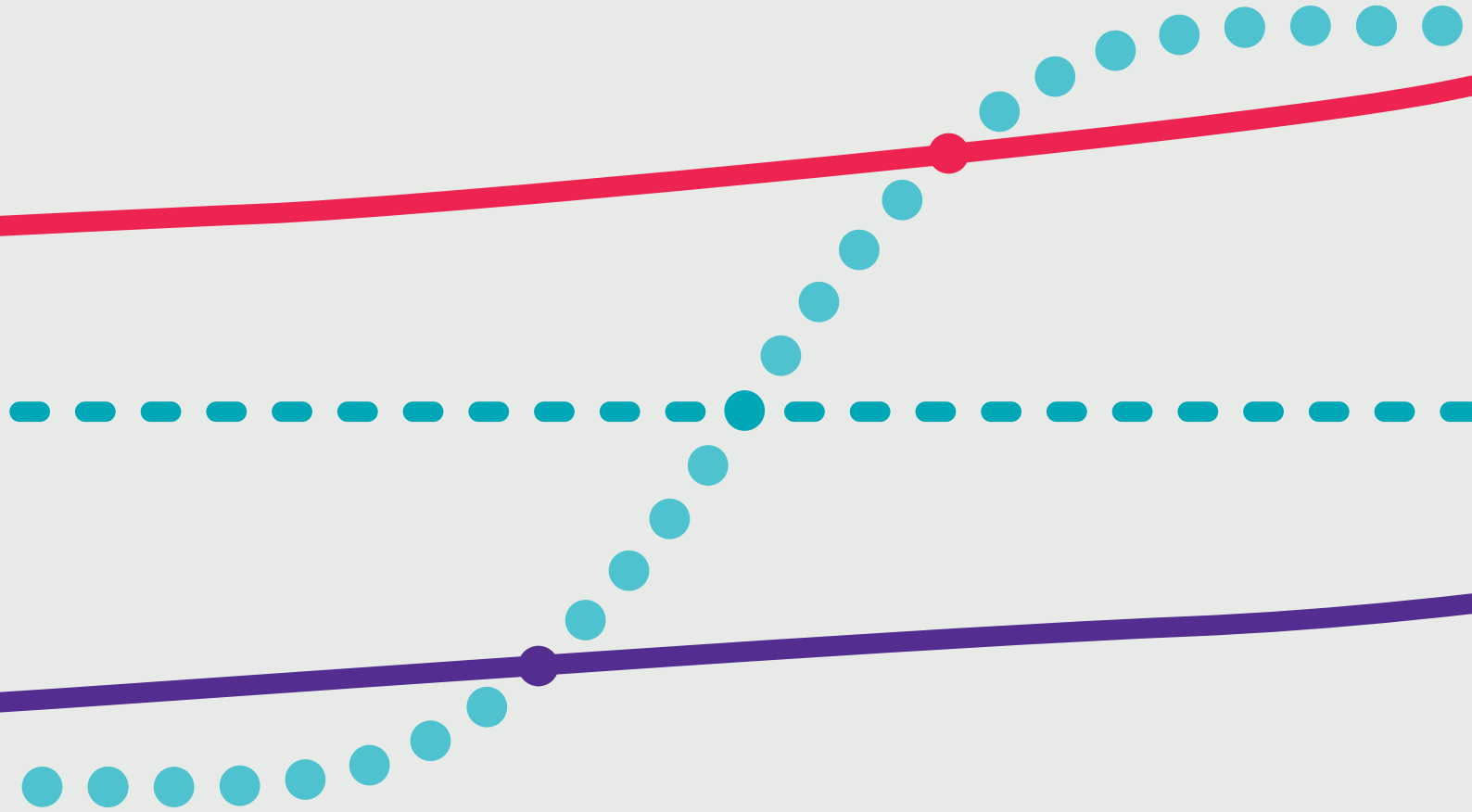
QualityWatch

Focus on: A&E attendances

Why are patients waiting longer?



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About QualityWatch

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

About this report

QualityWatch Focus On reports are regular, in-depth analyses 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. This QualityWatch Focus On report examines recent trends in attendance at Accident and Emergency (A&E) departments in England. It explores a range of factors thought to be contributing to increased pressure on A&E departments, and what might explain these.

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Summary

There is now a well-established perception that A&E services are under exceptional pressure, as evidenced most clearly by the dramatic increase in the number of patients waiting more than four hours between arrival at A&E and being admitted or discharged. Along with the headlines, there has been vigorous debate about the possible causes – but the evidence supporting some of these causes is often limited.

We explored a range of factors thought to be contributing to increased pressure on A&E in the English NHS and tested whether recent changes in these factors could explain the current pressures observed in the system. These factors were:

- Capacity – Have occupancy rates of A&E departments increased?
- Case-mix – Has the age distribution or morbidity of people using A&E changed significantly?
- External factors – What impact does change in the weather and availability of general practitioner (GP) services have on A&E targets?

In each case we used the latest available de-identified person-level data (which allows a greater level of insight than hospital-level data) to ask whether there is any association between the factor and achievement of the four-hour target, and whether changes in the factor could plausibly explain the dip in performance observed in the winter of 2012/13. We found that:

- The average occupancy of England's A&E units increased by around 8 per cent between 2010/11 and 2012/13.
- Despite large increases in the number of people using A&E services overall, attendances at major A&E units (where waits are a significant issue) have only increased in line with what would be expected from population growth – there has not been a great surge in attendances. However, sustained small increases in attendance, without additional departments being built, have increased the number of patients per department.
- High occupancy levels (in excess of what a department would expect for a given time of week) are associated with longer average waiting times, and an increased likelihood of breaching the four-hour target. However, high occupancy (often termed 'crowding') does not always explain breaches – around one quarter of breaches occurs when the department is less crowded than would be expected.
- The number of people spending more than four hours in A&E increased by more than 123,000 between 2011/12 and 2012/13. Although A&E departments see more older people than they did previously, this factor appears to only account for around 11 per cent of the observed decline in performance against the four-hour target. The winter months in 2012/13 were colder than those in 2011/12, but this appears to explain no more than 19 per cent of the decline in A&E performance over this period.
- We did not find evidence that cases being seen in A&E were becoming more complex. The proportion of people with one or more long-term conditions attending A&E did not change notably between 2010/11 and 2012/13, and

other expressions of case-mix also showed no particular change over time. This means that it is unlikely that these factors contributed to the decline in performance against the four-hour target.

- There is also no evidence that patient satisfaction with access to their GP is associated with achievement of the four-hour target, but it is related to rates of attendance.

While changing age distributions and weather patterns have impacted on the performance of A&E units, it appears that other factors are also influencing the ability of A&E units to meet the four-hour target. It is possible that A&E units are reaching a 'hard limit' of what they can achieve with the available resources, and small increases in attendance or case-mix result in disproportionate increases in waiting times. We noted an increase in occupancy of A&E units, and that relative occupancy levels and breaches of waiting-time targets are closely related. This is not unexpected – crowded departments take longer to process patients, and treating patients more slowly leads to greater A&E occupancy. However, it is significant that we have confirmed an increase in occupancy because treatment in crowded A&E departments is known to have a detrimental effect on patient experience and safety. We also found evidence that a lack of availability of inpatient beds increased waiting times for all patients in the A&E department. Understanding the relative impact of these factors is crucial if effective solutions are to be found and extra resources well spent.

