CMPO Working Paper Series No. 04/095

Mapping choice in the NHS: Analysis of routine data

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March 2004

Abstract

Background New policies in the National Health Service in England seek to extend the choice of provider of care for patients on waiting lists for elective surgery. We try to identify where in the country there are likely to be most constraints on choice for patients waiting over 6 months for elective care.

Methods The available supply, demand, and access to hospital care in England are estimated using routinely collected information and illustrated on maps.

Findings For most of the population there is already a significant potential choice of hospital. The number of available and unoccupied beds within 60 minutes travel time is lowest in the Scottish borders, north Yorkshire, and parts of East Anglia, Lincolnshire, Devon and Cornwall. Adding in private facilities does not alter this pattern. Putting together demand with this supply, the number waiting over 6 months per bed within 60 minutes travel time is highest in the South East (except London), parts of the South West (Cornwall, Bristol), East Anglia and the Welsh border.

Interpretation 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.

Keywords: NHS Choice, Hospital Care, Travel to Hospital

JEL Classification: H4, I11

Acknowledgements
We thank the Leverhulme Trust for funding this research .

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CMPO is funded by the Leverhulme Trust.

Introduction

One current aim of Government policy is to introduce more choice into the NHS. There are several key policies on this theme. The supply of providers - public and private - in secondary care (particularly elective care) and primary care is being boosted. For example, 18 new diagnostic and treatment centres (DTCs) are now open and a further 40 are planned (1)(2). Competition, or at least contestability, among secondary care providers is being enhanced (3). The available choice of secondary care provider to patients waiting more than 6 months for elective care is to be expanded, and a national consultation exercise on choice is underway in preparation for a forthcoming Government White Paper (4). A new system of financial flows around the NHS, essentially a cost-per-case mechanism, underpins these changes (5).

Increasing patient choice of provider is central to this clutch of policies (4). Since 2002 two groups of patients - all those waiting over 6 months for cardiac surgery, and all those in London waiting over six months for treatment in selected specialties - have been offered a choice of provider offering quicker treatment. Early results show that choice is very popular, for example, in pilot schemes in London involving 5000 patients over 70% opted to choose to be treated in another provider. A MORI poll for the BMA last year showed that, if facing a long wait for NHS care, 27% of people would be prepared to travel anywhere in the UK for NHS treatment (6). The intention of Government is to expand the patient choice model to all patients waiting over 6 months for treatment across all specialties by August 2004.

Expanding choice of provider to patients is a challenge in a system like the NHS in which there is a limited supply, for example, of hospitals, staff and beds. If choice is to be given, are there differences in the time those seeking care will have to travel?. If so, where will people have to travel furthest to exercise this choice? Will increased use of existing private facilities, in addition to those in the NHS, change the amount of time people will have to travel? We address these questions in the empirical study described below.

Methods

Focusing on England, we use routine available data for the NHS and the private sector to construct maps to show first the location of the available supply of NHS and private beds for elective care and the accessibility to this supply of beds for patients measured in terms of the time taken to travel to the facilities. We calculate travel time from the location in which patients live: their census electoral ward. Second, given this pattern of available supply, we add in demand (again relative to travel time) and show where in the country there are likely to be most constraints on choice for patients. We focus on travel time by patients as the unit of analysis, rather than more commonly used administrative or geographical units, since this perspective is more likely to be relevant for patients.

Data sources

Data on the number of 'general' and 'acute' beds open and available by NHS trust at March 2002 was downloaded from the Department of Health web site (7). The number of available and occupied 'general' and 'acute' beds are published, from which the number of available *unoccupied* beds (potential spare capacity) was calculated.

Data on the number of beds in private (non-NHS) hospitals and private facilities in NHS Trusts as of 2001 were obtained (8)(9)(10). Only private facilities that provided care in medical and surgical specialties were included - facilities that provided other services exclusively (for example rehabilitation after addiction, care for the mentally ill, and termination of pregnancy) were excluded. Data on the number of available and occupied beds per private facility were not available, so bed occupancy was estimated as being 60% as this is historically the level of occupancy experienced by the UK private sector (8). Therefore the number of available and unoccupied non-NHS beds are estimated as 40% of the total number of beds.

The postcodes of all acute NHS Trusts were obtained from the Department of Health's Organisational Codes Service (11). The postcodes of private facilities were obtained from published directories (8)(9)(10). The number of patients in each NHS Trust waiting over 6 months for NHS inpatient care for the last quarter 2001/02 was obtained from the Department of Health website (12).

