How representative is the population covered by the RCGP spotter practice scheme? Using Geographical Information Systems to assess


Abstract

Background The Royal College of General Practitioners Weekly Returns Service (WRS) is a network of sentinel general practices providing weekly data on illnesses diagnosed in general practice across England and Wales. The WRS contributes to the surveillance of infectious disease, most notably influenza. We use Geographical Information Systems (GIS) techniques to establish whether the practice populations of the current WRS are representative of the general population.

Methods This study compares the practice population with the general population using the Department of the Environment, Transport and Regions (DETR) Indices of Deprivation 2000 scores for English wards.

Results Comparisons at the national level reveal that the WRS population is less deprived than the general population. At a supra-regional level the WRS practice population shows the same North–South differences as the national population, but the proportions of patients in the more deprived and least deprived wards are more exaggerated in the WRS population. A supplementary analysis reveals that the WRS has no patients in the most deprived wards of London.

Conclusion The differences have implications for the future recruitment of practices to the WRS. Previous studies have demonstrated the effect of socio-economic deprivation on GP consultation rates. To ensure that the consultation rates reported by the WRS will better reflect consulting patterns in the general population the WRS will need to recruit practices with patients in the most deprived areas of the South and less deprived areas in the North of England. This study demonstrates the value of GIS in the establishment of surveillance systems.

Keywords: surveillance; Geographical Information Systems; socio-economic deprivation; sentinel practices

Introduction

The Royal College of General Practitioners (RCGP) Weekly Returns Service (WRS) is a network of 78 general practices that provide weekly data on major illnesses diagnosed in general practice across England and Wales. The service was established to serve a sentinel function and to warn particularly of the emergence of epidemic illnesses. The WRS gathers data electronically from a population in excess of 600,000 people each week. Each practice provides the number of episodes for a wide range of diseases together with the practice population. These episodes represent patient consultations with the GP and are recorded as first, new and ongoing. Weekly, four-weekly, quarterly and annual incidence rates per 100,000 population are calculated from the first and new episodes at national and supra-regional level (WRS Reporting Areas).

Many of the infections of importance to public health (e.g. most enteric and respiratory infections) are treated almost exclusively in the primary care setting. It is estimated that 40 per cent of the population consult their GP on at least one occasion during the year as a result of infection. Nearly one-third of all consultations in general practice are concerned with infection. By collating data from across the country the WRS is able to give a timely indication of the burden of illness from infection in the community. The WRS is particularly well known for the monitoring and surveillance of influenza but over recent years its ability to monitor a variety of other conditions has been recognized.

The recruitment of sentinel practices to the WRS has traditionally relied on 'willing volunteers' and the WRS has retained a number of practices that have reported for some considerable time. Previous studies have shown that the WRS practice population was generally representative of the national population.
enumerated in the 1991 Census, but at a regional level little is known of this population’s demography or socio-economic characteristics.3

This study aims to assess the representativeness of the WRS practice populations using current deprivation indices and by utilizing the computing power of Geographic Information Systems (GIS) to collect, edit, integrate, visualize and model socio-economic data. The Department of the Environment, Transport and Regions (DETR) Indices of Deprivation 2000 (IMD 2000) were used to ascertain the socio-economic profiles of the GP practice lists.

The IMD 2000 is the most recently constructed index of deprivation for England and Wales and has been adopted widely in studies across local and national government. It is an innovative and detailed ward-level index of deprivation, which is based on seven separate domains (income; employment; health deprivation and disability; education; skills and training; housing; and geographical access to services).4 Each domain reflects a different aspect of deprivation and each is constructed from a number of indicators that are widely available at small area level for the whole of England and are statistically robust and up-to-date. A similar index is available for Welsh wards. However, the Welsh Index is constructed from slightly different components and therefore cannot be compared directly with the English Index.5 The West Midlands Public Health Observatory recently used the IMD 2000 to report on patterns of deprivation between Primary Care Trust areas in the West Midlands (2002).6

Methods

This project required the assimilation of data from a number of health datasets, the DETR Indices of Deprivation 2000 and national administrative boundary data to carry out analysis using GIS.

The core health dataset used to determine the demography of the WRS practice populations was an extract of the NHS Information Authority (NHSIA) Attribution Dataset (ADS). The ADS is maintained and collated by the NHSIA on behalf of health authorities (pre-April 2002) and primary care trusts (PCTs) (post-April 2002). Before data can be released by the NHSIA consent must be sought from each health authority/PCT. As there is no requirement that patients reside in the same health authority as their GP, consent was sought from all 104 health authority Exeter System Key Users/Caldicott Guardians. The ADS extract was processed for all WRS practices with patients living in consenting health authorities. WRS practices were identified on the ADS using the GP National Code (GNC) of the senior partner. For each GP practice the data extract was summarized by the unit postcode of residence at 5 year age bands for males and females.

