Mapping choice in the NHS: cross sectional study of routinely collected data

Mike Damiani, Carol Propper, Jennifer Dixon

Policy Directorate, King's Fund, London W1G 0AN
Mike Damiani *visiting senior analyst*
Jennifer Dixon *director*

Department of Economics, University of Bristol, Bristol BS8 1TH
Carol Propper *professor*

Correspondence to: C Propper carol.propper@bristol.ac.uk

BMJ 2005;330:284–7

Abstract

Objective To identify where in England there are likely to be most constraints on choice of hospital for patients waiting longer than six months for elective care.
Design Cross sectional study using routinely collected data.
Setting Population of England and NHS trusts and private sector hospitals in England.
Participants All residents in England.
Main outcome measures Availability of beds (available and unoccupied hospital beds), demand (number of people waiting longer than six months), and access (travel time to facilities) to hospital care in England.
Results Most people in England already have an extensive potential choice of hospital. The number of available and unoccupied beds within 60 minutes' travel time was lowest in the Scottish borders, North Yorkshire, and parts of East Anglia, Lincolnshire, Devon, and Cornwall. This pattern was not altered by adding in private facilities. Putting demand with this supply, the number of people in a geographical area waiting longer than six months per bed within 60 minutes' travel time was highest in the south east (except London), parts of the south west (Cornwall, Bristol), East Anglia, and the Welsh border.
Conclusion People in the south east (outside London), East Anglia, and parts of the south west are likely to have to travel further to exercise meaningful choice of hospital for elective care.

Introduction

One aim of the UK government is to introduce more choice into the NHS, such as wider choice of secondary care provider for patients waiting longer than six months for elective care. Patients are interested in such choice—for example, a MORI poll showed that if faced with a long wait over a quarter of people would travel anywhere in the United Kingdom for treatment by the NHS.[1]

Expanding choice of provider to patients is a challenge to systems such as the NHS in which supplies are limited. We focused on the time it would take patients to travel to a provider and examined the extent to which choice differs between areas of England given the existing pattern of NHS and private facilities.

Methods

We used routine data available to the NHS and the private sector to construct maps showing the location of available NHS and private beds for elective care and their accessibility to patients, measured as time taken to travel to the facilities. Firstly, we calculated travel time from where patients lived—their census electoral ward—then we added in current demand for these facilities, as measured by number of patients waiting for a bed. We determined where in the country there were likely to be most constraints on patients for choice of provider.

Data sources

We downloaded data on the number of general and acute beds open and available by NHS trust at March 2002.[2] We calculated the number of available unoccupied beds (potential spare capacity) from data on the number of available and occupied general and acute beds.

We obtained data on the number of beds in private (non-NHS) hospitals and private facilities in NHS trusts as of 2001.[3–5] Only private facilities that provided care in medical and surgical specialties were included. As data were not available on bed occupancy per private facility, we estimated this at 60% as historically this is the level of occupancy experienced by the UK private sector.[3]

We obtained the postcodes of all NHS trusts dealing with acute conditions and the postcodes of private facilities.[3–6] For the last quarter of 2001-2 we obtained the number of patients in each NHS trust waiting longer than six months for inpatient care.[2]

Mapping data and calculating travel times

To produce maps showing the location of the private hospitals and NHS trusts, we imported the postcodes into MapInfo.[7] We used Microsoft MapPoint[8] to calculate the travel time to these facilities and the travel times and distances between hospitals and the centroids of electoral wards or between hospitals and the centroids of local authority districts. We adjusted travel times to reflect the average speed of cars across England, and we verified a selection of speeds.[8–11] Using data from the 1991 census, we constructed boundaries for local authority districts and electoral wards.[12] We calculated travel time from the centroid of each electoral ward in England to the centroid of the electoral ward containing the main postcode of each NHS trust or private facility. When travel time exceeded 60 minutes, we calculated the travel time from the centroid of the local authority district to the centroid of the electoral ward containing the main postcode of each NHS trust or private facility.

