QualityWatch

Focus On: Distance from home to emergency care

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About this work programme

This QualityWatch Focus On report examines the typical distances from home that people travel to receive emergency care, and how this has changed over time. It explores the distances between a person's home and the hospital at which they attended A&E, or received an emergency inpatient admission, using Hospital Episode Statistics from the 10-year period from 2001/02 to 2011/12.

QualityWatch Focus On reports are regular, in-depth analysis of key topics. These studies exploit new and innovative methodologies to provide a fresh view of quality in specific aspects of health and social care.

QualityWatch is a major research programme providing independent scrutiny into how the quality of health and social care is changing over time.

Developed in partnership by the Nuffield Trust and the Health Foundation, the programme provides in-depth analysis of key topics and tracks an extensive range of quality indicators. It aims to provide an independent picture of the quality of care, and is designed to help those working in health and social care to identify priority areas for improvement. The programme is primarily focused on the NHS and social care in England, but will draw on evidence from other UK and international health systems.

The QualityWatch website **www.qualitywatch.org.uk** presents key indicators by area of quality and sector of care, together with analysis of the data. This free online resource also provides research reports, interactive charts and expert commentary.

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Contents

List of figures and tables

Figures

Tables

Glossary

111	The telephone number that people in the UK can ring if they need urgent medical help or advice but they are not faced with a life-threatening situation.
Centroid	The centre mass of a two-dimensional region. For this report, the population density of areas of an LSOA represents the mass.
Confidence interval	Gives an estimated range of values which is likely to include an unknown population parameter, the estimated range being calculated from a given set of sample data.
Easting	The difference in between two positions as a result of a movement to the east.
Hospital Episode Statistics (HES)	Contain details of all NHS inpatient treatment, outpatient appointments and A&E attendances in England. They include private patients treated in NHS hospitals, patients resident outside of England and care delivered by treatment centres (including those in the independent sector) funded by the NHS.
Lower Super Output Area (LSOA)	Geographical areas within local authority areas, created for the 2001 Census. Each contains an average of 1,500 residents.
Major A&E department	A consultant-led 24-hour service with full resuscitation facilities and designated accommodation for the reception of A&E patients.
Major trauma centre	A hospital that provides specialist doctors and equipment to treat major trauma, which would be too expensive for all hospitals to supply.
Mean	A value that represents the most likely value in a sample, calculated by dividing the sum of all observations in the sample by the number of observations.
Median	A value halfway through the ordered dataset, below and above which there lies an equal number of data values.
Northing	The difference in between two positions as a result of a movement to the north.
Null hypothesis	The supposition that there is no relationship between two observed events, or that a potential treatment has no effect. Disproving the null hypothesis (or at least showing its probability of being true as minimal) is a central part of modern research.

Odds ratio	A measure of association between an exposure and an outcome, representing the odds that an outcome will occur given a particular exposure, compared with the odds of the outcome occurring in the absence of that exposure.
p-value	In statistical significance testing, the p-value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true.
Percentile	A measure used in statistics indicating the value below which a given percentage of observations in a group of observations falls. For example, the 20th percentile is the value (or score) below which 20 per cent of the observations may be found.
R^2	The proportion of the variation in a sample that is explained by a statistical model.

Summary

The accessibility of hospital emergency services is often seen by the public as a critical marker of the level of investment in healthcare. Yet, although public engagement in debates about closures of Accident & Emergency (A&E) departments is usually very strong, there is little systematic information about the typical distances that people travel for emergency care, or how this has changed over time. There has already been an increase in the number of these debates about closures of hospital sites and services due to the current period of constrained financing for health services, and there are likely to be many more in the near future.

Reconfiguration of services is especially topical for emergency care following the publication of the first phase of a review by Sir Bruce Keogh (NHS England, 2013). The review recommends that the provision of emergency services is redesigned, to enable easier access to non-urgent care, relieving the pressure on major A&E departments (a consultant-led 24-hour service with full resuscitation facilities and designated accommodation for the reception of A&E patients; HSCIC, 2013). It is possible that this will result in fewer, better-equipped major A&E departments, with the money saved from closing or downgrading departments being used to fund alternatives, such as the 111 service (a telephone number that people can ring if they need urgent medical help or advice but they are not faced with a life-threatening situation) or additional minor injury units. As a result, many people who do require emergency care may have to receive it further from where they live, but may benefit from easier access and a better quality of care upon arrival.

For this report we undertook analysis of the distances from home to the A&E departments that people had attended. We then took this further to explore the distances between a person's home and the hospital at which they received an emergency inpatient admission, using emergency hospital admissions data from 2001/02 to 2011/12. We looked at the changes in the distribution of hospital-based urgent care provision, and how these impacted on the average distances from a person's home to hospital. Understanding the current patterns will provide a useful basis for monitoring how access changes following any future redesign.

Key findings

70%

of emergency admissions occurred within 10 km of a person's home

- Major A&E services are currently provided from 200 sites around England. We estimate that there has been a net reduction in the number of sites of around 8 per cent since 2001/02.
- The mean distance between a person's home and the A&E department that they attended was 7.2 kilometres (km) (4.4 miles), with a median of 4.2 km (2.6 miles), based on analysis of 13 million attendances in 2011/12. Eighty-four per cent of these attendances were by people living within 12 km (7.5 miles) of a major A&E department.
- The mean distance from hospital to home for an emergency admission was 8.7 km (5.4 miles), with a median of 5.5 km (3.4 miles), based on five million emergency admissions in 2011/12. Seventy per cent of emergency admissions occurred within 10 km of a person's home, and very few people (3 per cent) were admitted to a hospital over 30 km (18.6 miles) away from their home.

'there was considerable variation in the average home-to-hospital distances by local authority'

- There was considerable variation in the average home-to-hospital distances by local authority. The shortest average distance was 2.5 km (1.6 miles) for residents of the London Borough of Camden, and the furthest was 34.2 km (21.3 miles) for people living in the Eden District of Cumbria.
- Nationally, a small minority of all cases (9 per cent) were admitted over 20 km (12.4 miles) away from their home. In 26 of the 326 English local authorities, more than half of the emergency admissions occurred over 20 km from the person's home.
- There was a slight, but not statistically significant, increase in the average distance for an emergency admission in the 10-year period from 2001/02 to 2011/12, rising from 8.3 km (5.2 miles) to 8.7 km (5.4 miles).
- The biggest increase in the distances travelled was observed for emergency admissions following stroke, which rose from an average of 7.9 km (4.9 miles) in 2001/02 to 8.9 km (5.5 miles) in 2011/12. The average distance following trauma did not change substantially.

Implications

The distance between a person's home and the hospital at which they receive emergency treatment is surprisingly short in most cases, with over half occurring within 6 km (3.7 miles). This is just over half the distance that people are prepared to travel for other trips (11.3 km, 7 miles), such as travelling to work, education, shopping or leisure (Department for Transport, 2011). The vast majority of people – 95 per cent of the population – live within 20 km of their nearest A&E.

While there has been an enormous increase in the volume of care delivered through A&E and in terms of emergency care in hospitals since 2001/02, the number of locations where this care was offered has been generally quite stable. However, where an A&E department is closed or downgraded, the direct impact on the local population can be large, in some cases doubling the distance that they travel for emergency admissions. The national impact of these changes, on the other hand, is minimal, with no major jumps in the average distances. There are only nine local authorities for which the average distance has increased by more than 5 km (3.1 miles).

There has only been a small increase in the average home-to-hospital distances since 2001/02: from 8.3 km (5.2 miles) to 8.7 km (5.4 miles). But these average figures conceal the national distribution, and there is a subset of mostly rural areas where the distances are much further than this average. It is these areas where changes in acute hospital configurations (such as closures) would have the biggest impacts.

There is evidence that longer ambulance journey distances reduce the chances of survival for some incidents (Nicholl and others, 2007), but there are no hard-and-fast rules to say at what point patient outcomes are significantly compromised. Furthermore, consideration of how distance impacts on patient convenience, safety or reassurance needs to be offset by a range of other factors that influence choices about hospital facilities – such as whether there are enough staff to provide a safe service, how training is organised and whether sufficient support facilities for major A&E departments are available. There are also some hard questions about what services can be afforded in the current economic climate.

Specialist centres such as major trauma centres that have emerged recently, are an example of where slightly longer distances are acceptable in order to ensure that

'there has only been a small increase in the average home-to-hospital distances since 2001/02'

specialist staff and facilities are available. There has been a similar reconfiguration of stroke services in London to provide fewer hyper-acute stroke units, which are felt to be part of a major service change that has patient benefits. In north-east London, death from stroke has been shown to be half as likely for patients admitted to a centre that provides best-practice care (Palmer, 2011).

The current economic constraints and recommendations resulting from the Keogh Review (NHS England, 2013) may result in changes to the locations providing major A&E services. Our analyses illustrate the large differences around the country, which we believe should help inform local choices regarding the location of services.

1 Introduction

The ease of access that people have to NHS services is an important element of the quality of service they receive, and this includes the geographic location of services. The distance that people travel for emergency care is particularly important for the following reasons:

- *Effect on outcomes* – the distance travelled, which broadly approximates to time taken, is particularly important in the outcome of emergency admissions. For example, it has been shown that longer travel distances for cases of acute myocardial infarction in Scotland have a direct detrimental impact on survival rates (Wei and others, 2008). Another study has suggested that an increase in the distance travelled will adversely affect the likelihood of people surviving after serious accidents (Nicholl and others, 2007).
- *Choices about care* – although not universally true, it is certainly common that people prefer their care to be local, to minimise the inconvenience of travel for themselves, as well as for friends and family, when admitted. It has been shown that when services, such as A&E departments or out-of-hours services, are located too far away, people are less inclined to use them (Hull and others, 1997; Turnbull and others, 2008).
- *Public perceptions of 'safety' and reassurance* – we like to feel that in the event of a crisis, help is not far away. Although few people may choose a house or flat solely on the basis of its proximity to a hospital, for some people the distance they would need to travel to receive healthcare can figure in their calculations.

'services for stroke admissions... are provided at fewer locations to ensure that the quality of service provided is as high as possible'

Set against these factors are known benefits of larger hospitals. Over the past decade there has been recognition that it is more effective for certain cases to be treated at a specialised centre, even if this means that the patient must travel further to a hospital to receive treatment. In 2007, Lord Darzi called for a reconfiguration of both stroke and major trauma services in London, so that highly specialised services could be provided at a few specific locations (Darzi, 2007). In the same year, the National Stroke Strategy (Department of Health, 2007) stated that specialised stroke care units were the single biggest factor that can improve a person's outcome following a stroke. In response, services for stroke admissions have been through a process of consolidation, whereby services are provided at fewer locations to ensure that the quality of service provided is as high as possible. Similarly, the cost associated with providing the specialist doctors and equipment required to treat major trauma (NHS England, 2012) (which tend to be rare) has meant that 26 major trauma centres have been established across England.

In 2006, the Royal College of Surgeons of England suggested that a safe acute hospital should serve a population of no fewer than 300,000 people (Royal College of Surgeons of England, 2006). If the population of England were evenly spread, this would suggest that the optimum number of hospitals would be approximately 177, although clearly the issues need more than such simplistic calculations.

The question of the accessibility of emergency services is likely to be especially important over the next few years. Funding for the NHS between 2011/12 and 2014/15 has been effectively frozen in real terms (Roberts and others, 2012). The NHS has not experienced a financial situation as tight as this in five decades. This level is substantially lower than that to which the NHS has become accustomed, having received average real-terms increases of over six per cent a year between 1996/97 and 2009/10 (Crawford and Emmerson, 2012). The demands on the funding currently available for the NHS mean that savings will need to be made through increased efficiency and service redesign. A potential impact of this is that services provided at certain locations are likely to close, or be merged with services provided at other locations, resulting in some people having to travel further in order to receive healthcare.