Mapping data and calculating travel times

The postcodes of NHS acute trusts and private hospitals were imported into MapInfo and presented as a map showing the location of these facilities.

To calculate travel time to NHS and private facilities, the travel times and distances between hospitals and the centroids of electoral wards, or the centroids of local authority districts, were calculated using Microsoft MapPoint. Travel times were adjusted to reflect *average* travel speeds by car across different parts of the country as published by the Department of Transport (13). Local authority district and electoral ward boundaries were constructed using data from the 1991 census (using enumeration district boundaries) obtained from the UKBORDERS web site (14). The travel time was calculated from the centroid of each electoral ward in England to the centroid of the electoral ward in which the main postcode of each NHS Trust or private facility was located. For those cases in which the travel time was longer than 60 minutes, the travel time was calculated from the centroid of the local authority district (rather than the ward centroid) to the centroid of the electoral ward in which the main postcode of each NHS Trust or private facility was located. This way, the number of facilities (hospitals and beds) that could be reached within specified travel times of patient location in England could be identified.

To calculate the number of people, or the proportion of the population of England, that had theoretical access to NHS or private facilities within certain travel times, population figures for each electoral ward were obtained from the 2001 census. Where the boundaries of wards had changed since 1991, the 2001 population figures were adjusted accordingly.

The number of patients waiting over 6 months was identified for all NHS Trusts. The number of patients waiting per available and unoccupied bed was calculated for all NHS Trusts within 60 minutes travel time of each electoral ward in England. This figure was calculated to provide an estimate of the demand for care relative to the available and accessible spare capacity.

The resulting maps were generated in MapInfo and Vertical Mapper.

Results

Map 1 shows the location of each acute NHS Trust in England (each Trust shown as a cross). For each area of the country the travel time to the nearest acute NHS Trust is shown as a gradation of colour. The blue areas show highest access, the red areas lowest access. There is an obvious concentration of hospitals in London, Birmingham, the Manchester/Liverpool and Tyneside areas.

Map 1 Travel time to nearest acute NHS Trust, England, 2001

The map shows that for most areas of the country, an acute NHS Trust is accessible within 100 minutes of travel, and for large parts of the country, a NHS Trust is accessible within 30 minutes (shaded as either blue or green on the map). In fact 25% of the population had exactly one hospital within 15 minutes, 41% had up to two. 15% did not have a hospital within 30 minutes, but 98% had a hospital accessible within an hour of travel. 92.4% had two hospitals to choose from within one hour of travel.

The map also suggests that there are three areas of the country in which the population has to travel relatively longer to reach an acute NHS Trust than elsewhere: the north of England close to the border with Scotland; East Anglia and parts of Lincolnshire; and parts of Devon and Cornwall.

Map 2 shows the number of NHS Trusts within one particular travel time - 60 minutes - in England. Again the blue areas show relatively higher access, and the red areas lower access.

Map 2 The number NHS Trusts within 60 minutes travel time, England , 2001

As noted above, the population in most of England has access to at least one trust within 60 minutes travel time. Map 2 shows more clearly the areas in which there is least choice of supply: the Scottish and Welsh borders, and parts of East Anglia, Lincolnshire and the South West.

Map 3 The number of NHS Trusts and private facilities within 60 minutes travel time, England, 2001.

Map 3 shows the picture when private facilities (shown in green) are also considered. This is similar to map 2, except the existence of private facilities has the effect of increasing the number of facilities available within 60 minutes travel time, particularly in the relatively low supply areas noted above. But because of the relatively small number of private facilities, and because most are located near NHS facilities, the proportion of the population with access to NHS and private facilities within an hour is only 1% higher than the proportion with access to the NHS alone.

Map 4 The number of available and unoccupied NHS beds within 60 minutes travel time, England, 2001.

Hospitals vary in size so that the pattern of potentially available beds may be different to that of hospitals. Map 4 shows the number of available and unoccupied NHS beds within 60 minutes travel time, England, 2001. It shows that access to available and unoccupied NHS beds resembles the pattern of access to hospital facilities shown in map 2. 98% of the population have access to up to 100 unoccupied NHS beds within one hour of travel, and 76% have up to 500. The picture for the number of available and unoccupied NHS *and* private beds within 60 minutes travel time, England, 2001 is almost identical to map 4, due to the relative paucity of private beds (data not shown). On the supply side, therefore, the potential for choice of provider by the population is large, much of the population having access to beds within 60 minutes.

Map 5 shows demand relative to this supply: the number of patients waiting over 6 months for elective inpatient care per available and unoccupied NHS bed within 60 minutes' travel time. This is a measure of the potential for choice.