Using population data from the 2001 census, we calculated the proportion of the population of England that would have access to NHS or private facilities within certain travel times. If boundaries had changed since 1991, we adjusted the population data for 2001 accordingly.

ELPS *This is the abridged version; the full version is on bmj.com*

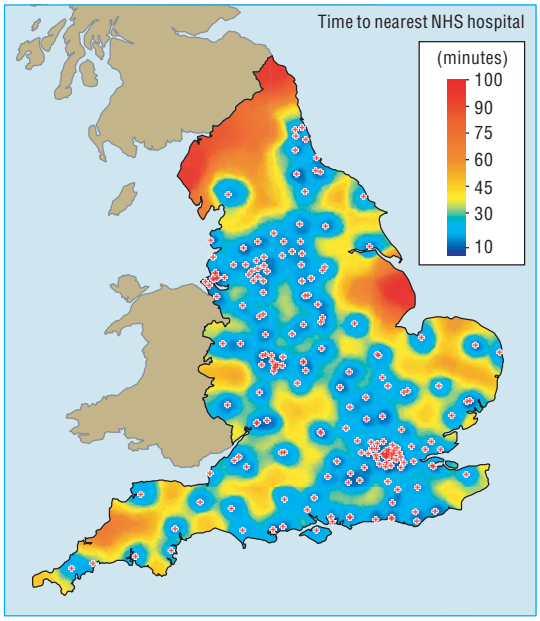

Fig 1 Travel time (gradation of colour) to nearest NHS trust dealing with acute conditions, England, 2001

For all NHS trusts we identified the number of patients waiting longer than six months for elective care. We calculated the number of patients waiting per available and unoccupied bed within 60 minutes' travel time of each electoral ward in England.

Results

For most areas of England, an acute NHS trust was accessible within 100 minutes' travel time, and for large parts of the country a NHS trust was accessible within 30 minutes (fig 1). Overall, 25% of the population had one hospital within 15 minutes' travel time and 41% had up to two hospitals. Fifteen per cent had no hospital within 30 minutes' travel time, but 98% had one hospital and 92% had two hospitals within 60 minutes' travel time.

In three areas of England people have to travel relatively further to reach an acute NHS trust: the north of England close to the border with Scotland, East Anglia and parts of Lincolnshire, and parts of Devon and Cornwall.

Figure 2 shows the number of NHS trusts within 60 minutes' travel time. We found that areas with high and low access to hospitals were relatively similar when we considered 30 minutes' travel time instead of 60 minutes. As 60 minutes is reasonably long for a one way journey, we used this time for the rest of the analysis.

Most people in England have access to at least one trust within 60 minutes' travel time. Areas with least choice of supply were the Scottish and Welsh borders (not including facilities in Wales) and parts of East Anglia, Lincolnshire, and the south west.

When private facilities are taken into account then travel times are similar to those in figure 2, except the number of facilities within 60 minutes' travel time increased, particularly in areas of relatively low supply (see bmj.com). The proportion of the population with access to NHS and private facilities within 60 minutes' travel time was only 1% higher than the proportion with access to the NHS alone, however, because of the relatively small number of private facilities and because most are located near NHS facilities.

Hospitals vary in size, so the pattern of potentially available beds may differ. The number of available and unoccupied NHS beds within 60 minutes' travel time in England in 2001 is shown on bmj.com. Access to these beds resembles the pattern of access in figure 2.

Demand relative to supply is shown in figure 3. This pattern is rather different to that of supply.

The demand per unoccupied bed was greatest in some of the areas of low supply—parts of East Anglia, the area near the Welsh border, part of Cornwall—and in areas of relatively high supply—the south east except for London, and south of Bristol. In contrast, other areas of low supply (for example, the Scottish borders) also had low demand, so demand relative to supply was low and the potential for choice was high. The areas with the highest demand per available and unoccupied beds were concentrated in the south east, particularly outside London, parts of the south west (Cornwall, Bristol), East Anglia, and an area alongside the Welsh border.