Although the issue of distances often comes into the spotlight when individual hospital sites are affected, there have been few systematic national analyses that look at how far people travel for emergency care. Those that have, have focused specifically on the current picture, rather than looking at the trend over time. One such study found that there is considerable variation in the distances travelled for hospital treatment across England, with a median distance of 16.1 km (10 miles) (Propper and others, 2007). Similarly, we accept that those living in rural areas will have to travel further, but we are not clear how much further and how many people are affected.

Reconfiguration of services is particularly topical for emergency care following the publication of the first phase of a review by Sir Bruce Keogh (NHS England, 2013). The review recommends that the provision of emergency services is redesigned, to enable easier access to non-urgent care, relieving the pressure on major A&E departments (type 1 – a consultant-led 24-hour service with full resuscitation facilities and designated accommodation for the reception of A&E patients; HSCIC, 2013). It is possible that this will result in fewer, better-equipped major A&E departments, with the money saved from closing or downgrading other departments being used to fund alternatives, such as the 111 service (the telephone number that people can ring if they need urgent medical help or advice but they are not faced with a life-threatening situation) or additional minor injury units. As a result, many people who do require emergency care may have to receive it further from where they live, but might benefit from easier access upon arrival and, potentially, a better quality of care.

‘rates of emergency admissions are inherently linked to the availability of A&E services’

Rates of emergency admissions are inherently linked to the availability of A&E services. The vast majority (70 per cent) of emergency admissions come through an A&E department, and proposals to close or downgrade A&E sites often cause local protest. Despite the clear public concern, understanding the true picture of what has happened to the organisation and location of urgent and emergency care since the early 2000s is not easy. There is no single definitive dataset tracking the pace of changes in A&E services, and definitions of services change. So we have seen changes such as the introduction of major trauma centres and minor injury units and the opening and closing of A&E departments, but it is difficult to identify the size and pace of these changes. To estimate the level of change we explored data supplied to an independent longstanding directory of health services in England. However, we are acutely aware that summaries from a national perspective may be quite different from the changes that are obvious at a local level in certain areas.

In this report we explore one element of the access that people in England have to emergency inpatient services by estimating the distance between where they live and the hospital site that they used. We further explore the distances for people who have suffered from stroke or trauma, to test whether there is any noticeable effect due to the policy of delivering care at specialist centres. We then track how these distances changed over the 10-year period from 2001/02 to 2011/12, looking in detail at areas with the biggest change.

2
Methods

Data sources

In undertaking this analysis we were able to exploit the national inpatient dataset on hospital use – Hospital Episode Statistics (HES) – collected by the Health and Social Care Information Centre (HSCIC). These data record information on every hospital admission that occurs in an NHS hospital in England. They include information about the hospital site at which treatment was received and the patient's area of residence in terms of the 32,482 Census category 'Lower Super Output Areas' (LSOAs). These are small areas of around 1,500 people, which are often used for presenting administrative data. Crucially, they are small enough to provide useful information on where an event happened, but large enough to protect the identity of the individual. We also examined similar data on A&E attendances for all major A&E departments (type 1 – a consultant-led 24-hour service with full resuscitation facilities and designated accommodation for the reception of A&E patients; HSCIC, 2013) in England.

The NHS Connecting for Health (2013) National Administrative Codes Service (NACS) provided the site code and postcode for all NHS sites in England – those currently open and historical sites. A list of major trauma centres was obtained from NHS England (2012) and is provided in Appendix 1.

Emergency admissions and A&E attendances for which the hospital postcode or LSOA of the patient's home could not be identified were excluded. These accounted for less than two per cent of all emergency admissions (see Appendix 2).

Definitions

For this report, attendances at a major A&E department in 2011/12, and emergency inpatient admissions to NHS hospitals in England between 2001/02 and 2011/12, were examined. A&E attendances were limited to those where the department type is 1. An emergency admission was defined as one that had one of the following admission method codes:

- 21 – Emergency admissions via an A&E or dental casualty department of the healthcare provider
- 22 – Emergency admissions via a general practitioner
- 23 – Emergency admissions via a bed bureau
- 24 – Emergency admissions via a consultant clinic
- 25 – Emergency admissions via a mental health crisis resolution team
- 28 – Emergency admissions via other means.

In addition to analysing all emergency admissions, two specific subsets of admissions were identified related to certain conditions: stroke and trauma. Each inpatient episode contains between one and 14 diagnosis codes, which use

the codes from the 10th revision of the *International Statistical Classification of Diseases and Related Health Problems* (ICD-10; WHO, 2013) to record morbidities related to the admission. Admissions following trauma were identified using codes between 'S01' and 'T14', and stroke admissions were identified by codes between 'I60' and 'I69', or by codes 'G45' or 'R470'. Additionally, admissions following road traffic accidents were identified using codes between 'V01' and 'V99', or by code 'Y850'.

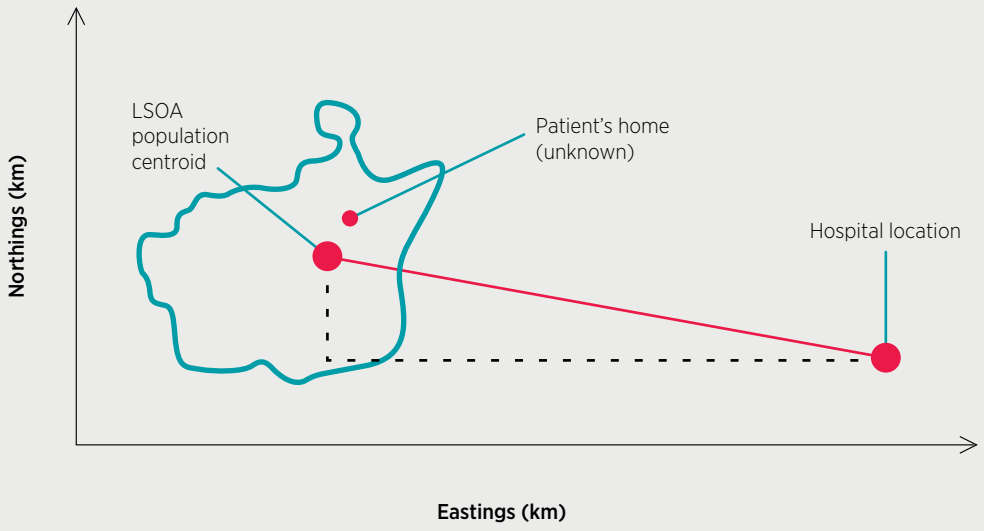
Episodes were grouped into spells using a combination of the following fields: HES person ID, provider code, provider spell number, admission method, patient classification, administrative category and admission date. Where one or more episode indicated stroke or trauma, the whole spell was considered to be associated with the condition.

We assumed that patients had travelled to hospital from their home. For reasons of confidentiality, we did not have access to patients' home addresses, so all patients living within an LSOA were assumed to live at the area's population-weighted centroid. This is a geographical point associated with where people live within the LSOA, rather than the geographical centre.

Distances

Using easting and northing data,[1] we identified the position for the postcode of each NHS site, along with the population-weighted centroid of each LSOA. This allowed a simple straight-line distance to be calculated by applying Pythagoras' theorem to the appropriate values for each emergency admission, as illustrated in Figure 2.1.

Figure 2.1: Example of calculating distance from a patient's home to hospital



1. Easting and northing data, from the ONS Census boundaries, provide a distance from a fixed point south west of the UK for each postcode in England, as well as the population adjusted centroid of each LSOA. Applying Pythagoras' equation allows for a straight-line distance to be calculated between any LSOA and postcode in England.

We used the LSOA centroid as an approximation of a person's home location, which is a population-weighted average location, rather than a person-level address. Results are provided at a national or local authority level. Therefore we do not think that this approximation would add a significance bias due to the relatively small size of an LSOA compared with a local authority.

Although it is likely in some cases that the person will have travelled to hospital from another location (such as their place of work), using their home LSOA provides a useful proxy for the access available in each area.

Some emergency admissions will arise while a person is travelling very far away from their home (for example while visiting another region of the country). Such admissions are not representative of that person's local access to emergency services; therefore we excluded distance travelled of over 80 km.[1] Counts of the emergency admissions excluded from the analysis in 2011/12 are given in Appendix 2.

Unlike inpatient admissions, monitoring the distances from home to A&E is complicated by the lack of precise information about which hospital site is visited. So, for example, we may know which NHS trust treated the patient, but there may be two or three different hospital sites within that umbrella organisation. Therefore we looked at the distance between the centroid of each attender's LSOA and the nearest major A&E department for the trust at which they attended, on the assumption that it was most likely that they would go to their nearest unit.

Locations

Understanding the change in the provision of A&E services since the early 2000s is not easy. There is currently no definitive record of the changes in the provision of hospital services. To estimate the level of change, we acquired data supplied to an independent longstanding directory of health services in England (Binley's). These data contain the name and address of each A&E department in England on 1 May in every year between 2006 and 2012. While there were occasional changes in the name used to identify a department, the postcodes used remained constant. Therefore we linked sites over time dependent on the postcode.

The Binley's directory identified 47 different types of A&E department using the address field. We split these into four groupings using the mapping provided in Appendix 3:

- major A&E department – a consultant-led 24-hour service with full resuscitation facilities
- minor injury unit – a predominantly nurse-led primary care facility dealing with illnesses and injuries
- paediatric A&E – an A&E department specifically for people aged 16 or under
- other – this includes ophthalmology A&Es.

1. We selected this distance because emergency admissions for people travelling over 80 km accounted for just over one per cent of all emergency admissions, but including them artificially raised the average distance by over 2 km.

3

Distances from home to hospital for emergency hospital care

How far do people travel for A&E attendances?

Of the 5.4 million emergency admissions that occurred in 2011/12, 70 per cent were admitted via an A&E department. The remainder were admitted following a referral from a:

- GP
- mental health crisis resolution team
- consultant clinic or
- a bed bureau.

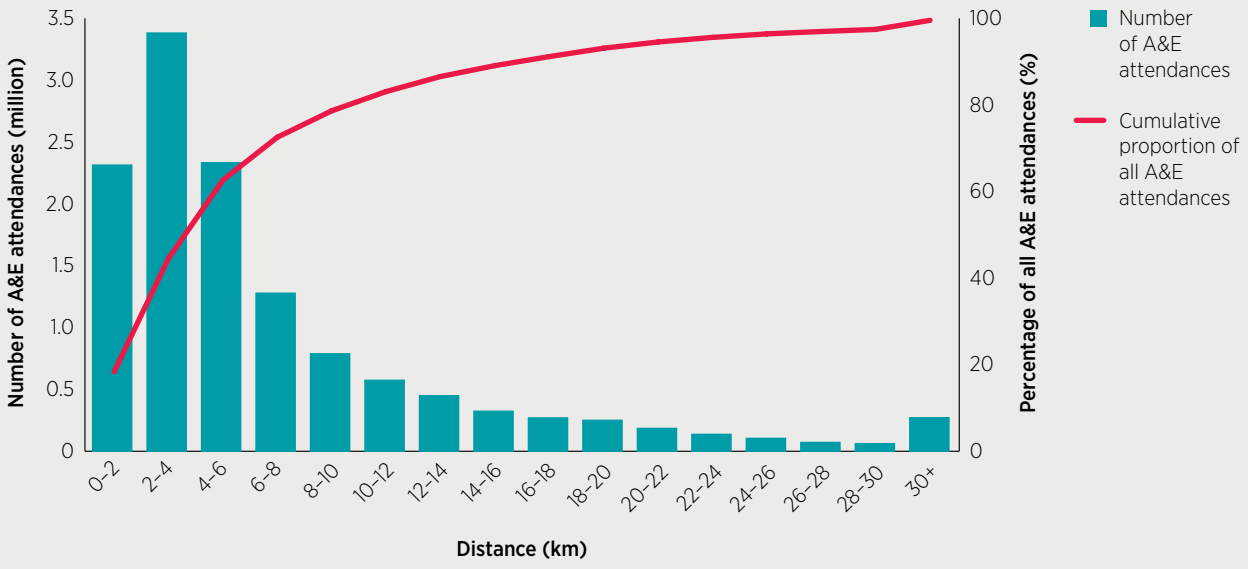
84%

of attendances were for people living within 12 km of a major A&E department

Initially we looked at the typical distance from home for people attending A&E departments, as these are the most common first point of access to emergency hospital care.