Map 5 The number of patients waiting over 6 months for elective inpatient care per available and unoccupied NHS bed within 60 minutes travel time

The map shows that the demand per unoccupied bed is greatest in both some of the low supply areas noted above - parts of East Anglia, the area near the Welsh border, part of Cornwall - but also in relatively high supply areas - the whole of the South East except for London, and south of Bristol. In contrast, other low supply areas (for example, the Scottish borders) also have low demand, so demand relative to supply is low and potential for choice is high.

Adding in the number of available and unoccupied beds in the private sector (map 6), shows the effective competition for available and unoccupied beds in different parts of the country.

Map 6 Number of patients waiting over 6 months for elective inpatient care per available and unoccupied NHS bed and private beds within 60 minutes travel time.

The pattern is again similar to that without private beds. The areas in which there is a lot of competition for beds are concentrated in the South East, particularly outside London, parts of the South West (Cornwall, Bristol), East Anglia and an area alongside the Welsh border. The population in all these areas will need to travel further than that living in other areas of England to access available beds.

Discussion

The results show that for most of the population there is significant potential choice of hospital. Almost all have access to an NHS Trust within an hour's travel time, and for over 90% there is a choice of two NHS providers. This echoes research for the 1990s that found that hospital location was such that competition between hospitals was possible for large areas of England (15, 16). The areas with the lowest number of NHS Trusts to choose from within an hour's travel include: the Scottish borders; north Yorkshire and parts of Lincolnshire, East Anglia; and Devon and Cornwall. Unsurprisingly these are the areas also with lowest access to available and unoccupied NHS beds. Taking into consideration private facilities does improve access to hospitals in most of these areas, except the very north east of England, South Lincolnshire and north Cornwall. But this is somewhat misleading, as access to beds is not improved because of the small number of beds in private facilities. Our results show that if the exercise of choice of hospital provider by a large number of NHS patients is to be a reality, this will depend on expanding choice of existing NHS rather than private facilities.

Taking into consideration the demand for beds, as well as the supply, the pattern changes. Now, the areas of low choice include a large part of the South East (outside London) stretching to the south coast, East Anglia, an area south of Bristol, and Cornwall. Why this is stems from, at least two, sources: in East Anglia and Cornwall it appears that a lack of available beds drives the lack of choice; in the South East a relatively high stock of patients already awaiting treatment. Private beds alleviate some of this demand on the NHS in London and the area immediately around it.

It appears that patients seeking to exercise choice will have to travel different amounts in different parts of England. Thus the costs of exercising choice for patients will vary. One way of overcoming this would be to subsidise travel for patients who have to make longer journeys: this analysis suggests these patients will be located in specific areas.

Travel time may not be the only barrier to the exercise of choice. Patients in pilot studies have expressed an interest in going to alternative providers but a recent survey of 44710 patients in England who were referred from primary care showed that 73% were not given a choice of hospital or specialist (17). Expanding choice may require altering referral patterns in primary care This, in turn, would require better

information for the referrers, for example on different services available, their quality and on capacity But even with this better information, the results here suggest patients in some areas would have to travel further to exercise this choice

Limitations

The travel time data only refers to travel in a car, whereas patients may not always choose, or be able, to use this form of transport. This paper presents results using a 60 minute maximum (one way) travel time for elective care. Elective patients might have treatment on a day-case basis, or they may have a longer stay, and desire visits from relatives or friends. In both these cases, a maximum travel time of 2 hours in a day seemed a reasonable (one way) travel time for patients being treated for elective care. The sensitivity of the results to this assumption was examined. As travel time is expanded, the number of hospitals and beds a patient can reach rises. Only 25 percent of people can reach more than one hospital within 15 minutes. The comparable percentages for 30, 60 and 90 minutes are 68, 95 and just under 100 percent. The choice of 60 minutes blurs some of the sharp differences between areas that would arise if a shorter travel time was used. Given it is not known how long most patients would be prepared to travel, the choice of a time that reduces sharp differences between areas makes differences in choice between areas less stark.

Travel time is also only one measure of accessibility of a patient to a provider; other measures of access that are important to patients include for example the cost of travel and the availability of public transport. Public transport in some areas of the country may reduce or increase the travel time to providers, resulting in the travel times being over-or underestimated in this study. It was not possible to take these factors into account using secondary data sources.