Discussion

Almost everyone in England has access to an NHS trust within an hour's travel time, and over 90% of people have a choice of two providers. Areas with fewest NHS trusts within an hour's travel included the Scottish borders; North Yorkshire and parts of Lincolnshire and East Anglia; and Devon and Cornwall. These are also the areas with lowest access to available and unoccupied NHS beds. When private facilities were considered then access improved to hospitals in most of these areas except for the north east of England, south Lincolnshire, and north Cornwall. This finding is, however, misleading, as access to beds is not improved because of the small number of beds in

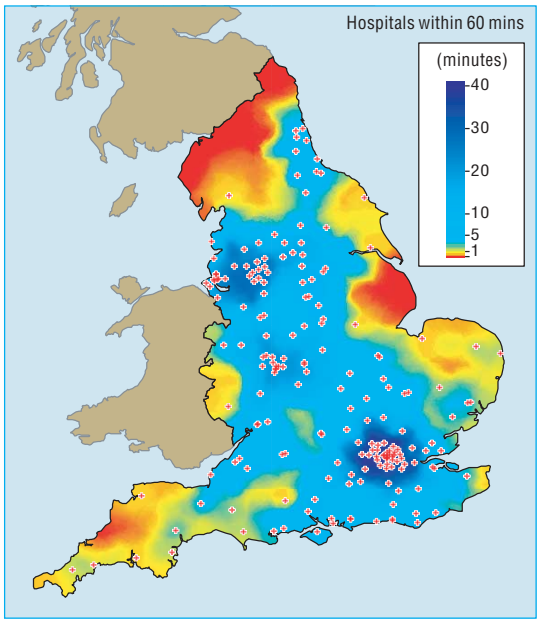

Fig 2 Number of NHS trusts within 60 minutes' travel time, England, 2001

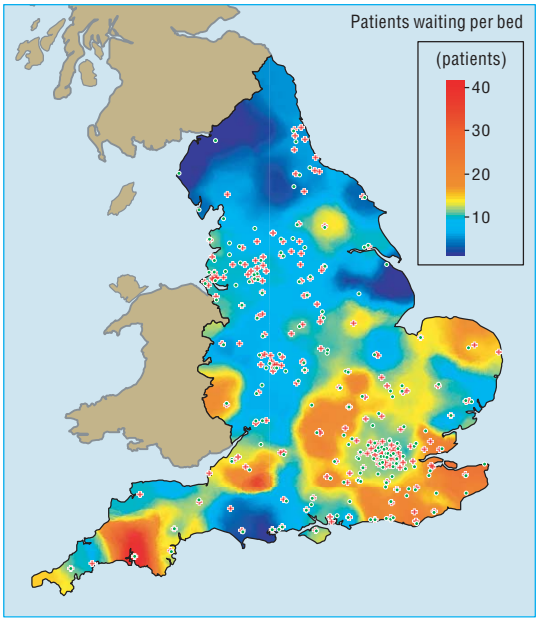

Fig 3 Number of patients waiting longer than six months for elective inpatient care per available and unoccupied NHS bed, and private beds within 60 minutes' travel time

private facilities. If a large number of NHS patients are to exercise choice of hospital then choice of NHS facilities rather than private facilities needs to be expanded.

The pattern changes when demand and supply for beds are considered together. The areas of low choice include most of the south east (outside London) stretching to the south coast, East Anglia, an area south of Bristol, and Cornwall. Private beds alleviate some of this demand on NHS facilities in London and surrounding areas.

Limitations of study

Our study has several limitations. We focused on only travel as one aspect of choice, whereas patients are concerned about several factors. Travel was assumed to be by car. We chose a maximum (one way) travel time of 60 minutes for elective care, whereas patients might have treatment on a day case basis or may have a longer stay and desire visits. In both these cases a maximum one way travel time of two hours a day seemed a reasonable assumption. We examined the sensitivity of our results using this assumption. As travel time is lengthened, the number of hospitals and beds a patient can access increases. The choice of 60 minutes blurs some of the differences between accessible areas. Travel time is also only one measure of accessibility; other measures that are important include the cost of travel and the availability of public transport. Public transport may reduce or increase the travel time, resulting in an overestimation or underestimation of the travel times in our study.