For the 12.8 million attendances that occurred between April 2011 and March 2012, the mean distance was 7.2 km (4.4 miles), with a median value of 4.2 km (2.6 miles). Eighty-four per cent of attendances were for people living within 12 km (7.5 miles) of A&E (see Figure 3.1).

Figure 3.1: Distribution of distances between a person's home and the A&E department that they attended between April 2011 and March 2012



There are no restrictions on visiting an A&E department, and so attendances can occur for a wide range of reasons, from a minor knock to a serious incident requiring a lengthy hospital stay. Between April 2011 and March 2012, 25 per cent of the attendances at A&E resulted in an inpatient admission. A&E attendances that required an admission tended to occur slightly further from the patient's home, with mean distances of 7.0 km (non-admitted patients) and 7.7 km (admitted patients). Median distances were 4.2 km and 4.7 km respectively.

Average distance for emergency hospital admissions

For the rest of this report we focus on emergency cases that were serious enough for the patient to be admitted to hospital. These include those admitted via A&E and all other sources. The analysis is split into three sections. We explore estimated distances between home and hospital as they exist currently, and how this varies across the country. We then look at how these distances have changed since the early 2000s, before taking a closer look at some examples where the distances have changed the most.

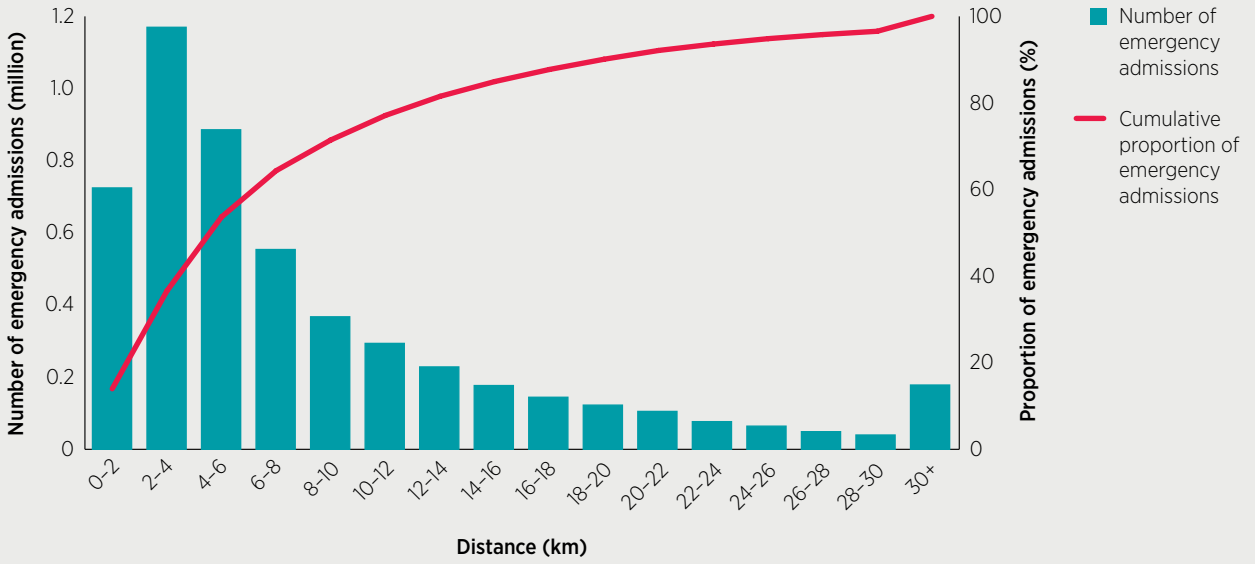
In the year between 1 April 2011 and 31 March 2012, there was an average distance of 8.7 km (5.4 miles) between a patient's home (as estimated using the population-weighted centroid of their LSOA) and the hospital site at which they received care for people admitted as an emergency. Figure 3.2 shows the distribution of home-to-hospital distances for all emergency admissions in England. The distribution is skewed such that over half of the emergency admissions occurred within 6 km (3.7 miles) of the patient's home; with nearly three-quarters occurring within 10 km (6.2 miles). The average distance for emergency admission did not vary significantly by age, with the maximum being 8.8 km (5.4 miles) for patients aged 18–64 and the minimum average distance of 8.4 km (5.2 miles) for those aged 85 and over.

9%

cases where the distance between home and hospital exceeded 20 km

The national average disguises a distinctive range of values at the person level. It is arguably more important to identify those people who live furthest from a hospital, as these are the people likely to face the greatest risk in terms of increased travel times, or inconvenience. At the edge of the distribution we found that in 9 per cent of cases the distance between home and hospital exceeded 20 km (12.4 miles), and 3 per cent of emergency admissions had estimated distances of over 30 km (18.6 miles) for emergency treatment.

Figure 3.2: Distribution of distances between a person's home and the site at which they received an emergency inpatient admission in 2011/12



2.5 km

the shortest average distance for emergency admissions is in Camden local authority, London

The average home-to-hospital distance varied substantially depending on which part of the country a person lived, from 5 km (3.1 miles) in London to 12 km (7.4 miles) in South West England (see Table 3.1). Much of this variation can be explained by the differences observed between rural and urban areas; the average distance in rural areas was 17.6 km (10.9 miles), compared with 7.6 km (4.7 miles) in urban settings, using Census area classifications.

Camden local authority in inner London had the shortest average distance at 2.5 km (1.6 miles) for 16,554 emergency inpatient admissions. At the other end of the scale, Eden District in Cumbria had the furthest average distance at 34.2 km (21.3 miles), although this was for a smaller population with just 4,165 emergency admissions.

Table 3.1: Average distance (km) between where a person lives and the hospital site used for an emergency admission for each region in 2011/12

Region	Average distance in km (miles)	Number of emergency admissions
London	4.67 (2.9)	702,824
North West	7.09 (4.4)	833,173
West Midlands	7.71 (4.8)	582,217
Yorkshire and the Humber	7.96 (4.9)	586,356
North East	8.25 (5.1)	332,523
South East	10.16 (6.3)	772,424
East Midlands	10.88 (6.8)	428,311
East of England	11.92 (7.4)	499,089
South West	12.24 (7.6)	491,054

Note: 95% confidence intervals for the average distances were 4.63–4.72, 7.02–7.15, 7.62–7.80, 7.86–8.07, 8.10–8.40, 10.07–10.25, 10.74–11.01, 11.79–12.04 and 12.09–12.39 respectively.

Figure 3.3 shows the proportion of emergency admissions from each local authority that occurred over 20 km from the patient's home. In total, we found that for 26 of the 326 local authorities, over half of the emergency admissions occurred over 20 km away from the patient's home. For 10 local authorities, over three quarters of the emergency admissions occurred over 20 km away from the patient's home (see Table 3.2). These are areas that are sparsely populated and include parts of East Anglia, the North West and the South West of England.

Figure 3.3: Map showing the proportion of emergency admissions in each local authority for which the admission occurred over 20 km away from the patient's home in 2011/12

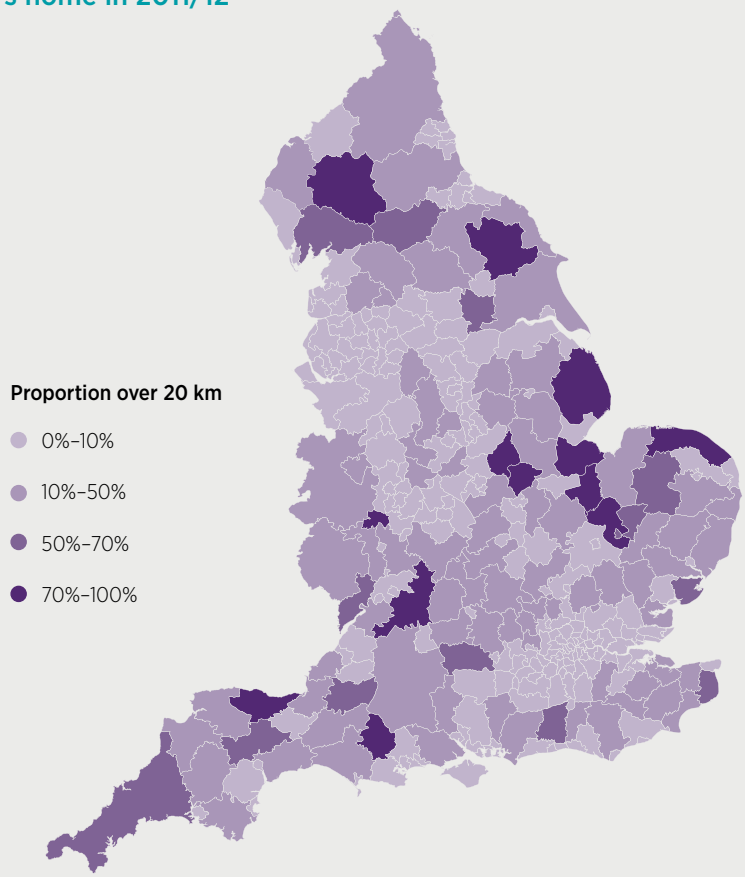
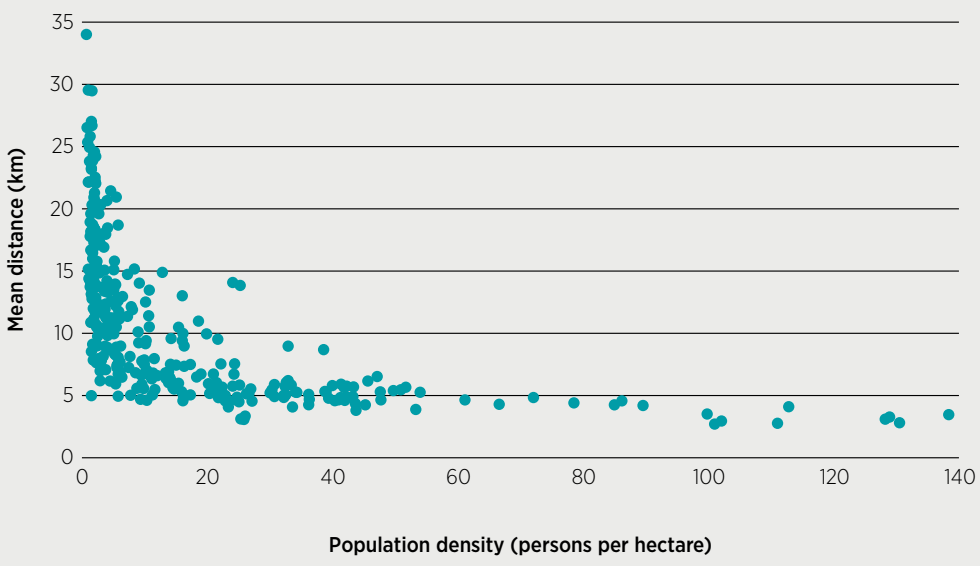


Table 3.2: Local authorities with over 75 per cent of emergency admissions occurring over 20 km away from the patient's home in 2011/12

Local authority	Number of emergency admissions occurring over 20 km from person's home	Total number of emergency admissions	Proportion over 20 km (%)
North Norfolk District	8,983	9,547	94%
Eden District, Cumbria	3,721	4,165	89%
West Somerset District	3,452	3,930	88%
Fenland District, Norfolk	8,289	9,645	86%
North Dorset District	5,034	6,114	82%
Rutland	2,126	2,687	79%
Ryedale District, North Yorkshire	3,410	4,311	79%
East Cambridgeshire	4,706	6,053	78%
South Holland District, Lincolnshire	6,781	8,793	77%
Melton District, Leicestershire	2,811	3,691	76%

Figure 3.4 shows how the average home-to-hospital distance changes with population density. The average distance is smallest for local authorities with a higher population density, while those with the greatest average distances have the lowest population density. This shows that hospitals tend to be located in densely populated areas. However, it is difficult to say at which point the average distance becomes disproportionally high for people living in sparsely populated rural areas.

