

A health equity methodology for auditing oral health and NHS General Dental Services in Sheffield, England.

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Objectives To describe a method used in a health equity audit (HEA) of oral health and National Health Service (NHS) General Dental Services. **Methods** Need, demand and provision of NHS General Dental Services were estimated by electoral ward using readily available data. Need was estimated using five-year-old dmft data. Scheduled and unscheduled demand were differentiated; scheduled demand was estimated using NHS dental registration data and unscheduled demand using emergency clinic and NHS Direct call activity data. Provision was estimated using self-declared dentist NHS hours and NHS Units of Dental Activity practice allocations. All variables were correlated with socioeconomic deprivation in each electoral ward, estimated by rates of receipt of Income Support. **Setting** Sheffield, England. **Results** Estimated need in electoral wards varied and correlated positively with increasing socio-economic deprivation. Scheduled demand tended to be lower and unscheduled demand higher in more deprived wards. Estimates of NHS General Dental Service provision indicated marginally higher provision in more deprived wards, though the correlation was weak. A synthesis of the findings estimated where need was least well met by provision. **Conclusion** A HEA of oral health and NHS General Dental Services can be undertaken using readily available data. However, data used to estimate need, demand or provision may have to change for future audits as the data routinely collected changes.

Key words: Audit, demand, dental service provision, deprivation, equity, need

Introduction

Historically the General Dental Services (GDS) in the UK have not met the needs of the population (Maunder *et al.*, 2006; Landes *et al.*, 2004; Jones, 2001). Instead a dental “inverse care law” exists (Jones, 2001) where the level of NHS services available are inversely proportionate to the population’s needs (Tudor-Hart, 1971).

Current UK Government policy requires National Health Service (NHS) primary care organisations (PCOs) to work to reduce inequalities in health and healthcare provision (Department of Health, 2000, 2001, 2003a, 2005). Local commissioning of dental services was introduced in England and Wales in April 2006 to enable PCOs to commission services appropriate to their populations’ needs (Department of Health, 2003b). Hitherto PCOs have been unable to influence significantly the distribution of dental services as practitioners were largely free to establish dental practices at a location of their choice and were remunerated from a centrally held, non-cash limited fund. Since April 2006 PCOs have been allocated funding from which to commission based on the historical NHS spend on dental services prior to this.

To meet their responsibilities, it is essential that PCOs are able to make evidence-based commissioning decisions. As requests for investment are likely to exceed resources available, the method used to inform decisions must be transparent and, ideally, should use routinely collected data so that that the process can be readily updated.

One method of identifying inequalities in healthcare

provision is by undertaking a health equity audit (HEA). The extent to which PCOs utilise HEAs in their planning and commissioning of services in England was assessed as part of the then Healthcare Commission’s balanced scorecard assessment of performance (Healthcare Commission, 2004). The Health Development Agency, now part of the National Institute for Health and Clinical Excellence (NICE), produced guidelines on undertaking HEAs and described a 6 stage process (Health Development Agency, 2003):

1. Identify priorities to be investigated and relevant stakeholder groups;
2. Carry out a descriptive profile of the need and provision of services in the areas of interest;
3. Identify action to address inequalities;
4. Agree local targets;
5. Secure necessary resources to implement change;
6. Monitor progress of implementing change.

The aim of this report is to describe the method used in a health equity audit of oral health and NHS General Dental Services in Sheffield, England.

Method

This HEA was undertaken on behalf of the Sheffield Dental Services Joint Planning Group, which is a multi-disciplinary group with representatives from all sectors of dental services, dental public health, Primary Care Trusts (PCTs) and service users. The work described was undertaken collaboratively by the Sheffield Dental

Public Health Unit and NHS public health information specialists and represents the first two stages of the HEA process. The aim of the HEA was to contribute to the understanding of inequity between oral health and NHS services provided by dental practices so as to inform the future commissioning process. It included estimates of need, demand and provision of NHS General Dental Services in each electoral ward in Sheffield and how these variables correlated with socioeconomic deprivation. For reasons of practicality and repeatability, only routinely available data were used.

Need for dental care at electoral ward level was estimated by using mean dmft of five-year-olds in 2003/4 as a proxy measure. These data were used for two reasons. Firstly the British Association for the Study of Community Dentistry (BASCD) coordinated epidemiological surveys in Sheffield routinely used census samples in this age group. Secondly, the dental health of five-year-olds broadly predicts dental health in older children (Gray *et al.*, 1991; Kaste *et al.*, 1992) and in later life (Kelly *et al.*, 2000; Pearce *et al.* 2004; Lader *et al.*, 2005).

