Abstract

Background The NHS Plan promises an equitable distribution of resources within primary care. To inform the debate on the extent to which resources should be redistributed we examined the association between primary care activity and deprivation. We used the natural experiment of the organization of primary care in Mansfield, Nottinghamshire, where town centre general practices have patients from electoral wards with a range of socio-economic characteristics who are subject to the same degree of supplier-induced demand and variations in data quality.

Methods We used one year’s prospective data for two practices with 20,106 patients from 15 electoral wards. We performed linear regression analysis of directly age-standardized rates for different types of primary care activity and primary care morbidity-specific contacts against Townsend and Index of Multiple Deprivation 2000 scores.

Results There were 44 per cent more out-of-hours contacts in more deprived areas (95 per cent confidence interval (CI) 17–70 per cent), 18 per cent more surgery consultations (95 per cent CI 8–27 per cent), and 28 per cent more same-day consultations (95 per cent CI 12–44 per cent). Routine visits by doctors and contacts by district and practice nurses did not have substantial associations with deprivation. Morbidity-specific contacts for psychological problems and respiratory problems were associated with deprivation but there was no significant association for contacts for low back pain, asthma or menopausal problems.

Conclusions Different types of primary care activity and contacts for different morbidities had different associations with deprivation. This makes it difficult to recommend a simple list size adjustment; however, increased activity in deprived wards needs to be recognized in resource allocation, service configuration and performance management in primary care.

Keywords: primary care, deprivation, activity rates, morbidity-specific contacts

Introduction

The NHS Plan promises an equitable distribution of primary care services including primary care in resource allocation formulae for the first time. This raises the question of how much resources should be adjusted for underlying need. One difficulty in studying the effects of social factors on demand for primary care is how to adjust for variations in the availability of primary and secondary care services. Studies using multilevel modelling have shown socio-economic factors are strong predictors of the likelihood of individuals to consult. Previous studies, however, have reported either overall contact rates or concentrated on specific types of activity such as surgery consultations, visits, out-of-hours contacts or practice nurse contacts. There is a lack of data on morbidity-specific activity in primary care, which makes it hard to plan a primary care led NHS. Previous studies of morbidity in primary care have tended to report variations in prevalences rather than activity rates.

We studied internal variations in primary care activity within two town centre practices in Mansfield, Nottinghamshire, serving the same geographical area. This allows us to describe variations in primary care activity between areas with different socio-economic characteristics but with the same primary and secondary care services. In previous studies we had shown that self-reported health status was worse in deprived wards, and was associated with increased surgery consultations and night visits. In the current study we prospectively recorded contacts by doctors and nurses. Our aims were to see whether different categories of primary care activity and morbidity-specific activity rates have different associations with social deprivation.

Methods

The practices had 15 doctors and covered 15 electoral wards in central Mansfield. Deprivation scores were spread to either side of the national average but the setting lacked extremes at both ends of the social deprivation scale. Mansfield has a low ethnic minority population.

R. Carlisle, A. J. Avery and P. Marsh

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We used two deprivation scores, the Townsend score (derived from four variables from the 1991 Census) and the Index of Multiple Deprivation 2000 (IMD 2000). The Townsend score has been used in previous studies, but is based on data 10 years old. The IMD 2000 is a multi-dimensional index derived from 32 variables in six weighted domains (income, employment, health, education, housing, and geographical access to services). Two component variables derive from the Census but the other 30 are from more recent data.

We employed a full-time research associate to standardize and validate data recording in the practices. We collected one year’s prospective data using agreed definitions. We looked at five types of contact in both practices: surgery consultation by doctors; out-of-hours contacts (by practice doctors and out-of-hours co-operative); daytime visits by doctors; contacts by practice nurses (all at the surgery); and contacts by district nurses (mainly visits). In one practice we were also able to separate out same-day contacts, which we analysed as a proxy for urgent contacts.

We choose five morbidity categories; upper and lower respiratory tract infections (including sore throats and otitis media); psychological problems (including clinical depression and anxiety, as well as mood states brought on by social problems); low back pain; asthma; and menopausal problems (including post-menopausal problems). The first three morbidities were chosen because we hypothesized that contacts would be greater in deprived wards. Menopausal problems and asthma were chosen because we felt that more contacts would be follow-ups and we hypothesized that there might be an inverse association with deprivation.