The NHS has three broad options for addressing this, though all have significant drawbacks:

- **Significant investment to increase the capacity of A&E** (in terms of both physical space and staffing levels), but this may seem difficult given the current financial situation and availability of qualified staff.
- **Renew efforts to reduce demand for urgent care and/or divert it away from A&E.** The search for effective ways to reduce the need for emergency care continues. Though this is the preferred solution it is also clear that there is no consensus on whether preventive or community interventions can deliver changes in this area in the timescales required. Similarly, for some time there has been a range of initiatives aimed at managing all but the most serious cases away from A&E without, as yet, any widespread evidence of success. However, new initiatives and techniques are being developed constantly.
- Many organisations struggle to implement and sustain recommended best practice to reduce pressure in A&E (such as rapid senior assessment and improved discharge planning). If these cannot be achieved swiftly by all hospitals then maintaining even current levels of performance may not be sustainable. Even if the **NHS refocuses on alternative performance measures for A&E**, reduced performance on the four-hour target will not be popular with the public or politicians and would mean exposing patients to the poorer outcomes that are associated with longer waits.

Whatever route is ultimately taken to address the long-term issues, it is essential that we continue to monitor the many dimensions of quality of care delivered inside A&E and outcomes across the whole system for patients who use urgent care.

1 Introduction

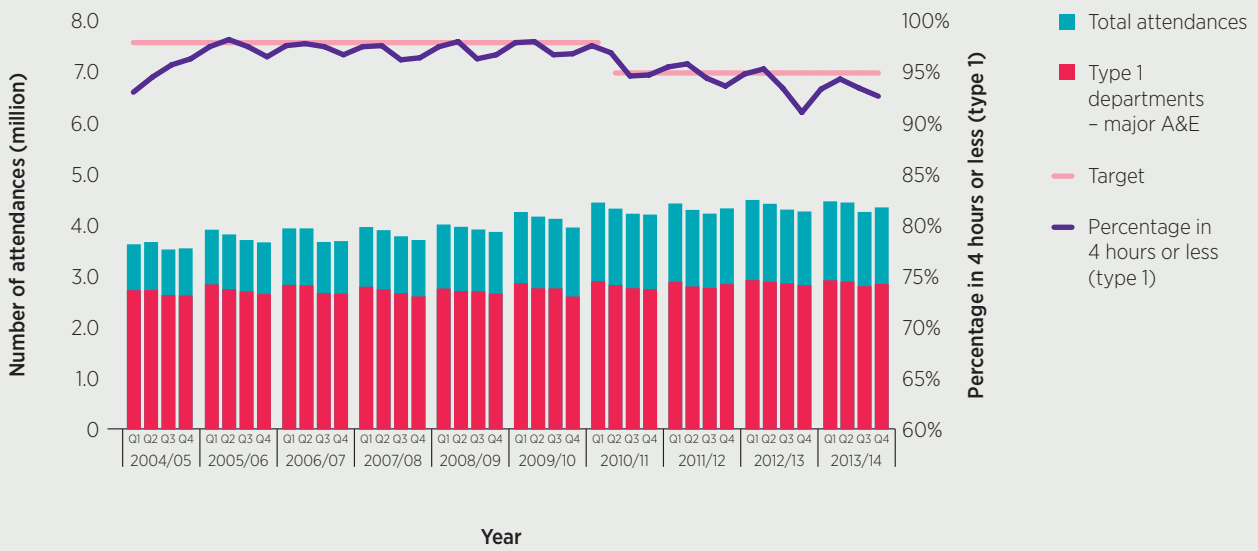
40
average number of people who arrive at A&E departments in England every minute

Every minute of every day, an average of 40 people arrive at Accident and Emergency (A&E) departments in England. A&E has been the focus of public interest and performance management in the NHS for at least the last decade – and the speed with which people move through A&E has come to be a sentinel marker of the healthcare system.

A&E units are divided into 'major' and 'minor' types. Major A&E units offer a consultant-led 24-hour service with full resuscitation facilities, whereas minor units are designed to treat less serious cases. There are many ways to measure the performance of an A&E unit. By far the highest-profile metric in England is the 'four-hour wait', which counts patients who spend a total of less than 240 minutes between arrival and leaving the department (having been either discharged or admitted to an inpatient bed). As of January 2014, this target has been in place in English NHS hospitals for 10 years, and while it has been controversial there can be little doubt that it has changed the way A&E departments operate.

In 2003, before the introduction of the target, 87 per cent of attendees at a major A&E department completed their journey through A&E in less than four hours. In 2005, this proportion was 97 per cent and exceeded 98 per cent in 2008 (Figure 1.1). It is a mark of the target's success, and its resonance with the public, that it was one of the few targets that continued to be performance managed nationally after the change of government in 2010. However, the incoming coalition government did relax the target from 98 per cent to 95 per cent of

Figure 1.1: Quarterly number of A&E attendances (major and total), 2004 to 2014, with major A&E four-hour target achievement



Source: NHS England, 2014

attendees being seen within four hours. This relaxation was associated with an almost immediate fall in the proportion of people seen inside four hours to an average of 95 per cent in 2011 (QualityWatch, 2013). While the step-change in performance is marked, it is important to remember there were many other changes being introduced around this time which may also have had some effect on A&E performance – although the distorting effect of a single high-profile target has been noted (Cooke, 2014).

However, some time around September 2012, performance against the four-hour target in major A&E departments started to fall further. The average performance in December was 92 per cent, and by April 2013 achievement of the target had fallen to just 90 per cent – the lowest level since the introduction of the four-hour target in January 2004. Performance against the A&E target began to improve in mid-May and by June had been restored to pre-2012 levels. However, performance declined again from July onwards and by October had fallen to an average of 93 per cent (NHS England, 2014). These lapses in meeting the four-hour target were not an issue in most of the minor A&E units, but concentrated in the 197 major A&E units (in fact, the NHS as a whole only met the four-hour target because performance was measured over all types of A&E units).

Box 1.1: Measures of A&E performance

It is worth noting that while the time from arrival to departure is the highest-profile performance indicator, it is not the only way of gauging the performance of an A&E department. 'Trolley waits' – that is, the time between the A&E doctor making the decision to admit and the patient arriving in an inpatient bed – also increased over the same period (NHS England, 2014), adding to crowding in A&E departments. A&E performance is also gauged by measures such as the time from arrival to initial assessment, the number of patients leaving the unit without being seen and the proportion of patients returning to A&E within seven days (Health & Social Care Information Centre, 2013b). Wider metrics can include the impact of A&E on other services such as ambulance diverts and cancelled operations. Common metrics that are not routinely collected include estimates of overcrowding and handover delays (Hoot and Aronsky, 2008).

When the figures showing the reduction in achievement of the four-hour target emerged, they prompted much discussion and debate among the media, the service and policy-makers. There were a variety of responses to the perceived problems in A&E. The Commons Health Select Committee conducted an inquiry into emergency care (House of Commons Health Committee, 2013), which concluded that the 'system cannot accurately analyse the cause of the problem … More accurate information about the causes of rising service pressures is not simply a management convenience; it is fundamental to the delivery of high quality care' (2013, p. 16). It also highlighted that 'when demand for care is not met elsewhere, people go to A&E because they know the door is always open' (Dorrell, 2013), and suggested that low staffing levels were exacerbating the current pressure on the system. The College of Emergency Medicine (2013b) highlighted the challenges of maintaining a full staff roster in busy A&E departments, especially when competing against other specialties which junior doctors perceived to provide a better work/life balance. Despite this perception, the number of doctors with an emergency medicine specialty has increased at a

faster rate than all other specialties combined between 2002 and 2012, and the rate and pattern of sickness absence among doctors with an emergency medicine specialty does not differ greatly from doctors in other specialties (Health & Social Care Information Centre, 2013a). The Department of Health announced an extra £500 million available to ease winter pressures on A&E over the next two years – equivalent to a 13 per cent increase in the annual spend on A&E services (Department of Health, 2013b; 2013c). This emphasises the totemic role of the four-hour target as an indicator for performance of the NHS in general. However, just a small amount of the extra money was spent directly on A&E units, with large amounts being used to fund admission avoidance schemes and to support additional inpatient bed capacity. This demonstrates the extent to which other aspects of the health system impact on performance in A&E.