Demand for dental care was estimated by using three different data sources: Dental Practice Board (DPB) NHS registration data; unscheduled care attendances at Sheffield Dental Hospital; and dental emergency and urgent advice calls to NHS Direct, which is a free health telephone advice service. At the time of the study, readily available registration data from the DPB were based on registrations at each dental practice and did not provide an accurate indication of registration levels for each electoral ward, as many patients sought care away from their home. Due to increased use of postcodes on payment claim forms, the DPB was able to provide registration data by patients' home postcode at October 2004. Unmet demand was estimated using NHS Direct calls data (for dental emergencies and urgent advice) and attendance data for the unscheduled care services at Sheffield Dental Hospital for the period December 2002 to December 2004.

Dental service provision was estimated by using two sets of data. Firstly, self-reported data provided by dental practices on the number of dentist hours committed to the NHS, which was routinely collected as part of the commissioning process prior to the introduction of the new dental contract in April 2006. Secondly, the number of Units of Dental Activity (UDAs) allocated to each electoral ward when the new contract commenced. The number of UDAs allocated indicates the numbers of weighted course of treatment contracted for in an electoral ward from NHS dentists.

As electoral ward boundaries changed in 2003, it was not possible to use the Index of Multiple Deprivation (IMD) (Department of Environment, Transport and the Regions, 2000) to estimate socio-economic deprivation in each ward. Instead socio-economic deprivation was estimated using rates of claim of Income Support as a proxy measure in each electoral ward. All data used in this HEA are summarised in Table 1.

The method described allowed the production of a health equity profile of oral health and NHS General Dental Services in Sheffield, England. The results presented are for illustrative purposes only and, for reasons of brevity, not all findings are presented.

Table 1: Data used to estimate need, demand, deprivation and NHS provision from dental practices in electoral wards

<i>Variable estimated</i>	<i>Data used</i>
Need for dental care	dmft of five-year-olds
Socio-economic deprivation	Rate of receipt of Income Support
Demand for dental care	NHS Dental Practice Board registration data
Scheduled service use	Unscheduled care attendances at Sheffield Dental Hospital
Unscheduled service use	Emergency and urgent calls to NHS Direct
NHS provision from dental practices	Number of NHS dentist hours Units of Dental Activity allocated

Results

Estimating need for dental care

Mean dmft correlated with estimated deprivation at an electoral ward level (Figure 1). In the ward with the highest socio-economic deprivation, five-year-olds had, on average, 3.1 teeth affected by dental caries. In comparison, the mean dmft in the most affluent ward was 0.5 (data not presented).

Estimating demand for dental care

Scheduled demand

At the electoral ward level, registration rates varied from 32% to 70%. In general, registration rates negatively correlated with socio-economic deprivation ($r = -0.59$), although there were outliers to this trend (Figure 2).

Overall, registration rates were highest amongst 6-17 year olds (71%) and lowest amongst those aged 75 and over (35%). The greatest variation was amongst the 18-24 age group where less than one quarter of residents in some wards was registered (data not presented).

Unscheduled demand

Individual patient unscheduled attendances at Sheffield Dental Hospital for the period December 2002 – December 2004 were analysed by electoral ward (Figure 3). In general, unscheduled attendance rates were highest amongst those living in areas estimated as more socio-economically deprived ($r=0.53$). There was also a correlation between the rate of NHS Direct calls received and estimated socioeconomic deprivation ($r=0.62$) (Figure 4).

Estimating NHS General Dental Services provision

Electoral wards estimated to have higher socio-economic deprivation and higher need tended to have higher provision, as measured by self-reported data on dentists' time dedicated to the NHS, although the correlations were weak ($r = 0.20$ and $r = 0.15$ respectively). At April 2006, there were weak positive correlations between deprivation and numbers of UDAs allocated per 1000 of the population ($r = 0.26$) and estimated need ($r = 0.16$) (data not presented).