The extract of the ADS data was imported into an Access database to create aggregated tables of GP practice patient postcodes at 5 year age groups. The ADS total practice populations were compared with the WRS average weekly practice populations (2001) to assess the completeness of the ADS extract. We included in the study those practices with at least 90 per cent of their patient list identified in the ADS extract.

Patient postcodes were geocoded using the NHS Postcode Directory (May 2002) enhanced to 10 m grid references. The geocoded patient postcodes were then used to determine the ward of residence of the patients and hence the ward deprivation scores. GP practice locations were geocoded from the WRS address list and were mapped to local and regional health boundaries. The WRS traditionally produces its reports based on its own supra-regional classification of the practices – North, South and Central Reporting Areas (RA). This classification is also used for this study.

Deprivation quintiles were constructed for all wards in England by ranking them in order of their IMD score and dividing them into quintiles, each quintile by definition having 20 per cent of the total national population. These deprivation quintiles form the basis of our assessment of representativeness.

A supplementary analysis examined the deprivation quintile distribution of the WRS population in the four former Directorates of Health and Social Care (DHSC) – North, South, Midlands and London. At the time of analysis the DHSCs were emerging as the higher level of health geography and were used as a comparative measure of representativeness of the WRS population. Although DHSCs have since been abolished, the results for the London area are significant and are presented in this study.

To verify our sample of practices against the whole WRS practice list we used the postcode of the practice address, its ward and ward IMD score to provide a crude indicator of the deprivation of all WRS practices. The range of these ward IMD scores was also examined by deprivation quintile.

Results

Of the 104 health authorities 78 (75 per cent) gave their consent to our use of the ADS data, four (4 per cent) refused and the remaining 22 (21 per cent) failed to reply to reminder letters.

The locations of the 77 sentinel practices in the WRS in April 2001 were mapped in relation to health authority and classified according to WRS Reporting Areas (Figure 1).

Patient postcoded data were obtained from the NHSIA in the form of 449,697 records. This amounted to a total practice population of 522,932 persons (264,599 females and 258,333 males). Of this practice population 1482 (0.3 per cent) live at ‘unknown’ postcodes and were discounted from analysis.

A comparison between the ADS extract and the WRS 2001 average weekly practice populations revealed that only 54 of the 77 practices had achieved at least 90 per cent of their expected population in the ADS extract. This was due to a number of practices having patients resident in health authority areas where consent had not been given. These 54 practices were used for further analysis. The populations of these ranged from 1470 to 14 165 patients (mean = 8554).
Following the allocation of patients to wards, four practices were found to have some or all of their patients in Welsh wards. Because of the incompatibility of the Welsh and English IMD scores these practices were excluded from further analysis.

As a result of these exclusions the total WRS practice population included in the following analyses was 436,707 (50 practices; 67 per cent of the potential practice population). Table 1 shows this population by WRS Reporting Areas (RA) (North, Central, South).

**Deprivation quintiles**

The least deprived 20 per cent of the English population falls into quintile 1, where the IMD score ranged from 1.16 to 10.16. The most deprived 20 per cent of the population falls into...
quintile 5, where the IMD score ranged from 39.97 to 83.77 (Table 2).

National comparison

Figure 2 shows the England population divided into deprivation quintiles based on the IMD scores of the wards. It also shows the WRS practice population (436 707) divided into the deprivation quintiles based on the IMD scores of the wards where the patients reside. The most striking differences between the WRS and the national population is that the WRS has a higher proportion of its population in the least deprived quintile (31 per cent in quintile 1) whereas only 11 per cent of the WRS population are classed in quintile 4.

WRS Reporting Areas (RAs)

The differences between the WRS population and the England population are shown in Figure 3. The pattern of quintile distribution in the WRS population shows over-representation of the most deprived quintile in the North and under-representation of the most deprived quintile in the South. The middle quintiles (2, 3 and 4) are under-represented in the North.

WRS practices in London show over-representation of least deprived quintiles (Q1 = 30 per cent and Q2 = 39 per cent) whereas none of the WRS population is drawn from the most deprived London wards (Q5 = 0 per cent) (Figure 4).

Excluded practices

A comparison of all WRS practices based on the ward in which they are located showed a similar distribution through the deprivation quintiles as the smaller study group of practices. We conclude that the excluded practices do not differ significantly from the practices included in the study.