NHS England's review of the entire system of urgent care in England (Urgent and Emergency Care Review Team, 2013b) was already under way when A&E performance became a major issue. When the first stage of the review reported in November it noted confusion among the public about which was the most appropriate service for their urgent care need, and proposed large-scale restructuring and re-labelling of the service. This is to be structured around five key elements, set out in Table 1.1.

Table 1.1: Key elements listed in Urgent and Emergency Care Review

Key elements	To be achieved by...
Providing better support for people to self-care	Improving the quality and accessibility of information about self-treatment options so that people who prefer to can avoid the need to see a healthcare professional. Standardised care planning will also be used so that information about a patient's condition and future wishes are known to relevant healthcare professionals.
Helping people with urgent care needs to get the right advice in the right place, first time	Enhancing the NHS 111 service through: • access to medical records • option to speak directly to a clinician • direct booking of GP or urgent care centre appointments.
Increasing the credibility of urgent care services outside of hospital	Providing faster and consistent same-day, everyday access to GPs, primary care and community services such as local mental health teams and community nurses for patients with urgent care needs. Community pharmacists and ambulance paramedics will become increasingly involved in resolving urgent care cases.
Standardising the services available at A&E departments	Introducing two levels of hospital emergency department – under the current working titles of Emergency Centres and Major Emergency Centres – to replace the inconsistent levels of service provided by current A&E departments. Emergency Centres will be capable of assessing and initiating treatment for all patients and safely transferring them when necessary. Major Emergency Centres will additionally provide a range of highly specialist services. Both will have senior clinicians present seven days a week.
Improving the action of the urgent care system as a whole	Developing Emergency Care Networks, directed by Major Emergency Centres, to support the free flow of information and specialist expertise. These networks will also support the introduction of an efficient critical care transfer and retrieval system so that patients requiring specialist help reach the best possible facility in a timely fashion.

Explaining A&E performance

As with the equally complex phenomenon of rising emergency admissions (Blunt and others, 2010), there are many explanations mooted for the problems in A&E. Despite the amount of debate since the decline in performance was noticed, the causes of the additional A&E pressure are still unclear.

> '... the NHS is also struggling from ill-informed speculation about what is causing the pressures and what services they can rely on to meet their needs.'
> Mike Farrar, Chief Executive, NHS Confederation (Boffey, 2013)

'more careful inspection of the data revealed that the rise [in A&E attendances] was almost exclusively acting on minor A&Es'

First, we note from Figure 1.1 that there has been a sizable increase in the number of A&E attendances, from 16.5 million in 2003/04 to 21.7 million in 2012/13, a rise of 32 per cent. However, more careful inspection of the data revealed that this rise was almost exclusively acting on minor A&Es (for example, urgent care centres, minor injury units and walk-in centres). Although attendances at major A&E departments had also been increasing, this was at a much lower level (just 13 per cent between 2003/04 and 2012/13) and was entirely in line with what would be expected based on population ageing and growth (see Appendix B). Much of the increase in attendances at minor A&E units is likely to be related to the range of new services available (Rosen, 2014). It is also worth noting that some of the increase is thought to be an artefact of better recording and changes to the labelling of existing services, rather than 'new' service use.

In September 2013 the Department of Health called for fundamental change to alleviate pressure on A&E (Department of Health, 2013a). It identified increasing numbers of vulnerable older patients with complex care problems using A&E because other services do not offer the care they need when they need it. The proposed solution was greater integration between primary, secondary and social care with the aim of reducing the need for repeated trips to A&E and speeding up people's journey through A&E.

A member survey of the NHS Confederation (NHS Confederation, 2013) also highlighted the perceived pressure caused by treating an increasing number of people with long-term conditions. The survey also reported that members did not feel that the introduction of the NHS 111 telephone number had contributed significantly to reducing A&E pressures.

NHS England's *Understanding Winter Pressures in A&E Departments* (NHS England, 2013b) highlighted the role winter plays in demand on A&E – particularly in the form of increased admissions to hospital and greater numbers of patients breaching the four-hour target. Indeed, many studies have established a relationship between extremes of temperature and morbidity (Ye and others, 2012). The temperature–morbidity relationship may be confounded or modified by sociodemographic factors and air pollution, and exhibits varying degrees of time lag. Seasonal outbreaks of flu-like illnesses, norovirus and rotavirus also impact A&E use, by both people attending A&E because of their illness and reducing inpatient bed availability through ward closures.

In November 2013 the College of Emergency Medicine issued what it saw as 10 priorities for resolving the crisis in A&E (College of Emergency Medicine, 2013a). The main focus of these points was around defending and expanding A&E capacity by:

- promoting alternative services for lower acuity cases
- reducing crowding in A&E by removing barriers to patients leaving the department
- increasing staffing levels in A&E at all times of day and night.

A study prior to the introduction of the target found that the main risk factors for spending over four hours in A&E were requiring admission, arriving by ambulance, arriving during the night, increasing age and higher levels of deprivation (Downing and others, 2004).

When inpatient beds are scarce, patients indicated for admission will remain in A&E for longer, increasing waiting times and crowding. It has been demonstrated that high ratios of daily inpatient admissions to discharges increases next-day A&E waits, and low ratios reduce them (Vermeulen and others, 2009). The availability of inpatient beds is influenced by a hospital's ability to discharge current inpatients, the scheduled bed occupancy and the frequency of GP direct admission.

A substantial body of literature highlights the link between crowding in A&E and poorer outcomes for patients (Sprivulis and others, 2006; Carter and others, 2014; McGirr, 2014). The causes of crowding are structured with the following framework (Asplin and others, 2003):

- input factors related to sources and aspects of patient inflow (for example, non-urgent visits, frequent attendees, seasonal influenza, lack of alternative sources of care)
- throughput factors related to bottlenecks within the emergency department (for example, inadequate staffing, lack of streaming)
- output factors related to bottlenecks in other parts of the care system that might affect A&E (for example, hospital bed shortages, delays in investigation).

The objective of this study was to assess what contribution each of these were making to the current pressures on A&E. There are many proposed factors, and without robust evidence as to which causes are most significant, there is the risk that efforts to alleviate pressure will be misdirected.

In this analysis we have explored the impact of a range of factors and used de-identified person-level A&E data to test three commonly cited causes of additional pressure on major A&E departments against the patterns of performance on the four-hour target.

These factors are:

- Capacity – Have occupancy rates of A&E departments increased?
- Case-mix – Has the age distribution or morbidity of people using A&E changed significantly?
- External factors – What impact does change in temperature and availability of GP services have on A&E targets?

In each case we ask whether there is any association between the factor and achievement of the four-hour target, and whether changes in the factor could plausibly explain the dip in performance observed in the winter of 2012/13.

Using de-identified person-level data offers many significant advantages over the summary data reported at the level of the A&E department. For example, rather than inferring the impact of age on target achievement by comparing the age distribution of people using the department to the department performance, we are able to calculate the time each individual spent in A&E, and their age – without revealing their identity. This allows us to explore possible causes much more thoroughly.

2
Summary of methods

The analysis was based on pseudonymised person-level hospital episode statistics (HES) A&E data from April 2010 to March 2013. These datasets create a single record for each A&E attendance and document basic information such as age, sex, area of residence, and time and method of arrival and departure.

The time spent in A&E can be calculated by comparing the departure time with the arrival time. The pseudonymous identifier can be used to link A&E attendances together over time, and also link attendances to hospital inpatient records. The analysis used only attendances at major A&E departments because these are the departments that struggle with the four-hour target, and are most influential on the public's perception of A&E.