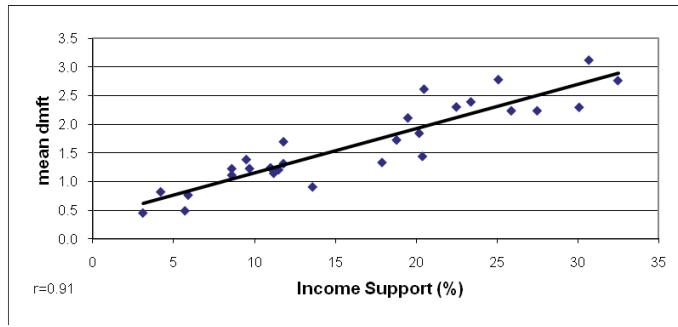


Figure 1: Correlation between mean dmft of five-year-olds with percentage of and rates of claim of Income Support, by electoral ward

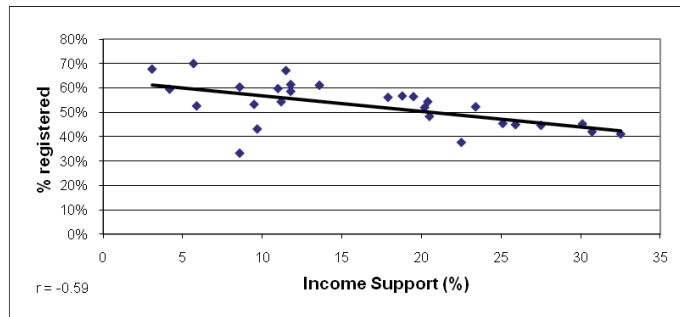


Figure 2: Correlation between percentage registered with a Sheffield dental practice and rates of claim of Income Support, by electoral ward.

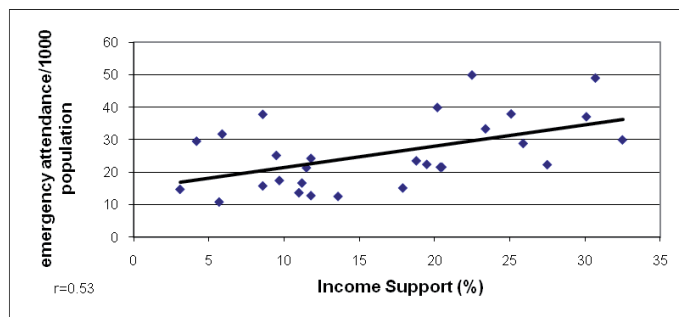


Figure 3: Correlation between unscheduled attendances at Sheffield Dental Hospital and rates of claim of Income Support, by electoral ward

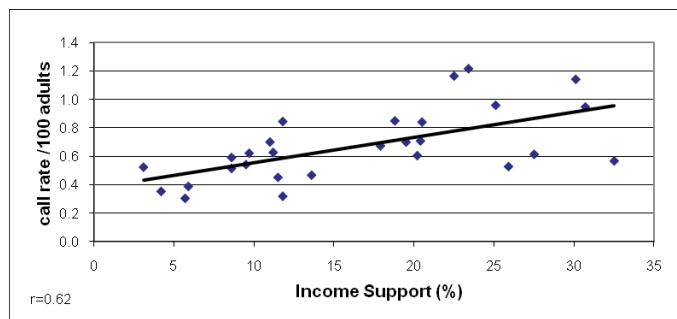


Figure 4: Correlation between calls to NHS Direct for dental emergencies and urgent advice and rates of claim of Income Support, by electoral ward

Synthesis of findings

Table 2 summarises estimations of dental care need (using dmft of five-year-olds), scheduled demand (using registration rates), unscheduled demand (using unscheduled attendances at Sheffield Dental Hospital and NHS Direct calls) and provision (UDA allocations) for the 28 electoral wards in Sheffield. For each variable, data were divided into quintiles so that an electoral ward was allocated a “score” of low, below average, average, above average and high.

To provide an indication of the extent to which need was being met by provision in each electoral ward, a numerical score of 1 to 5 was allocated to each category. A score of 1 was allocated to low need, high scheduled demand, low unscheduled demand and high provision. These numerical scores were then summed to provide an overall numerical indication of the adequacy of provision to meet need – the higher the score, the less well need was being met.

Initially, self-reported dentist hours allocated to the NHS were considered as an estimate of provision. However, as these data were deemed to be less reliable than UDA allocations, they were replaced by the latter.

Unscheduled demand was estimated by averaging the weighted ranks of NHS Direct calls (60%) and unscheduled attendances at the Sheffield Dental Hospital (40%). NHS Direct calls data were given more weighting as they were regarded as a more reliable estimate for a number of reasons. Firstly, the hospital emergency service had limited capacity and was not a walk-in service. Secondly, analysis of service activity data revealed that attendees tended to originate from parts of the city adjacent to the hospital. The proportional weighting of each variable was based on a consensus agreed by members of the Sheffield Dental Services Joint Planning Group who commissioned the audit.