We use only one measure of spare capacity in acute providers - the number of available and unoccupied beds classified as 'general' and 'acute'. This figure was calculated from a snapshot census of beds at one point in time and clearly the number will fluctuate. Obviously other 'supply' factors are also relevant such as the number of available staff (and the ratio of staff to patients) and the availability of operating theatres to carry out elective procedures. A large assumption implicit in our analysis is that every available and unoccupied bed could be staffed in order to treat increased demand from over six-month waiters who exercised choice from elsewhere in the country. Another assumption is that these beds would be available for elective care, whereas in reality patients admitted as emergencies would also be competing for those beds. It is not possible, using routine data sources, to estimate the actual number of beds available for elective care. For these two reasons we may have overestimated the amount of choice of provider available, and underestimated the time patients would need to travel to access spare capacity. If it is easier to bring into use spare capacity in the private sector that the public sector, the analysis presented here would underestimate the contribution of the private sector to choice.

The paper uses number of patients waiting over six months at each Trust as an indicator of potential demand for beds. Waiting times are a stock measures, and as such will be affected by supply side factors, such as hospital inefficiency or the quality of care provided, as well as demand. They are therefore not a measure of demand alone. However, in a system such as the NHS in which care is rationed by waiting lists (among other methods), the greater the number of persons waiting for care at any particular Trust, the greater the competition for a bed at that Trust. Finally, the waiting times pertain to a Trust, rather than a local area: the analysis here assumes that this difference is not important.

Conclusion

To our knowledge this is the first paper that has analysed demand and supply using travel time. Other researchers have used travel distances to calculate potential competition for NHS trusts (16). However, analyses which have looked at both the demand and supply sides together have used administrative areas as the unit of analysis (19).

Considering the supply side only, the potential for choice of provider by the population in England is large. Yet taking into account demand for beds and travel time to them, the pattern changes. Pressure on beds, within a given travel time, is highest, in the South East (outside London), East Anglia, an area south of Bristol, and Cornwall. People in these areas needing elective care are likely to have to travel further to exercise meaningful choice. To make choice meaningful and equitable may mean introducing subsidies for travel for people located in these low choice areas. It may also require better information for referrers on the patterns of available capacity.

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What is already known about this topic

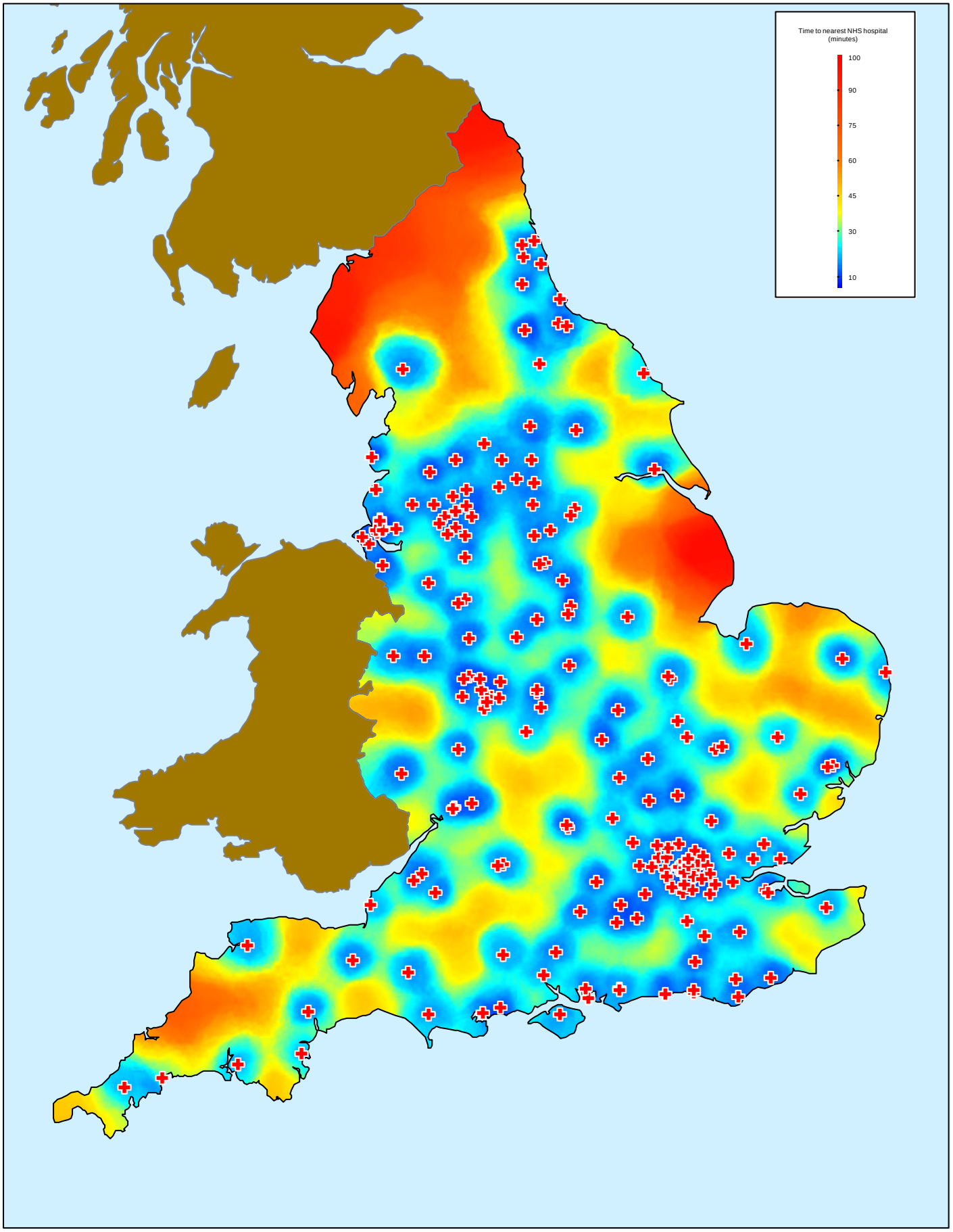
- There is significant interest by patients in exercising choice of provider for elective treatment
- Patients are willing to travel
- There is a large potential for choice of provider in the NHS