Figure 3.4: Average home-to-hospital distance for an emergency admission in 2011/12 for each English local authority, by population density



Differences in distance by cause of admission

10%
of all emergency admissions followed a trauma

We compared the patterns for all emergency admissions with those following stroke or trauma. Stroke and trauma cases accounted for 5 per cent and 10 per cent of all emergency admissions respectively, and both conditions are thought to have better outcomes when treated in specialist centres. The mean distance for an emergency admission following a stroke was similar to that for all admissions, at 8.9 km (5.5 miles). However, the mean distance following trauma was over a kilometre further, at 10.0 km (6.2 miles). This pattern can also be seen in the median travel distances.

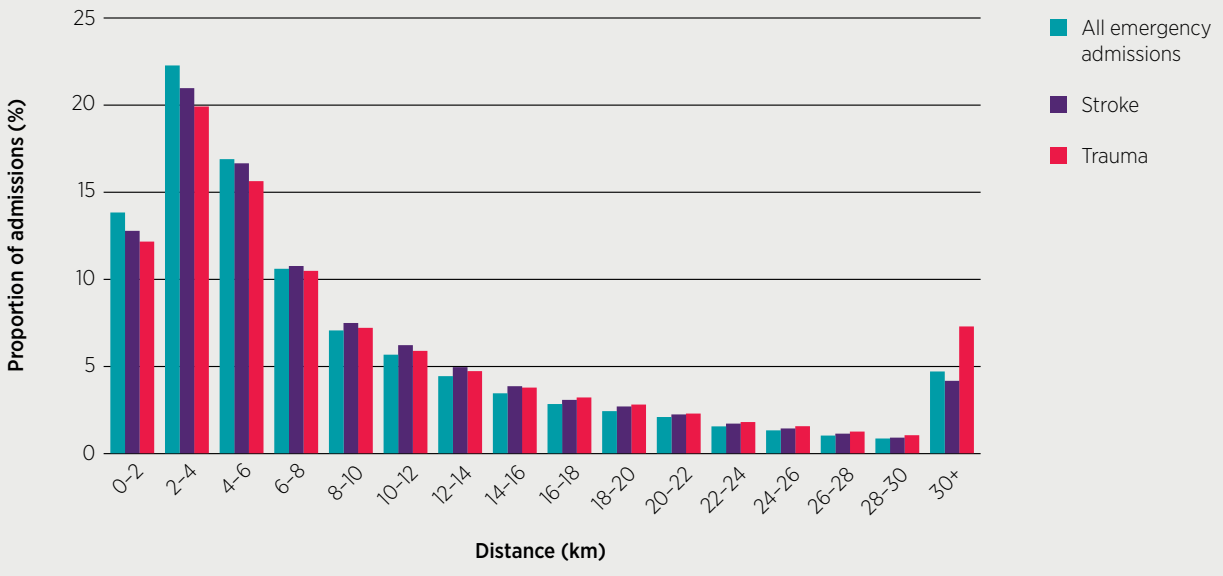
Table 3.3 and Figure 3.5 both show that the distribution in distances for emergency admissions following stroke and trauma was similar to that for all emergency admissions. In each case, there was a strong positive skew towards shorter travel distances. The majority of cases were less than 10 km: 69 per cent for stroke and 67 per cent for trauma. The proportion of admissions with people travelling over 30 km in cases of stroke (3 per cent, 8,583 admissions) was similar to all emergency admissions (3 per cent, 179,893 admissions), but higher for trauma (5 per cent, 28,057 admissions).

Table 3.3: Distribution of distances observed in 2011/12 between a person's home and the site at which they received an emergency admission, for all admissions, and those following stroke and trauma

		Percentile*						
	Number of admissions	10th	25th	Median	Mean	75th	90th	Max
All emergency admissions (km)	5,227,971	1.6	2.9	5.5	8.7	11.2	19.9	80.0
Stroke admissions (km)	270,825	1.7	3.1	5.9	8.9	11.9	20.2	80.0
Trauma admissions (km)	534,445	1.8	3.2	6.2	10.0	12.9	22.7	80.0

*A percentile (or a centile) is a measure used in statistics indicating the value below which a given percentage of observations in a group of observations falls. For example, the 20th percentile is the value (or score) below which 20 per cent of the observations may be found.

Figure 3.5: Distribution of distances between hospital and home for emergency admissions in 2011/12, by admission cause



We looked in more detail at two factors that we thought might explain the longer distances observed for trauma admissions.

First we looked at road traffic accidents (RTAs), for which there were 55,005 emergency admissions in 2011/12, with 81 per cent (44,747) involving trauma. Our assumption was that trauma cases related to RTAs occur away from a person's home and therefore the person will be taken to the hospital closest to the accident, which may not be the closest to that person's home. This could explain the increased distance because one of the limitations of our method is that we had to look at distances to a person's area of residence, rather than where an accident occurred.

Table 3.4 shows that emergency admissions following an RTA had a much greater observed average distance (12.3 km) than the average for all emergency admissions (8.7 km), as expected. But not all RTA admissions were associated with trauma. Those that were, accounting for around 10 per cent of all trauma admissions, occured an average of 2 km further from home than emergency admissions for trauma due to other causes. However, while the effect of RTAs did raise the average distance for trauma admissions slightly, trauma cases not involving an RTA still remained significantly higher than for other types of emergency admissions. As such, RTAs do not fully explain the increased distance for emergency admissions due to trauma.

Table 3.4: Mean distance (hospital to home) of emergency admissions for trauma following RTAs compared with admissions not following RTAs

Trauma	RTA	Trauma and RTA	Trauma excluding RTA	All emergency admissions
10.0 km (6.2 miles)	12.3 km (7.6 miles)	12.6 km (7.8 miles)	9.7 km (6.0 miles)	8.7 km (5.4 miles)

Note: From left to right, 95% confidence intervals were 9.9–10.0 km, 12.3–12.4 km, 12.6–12.7 km, 9.7–9.8 km and 8.7–8.7 km.

Another possible reason for trauma cases travelling further is that they may have been redirected to a major trauma centre, rather than a local hospital that might be closer. Major trauma centres are hospitals that provide specialist doctors and equipment to treat major trauma, which would be too expensive for all hospitals to supply (NHS England, 2012). However, we found no significant difference in the average distance for an emergency admission at one of the 26 major trauma centres (10.03 km, 6.2 miles)[1] compared with that of other hospitals (9.95 km, 6.18 miles).[2]

While the average distance for all emergency admissions was not sensitive to age, we found that the average distance for emergency admissions following trauma was much greater for young people and for people of working age (those under 65 years old) at 10.8 km (6.26 miles),[3] compared with people aged 65 and older with an average of 9.0 km (5.6 miles).[4] So the greater distances for admissions following trauma are driven by admissions for the under 65s. Further research is required to understand the reason for this.

1 95% confidence interval = 9.97–10.10 km.
2 95% confidence interval = 9.92–9.99 km.
3 95% confidence interval = 10.76–10.84 km.
4 95% confidence interval = 8.96–9.04 km.

How has the average distance changed since 2001/02?

Changes in hospital A&E services

34%

increase in number of emergency admissions from 2001/02 to 2011/12

Between 2001/02 and 2011/12, the number of emergency admissions in our analysis increased by 34 per cent, from 4.0 million to 5.3 million. There is no one simple explanation behind this increase (Blunt and others, 2010; National Audit Office, 2013). Some, but by no means all, of the increase can be explained by an ageing population. In addition, we saw a rise in short-stay admissions. There was also a large increase in the number of A&E visits that resulted in a hospital admission, from 2.2 million in 2001/02 (accounting for 54 per cent of all emergency inpatient admissions) to 3.8 million in 2011/12 (accounting for 70 per cent of all emergency inpatient admissions).

During this time there were a number of changes to hospital configurations, including A&E services. These included:

- the closing of some A&E departments
- changing major A&E departments to walk-in clinics or minor injuries units or
- opening new A&E departments.

Table 3.5 shows the number of major A&E departments that we were able to identify between 2006 and 2012, using Binley's directory of health services in England, mentioned earlier. This suggests that there was a fall of around 17 A&E departments by the end of this period, due to closures, reclassifications and some openings, although we accept that this is an estimate and not a definitive figure.

Table 3.5: Number of emergency department types in England at 1 May in 2006–12

Year:	2006	2007	2008	2009	2010	2011	2012	Change	% change
Major A&E departments (including paediatric)	215	213	205	205	204	200	198	-17	-8%

Source: Data provided by Binley's

Looking at the years from 2006 to 2012, it appears from these records that:

- 185 sites had an A&E department at the same site from 2006 to 2012
- 12 new sites had an A&E department, plus in one site a clinical decision unit had now become an A&E department
- 25 sites had an A&E department in 2006 but not in 2012
- three sites had an A&E department in 2006 but had minor injury units in 2012
- two sites had an A&E department in 2006 which had a different classification in 2012 (Leicester General Hospital now has an acute medicine unit and Westmorland General Hospital now has a primary care assessment service).

Although we have not been able to establish a definitive indication of the rate of change for A&E, we can see that the number of departments remains relatively stable, with few changes. We explore the effects of some of these examples in more detail in the next section.

Changes in distance to admission

<5%

increase in average distance between home and hospital for all emergency admissions from 2001/02 to 2011/12

There was a slight increase in the average distance between a person's home and the hospital at which they had an emergency admission between 2001/02 and 2011/12. The average value rose from 8.3 km (5.2 miles) in 2001/02 to 8.7 km (5.4 miles) in 2011/12. This represents an increase of just under 5 per cent. Figure 3.6 suggests that these changes fitted a general trend across the 10-year period, with an increase of 0.5 per cent a year, although the trend was not particularly strong.[1]

The average distance travelled for emergency admissions following a stroke showed a steeper upward trend, rising by 13 per cent from an average of 7.9 km (4.9 miles) in 2001/02 to 8.9 km (5.5 miles) in 2011/12 – an average increase of 1.2 per cent a year.[2]

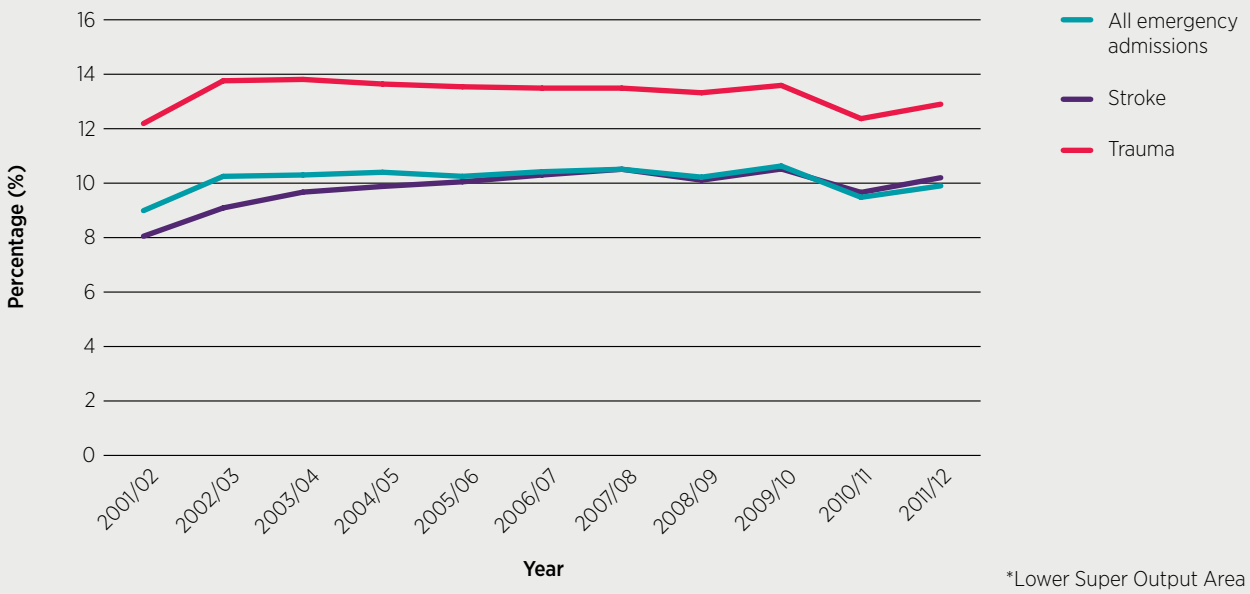
The average distance travelled for emergency admissions following trauma was consistently higher than for other emergency admissions. However, there was little change in the average distance for trauma cases over the period:[3] the average distance in 2011/12 was slightly higher (10.0 km, 6.2 miles) than in 2001/02 (9.6 km, 6.0 miles), but the average distances in the intervening years showed little change (Figure 3.6). When we looked specifically at the subset of people admitted from longer distances (over 20 km), the trends over the period were fairly stable (see Figure 3.7).