Table 2: A synthesis of estimates of need, demand and provision

<i>Electoral ward</i>	<i>Need</i>	<i>Scheduled demand</i>	<i>Unscheduled demand</i>	<i>Provision</i>	<i>Indication of adequacy of provision to meet need</i>
Burngreave	high	low	high	average	18
Darnall	high	below average	high	above average	16
Manor Castle	high	low	above average	average	17
Gleadless Valley	high	below average	average	low	18
Shiregreen and Brightside	high	average	high	low	18
Central	above average	low	high	high	15
Firth Park	above average	below average	high	above average	15
Arbourthorne	above average	below average	below average	above average	12
Southey	above average	below average	below average	low	15
Richmond	above average	above average	above average	below average	14
Walkley	above average	below average	above average	high	13
Woodhouse	average	above average	above average	below average	13
Hillsborough	average	above average	above average	low	14
Beauchief and Greenhill	average	average	below average	average	12
Nether Edge	average	average	average	high	10
Birley	average	average	below average	below average	10
West Ecclesfield	average	high	low	average	8
Beighton	below average	above average	average	low	12
Stocksbridge and Upper Don	below average	low	below average	below average	11
Graves Park	below average	above average	below average	above average	10
Stannington	below average	high	low	average	7
East Ecclesfield	below average	average	average	average	11
Broomhill	below average	low	above average	high	12
Mosborough	low	high	low	above average	5
Fulwood	low	above average	average	below average	10
Crookes	low	average	average	high	8
Dore and Totley	low	high	low	below average	7
Ecclesall	low	high	low	above average	5

Discussion

To our knowledge this is the first published UK health equity methodology which has estimated need, demand and provision of NHS General Dental Services. Although the findings suggest that an overt “inverse care law” did not exist for NHS services provided from dental practices in Sheffield (those electoral wards estimated to have higher treatment need had, on average, marginally higher provision of services), there was still inequity in that resources were not allocated in proportion to estimated need.

These findings do not concur with earlier national (Jones, 2001; Landes *et al.*, 2004) and local (Maunder *et al.*, 2006) equity studies of the distribution of NHS resources for dental care of children in dental practice, where marked inverse care laws operated. Maunder *et al.* (2006) correlated registration rates by electoral ward with socioeconomic deprivation using the index of multiple deprivation. However, no attempt was made to estimate need, unmet demand, nor the level of local provision in local NHS practices.

Assuming the validity of the method described, for NHS resource allocation to be equitable, the sum of the scores allocated to need, demand and provision should be equal for each electoral ward. Although the findings of this equity audit have informed the allocation of NHS resources in NHS dentistry, it has been regarded as necessary, but not sufficient, information on which to base decisions. Other evidence, such as the location of Salaried Dental Services clinics, outreach undergraduate student clinics, the dental hospital and their respective levels of service provision, has also been considered. In this respect, the multirepresentative Dental Services Joint Planning Group, which commissioned the audit, has performed a vital role in bringing other essential information to commissioning decisions.

All data used were readily available during the audit process. Their limitations should be considered. Need for care has been estimated by using mean dmft of five-year-old children. Although the dental health of children, as estimated by total caries experience, broadly predicts dental health in later life (Gray *et al.*, 1991; Kaste *et al.*, 1992; Kelly *et al.*, 2000; Pearce *et al.*, 2004; Lader *et al.*, 2005), this only considers dental caries and not other oral diseases and conditions. It is also unclear how well dental health of five-year-olds indicates need of older adults who are increasingly retaining their natural dentition. Local data on the dental health of adults may be available in the future with the reconfiguration of the BASCD coordinated surveys. Furthermore, dmft only considers professionally defined, or normative, need (Bradshaw, 1972) and it is recognised that normative need often does not estimate need adequately (Sheiham and Tsakos, 2007). For example, dmft does not provide any indication of the impact of caries and its sequelae on function and, ultimately, quality of life (Locker, 1989). However, the availability of dmft data at an electoral ward level meant that it was the only practical indicator of need available.