What this study adds

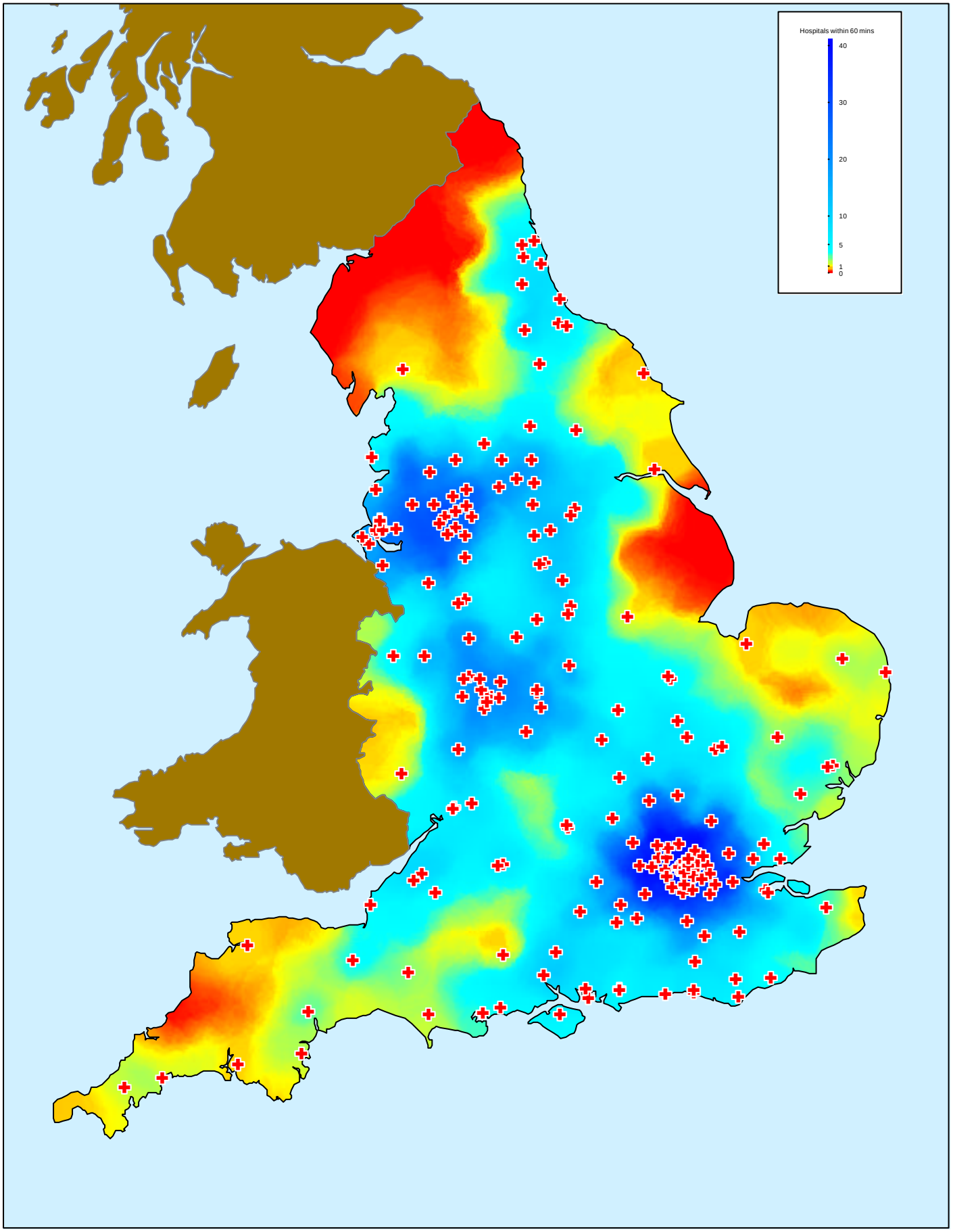
- A new method of measuring the potential for choice based on supply, demand and travel time
- The lowest choice areas in England are: the South East (except London), East Anglia, an area south of Bristol, and Cornwall.