Data were extracted from routine surgery and hand-held computers. For every contact clinicians recorded at least one morbidity they felt ‘contributed significantly’ to the contact. They were encouraged not to use vague codes (such as ‘follow-up’) but to record underlying morbidities. The practice teams agreed definitions and preferred Read codes for the morbidity categories. The majority of relevant contacts were entered using these codes but during data extraction all codes used during the study were inspected and other relevant codes, for example, those for less common psychiatric conditions, included in the analysis.

The data were validated before the start of the study and four times during the study. For each validation we selected 100 manual records per clinician using random numbers from the appointment systems. We checked whether contacts were recorded on computer and if the manual record or prescription record referred to any of the morbidities being studied. The validation results were fed back to the clinicians, with details of their comparative recording rates. Morbidity-specific contact rates varied between clinicians but recording rates for individual clinicians remained constant throughout the study. We chose a standard that 98 per cent of all contacts should be recorded on the clinical computers without evidence of omission of study morbidities. One practice achieved this standard before the other so the respective recording periods were from 1 August 1998 to 31 July 1999, and from 1 October 1998 to 31 September 1999. Both practices exceeded the standard at each subsequent validation.

Statistical methods

Ward rates were calculated using practice populations at the start of the study. Direct age-standardized rates were calculated using the National Morbidity Statistics from General Practice (MSGP4), as the reference population. For contacts for menopausal problems we calculated age-standardized rates for women aged between 25 and 75. For asthma we used age-standardized rates for people under 45 to minimize diagnostic confusion with chronic respiratory disease. We entered the age-standardized rates as independent variables in linear regression using SPSS for Windows and used ward deprivation scores as explanatory variables.

Results

The two practices had 20 862 patients (11 037 and 9825, respectively); 20 106 (93.4 per cent) were from the 15 wards studied. The percentage of patients in individual wards registered with the practices ranged from 8.1 to 35.7 per cent. Townsend scores ranged from −4.89 to 6.39. IMD 2000 scores ranged from 14.32 to 55.09 (the wards were ranked between 385 and 4913 out of 8414 wards in England: low rank, most deprived).

Table 1 shows numbers for each type of contact and morbidity. There were marked differences in variation between wards for the different categories: ward surgery consultations varied by a factor of one-third, district nurse contacts varied five-fold.

The results of the linear regression are shown in Table 2. The table shows analysis of age-standardized data but results without age standardization were similar. $R^2$ values represent the amount of variation in activity explained by deprivation. The $B$ coefficient represents the change in activity associated with deprivation and allows predictions to be made to see if associations are of practical relevance. To allow comparisons between categories we calculated the percentage differences in activity predicted across the range of deprivation studied (Figure). A zero increase implies no association. The trend was for predicted activity to be increased in deprived areas for all categories except for menopausal problems, but the trends are statistically significant only where the 95 per cent confidence intervals (CIs) do not cross zero.

Discussion

Principal findings

Three categories of contact by doctors had increased activity in deprived areas sufficient to be of practical importance: out-of-hours contacts (44 per cent increase using Townsend score, 95 per cent CI 17–70 per cent); surgery consultations (18 per cent,
Table 1  Number, rates and variation between wards for different types of contact and morbidities

<table>
<thead>
<tr>
<th>Contact type</th>
<th>Number of events</th>
<th>Ward rate/1000 patients</th>
<th>% variation between wards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in 1 year</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Surgery contacts²</td>
<td>69463</td>
<td>3454.8</td>
<td>2879.7</td>
</tr>
<tr>
<td>Daytime visits³</td>
<td>5781</td>
<td>287.5</td>
<td>119.1</td>
</tr>
<tr>
<td>Out-of-hours contacts⁴</td>
<td>2679</td>
<td>133.2</td>
<td>86.7</td>
</tr>
<tr>
<td>Same-day contacts⁵</td>
<td>5868</td>
<td>548.6</td>
<td>432.5</td>
</tr>
<tr>
<td>Practice nurse contacts⁶</td>
<td>22266</td>
<td>1107.4</td>
<td>896.3</td>
</tr>
<tr>
<td>District nurse contacts⁷</td>
<td>15276</td>
<td>759.8</td>
<td>264.0</td>
</tr>
<tr>
<td>Morbidity-specific contacts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological problems</td>
<td>6826</td>
<td>339.5</td>
<td>236.8</td>
</tr>
<tr>
<td>Respiratory tract infections</td>
<td>7729</td>
<td>384.4</td>
<td>283.7</td>
</tr>
<tr>
<td>Low back pain</td>
<td>2721</td>
<td>135.3</td>
<td>79.0</td>
</tr>
<tr>
<td>Asthma (aged 0–44)</td>
<td>1013</td>
<td>87.9</td>
<td>34.2</td>
</tr>
<tr>
<td>Menopausal problems (aged 25–74)</td>
<td>957</td>
<td>147.7</td>
<td>67.3</td>
</tr>
</tbody>
</table>