Discussion

The fourth National Survey of Morbidity in General Practice (1991–1992), in which WRS practices took part, reported that the practice population was generally representative of the national population enumerated in the 1991 Census. This was in terms of age, sex, marital status, housing tenure, economic position, occupation and whether they lived in an urban or rural area. The results of the survey also showed that different individual, and combinations of, socio-economic factors affect general practice consulting rates. Our study used more recent

Table 1 The England population and the WRS practice population by WRS Reporting Area (numbers, with percentages given in parentheses)

<table>
<thead>
<tr>
<th>WRS Reporting Area</th>
<th>England population</th>
<th>WRS practice population*</th>
</tr>
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<tbody>
<tr>
<td>North</td>
<td>14 040 500 (28)</td>
<td>110 530 (25)</td>
</tr>
<tr>
<td>Central</td>
<td>12 168 300 (25)</td>
<td>156 146 (36)</td>
</tr>
<tr>
<td>South</td>
<td>23 285 300 (47)</td>
<td>170 031 (39)</td>
</tr>
<tr>
<td>Total</td>
<td>49 494 100 (100)</td>
<td>436 707 (100)*</td>
</tr>
</tbody>
</table>

*Excludes practices with insufficient data or with patients in Welsh wards.

Table 2 Deprivation quintiles

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Range of IMD 2000 scores</th>
</tr>
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<tbody>
<tr>
<td>Quintile 1 – least deprived</td>
<td>0.156–10.163</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>10.164–16.833</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>16.834–26.065</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>26.066–39.968</td>
</tr>
<tr>
<td>Quintile 5 – most deprived</td>
<td>39.973–83.766</td>
</tr>
</tbody>
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Figure 2 English ward populations and the WRS practice population by deprivation quintile. Source: DETR Indices of Deprivation 2000 and Oxford University population estimates for wards in England, mid-year 1998.
socio-economic data to assess the representativeness of the current WRS.

Using the NHSIA ADS extract was seen as the most efficient means to obtain practice population profiles. The alternative would have been to ask individual practices to provide their own profiles, which would have been both time consuming and complex as different practices use different computer systems. However, there were some problems associated with using the NHSIA download. For nearly a third of the practices we were unable to obtain permission to use the ADS as a result of health authorities failing to reply to the request or refusing to give permission. This could have invalidated the whole study if we were later to find that the missing practices were in some way atypical of the study practices. However, there was no evidence of this.

In 2001 there were 104 health authorities; there are now over 300 local PCTs. To repeat this exercise based on the ADS consenting system would now be beyond the resources of this project team. Also, with current sensitivities to the use of potentially identifiable patient data, future work of this nature might well require approval of the Patient Information Advisory Group (PIAG).

Our study of the representativeness of sentinel practices has been facilitated by the use of GIS techniques enabling us to visualize the relationships between WRS practices and local health organizations. GIS allowed us to convey the distribution of GP practices in terms of other organizational boundaries and to highlight where non-consenting health authorities were likely to result in reduced sample size. At a more detailed level,
GIS alerted us to reasons why we had been given data for practices we had not expected and raised our suspicions to the fact that some practices were not achieving a true patient population.

It would not have been possible to map patient postcodes and attribute their population to census and ward geography satisfactorily without reference to Geographic Information Systems. The GIS allowed us, working in collaboration with others, to pool resources and expertise and to share some of the data-processing operations.

Conclusion

The results of this study suggest that there are some differences in the socio-economic profiles of the WRS practice population and of the general population. In other studies it has been shown that these differences will affect consulting patterns and might therefore be influencing WRS activity rates.7–10 This should be taken into consideration in the future recruitment of practices to the WRS; the WRS may wish to enrol practices in more deprived areas as well as ensuring a good geographical spread of practices (especially in the South of England).

The GIS proved to be an invaluable tool in this project, allowing the accurate assignment of patient postcodes to wards and facilitating the allocation of the practice population to deprivation quintiles. The use of GIS techniques should be considered in the development of future surveillance schemes, to ensure that populations contributing to such schemes will be truly representative of the general population not only in terms of their age/sex profiles but also in terms of their socio-economic characteristics.

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Contributors

S.H. co-ordinated the task of obtaining consent from Health Authorities, the ordering of the extract from the ADS, the analysis and presentation of results, and the preparation of drafts of the paper. D.E. undertook the geocoding, geographical analysis, production of postcode to ward lookup tables and output maps required in the GIS aspects of the study, and the preparation of drafts. D.F. initiated the study and, with R.S. and G.S., was involved in the design of the study, offered guidance and commented on drafts of the paper.

References


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