Figure 3.6: Average distance between LSOA* and hospital site between 2001/02 and 2011/12 for all emergency admissions, and emergency admissions following stroke or trauma

*Lower Super Output Area

1 $R^2 = 0.34$, $p = 0.059$.
2 $R^2 = 0.88$, $p < 0.001$.
3 $R^2 = 0.12$, $p = 0.31$.

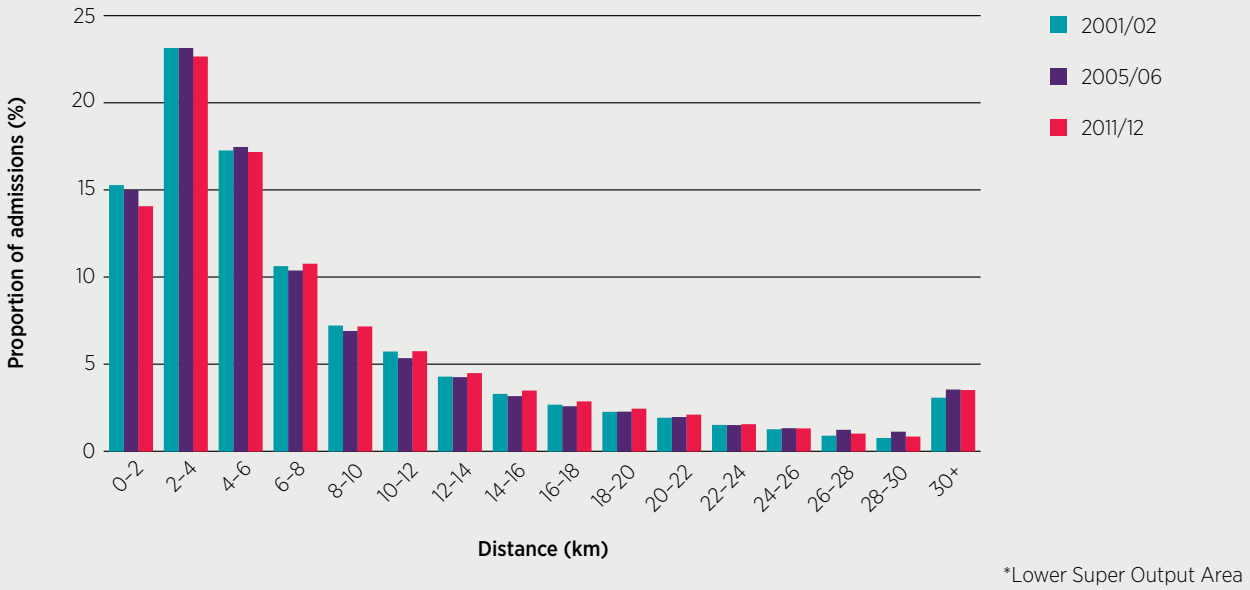
Figure 3.7: Proportion of emergency admissions for which the distance between LSOA* and hospital site is over 20 km



*Lower Super Output Area

Figure 3.8 shows that there was a slight shift towards longer distances in the distribution of the average distance between a person's LSOA and the hospital at which they received an emergency admission between 2001/02 and 2011/12. While the number of emergency admissions increased for each distance over this period, the increase was greater for the longer distances. As a result, the proportion of emergency admissions coming from LSOAs further away from the hospitals was higher in 2011/12 than in 2001/02. This suggests that people living further away from emergency services may have become more inclined to access them.

Figure 3.8: Change in distribution of distance between a patient's LSOA* and the hospital in which they received an emergency admission



*Lower Super Output Area

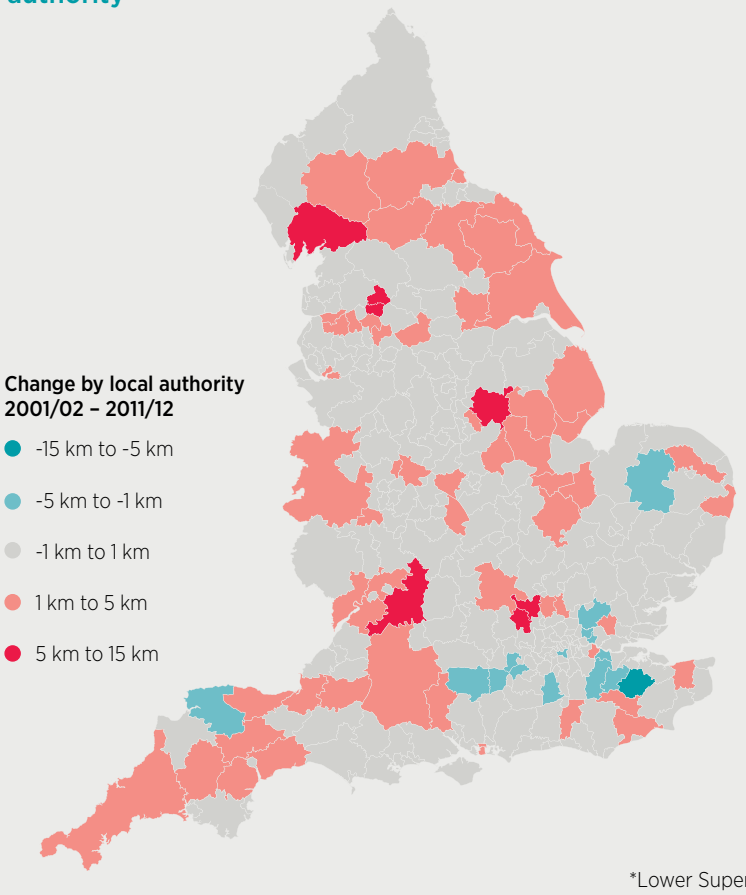
The relatively small changes in the total average distance seen in Figure 3.8 mask the fact that change was not spread evenly across the country. We therefore looked at the individual local authority areas, estimating average change for all residents of those areas having an emergency admission. The average change at local authority level depends partly on whether A&E facilities are present, whether they opened or closed during the period, and also where the new facilities are located. For example, opening a new A&E in a more densely populated area would have a greater effect on the average distances than one in a more sparsely populated area.

'for three quarters of local authority areas, the change between 2001/02 and 2011/12 in average distance travelled was less than 1 km'

We found that for three quarters of local authority areas, the change between 2001/02 and 2011/12 in average distance travelled was less than 1 km (0.6 miles). Where the average distance for a local authority changed by a magnitude greater than 1 km, in 20 cases the result was a reduction in the average distance. In contrast, 62 local authorities showed an increase of between 1 and 5 km, with nine local authorities showing a substantial increase in the average distance of over 5 km (3.1 miles).

The low number of local authorities that experienced a change in travel distance is shown in Figure 3.9, which categorises areas by the degree of change in average distance. The local authorities that experienced the biggest absolute change in the average distance for an emergency admission between 2001/02 and 2011/12 are listed in Table 3.6. In the following section we look at what happened in some of these cases to cause this change.

Figure 3.9: Map of actual change in average distance between LSOA* and hospital site between 2001/02 and 2011/12 for all emergency admissions, by local authority



*Lower Super Output Area

Table 3.6: Local authorities with greatest absolute change in the average distance from home to hospital for an emergency admission

		Average distance from home to hospital (km)			Number of admissions over 20 km				
	Local authority	2001/02	2005/06	2011/12	2001/02	2005/06	2011/12	Change 2001/02 to 2011/12 (km)	Change 2001/02 to 2011/12 (%)
Biggest increase	Pendle District	7.7	7.8	18.7	535 (6%)	546 (6%)	4,406 (43%)	11.0	144
	Burnley District	4.8	4.7	15.1	369 (4%)	342 (4%)	613 (5%)	10.4	216
	South Lakeland District	17.0	17.3	25.0	2,701 (33%)	3,134 (35%)	5,974 (62%)	8.0	47
	Dacorum District	6.5	7.5	14.7	562 (6%)	792 (8%)	1,225 (12%)	8.3	128
	Chiltern District	8.5	13.4	15.8	326 (7%)	671 (12%)	1,086 (18%)	7.3	86
	Newark and Sherwood	13.4	16.0	20.2	1,824 (21%)	2,891 (31%)	5,165 (47%)	6.8	50
	Cotswold District	18.0	20.7	23.9	3,646 (54%)	4,357 (63%)	5,178 (74%)	5.9	32
	West Somerset District	23.5	25.5	29.7	2,061 (67%)	2,300 (74%)	3,452 (88%)	6.2	26
	Chorley District	7.5	10.6	12.6	335 (4%)	537 (5%)	867 (7%)	5.1	68
	Hartlepool	4.6	5.4	9.3	180 (2%)	795 (7%)	461 (4%)	4.7	104
Biggest decrease	Maidstone District	23.8	8.6	10.6	5,751 (81%)	1,326 (11%)	2,244 (16%)	-13.2	-55
	Tonbridge and Malling	15.1	9.5	10.4	2,224 (37%)	635 (7%)	940 (9%)	-4.7	-31
	Mole Valley District	14.8	10.8	11.4	405 (9%)	481 (8%)	598 (8%)	-3.4	-23
	Redbridge	8.3	4.5	5.3	488 (3%)	394 (2%)	605 (2%)	-3.1	-37
	Bracknell Forest	16.2	11.7	13.4	1,001 (16%)	652 (9%)	677 (8%)	-2.8	-17
	Epsom and Ewell District	7.8	4.8	5.5	107 (3%)	147 (3%)	188 (3%)	-2.2	-29
	Barking and Dagenham	8.0	5.6	5.5	463 (4%)	423 (3%)	501 (3%)	-2.5	-31
	Epping Forest District	12.8	10.3	10.9	732 (10%)	414 (4%)	685 (6%)	-1.9	-15
	Wandsworth	6.1	6.4	4.0	153 (1%)	223 (1%)	248 (1%)	-2.1	-34
	Dartford District	8.2	5.4	5.9	1,191 (19%)	527 (7%)	753 (8%)	-2.3	-28

4

Case studies of local change

This chapter describes how service change impacted on the average distance from home to hospital for emergency patients for three specific areas. Please note that the maps that follow only include the hospitals with the highest volumes of emergency admissions from the relevant local authorities. In some cases there are additional emergency centres that may reduce the impact of a closure.

Case study 1: Burnley District and Pendle District local authorities, Lancashire

In June 2007, the A&E Department at Burnley General Hospital was closed, with all emergency ambulance cases being taken to the A&E department at the Royal Blackburn Hospital. Burnley General Hospital was located in Burnley, within the boundaries of Burnley District local authority[1] and close to the borders of Pendle District local authority.[2] However, the A&E department at the Royal Blackburn Hospital is located outside of the boundaries of both, and further away from Pendle District local authority than Burnley General Hospital was (see Figure 4.1).