A&E HES is a relatively new dataset, and completeness of the dataset has improved substantially over time. By comparing HES with department-level attendance data (Department of Health, 2011) it is obvious that in the earlier years a large proportion of attendances was not captured. For this reason we have focused on data from 2010/11 onwards, and inflated the 2010/11 figures where appropriate.

The other data used in this study were derived from the following sources:

- Age is recorded in A&E HES for each attendance, and population rates were calculated using Office for National Statistics population estimates.
- Information on co-morbidities was drawn from the diagnosis fields of inpatient HES data from April 2001 to March 2013, using the list set out in Table 2.1.
- Mean area temperature on the day of attendance was calculated by matching small grid Met Office data (Met Office, 2012) to the centre of each patient's area of residence. As this highly granular temperature dataset was only available for 2011, we used it to calculate a distribution around the Central England Temperature (Met Office, 2014), which could be applied to days in 2012/13.
- Data on the accessibility of GP practices were taken from the GP patient survey (NHS England, 2013a) covering the periods July 2011 to March 2012 and July 2012 to March 2013 and mapped to A&E attendance using the GP practice code recorded in the HES data.
- Finally, the occupancy of each A&E unit was calculated by counting each patient in and out of each unit using the A&E department code and times of arrival and departure. This process was calculated for 15-minute 'slots' between 1 April 2010 and 31 March 2013, and was equivalent to taking a national bed census every 15 minutes.

Further details of methods used are provided in Appendix A of this report.

Table 2.1: Long-term conditions considered for this study

Cancer	Injury from fall	Atrial fibrillation
Diabetes	Non-rheumatic valve disorders	Cerebrovascular disease
Hypertension	Mental illness	Peripheral vascular disease
Congestive heart failure	Angina	Mild liver failure
Chronic obstructive pulmonary disease	Ischaemic heart disease	Connective tissue disease/ rheumatoid arthritis
Asthma	Anaemia	Renal failure

3

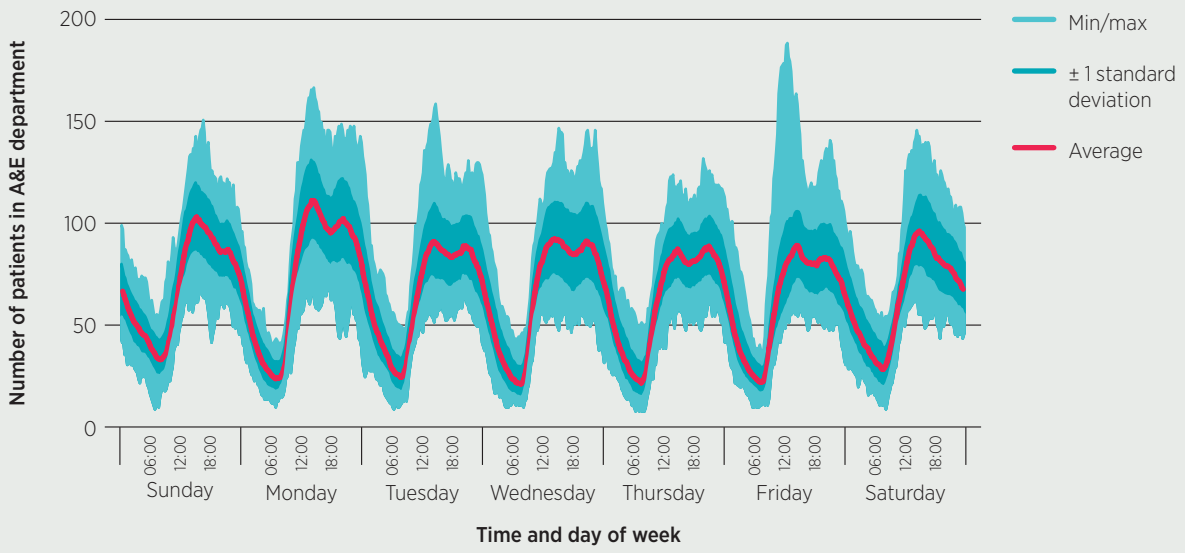
Results – have the occupancy levels of A&E departments increased?

One explanation put forward to explain the dip in performance against the four-hour wait is that hospitals do not have the capacity in A&E to meet demand within target timescales. Capacity in this case mainly rests upon having sufficient A&E staff to see the number of patients arriving, availability of inpatient beds and timely access to tests, such as X-rays etc. These factors are closely related to crowding in the A&E department as patients wait longer to complete their visits, and many studies have shown that more crowded departments are associated with worse outcomes for patients (Carter and others, 2014).

> '62% of the current [emergency medicine] consultant workforce reported that their job was not sustainable in its current form'
> *Stretched to the Limit* (College of Emergency Medicine, 2013b, p. 7)

The de-identified person-level data can be used to calculate how many patients were in A&E at any particular time, simply by counting them in and out of each department. This method is illustrated in Figure 3.1, which shows the average occupancy for a single A&E department by time and day of the week in 2012/13.

Figure 3.1: One hundred and sixty eight hours in A&E, 2012/13. Estimated number of cases and distribution of average daily values at given time for a single A&E unit

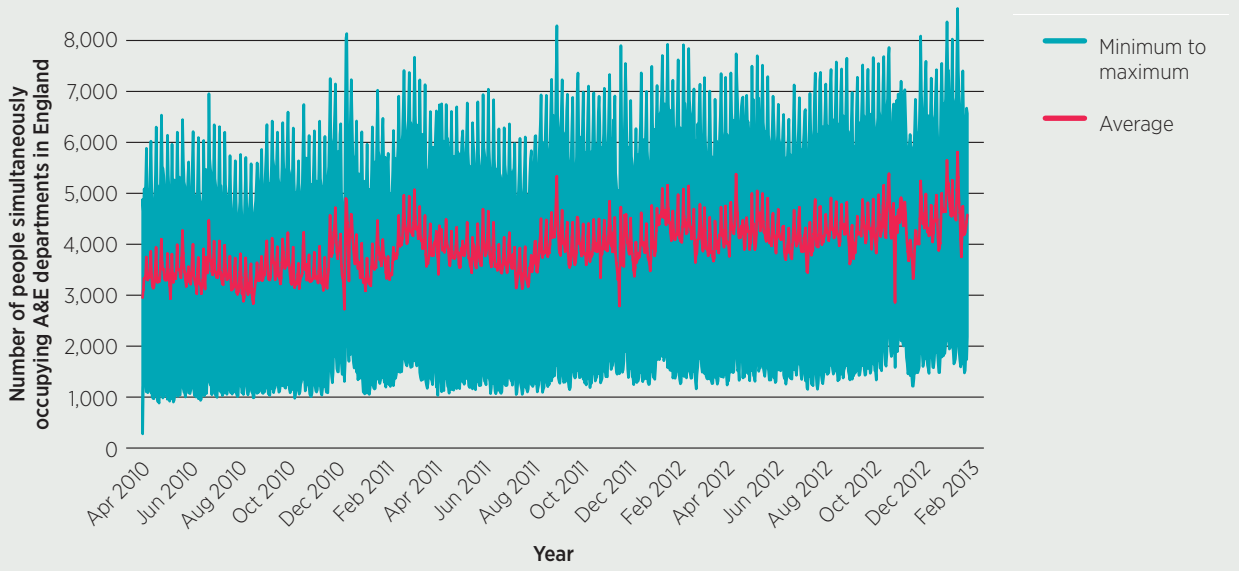


It is well known that the occupancy of A&E departments varies substantially by time of the day and day of the week. The A&E department in Figure 3.1 ranged from containing an average of just 25 patients at 7am to over 80 by midday. This does not necessarily mean that staff are likely to be idle in early morning and overstretched in the afternoon – clearly hospitals will adjust their shift-staffing levels (and therefore, to an extent, their A&E capacity) according to the expected demand.