To measure spare capacity we used available and unoccupied beds classified only as general or acute. Spare capacity was calculated from a census of beds at one time point. Other factors for supply are also relevant, such as the number of available staff (and the ratio of staff to patients) and the availability of operating theatres. An assumption implicit in our analysis is that every available and unoccupied bed could be staffed to treat increased demand from patients waiting longer than six months who exercised choice from elsewhere in the country. Another assumption is that these beds would be available for elective care, whereas patients admitted as emergencies would compete for those beds. It is not possible to estimate from routine data sources the actual number of beds available for elective care. We also cannot assign beds to specialities with any confidence. For these reasons we may have overestimated the extent of choice of provider and underestimated the time patients would need to travel to access spare capacity. However, if bringing into use such spare capacity incurred the same costs everywhere, the relative rankings of areas would not change. Finally, if it is easier to bring spare capacity into use in the private sector rather than the public sector, our analysis would underestimate the contribution of the private sector to choice.

We have assumed that all specialties contribute equally to waiting list figures, but the distribution of waits may be uneven.[13] Finally, we assume that differences in waiting times that pertain to NHS trusts are relevant to the population in their local areas.

Implications for policy

Patients in England who want to exercise choice of provider have varied distances to travel. Thus the cost of exercising such choice will vary. Differences in costs could be overcome by subsidising travel for those requiring longer journeys.

Expanding choice of provider may also require altering referral patterns in primary care, which in turn would require better provision of information for referrers on available services. Finally, new capacity (or measures to use existing capacity better) needs to be focused on East Anglia, Devon and Cornwall, and the areas surrounding London. These are not the areas in which diagnostic and treatment centres are to be located, thus given the current patterns for referral and capacity these facilities may do little to increase choice.

What is already known on this topic

Patients are interested in exercising choice of provider for elective care

The NHS has a large potential for such choice

Patients are willing to travel to exercise their choice

What this study adds

In England, patients living in the south east (except London), East Anglia, an area south of Bristol, and Cornwall have the lowest choice of provider for elective care

Subsidising travel for people located in these areas may make choice of provider more attractive

Currently the supply of acute beds in non-NHS facilities is too small to make a significant contribution to patient choice

Contributors: JD and CP conceived the study. All, in particular MD, developed the methods. MD was responsible for the analysis and producing the maps. JD and CP wrote the article. MD commented critically on the paper. CP revised the paper in the light of reviewers' comments. All authors are guarantors.

Funding: None.

Competing interests: None declared.

Ethical approval: Not required.

1 Mori poll for BMA finds many patients willing to travel abroad for treatment. Press release archive, Jun 2002. www.mori.com/polls/2002/bma-travel.shtml (accessed 7 Jan 2005).
2 Department of Health. Performance. 2005. www.dh.gov.uk/PolicyAndGuidance/Performance/fs/en (accessed 7 Jan 2005).
3 *Laing's healthcare market review 2001-2*. London: Laing and Buisson, 2002.
4 *Dr Foster good hospital guide 2002*. London: Vermilion, Ebury, 2002.
5 *Directory of independent hospitals and health services 1998/1999*. London: Financial Times Health Care, 1999.
6 National Administrative Codes Service. www.nhs.uk/nacs/ (accessed 7 Jan 2005).
7 MapInfo. www.mapinfo.com (accessed 28 Jan 2005).
8 Mappoint. www.mappoint.com (accessed 7 Jan 2005).
9 Department of Transport. www.dft.gov.uk (accessed 7 Jan 2005)
10 RAC. www.rac.co.uk/ (accessed 7 Jan 2005).
11 Automobile Association. www.theaa.com/ (accessed 7 Jan 2005).
12 Edina. UKborders. edina.ac.uk/ukborders/ (accessed 7 Jan 2005).
13 Martin RM, Sterne JAC, Gunnell D, Ibrahim S, Davey Smith G, Frankel S. NHS waiting lists and evidence of national or local failure: analysis of health service data. *BMJ* 2003;326:188-98.