Contributors: JD and CP had the basic original idea, MD contributed greatly to expanding the idea. All, in particular MD, contributed to developing the methodology. MD was responsible for the analysis and producing the maps, JD for writing up. CP and MD commented critically on the paper and made alterations.

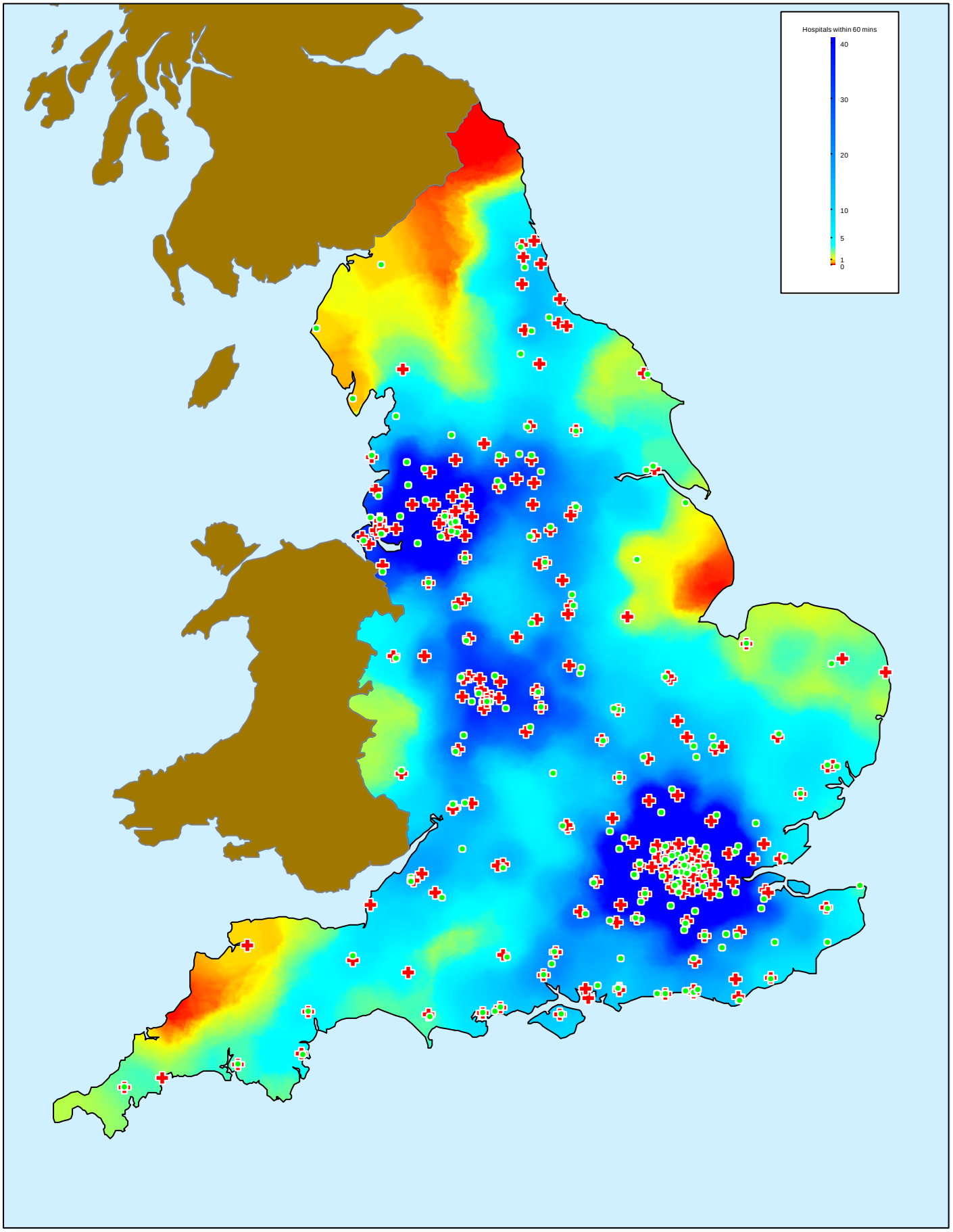
Map 1: Travel time to nearest acute NHS Trust, England, 2001