However, the figure also highlights the level of variation between days for any given time of day. Average occupancy at midday is 81 patients, but can be as low as 40 or as high as 178. This less predictable fluctuation in demand can put much greater strain on departments.

The average, minimum and maximum occupancy of A&E departments in England has been steadily increasing (Figure 3.2). Some of this may be due to known under-reporting in the 2010/11 data, but even when this is taken into account we still observe an 8 per cent increase in occupancy in 2012/13.

Figure 3.2: Daily A&E occupancy in England, 2010 to 2013



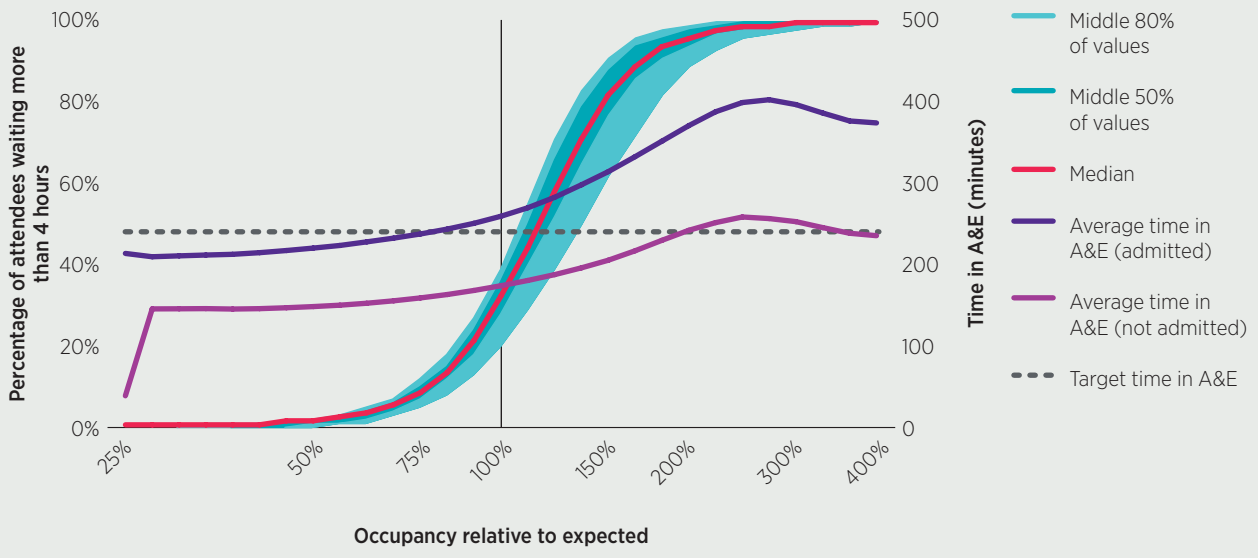
It is clear that greater numbers of people are being treated in England's A&E units. If hospitals have not expanded their physical and staffing capacity to accommodate this growth, then it would be expected that levels of crowding in departments would also have increased. This should be detectable through extended waiting times. Indeed, average waits in A&E have increased year on year since April 2010, to 147 minutes (2010/11), 151 minutes (2011/12) and 158 minutes (2012/13), respectively. Increases were broadly evenly spread throughout the day, with greatest increases being seen at 6.30am (15 per cent increase in 2012/13 compared with 2010/11, adjusting for under-reporting) and the least at 11.45am (6 per cent).

How close an A&E is running to its capacity can be inferred by comparing its current occupancy to what would be expected for that time of the day and week. In this way we calculated an expected occupancy based on the average occupancy for each department between 2010 and 2013, standardising for day of the week and time in 15-minute slots to reflect changing shift staffing patterns.

The ratio of observed-to-expected occupancy indicates the potential pressure on an A&E unit. Half of all the time slots had actual occupancy levels within 75 to 125 per cent of expected; this indicates that although occupancy in A&E units was broadly predictable there was still some variability (that is, for half of the year a unit could find itself with occupancy levels either 25 per cent above or below normal).

We might also expect the relative occupancy levels to be associated with the likelihood of very long waits and breaches to the four-hour target. The relationship between occupancy ratio and the average time from arrival to departure is shown in Figure 3.3, representing the average waiting times for people using a department at a particular level of relative occupancy. The figure also shows the distribution of target breaches across departments as a cumulative proportion.

Figure 3.3: Link between occupancy and waiting time/breaches (based on average occupancy, 2010 to 2013)



The average waiting times clearly increase as departments become busier. In turn, this increases the number of people occupying a department who will ultimately wait more than four hours. Nearly half of breaches[1] (44 per cent) happen when the department is running at more than 125 per cent of its usual occupancy. However, 27 per cent of all breaches occur when departments are less busy than expected for the time of day.[2]

Based on the pattern of achievement of the four-hour target, for departments operating at between 90 per cent and 190 per cent of usual occupancy, it appears that performance falls by 0.3 per cent for every 1 per cent increase in occupancy. To translate this effect into a potential impact on national targets, if we assume an 8.1 per cent increase in occupancy (from 2010/11 to 2012/13, see Figure 3.2), with other things being equal, we would expect a subsequent 2.4 per cent decline in achievement of the four-hour wait target. The actual decline in performance was

1. Based on the number of people present in each 15-minute slot who breach, rather than the number of individuals who breach.

2. As a methodological point, note that the average waiting times appear much higher than values reported nationally – this is because they have been formed by calculating the length of stay for every individual present at each 15-minute interval. This means people staying longer are counted more often, and extend average waiting times beyond those calculated as the length of time each individual stays in A&E (everybody counts once). However, while this approach is not comparable to overall waiting times it does provide an accurate answer to how long people wait at any given level of occupancy.

only 1.3 per cent, so the increase in A&E occupancy has the potential to explain the dip in performance in late 2012. However, it is also clear that a substantial proportion of breaches occur in departments that are not significantly more occupied than usual.

Conversely, if A&E capacity could be increased so that relative occupancy is reduced by 10 per cent, we might expect that target achievement would rise to around 96 per cent. However, this would mean generating enough A&E space to accommodate around 430 extra patients nationwide – equivalent to approximately 19 new A&E departments (and people to staff them). While it should be possible to selectively target those departments with higher levels of relative occupancy for expansion, the distribution in Figure 3.3 shows that most departments are relatively similar in this respect.

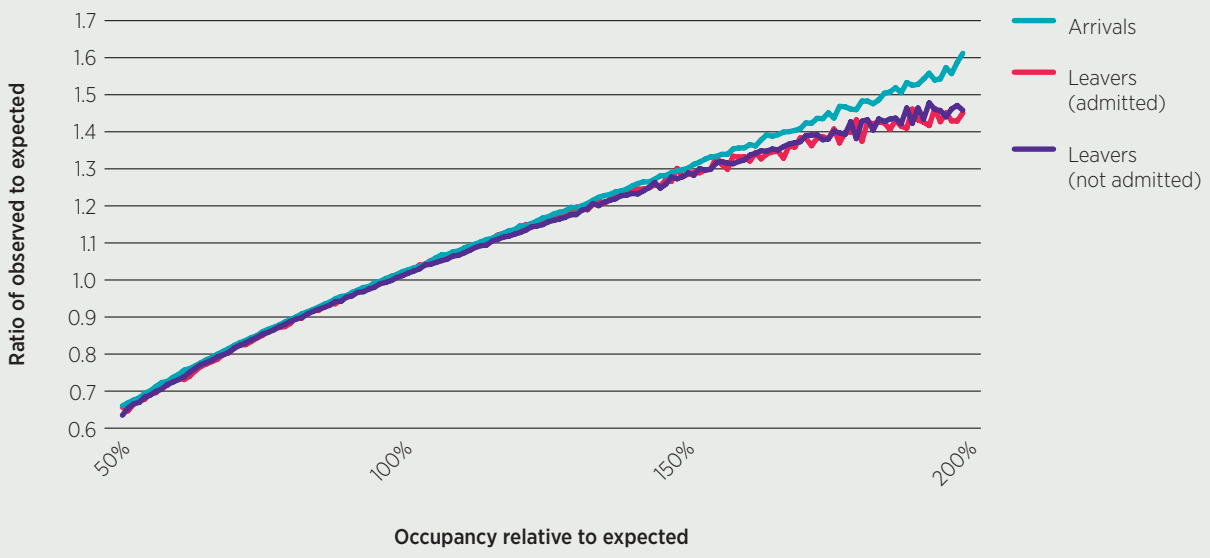
The level of crowdedness of an A&E department may be due to any combination of three factors:

- unexpectedly high numbers of people arriving at the department
- delays in moving patients through the department (reflected in unexpectedly low numbers of people leaving, whether to be discharged or to be moved to an inpatient bed)
- delays in placing admitted patients in inpatient beds (reflected in unexpectedly low numbers of people leaving to an inpatient bed).

However, these factors are interrelated which makes them difficult to study. For example, low numbers of inpatient admissions could signal a lack of inpatient beds, but it could also signal low numbers of people arriving or a fluctuation in case-mix.

Figure 3.4 examines the relationship between the balance of admissions and discharges (the ratio of observed-to-expected arrivals and departures – admitted and not admitted) against the relative occupancy of A&E departments.

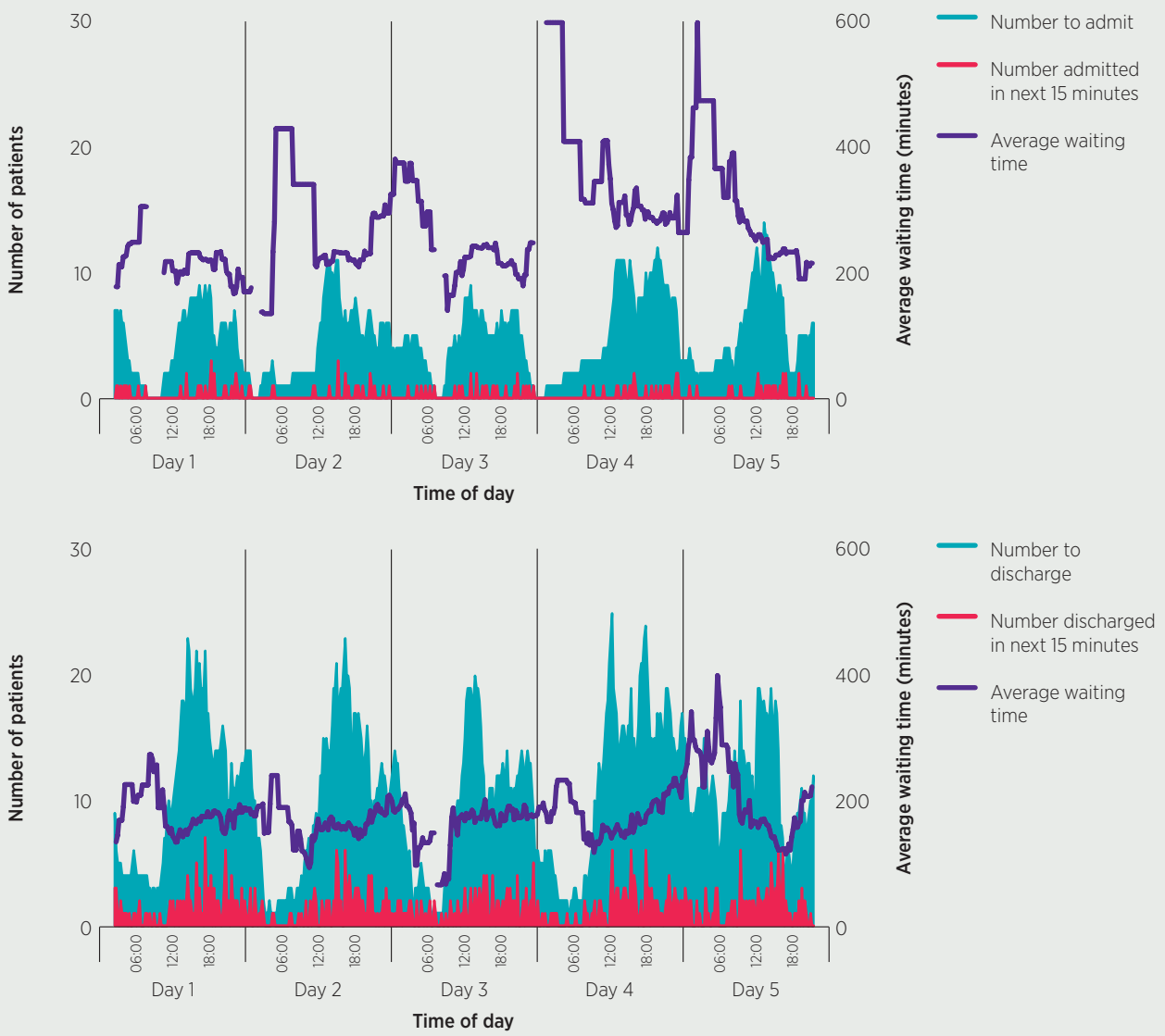
Figure 3.4: Ratio of observed-to-expected arrivals and departures (admitted and not admitted) as a function of the crowdedness of A&E departments



As departments receive more patients than they would expect for a given time of the week, their occupancy increases. However, this is offset by increases in the numbers of patients leaving the department; that is, A&E units generally respond to increased attendees by increasing productivity ('running hot'). As the levels of occupancy increase further, the number of departures can no longer keep pace with the number of arrivals. This will lead to occupancy increasing at an even greater rate.

It is interesting to note that the ratios of observed-to-expected departures for admitted and non-admitted patients change in almost exactly the same way as relative occupancy increases. It might be thought that while discharging to a hospital bed is limited by availability of inpatient beds, the department would remain free to discharge people to home as needed, so we would have expected to see that rates of departures to inpatient beds would fall first as admitted patients wait in A&E while non-admitted patients continue to exit the department.

Figure 3.5: Patient departure patterns for a single unit over five days



Indeed, it is possible to observe blocks on inpatient beds when inspecting the data for individual departments. For example, Figure 3.5 shows patient departure patterns for a single unit over just five days in February 2011. The top chart shows the number of patients in the department that will ultimately be admitted, the number of those patients who were admitted in the next 15 minutes and the average waiting time for all admitted patients. The bottom chart shows the same measures for non-admitted patients.

Prolonged periods (multiple hours) without inpatient admissions are associated with high waiting times for patients who are eventually admitted – for example, in Figure 3.5 this can be seen between 3am and 7am on the second day, or midnight to 9am on day four. These tend to occur at night, when there are low numbers of people in the unit. However, the average rate of admission for a unit is relatively small (1.6 admissions per unit per hour) which means that inpatient bed blockages are indistinguishable from natural variation in summary measures such as Figure 3.4. These effects are not generally evident in the patterns for non-admitted patients, although it is notable that no non-admitted patients left the department between 7.30am and 8.45am. This was despite the presence of a number of non-admitted patients in the department, and was reflected in a sharp increase in average waiting time.