(Accepted 15 November 2004)

Mortality associated with passive smoking in Hong Kong

S M McGhee, S Y Ho, M Schooling, L M Ho, G N Thomas, A J Hedley, K H Mak, R Peto, T H Lam

Passive smoking can cause death from lung cancer and coronary heart disease, but there is little evidence for associations with other causes of death in never smokers. A recent study showed increased all cause mortality with exposure to secondhand smoke at home but did not examine associations with specific causes of death and dose-response relations.[1] We have published estimates of the mortality attributable to active smoking in Hong Kong[2] and now present the related findings on passive smoking at home.

Participants, methods, and results

Details of the sample selection and data collection have been reported.[2] Each person who reported a death in 1998 at four death registries was given a questionnaire which asked about the lifestyle 10 years earlier of the decedent and of a living person about the same age who was well known to the informant. Passive smoking was identified in the interview with the question, "Ten years ago, in about 1988, excluding the decedent/control, how many persons who lived with the decedent/control smoked?" Decedents or controls who lived with one or more smokers were classed as exposed. Cause of death was obtained from the death certificate.

We selected never smoking decedents and controls aged 60 years or over because there were few younger controls. To avoid selection bias, we included only cases and controls who had a living spouse at the time of reporting. We used logistic regression to derive odds ratios adjusted for age and education, and for sex when men and women were combined.

We identified 4838 never smoking cases (55% male) and 763 never smoking controls (55% male). All controls were used in the analysis for each specific cause of death.

We found significant dose dependent associations between passive smoking and mortality from lung cancer, chronic obstructive pulmonary disease, stroke, ischaemic heart disease, and from all cancers, all respiratory and circulatory diseases, and all causes (table). The association between mortality and passive smoking did not differ between males and females. Deaths due to injury or poisoning were not associated with passive smoking.

Comment

Dose dependent associations between passive smoking and causes of death are consistent with previous findings for lung cancer and coronary heart disease and extend the evidence on stroke. Previous studies have shown associations between passive smoking and first acute strokes,[3 4] and we have now shown a dose-response relation with mortality from stroke. Previous studies focused on ischaemic strokes but Chinese populations have a greater incidence of haemorrhagic stroke than do white populations,[5] implying that many of the strokes in our study may have been non-ischaemic. Passive smoking probably affects all stroke subtypes, as does active smoking.

Our finding of a 34% increase in all cause mortality is consistent with but higher than that (15%) in the New Zealand cohort.[1] Exposure to secondhand smoke at home is higher in Hong Kong than in New Zealand due to crowded living conditions. Before the 1990s, awareness of the danger of passive smoking was lower and smokers smoked freely at home.

We focused on passive smoking at home because the proxy reporter could most reliably supply these data, and we adjusted for education, which was also

What is known on this topic

There is strong evidence that passive smoking is causally associated with death from lung cancer, coronary heart disease, and all causes, and also with acute stroke

What this study adds

The dose-response relation between passive smoking and mortality from stroke and chronic obstructive pulmonary disease, as well as from lung cancer, ischaemic heart disease, and all causes of death, strengthens the causal link

This article was posted on bmj.com on 27 January 2005: http://bmj.com/cgi/doi/10.1136/bmj.38342.706748.47

See *Editorial* by Kawachi

Department of Community Medicine, University of Hong Kong, 21 Sassoon Road, Pokfulam, Hong Kong, China
S M McGhee *associate professor*
S Y Ho *research assistant professor*
M Schooling *research associate*
L M Ho *senior computer manager*
G N Thomas *research assistant professor*
A J Hedley *chair professor*
T H Lam *chair professor and head of department*

Department of Health, Student Health Service, 4/F Lam Tin Polyclinic, Kowloon, Hong Kong, China
K H Mak *consultant, community medicine*

Nuffield Department of Clinical Medicine, University of Oxford, Oxford OX2 6HE
R Peto *professor of medical statistics and epidemiology*

Correspondence to:
T H Lam
hrmrlth@hkucc.hku.hk

BMJ 2005;330:287–8