¹Difference between the maximum and minimum ward rates as a percentage of the minimum rate.
²Contacts with a doctor in surgery between 7 a.m. and 6.59 p.m. Monday–Friday or between 7 and 11.59 a.m. Saturday.
³Doctor visits between 7 a.m. and 6.59 p.m. Monday–Friday or between 7 and 11.59 a.m. Saturday.
⁴Contacts with a doctor or out-of-hours cooperative 7 p.m. to 6.59 a.m. Monday–Friday, 12 a.m. Saturday to 6.59 a.m. Monday and all Bank Holiday contacts.
⁵Contacts made and carried out on the same day between 7 a.m. and 6.59 p.m. Monday–Friday (one practice only, 11 037 patients).
⁶Contacts with a practice nurse at the surgery.
⁷Contacts with a district nurse at home or at the surgery.

Table 2  Associations between ward activity and morbidity-specific rates with deprivation scores

<table>
<thead>
<tr>
<th>Morbidity-specific contacts</th>
<th>Deprivation score</th>
<th>B coefficient* for B coefficient</th>
<th>95% CIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological problems</td>
<td>Townsend score</td>
<td>55</td>
<td>54.5</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>79</td>
<td>18.42</td>
</tr>
<tr>
<td>Respiratory tract infections</td>
<td>Townsend score</td>
<td>50</td>
<td>5.14</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>42</td>
<td>1.32</td>
</tr>
<tr>
<td>Low back pain</td>
<td>Townsend score</td>
<td>51</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>44</td>
<td>3.54</td>
</tr>
<tr>
<td>Asthma (aged 0–44)</td>
<td>Townsend score</td>
<td>33</td>
<td>7.56</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>14</td>
<td>13.89</td>
</tr>
<tr>
<td>Menopausal problems (aged 25–74)</td>
<td>Townsend score</td>
<td>30</td>
<td>8.76</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>37</td>
<td>2.72</td>
</tr>
<tr>
<td></td>
<td>Townsend score</td>
<td>40</td>
<td>7.91</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>39</td>
<td>2.18</td>
</tr>
<tr>
<td>Low back pain</td>
<td>Townsend score</td>
<td>16</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>12</td>
<td>0.62</td>
</tr>
<tr>
<td>Asthma (aged 0–44)</td>
<td>Townsend score</td>
<td>2</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>Menopausal problems (aged 25–74)</td>
<td>Townsend score</td>
<td>4</td>
<td>−1.78</td>
</tr>
<tr>
<td></td>
<td>IMD 2000</td>
<td>1</td>
<td>−0.2</td>
</tr>
</tbody>
</table>

* B coefficient refers to the number of extra annual contacts per 1000 patients for each extra unit of deprivation score (it applies to Townsend scores in a range of −4.9–6.4 and IMD 2000 scores of 14–55).

¹See definitions given for Table 1.
95 per cent CI 8–27 per cent); and same-day consultations (28 per cent, 95 per cent CI 12–44 per cent). Other contacts either had no association or increases with lower confidence intervals so small that they are not practically relevant. We hypothesized that same-day contacts would have a markedly steeper gradient with deprivation than routine contacts, but this was not the case.

Morbidity-specific contacts for psychological problems and respiratory infections were associated with deprivation; this was in line with our hypotheses but there was no significant association for consultations for back pain. Asthma and menopausal problems were included to see if there might be inverse care for these conditions. For menopausal problems the trend was towards more consultations in affluent wards but this was not statistically significant.