Between 2006/07 and 2008/09, the average distance for an emergency admission in Burnley District local authority rose from 5.2 km (3.2 miles) to 14.0 km (8.7 miles), while in the more distant Pendle District local authority the average rose from 8.4 km (5.2 miles) to 17.3 km (10.8 miles). At the same time, the proportion of emergency admissions for which the distance between home and hospital site was over 20 km rose from 4.0 per cent to 6.9 per cent, and 8.2 per cent to 37.1 per cent respectively.[3]

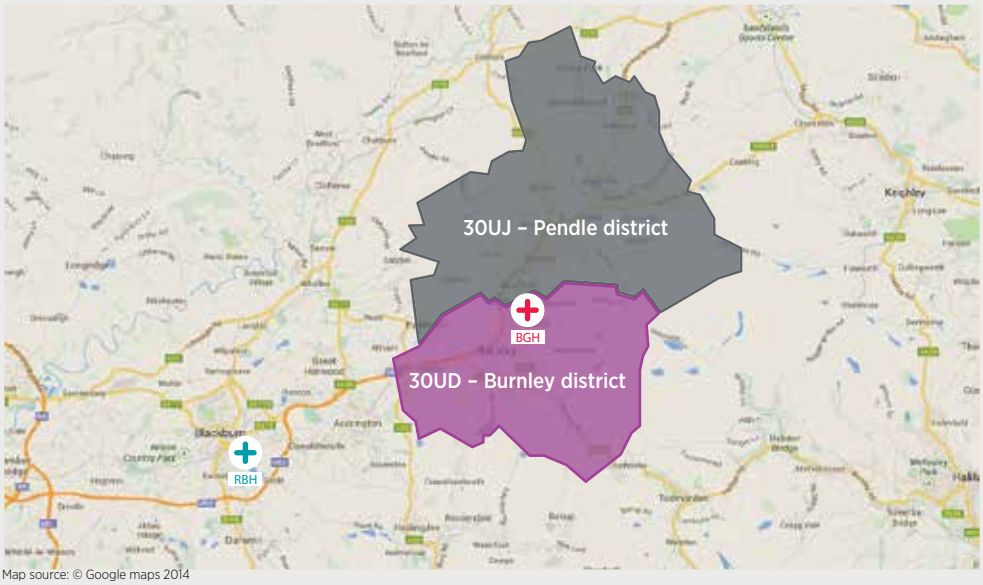
'despite the increase in distance to A&E, there was no evidence that emergency admissions were impeded by the change in either district'

For both local authorities, the average distance travelled had been fairly stable prior to the change, and stabilised again at the higher level afterwards, as shown in Figure 4.2. This transfer of A&E provisions led to an increase in average travel distance of over 11 km (6.8 miles) for both local authorities.

Despite the increase in distance to A&E, there was no evidence that emergency admissions were impeded by the change in either district (Figure 4.3). Numbers of emergency admissions remained broadly consistent with previous levels for 18 months after the closure, and then increased.

1 Local authority code 30UD.
2 Local authority code 30UJ.
3 In both cases we also observed a similar jump in the median distance (for Burnley District the median increased from 3.3 km to 14.8 km – 2.0 miles to 9.1 miles; for Pendle District the median increased from 4.5 km to 18.4 km – 2.8 miles to 11.4 miles), showing that the increase was caused by a general increase in distances for the local authorities, rather than a substantial increase for a small number of cases.

Figure 4.1: Map of Burnley District and Pendle District local authorities and local hospitals



Map source: © Google maps 2014

Figure 4.2: Change in average distance between hospital and home for an emergency inpatient admission between 2001/02 and 2011/12 in Burnley District and Pendle District local authorities

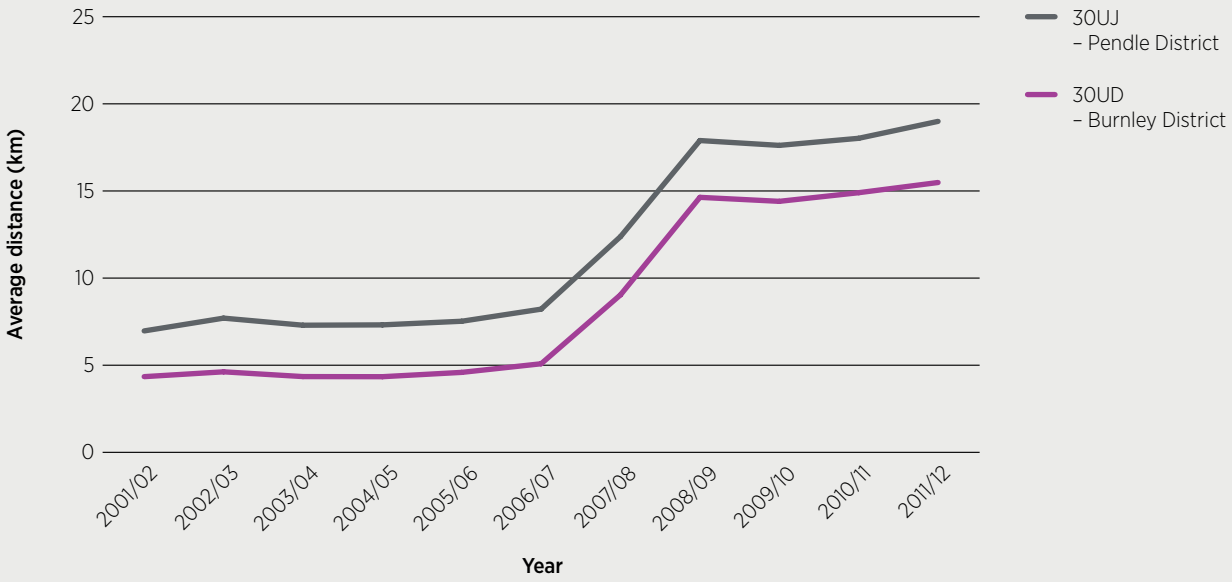
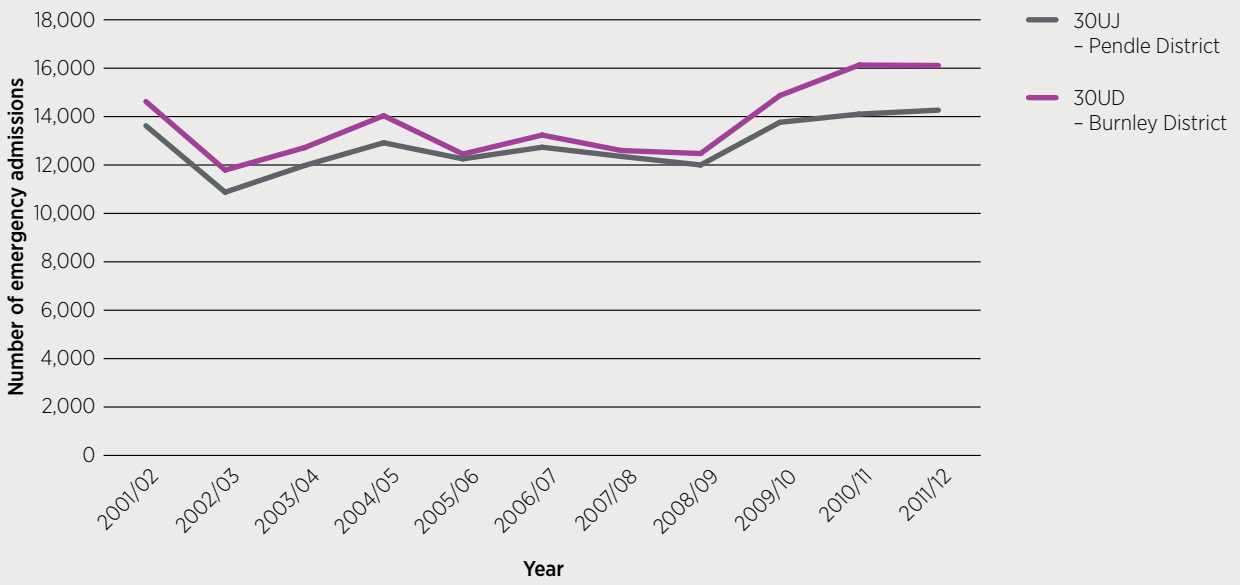


Figure 4.3: Number of emergency admissions for residents of Pendle District and Burnley District between 2001/02 and 2011/12



Case study 2: Newark and Sherwood District local authority, Nottinghamshire

The A&E department at Newark Hospital was converted to a walk-in centre in April 2011. Patients who would previously have been taken to Newark Hospital are now taken to Lincoln County Hospital, 29.3 km (18.2 miles) away (see Figure 4.4 for a map of Newark and Sherwood local authority and the three hospitals). As a result, the average distance for emergency admissions for people living in Newark and Sherwood local authority[1] rose from 17.4 km (10.8 miles) in 2010/11 to 20.2 km (12.6 miles) in 2011/12,[2] an increase of 16 per cent. This change in the average distance was not as great as might be expected, as throughout the period from 2001/02 to 2011/12 the majority of emergency admissions for people living in this local authority were admitted to King's Mill Hospital, and therefore these cases were not affected by the closure of the Newark A&E department.

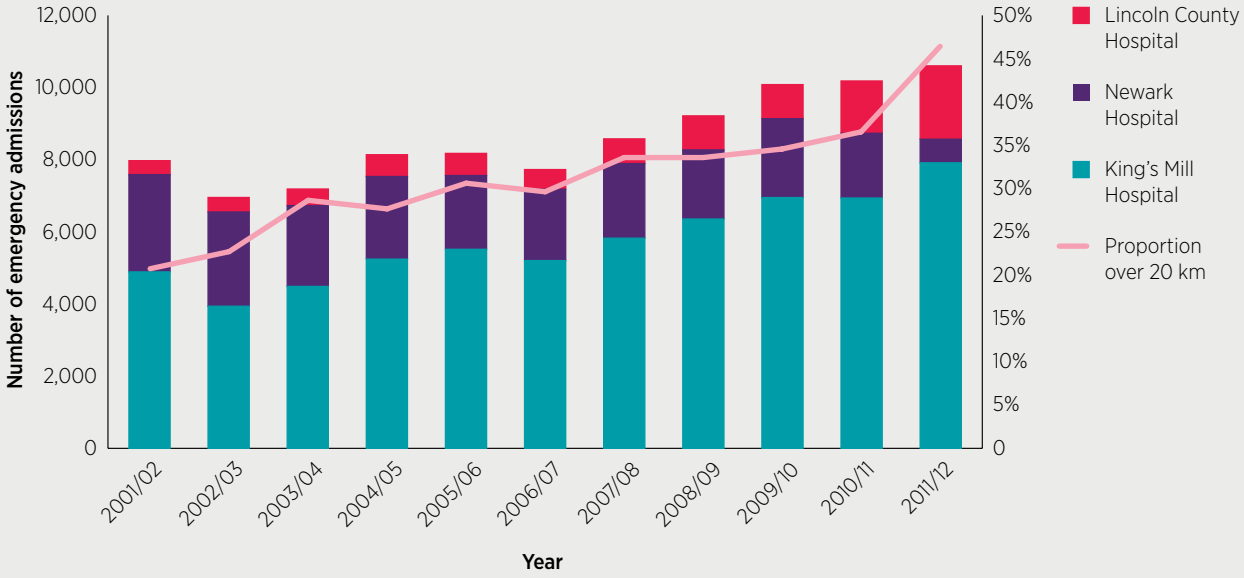
The effect of the transfer of emergency services from Newark Hospital to Lincoln County Hospital was more obvious when looking at the proportion of admissions for which the estimated distance was greater than 20 km, which rose from 37 per cent of emergency admissions in 2010/11 to 47 per cent in 2011/12 (see Figure 4.5).