Another way to estimate the availability of inpatient beds is using the ratio of inpatients discharged to those admitted – the daily discharge ratio (DDR). Low ratios are known to be associated with increased A&E waits the next day (Vermeulen and others, 2009). While this method is not as precise as the previous approach in terms of bed availability at a point in time, it does include information about inpatient activity which can only be inferred in the previous analysis. We calculated DDR at trust level for each day in 2012/13 and examined the way A&E waiting times and breaches of the four-hour target change as the ratio increases (Figures 3.6a and 3.6b, page 20). Although there is a broad range of DDRs, the vast majority (91 per cent) of inpatient admissions from A&E occur in trusts with DDRs of between 0.8 and 1.2; that is, where trusts are discharging between four and six patients for every five patients they admit.

Overall there is a statistically significant 10-minute decrease in average time spent in A&E as DDR increases between 0.8 and 1.2. This relationship is stronger in admitted patients (28 minutes) than in non-admitted patients (3 minutes), and these differences represent 6 per cent, 13 per cent and 2 per cent of the respective average A&E waits. There was also a strong relationship with achievement of the four-hour target, with performance increasing from 78 per cent for admitted patients at DDRs of 0.8, to 86 per cent when trusts have DDRs of 1.2.

Summary

The number of people being treated in England's A&E units increased by 8 per cent between 2010/11 and 2012/13. Through analysis of routine data we can estimate levels of occupancy in excess of what a department would usually expect for a given time of the week. This measure of relative occupancy is an indication of the 'pressure' in the department and is found to be associated with longer average waiting times, and increased likelihood of breaching the four-hour target. Not all breaches happen when occupancy is high; around one quarter of breaches occur when departments are less busy than would be expected. Nevertheless the relationship between occupancy and long waits is strong. There was some evidence of reductions in rates of inpatient admissions increasing average waiting times for admitted patients.

Figure 3.6a: A&E waits as a function of the previous day's inpatient discharge ratio, 2012/13

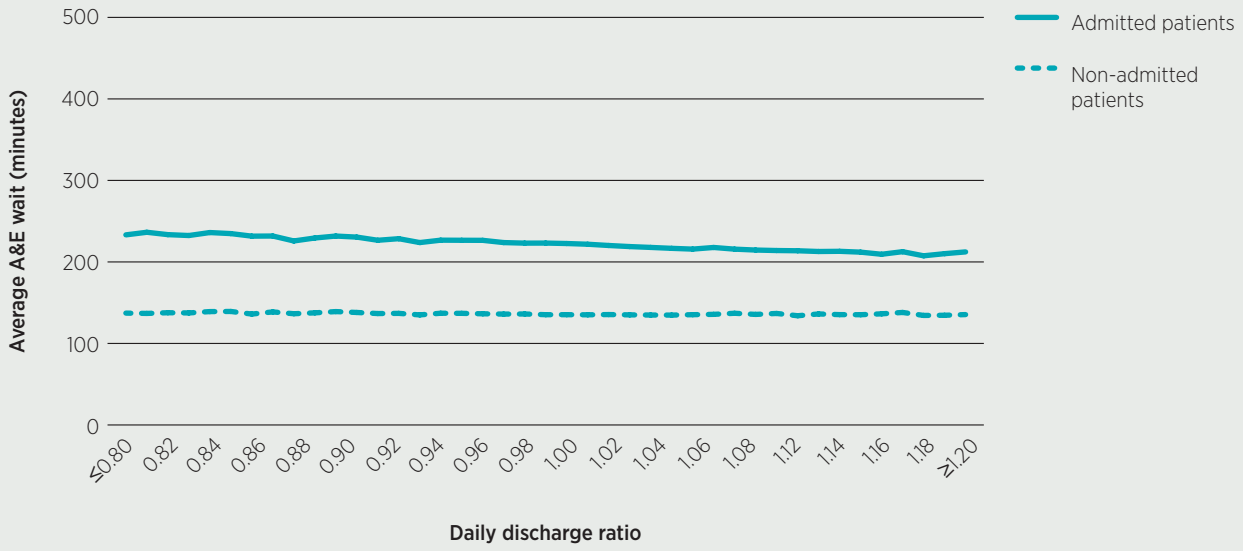
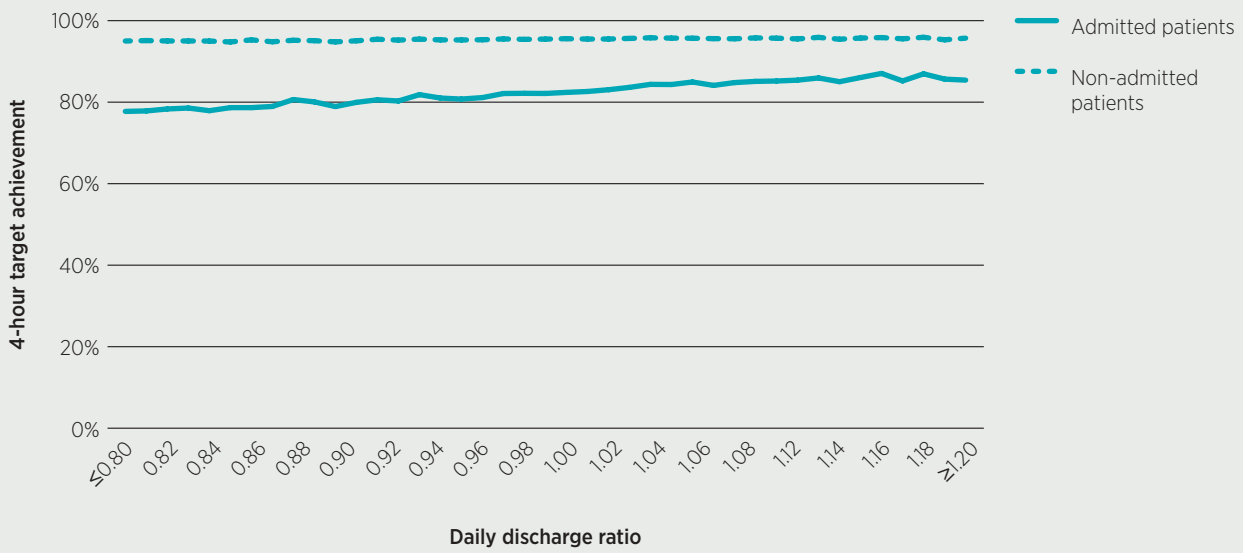


Figure 3.6b: Four-hour target performance as a function of the previous day's inpatient discharge ratio, 2012/13



4

Results – was there a change in the type of cases seen in A&E?

A further set of factors put forward to explain the dip in A&E performance was that the case-mix had changed. That is, the people coming to A&E (or their conditions) were somehow fundamentally different from previous years, and therefore were taking longer to treat and move through the department.

> 'Members were clear the biggest cause of pressures on local A&E services is the rising number of frail older people with multiple long-term conditions'
> Survey of NHS Confederation members (NHS Confederation, 2013, p. 2)

This view features strongly in the government's response to the performance dip, with a focus on community support measures for vulnerable older people and those with long-term conditions. It was also an explanation favoured by the NHS Confederation's member survey. This chapter tests that assertion, looking at first whether there is evidence to support the impact of each factor, and second whether changes in the factor could explain the increase in pressure on A&E departments between 2011/12 and 2012/13.

Changes in the proportion of older people in A&E

Despite accounting for just 21 per cent of all visits to major A&E units, people aged 65 and over have a large impact on the urgent care system. Older people have much higher rates of A&E attendance than other age groups (334 attendances per 1,000 population for those age 65 and over, compared with 253 for those under 65).

By analysing de-identified person-level A&E data we can see that older people also spend longer in A&E departments when they visit. People over 75 spent an average of 213 minutes in A&E, compared with 149 for those aged under 75 in 2012/13. This difference applied regardless of whether they were ultimately admitted or discharged. This means that increases in the numbers of older people visiting A&E (whether because of population ageing or an increase in demand) will have a disproportionate impact on A&E performance. Figure 4.1 shows the average time spent in A&E by age and whether or not the patient was admitted.