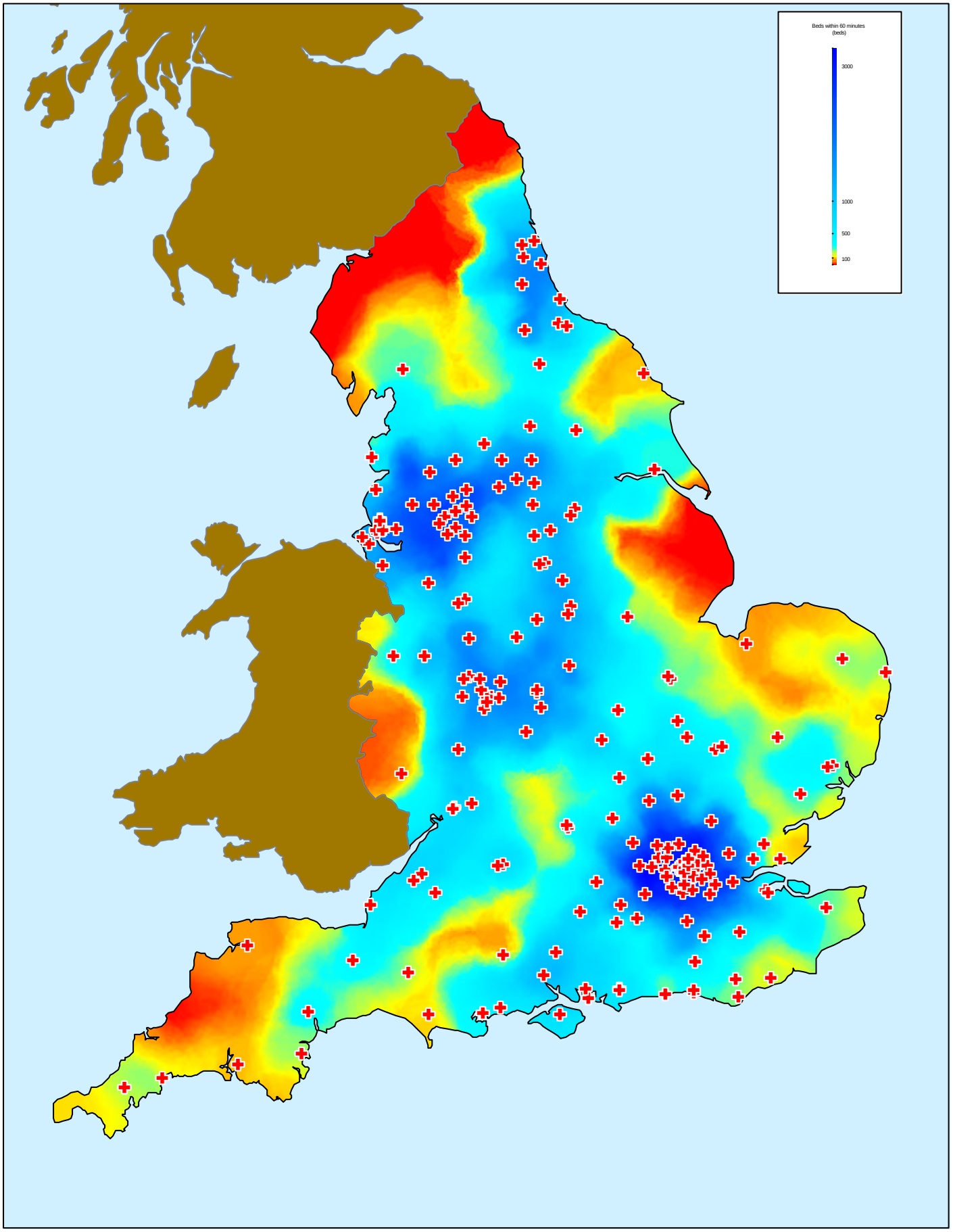
Map 2: Number of NHS Trusts within 60 minutes, England, 2001