1 Local authority code 37UG.
2 The median distance rose from 15.3 km (9.5 miles) to 19.2 km (11.9 miles).

Figure 4.4: Map of Newark and Sherwood local authority and local hospitals

Map source: © Google maps 2014

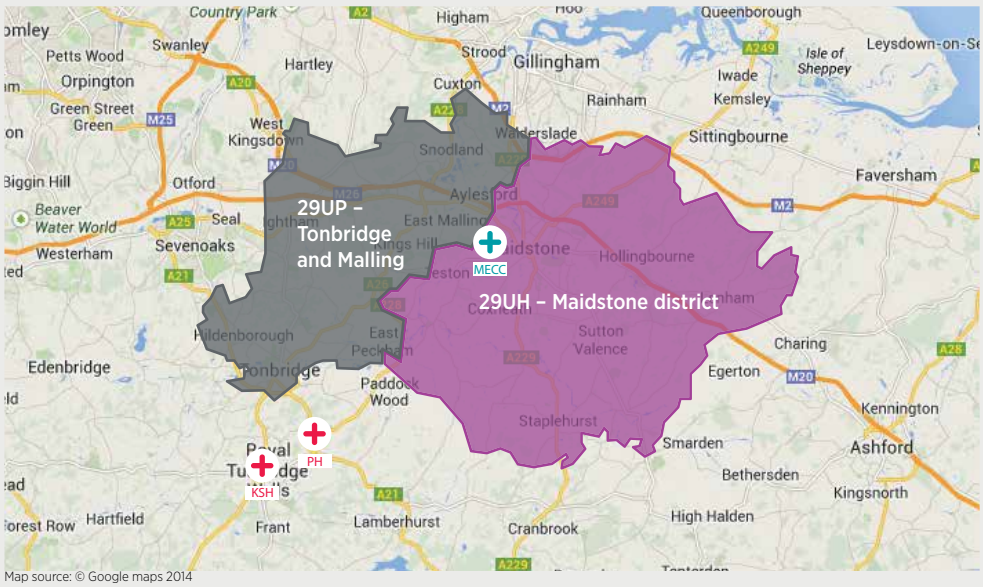
Figure 4.5: Number of emergency admissions at top three hospitals from Newark and Sherwood local authority between 2001/02 and 2011/12, with proportion of admissions with estimated distance from hospital to home greater than 20 km



Case study 3: Maidstone District and Tonbridge and Malling local authorities, Kent

Maidstone Emergency Care Centre was opened within Maidstone Hospital in 2005, providing traditional A&E services, along with a nurse-led NHS walk-in centre and a base for GP out-of-hours services. The centre is located within the borders of Maidstone District local authority,[1] and very close to the border of Tonbridge and Malling local authority.[2] Before Maidstone Emergency Care Centre opened, most of the emergency cases had travelled either to Kent and Sussex Hospital, which closed in 2011, or Pembury Hospital, both of which were located outside of the borders of the local authorities.

Figure 4.6: Map of Maidstone District local authority (29UH) and Tonbridge and Malling local authority (29UP) and local hospitals



Map source: © Google maps 2014

- 29UH – Maidstone District
- 29UP – Tonbridge and Malling
- KSH Kent and Sussex Hospital (closed)
- PH Pembury Hospital (closed)
- MECC Maidstone Emergency Care Centre (open)

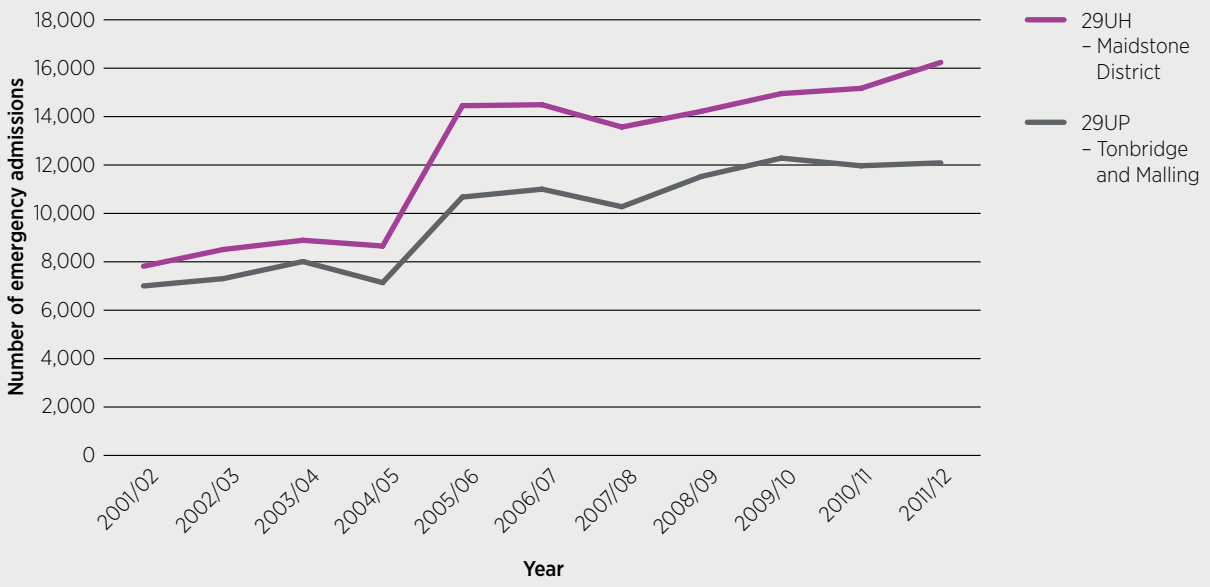
66%

reduction in average distance travelled for people living in Maidstone District local authority for emergency admissions from 2004/05 to 2005/06

As a result, the average distance travelled for an emergency admission for people living in Maidstone District local authority fell from 25.3 km (15.7 miles) in 2004/05 to 8.6 km (5.3 miles) in 2005/06 – a fall of 66 per cent. Similarly, the average distance for Tonbridge and Malling local authority fell from 16.3 km (10.1 miles) in 2004/05 to 9.5 km (5.9 miles) in 2005/06 – a fall of 41 per cent. The opening of Maidstone Emergency Care Centre also meant that the proportion of emergency admissions with a home-to-hospital distance over 20 km fell from 25.3 per cent to 8.6 per cent in Maidstone District local authority and from 16.3 per cent to 9.5 per cent in Tonbridge and Malling local authority over the same time period.[3] There was a step-change in the number of emergency admissions for each area around the time that the Maidstone Emergency Care Centre was opened in 2005 (see Figure 4.7).

1 Local authority code 29UH.
2 Local authority code 29UP.
3 The median distances for Maidstone District and Tonbridge and Malling fell from 23.3 km (14.4 miles) and 15.7 km (9.7 miles) in 2004/05 to 4.7 km (2.9 miles) and 7.1 km (4.4 miles) in 2011/12 respectively.

Figure 4.7: Number of emergency admissions for residents of Maidstone District and Tonbridge and Malling between 2001/02 and 2011/12



5 Discussion

Headline findings

For many people it is important to feel close to a hospital that can offer emergency treatment in times of crisis. The significance of this can be seen only too clearly when looking at the public's responses to changes in their local A&E provision (Adams, 2013; The Press Association, 2013). Yet despite the clear public interest there is little systematic work looking at the actual distances involved and how these are changing.

Initially we found that the average distance from home to an A&E department (the most common entrance point for emergency admissions) was 7.2 km (4.4 miles) in 2011/12. We chose to focus specifically on the more severe cases that required an emergency admission, looking at the distance from people's homes to the hospitals that they used for emergency care. This measure provided an approximation of the distance they travelled in order to access emergency hospital services. However, nearly one in 10 emergency admissions occurred over 20 km (12.4 miles) away from a person's home, with three per cent occurring at a distance of over 30 km. Unsurprisingly, the distances were longer in rural areas than in urban settings. We found 10 local authorities for which over three quarters of the emergency admissions occurred over 20 km away.

The relative distances following trauma were consistently longer than for other types of emergency admission, but have not changed markedly since 2001/02. Some of the difference may be an artefact of the measure we used, with greater distances being associated with young people or working-age people, rather than those who were of retirement age, and with admission after a road traffic accident. This suggests that the hospital distances might be a reflection of where the accident occurred, rather than actual travel distance from home.

We could not find a definitive record of the sites offering emergency services over the 10-year period from 2001/02 to 2011/12. To provide an estimate we used data provided by Binley's, observing a net reduction in the number of A&E departments from 2006. As a result, there was a small but steady increase in home-to-hospital distances between 2001/02 and 2011/12 – from 8.3 km (5.1 miles) to 8.7 km (5.4 miles). The increase was more pronounced for emergency admissions following stroke, where the period saw an increasing focus on the development of specialist sites for stroke care.

'while the average distances crept up over the period, the proportion of emergency admissions where distances exceeded 20 km remained stable'

In 2007, the National Stroke Strategy (Department of Health, 2007) stated that specialised stroke care units were the single biggest factor that can improve a person's outcome following a stroke. In response, services for stroke admissions have been through a process of consolidation, whereby services are provided at fewer locations, to ensure that the level of service provided is as high as possible. Therefore, the increase in the distance travelled reflects the impact of this policy.

While the average distances crept up over the period, the proportion of emergency admissions where distances exceeded 20 km remained stable at the national level. But this was not the case in certain areas where a major opening

or closure of an A&E department had occurred. In Chapter 4 we presented some case studies which show that closing or opening an A&E department can have a substantial effect on distance metrics. In some cases people were required to attend a hospital that was more than twice as far from their home as previously.

Strengths and weaknesses

We found that, across England, our estimated distance between a person's home and the hospital of their emergency admission averaged 8.7 km (5.4 miles). We note that our estimated distance for emergency admissions was much shorter than that published in a study from 2007 (Propper and others, 2007), which quoted a median value of 16.1 km (10 miles). However, that study did not exclude very long distances, and was based on unweighted averages of distance at ward level (Damiani, 2013). In contrast, our values were derived from the distribution of values at person level – effectively a weighted analysis.

We were not able to identify the specific location of a person's home, and therefore calculated the distance from the weighted centroid of the patient's LSOA. The resulting figure is therefore an approximation to travel distances.

For this report we looked at straight-line distance, whereas time is more important in practice. The two may differ in urban areas where travel speed may be slowed by congestions; or in very rural areas where local geography means that routes differ markedly from straight lines. However, straight-line distance and travel time will clearly have a strong correlation (Phibbs and Luft, 1995), and provide a useful metric for access that can be easily tracked over time.

Not all emergency admissions will travel from home. For example, if an accident occurs while driving or at work, then the person would be taken to the closest hospital to where the accident occurred, which may be different from the closest hospital to their home. Our metric therefore provides an indication of the availability of service relative to where people live, rather than where accidents occur.

Implications

'in most cases, the distance between a person's home and the hospital at which they receive emergency treatment is fairly small'

In most cases, the distance between a person's home and the hospital at which they receive emergency treatment is fairly small, with over half occurring within 6 km (3.7 miles), with a mean distance of 8.7 km (5.4 miles). In 2010, for people in Great Britain, the average length for a trip for any purpose was 11.3 km (7.0 miles) (Department for Transport, 2011). Therefore, on average, the distance between a person's home and the hospital at which they receive an emergency admission is around 30 per cent shorter than the distance that they are prepared to travel for other trips, such as travelling to work, education, shopping or leisure.

We have not specifically explored the outcomes associated with longer travel distances for this study, choosing instead to help clarify the picture of what has occurred in recent years. However, Nicholl and others (2007) have shown that an increase in straight-line ambulance journey distances is associated with an increased risk of death.[1] This association is not changed by adjustment for confounding factors related to age, sex, clinical category or illness severity. The authors suggest that an increase of 10 km in straight-line distance is associated with around a one per cent absolute increase in mortality.

1 Odds ratio = 1.02 per km, 95% confidence interval = 1.01–1.03, p = 0.001.

Another study in 2008 (Wei and others, 2008) focused specifically on emergency admissions following myocardial infarction. The authors found that an increase in the distance between home and admitting hospital was significantly associated with increased mortality, both before and after hospitalisation. However, they did not find the same effect for in-hospital mortality.

