ward level by IMD Score in south east London, 30th Sept 03

Deprivation and registration in SE London: 6-17 years



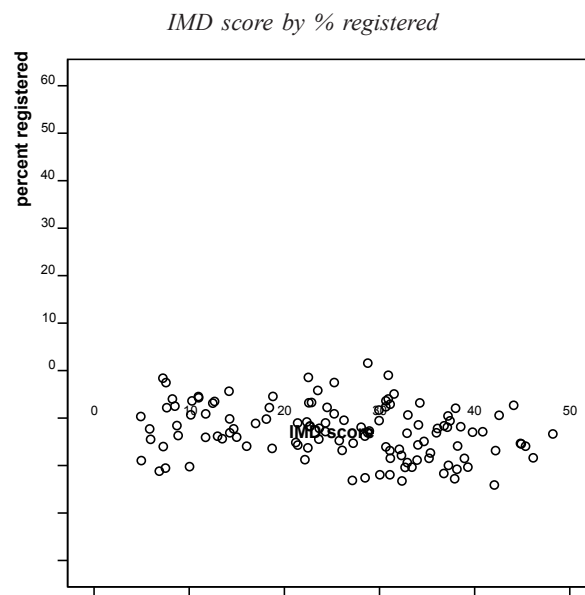
Source: ONS, 2001; DPB, 2003; ODPM, 2004

Figure 3. Deprivation and Registration for dental care for resident in south east London by ward: 6-17



Sources: ONS, 2001; DPB, 2003; ODPM, 2004

Figure 4. Percent of 18-64 year-old population registered at ward level by IMD Score in south east London, 30th Sept 03



Sources: ONS, 2001; DPB, 2003; ODPM, 2004

Figure 5. Percent of 65+ year-old population registered at ward level by IMD Score in south east London, 30th Sept 03

deprivation and multiple deprivation, providing support for an inverse care law in children.

Retrospective analysis of population and dental service data sets have recognised limitations. These limitations include the fact that, for example, although the Dental Practice Board data represent valid postcodes, they are not validated against the patient address. Also, census data suffer from temporal mismatch due to population change and under-enumeration. The former is most likely in the inner city deprived boroughs where population mobility is high; as is the latter, which is adjusted for by ONS in their census data for the area. Under-enumeration would tend to moderate the deprivation score; but this would only serve to increase the level of deprivation, rather than lessen it. Whilst it is important to understand the limitations of the data used in this study, they are the best data available and routinely used in health service monitoring (DPB, 2005). Furthermore, they have been used in past analyses of the association between deprivation and registration with primary dental care a population level (Jones, 2001), and the uptake of orthodontics by individuals (Morris and Landes, 2006; Drugan *et al.*, 2007). Unlike Jones (2001) who utilised crude registration rates calculated by the DPB for the population, and Morris and Landes (2006) who limited their analysis to resident children attending services within the Strategic Health Authority boundaries, this analysis includes all known registrations of local residents, relating them to census data at ward level. It is the first study to report such a secondary analysis.

Measures of deprivation (both IMD and income deprivation) at ward level are significantly associated with low levels of registration in children. The findings thus support a rejection of the null hypothesis and add weight to Jones' (2001) proposal of an 'inverse dental care law' in children, following the work of Tudor Hart

(1971). Furthermore, given their role as gatekeeper to specialist services, the low uptake of primary dental care in socially deprived areas could go some way to explaining the negative association between uptake of orthodontic care and deprivation demonstrated by similar analyses of DPB data in north and south west England respectively (Morris and Landes, 2006; Drugan *et al.*, 2007). Clearly these inequalities in uptake of dental care need to be tackled by PCTs. Although primary dental care is free for children, the relationship of registration with both IMD and income deprivation does raise a question over whether the market in dentistry results in parents failing to take up care for their children or whether it is socially related. The correlation is strongest and inequality most marked within the most affluent PCTs where there is greater social diversity. However, the PCTs requiring most action are those with the more deprived populations where there is less inequity within the PCT than with other areas.

In contrast, the same analysis for adults (18-64 years) and for older people (65 years and over) reveals no obvious correlation between social deprivation and the uptake of care provided by GDS/PDS, thus the null hypothesis stands for adults. Uptake of dental care amongst adults is more complex as co-payments are required for much of this group in England and 'cost' of care and 'fear of cost' are commonly reported barriers to the uptake of care (Finch *et al.* 1988; Kelly *et al.*, 2000; Croucher and Sohanpal, 2006). Exemption from charges is common in more socially deprived areas where a high proportion received income support (DPB, 2005). However, these data provide some evidence that exemption from payment of charges in adults may result in slightly better NHS primary dental care uptake in some of the more deprived wards of socially deprived PCTs, such as Lambeth. Furthermore, Lambeth adult residents also have access to emergency,

community services and primary dental care provided as part of workforce education. The level of private care appears to be increasing, particularly, but not exclusively, in affluent areas. Healthcare Commission (2005) data, although based on small samples, provide an indication of the level of private care in adults, which ranges from a 15% in the most deprived (Southwark) up to 42% in the most affluent borough (Bromley). If comparable information on private care were to be included, the results are likely to lend support to an inverse dental care law for adults and the population in general. However, these findings suggest that the relationship might not be completely linear with a slightly increased uptake from the most deprived areas due to exemption from dental charges and possible use of other locally available state funded services. Further research to profile dental services uptake across services is required.

Amongst adults there was one further point of note. In general, women are more likely to report accessing dental care than men (Kelly *et al.*, 2000). It was therefore interesting to note that registration of older men just exceeded that of older women, aged 65 years and over. Considering all older people together obscures the fact that women, who live longer than men, dominate this group, particularly the upper age bands. Women in general, and older old people in particular, are more likely to be edentate (Kelly *et al.*, 2000). Edentate people are less likely to attend a dentist regularly; hence, the findings may be explained by the demographic profile of this age group and the impact of edentulousness on dental attendance. This issue would also benefit from further research.

Current funding and workforce capacity and dental premises do not provide the opportunity to extend coverage significantly beyond historical levels, which Moles *et al* (2001) have shown contains inequalities. Recent policy changes that involve the devolution of historical NHS funding to PCTs/Care Trusts, therefore are replicating, rather than addressing existing inequalities. We should heed the warnings of Tudor Hart (1971) concerning the “operation of the market” and the need for social change to fundamentally dress inequity. PCTs must grasp current opportunities to work more closely with dental providers and local communities to explore how services can be developed to meet the needs and demands of the local population, particularly in the wards with the lowest service uptake and amongst vulnerable groups. This should lead to innovative methods of providing primary dental care in future; however, radical changes will require additional funding and possibly policy support.

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