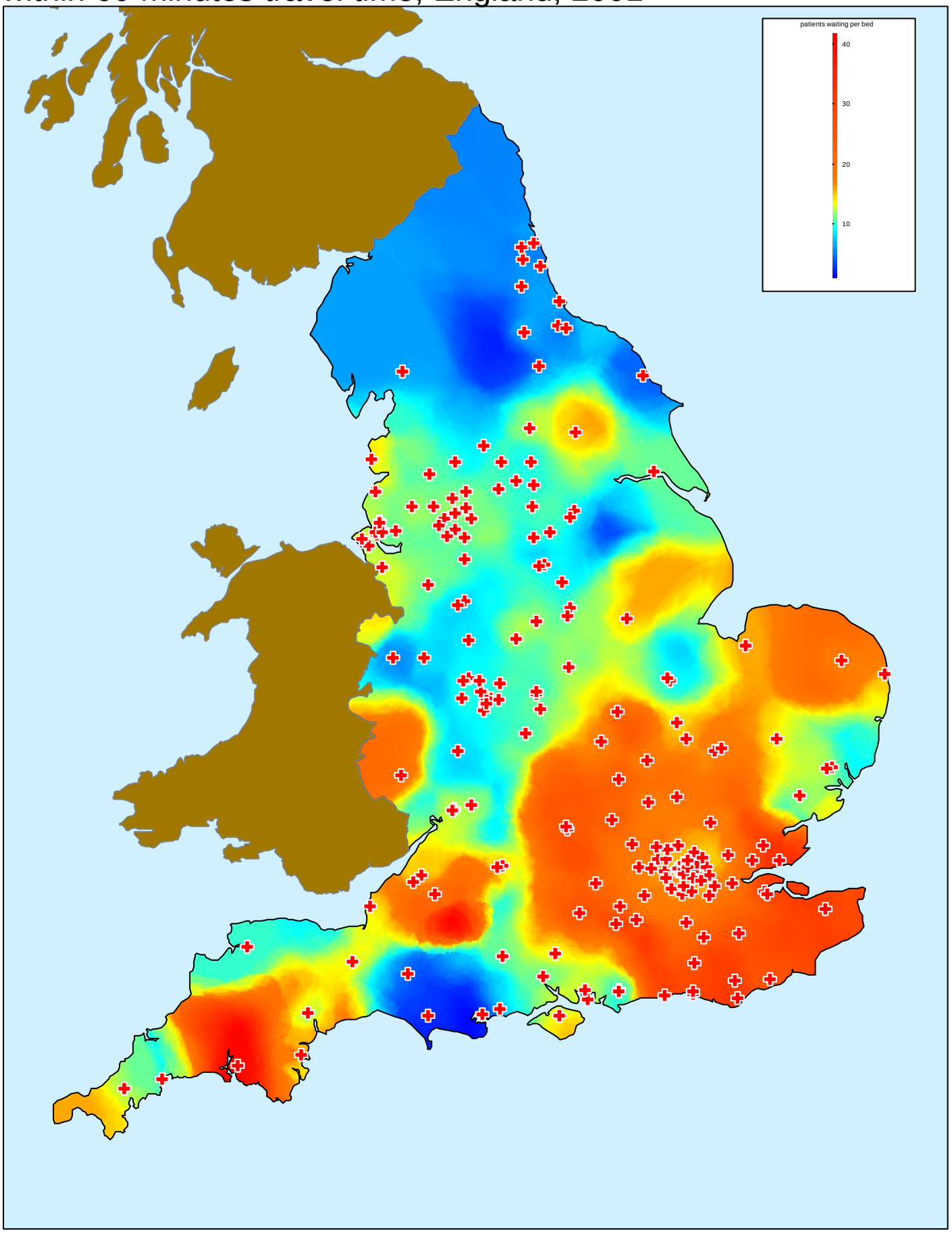
Map 3: Number of NHS Trusts and private facilities within 60 minutes, England, 2001



Map 4: Number of available and unoccupied NHS beds within 60 minutes, England, 2001



Map 5: Number of patients waiting over six months for elective inpatient care per available and unoccupied NHS bed within 60 minutes travel time, England, 2001



Map 6: Number of patients waiting over six months for elective inpatient care per available and unoccupied NHS and private bed within 60 minutes travel time, England, 2001