In 2006, the Royal College of Surgeons of England suggested that a safe acute hospital should serve a population of no fewer than 300,000 people (Royal College of Surgeons of England, 2006). If the population of England were evenly spread, this would suggest that the optimum number of A&E departments would be approximately 177. It is clear that the issues need more than such simplistic calculations. Specialist centres, such as major trauma centres, which have emerged recently, are an example of where longer distances are acceptable in order to ensure that specialist staff and facilities are available. Similar changes in stroke care in London are felt to be part of a major service change with patient benefits. In north-east London, death from stroke has been shown to be half as likely for patients admitted to a centre that provides best-practice care (Palmer, 2011).

There are no hard-and-fast rules to say at what point longer distance becomes a particular problem. Furthermore, consideration of how distance impacts on patient convenience, safety or reassurance needs to be offset by a range of other factors that influence choices about hospital facilities, such as:

- whether there are enough staff to provide a safe service
- how training is organised
- whether there are sufficient support facilities for major A&E departments.

There are also some hard questions about what services can be afforded in the current economic climate. Reconfiguration of emergency services, as with all NHS services, is complex, torturous and highly political (Spurgeon and others, 2010). Clearly, setting up a major A&E facility on every street corner is not realistic, but the question of how many we need is not easily answered.

95%

of the population live within 20 km of their nearest A&E

Since the early 2000s there has been an enormous change in the volume of care delivered through A&E and in terms of emergency care in hospitals. Yet the number of locations has been generally quite stable over this period. For the vast majority of people, the distance to a local A&E is not very far; 95 per cent of the population live within 20 km of their nearest A&E. However, where an A&E department is closed or downgraded, the direct impact on the local population can be large, in some cases doubling the distance from home to hospital for emergency admissions. The national impact of these changes, on the other hand, is minimal, with no major jumps in the average distances that people travel. Of the 71 local authorities that have experienced an increase in the average distance of greater than 1 km, there are only nine for which the distance has increased by more than 5 km (3.1 miles).

The closure or moving of a service away from people's homes is always controversial, eliciting a strong reaction from the local area in question, although in many cases there is strong evidence to support the action. During the current period of austerity, the rationalising of services will become increasingly necessary to ensure that the best level of services can be provided with limited resources. Despite widespread concern around access to services, we have shown that in general the distance that people travel for emergency care has not changed

substantially since 2001/02. Although clearly there will always be some local areas more greatly affected by reconfigurations, it remains rare that people will need to travel further for emergency care than they would be prepared to travel for other general activities. A balance must be struck between people's ability to access emergency care and ensuring that the quality of services provided is as high as possible.

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Appendix 1: Major trauma centres in England

Hospital	Type of major trauma centre
Addenbrooke's Hospital, Cambridge	Adult and children's
Frenchay Hospital, Bristol	Adult and children's
James Cook University Hospital, Middlesbrough	Adult and children's
John Radcliffe Hospital, Oxford	Adult and children's
King's College Hospital, London	Adult and children's
Leeds General Infirmary	Adult and children's
Queen's Medical Centre, Nottingham	Adult and children's
The Royal London Hospital	Adult and children's
The Royal Victoria Infirmary, Newcastle	Adult and children's
St Mary's Hospital, London	Adult and children's
St George's Hospital, London	Adult and children's
Southampton General Hospital	Adult and children's
Derriford Hospital, Plymouth	Adult
Hull Royal Infirmary	Adult
Northern General Hospital, Sheffield	Adult
Queen Elizabeth Hospital, Birmingham	Adult
Royal Preston Hospital	Adult
Royal Sussex County Hospital, Brighton	Adult
University Hospital Coventry	Adult
University Hospital of North Staffordshire, Stoke-on-Trent	Adult
Alder Hey Children's Hospital, Liverpool	Children's
Birmingham Children's Hospital	Children's
Royal Manchester Children's Hospital	Children's
Sheffield Children's Hospital	Children's
Salford Royal NHS Trust	Manchester Collaborative MTC
Manchester Royal Infirmary	Manchester Collaborative MTC
University Hospital of South Manchester	Manchester Collaborative MTC
Aintree University Hospital	Liverpool Collaborative MTC
Walton Centre, Liverpool	Liverpool Collaborative MTC
Royal Liverpool University Hospital	Liverpool Collaborative MTC

Note: MTC = major trauma centre.
Source: NHS England, 2012

Appendix 2: Emergency admissions included and excluded from the analysis

Year	No hospital site code	Unable to identify LSOA	Distance over 80 km	Total admissions excluded	Total admissions included
2001/02	22 (0%)	693,14 (1.7%)	50,081 (1.2%)	119,417 (3%)	3,902,387
2002/03	183 (0%)	64,168 (1.6%)	49,899 (1.2%)	114,249 (2.8%)	3,974,727
2003/04	107 (0%)	68,253 (1.6%)	55,586 (1.3%)	123,945 (2.9%)	4,210,693
2004/05	156 (0%)	77,944 (1.7%)	59,336 (1.3%)	137,435 (3.0%)	4,440,509
2005/06	475 (0%)	85,885 (1.8%)	60,997 (1.3%)	147,354 (3.1%)	4,665,642
2006/07	588 (0%)	87,092 (1.8%)	63,049 (1.3%)	150,729 (3.1%)	4,676,520
2007/08	764 (0%)	109,374 (2.2%)	64,682 (1.3%)	174,808 (3.6%)	4,715,648
2008/09	338 (0%)	106,427 (2.1%)	61,398 (1.2%)	168,161 (3.3%)	4,994,801
2009/10	371 (0%)	98,153 (1.8%)	64,550 (1.2%)	163,073 (3.1%)	5,155,927
2010/11	422 (0%)	100,967 (1.9%)	64,754 (1.2%)	166,143 (3.1%)	5,267,521
2011/12	1,832 (0%)	96,073 (1.8%)	65,379 (1.2%)	163,260 (3.0%)	5,227,971

Note: We used an arbitrary value of 80 km to remove the effects due to events when people were away from home. Each LSOA had at least one hospital site that provided emergency services within 45 km of its centroid, while 22 per cent of LSOAs had no admissions over 80 km in 2011/12. Therefore, a limit of 80 km ensured that most meaningful admissions would be included.

Appendix 3: Binley's A&E types

		Number of sites						
First line of address	Group	2006	2007	2008	2009	2010	2011	2012
A&E Department	Major A&E department	25	30	24	25	25	21	20
Accident & Emergency	Major A&E department	0	0	0	1	1	1	1
Accident & Emergency Department	Major A&E department	260	265	238	245	247	240	235
Accident & Emergency Department – Roch House	Major A&E department	1	1	1	1	1	1	1
Casualty Department	A&E department	0	0	0	1	1	1	1
Casualty Team	A&E department	0	0	0	0	0	0	1
Emergency Department	A&E department	0	1	2	2	2	3	4
Emergency Medicine Department	A&E department	1	1	1	1	1	1	1
Minor Injuries	MIU	1	1	0	1	0	0	2
Minor Injuries Department	MIU	10	0	3	5	3	5	5
Minor Injuries Unit	MIU	14	11	1	3	0	1	1
Urgent Care	MIU	0	0	0	0	0	0	2
Urgent Care Centre	MIU	0	2	0	0	1	1	2
Urgent Care Department	MIU	0	0	0	0	0	1	0
Clinical Assessment Unit	CDU	0	0	0	1	1	0	0
Clinical Decision Unit	CDU	0	0	0	0	0	0	1
Clinical Decisions Unit	CDU	0	0	0	0	1	1	1
Clinical Decisions Ward – Ward 1	CDU	0	0	0	0	1	1	1
Emergency Admissions Unit	CDU	1	1	1	2	3	2	0
Emergency Admissions Unit – Ward 7	CDU	0	1	1	1	1	1	1
Emergency Assessment Department	CDU	1	1	1	1	1	1	1
Emergency Assessment Unit	CDU	3	1	1	3	3	2	2
Emergency Medical Unit	CDU	0	1	2	1	2	1	0
Emergency Medicine Unit	CDU	0	0	0	1	1	1	0
Medical Admissions Unit	CDU	1	1	1	0	0	0	0
Medical Assessment Unit	CDU	0	0	2	4	3	1	2
Medical Assessment Ward	CDU	0	0	0	0	0	1	1
Paediatric A&E Department	Paediatric A&E	1	1	1	1	1	1	1
Paediatric Accident & Emergency Department	Paediatric A&E	1	1	1	1	1	1	1
Children's Casualty Department	Paediatric A&E	1	2	1	1	1	1	1

		Number of sites						
First line of address	Group	2006	2007	2008	2009	2010	2011	2012
Accident Treatment Centre	Other	1	1	1	0	0	0	0
ACTRITE Team	Other	0	0	0	0	1	1	1
Acute Medical Unit	Other	0	0	0	0	0	0	2
Assessment Department	Other	1	1	1	0	0	0	0
Community Casualty	Other	0	0	0	1	1	1	1
Emergency Admissions Discharge Unit	Other	0	0	0	0	0	1	1
Emergency Care Centre	Other	1	1	1	1	1	1	1
Emergency Care Ward	Other	0	0	0	0	0	1	1
Emergency Management Unit	Other	0	0	0	0	1	1	1
Intermediate Care Team	Other	0	0	0	0	0	1	1
Ophthalmology Emergency Department	Other	0	0	0	1	1	1	1
Primary Care Assessment Service	Other	0	0	0	1	1	1	1
Rapid Response Department	Other	0	0	0	0	1	1	1
Resuscitation Department	Other	1	1	1	1	1	0	0
Resuscitation Services	Other	1	1	1	2	2	2	1
Special Receiving Unit	Other	0	0	0	0	0	0	1
Unscheduled Care Department	Other	1	2	1	1	1	0	0

Note: MIU: minor injury unit, CDU = clinical decision unit.

About the authors

Adam Roberts is a Senior Research Analyst at the Nuffield Trust working across the research and economics teams. Among other projects, he is responsible for the Trust's work around the projections for the demand for NHS services and the potential future funding gap.

He joined the Trust in November 2010 from Humana Europe, where he led a team analysing costed acute data to identify potential issues for NHS commissioners. During his time at Humana he developed a strong understanding in commissioning of secondary care services, NHS Acute Data, National Payment by Results (PbR) Tariffs and PbR Rules for Acute Contracting and Invoice Validation.

Prior to Humana, Adam was responsible for the production of risk estimates of NHS organisations for the Care Quality Commission (and the former Healthcare Commission) to support the programme of targeted inspections. These estimates were generated by applying cutting-edge methods to all relevant and available data sources, both quantitative and qualitative, to identify areas of possible concern for the commission to follow up.

Ian Blunt is a Senior Policy Analyst at the Nuffield Trust. He joined the Trust in October 2009 and leads a range of quantitative analyses making use of large administrative datasets. Recent examples include an evaluation of a NHS integrated care pilot, a descriptive analysis of long-term trends in admissions for ambulatory care sensitive conditions and implementing a predictive risk model for emergency readmissions within 30 days. Past projects have included studies on person-based resource allocation, patient-level costing and the rising trend of emergency admissions. Before joining the Trust, Ian worked for the Healthcare Commission developing an automated risk assessment process to target inspections of providers.

Martin Bardsley is Director of Research at the Nuffield Trust. He joined the Trust in September 2008. He leads a specialist team undertaking a range of quantitative research projects, most of which aim to exploit existing information systems in the NHS.

Martin has over 20 years' experience in health services research and analysis. Before joining the Trust he worked in healthcare regulation. He was Assistant Director at Commission for Health Improvement before moving to the Healthcare Commission, where he led their work on new ways to use information to target regulatory activity. This included ground-breaking work on the use of multiple indicators and time series analyses for surveillance.

Martin is a Fellow of the Faculty of Public Health and in the 1990s he established a London-wide resource on public health information. This work led to a number of reports on health in London, including the first Public Health Report for Greater London in 1998. Prior to that Martin had worked on the application of outcome measurement which formed the basis of his PhD. He was also involved in early stages of the application of DRGs (diagnosis-related groups) in the UK – work that eventually led to HRGs (healthcare resource groups) and Payment by Results. Martin is a member of the board of CLOSER, a project funded by the Medical Research Council on longitudinal surveys; and a member of the Peter Sowerby Commission.

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