**Strengths and weaknesses of the study**

The study reports variations in activity rates and was designed to minimize variations caused by supplier-induced demand. However, the relationship between primary care activity and need is complex. The study cannot answer the question of whether the observed increases in activity in deprived wards adequately reflect increased needs. Primary care morbidity recording can be incomplete and involves difficult and subjective decisions about the content of consultations. A strength of our study is that data were collected prospectively and we had a full-time research associate to encourage accurate and complete recording. Despite this, there were substantial variations in morbidity-specific contact rates between individual doctors and nurses. In particular, some doctors were more likely to use physical morbidity codes and others psychological codes. This may partly be a coding issue but could also reflect genuine differences in the emphasis within individual doctor’s consultations. It is important to recognize that the data represent doctors and nurses’ views of morbidities that contributed substantially to consultations; they may not necessarily coincide with patients’ views of their reason for consultation. The clinicians were not blinded to the hypotheses being tested. This could conceivably have some effect on morbidity recording but should not have affected the vast majority of contact data because most appointments and visits were accepted by reception staff who were unaware of the specific hypotheses.

The study is limited to two practices in one town. Other
studies have shown that the influence of socio-economic factors varies between different parts of the United Kingdom.\(^1\) The wards lacked extremes of deprivation. Studies in more deprived areas might show larger effects but our study illustrates the fact that social variation is important in average practices not just in highly deprived areas.\(^2\) Our conclusions depend on the assumption that the practice population in a ward has the same characteristics as the overall ward population.\(^3\) For this reason we restricted the analysis to central wards, excluding wards where the practices had low numbers of patients.

**Comparison with other studies**

Overall contacts were higher than in MSGP4.\(^4\) This may represent more complete recording or greater workload in the practices studied.

The increases in surgery contacts,\(^5\)\(^,\)\(^6\) and out-of-hours contacts,\(^7\)\(^,\)\(^8\) in deprived areas are in line with previous studies. Other studies have shown large variations in daytime visits between practices, which are largely unexplained.\(^9\) The lack of association with deprivation in our study might suggest that this aspect of primary care is not always directly related to need.

Practice nurse activity was not substantially associated with deprivation. The division of tasks within practices varies.\(^10\) In these practices the nurses’ main roles were chronic disease management, health promotion and performing routine nursing tasks. Our results contrast with those reported by a practice in London, where patients from lower social classes had three times as many contacts with nurses.\(^8\) Contact rates for district nurses are heavily dependent on small numbers of patients who receive extremely large numbers of contacts (20 patients received over 100 contacts each and accounted for 40 per cent of all contacts). This is the reason for the wide confidence intervals and suggests that district nurse workload should be studied in larger datasets.\(^9\)

The results for morbidity-specific contacts may be partly because the epidemiology of different conditions has different relationships with deprivation,\(^2\) but may also be because practice activity is not always congruent with need.\(^2\) Secondary care psychiatric activity is strongly associated with deprivation.\(^2\) Mental health in these practices is worse in deprived wards,\(^1\) so it was reassuring that this was reflected in an increase in contacts for psychological problems.

**Policy implications**

Currently, general practitioners (GPs) are inversely distributed with fewer in deprived areas.\(^2\) In future, resources will be allocated to Primary Care Trusts (PCTs) according to needs-based formulae. It is difficult to recommend a simple list size adjustment to account for the extra workload in deprived areas because different activities are affected to different extents, but our results suggest there is justification for around 20 per cent more GPs per patient to account for the relatively narrow range of deprivation studied. Out-of-hours activity has a particularly strong association with deprivation, and because GPs retain financial responsibility for out-of-hours cover this is a disincentive to practice in deprived areas. Until resources are more equitably allocated, those involved in performance monitoring need to be aware that practices in deprived areas will find it harder to achieve the appointment targets set out in the National Plan.

It has been suggested that additional nurses could help to respond to the additional morbidity in deprived areas.\(^8\) We would not argue against this in principle but if PCTs adopt this approach they will need to ensure that additional resources allocated to deprived areas go to deprived patients. The practice nurse data from our study suggest this need not necessarily be the case and highlight the fact that equity audits within practices are important as well as equitable resource allocation to practices.

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