Postcodes of patients registered with NHS dentists were used as a measure of scheduled demand, i.e. the

proportion of the population in an electoral ward that attended for regular dental care. However, not all of those registered would have attended regularly – some may have been treated symptomatically. Nine per cent of patients who were registered at a dental practice in Sheffield either had invalid postcodes or their postcode was unknown. Although this resulted in an underestimation of scheduled demand, as missing data were evenly distributed across the city, it is unlikely that these would affect the findings significantly. It had been assumed that scheduled demand would closely correlate with the availability of services. However, the findings suggest that this is not always the case. In some wards there was average provision but high scheduled demand of services and vice versa. This may reflect that many attend dental practices in electoral wards other than that in which they live, or that some choose not to attend regularly even when services are available.

At the time of data collection, registration data were readily available. The removal of registration as part of the new dental contract in England and Wales means that other proxy measures for scheduled demand need to be considered, such as the proportion of the population that have attended for non-emergency treatment in a two-year period. As a health equity audit is primarily a cross-sectional and not a longitudinal exercise, it is not critical that measures used to estimate variables remain the same, except for evaluating benefits of interventions.

Although more affluent wards generally had higher scheduled demand (Figure 2), there were a number of outliers to this trend. For example, low registration rates in some affluent wards in Sheffield may have been a result of a large proportion (up to 43%) of their adult population being students who may still be registered at their parents' place of residence. Furthermore, a number of individuals would only have regular private dental care. Residents of electoral wards on the outskirts of the city are more likely to be registered elsewhere given that Sheffield is part of the South Yorkshire conurbation. This would underestimate the levels of scheduled demand in these peripheral wards as the data did not include those registered at practices outside of Sheffield.

Dental emergency and urgent advice calls data in England are universally available from NHS Direct. Prior to April 2006, registered patients received out-of-hours emergency care from their practitioner or delegated representative. Although some calls received may have been from regular attenders, the vast majority would have been from those unregistered with a NHS dentist. Therefore, emergency and urgent advice calls data from NHS Direct provide an indicator of unmet demand from patients who do not access regular care. Since April 2006, PCTs have been responsible for providing all out-of-hours care for their population. The arrangements for these services vary, however it is likely that call handling data of dental emergencies and data from subsequent attenders of emergency clinics, will still be available although it will not be easy to separate regular and irregular attenders. Indicators of unscheduled demand that could be used in addition to emergency clinic activity data include the rates of claim for emergency treatment under the new contractual arrangements.

As electoral ward boundaries changed in 2003, it was not possible to use the existing Index of Multiple Deprivation (IMD) (Department of Environment, Transport and the Regions, 2000) to estimate socioeconomic deprivation in each ward. Instead rates of claim for Income Support were used as a proxy as contemporary data were available at the time of data collection. Rate of claim of income support have been used in health studies as a proxy for income deprivation (Alwan *et al.*, 2007) and is also one of the components of the income deprivation domain of IMD (Department of Communities and Local Government, 2008). However, future HEAs should use IMD wherever possible to provide a more comprehensive indication of socioeconomic deprivation.

Service provision data were collected some time after the main period of data collection because of the introduction of the new NHS dental contract in April 2006. Critically these only include NHS dentist hours and UDA allocations and exclude non-NHS services. NHS hours provided by dental therapists and hygienists were also excluded. As proportionally more time is likely to be committed to private care in more affluent wards, the totality of dental service provision is likely to be underestimated in these wards. In addition, there were four practices that provided only private care across the city, three of which were situated in more affluent wards. Overall, therefore, an inverse care law may exist when all dental services are taken into account.

As has been identified, there were limitations to the data used to estimate needs, demand and service provision. However any HEA will inevitably have strengths and weaknesses that must be considered when commissioning decisions are to be made. Consequently, ensuring that all stakeholders in dental services are involved in the interpretation of findings is important. In addition, such stakeholders may be aware of other “soft” data, both qualitative and quantitative, such as the views of local residents, patient and public representative groups and data from other feedback processes, which would further inform the decision-making process.

Conclusion

This report describes the method and findings of a health equity audit of oral health and NHS General Dental Services in Sheffield, England. It identified that such an audit can be undertaken using readily available data. In theory, at least, local commissioning will bring opportunities for reducing any inequities within the constraints of available NHS resources. In England and Wales, it is expected that funding previously allocated to dentistry will become part of the PCOs’ general funding allocation in the future and therefore subject to broader healthcare funding priorities. Therefore it will become increasingly important to ensure that future commissioning decisions are evidence-based.

Acknowledgements

The authors would like to acknowledge the help of the Dental Practice Board in providing the data set, members of the Sheffield Dental Services Joint Planning Group, and particularly Peter G Robinson, for comments on an early draft of this paper and Semina Makhani for her work on UDA allocation data.

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