We compared the rate at which different age groups attended A&E in 2010/11 (uplifting for under-reporting in HES) and 2012/13 (Appendix B). It appears there was an increase in the proportion of A&E users who were older people. The largest increases were in the over 50s age groups (both sexes) with attendances for those aged 85 and over increasing by nearly 20 per cent more than would be predicted by population growth alone. These differential changes in rate of attendance altered the proportion of A&E users who were older people, but only slightly. The proportion of attendees aged over 65 increased from 19.4 per cent in 2010/11 to 21.2 per cent in 2012/13. But did this shift in age distribution cause the decline in performance? The likelihood of a patient in each five-year age group breaching the four-hour target was calculated for both years (Figure 4.2).

Figure 4.1: Average time spent in A&E by age and outcome

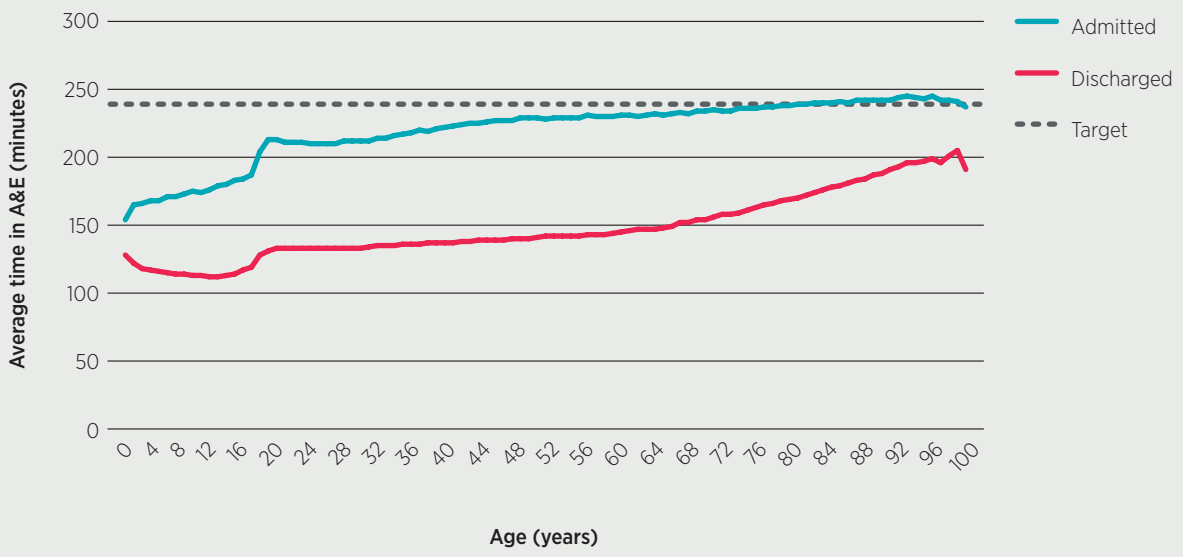
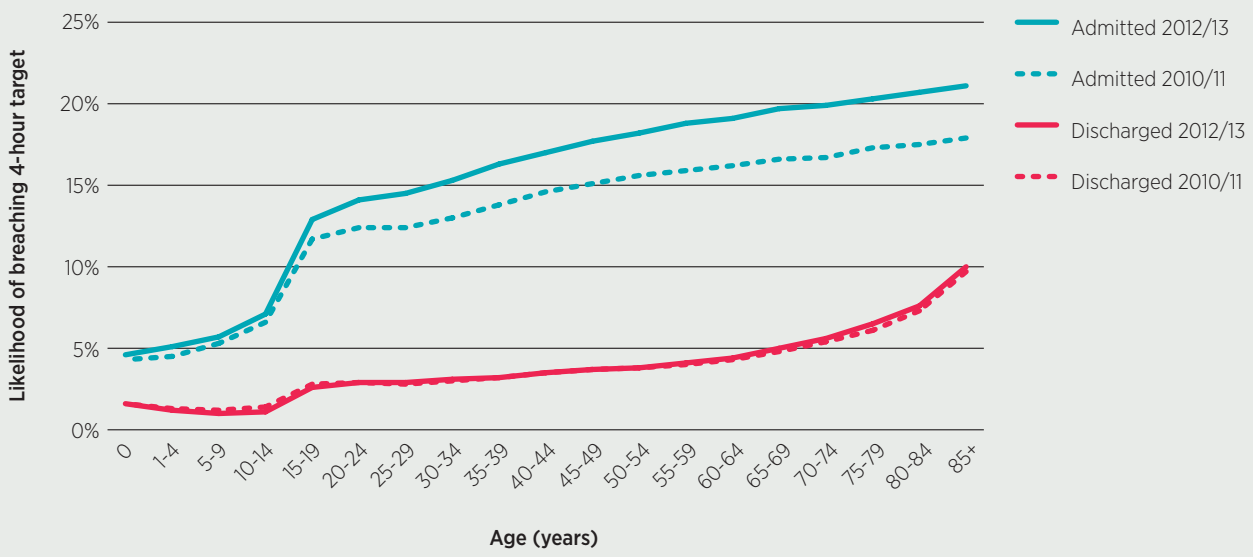


Figure 4.2: Likelihood of breaching four-hour target by age and outcome



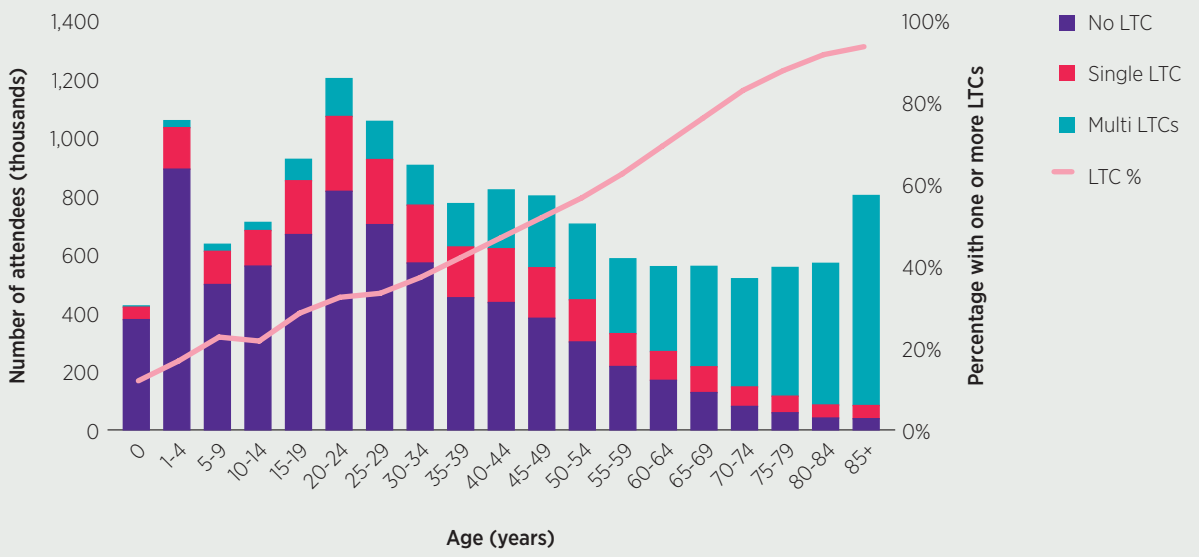
As might be expected, older people were much more likely to breach the four-hour target, with those aged 65 and over being nearly three times as likely to breach the target as those under 65 (for attendances that do not result in admission). It is also apparent that the likelihood of breaching has increased over time for admitted patients, but not for non-admitted patients. This strongly suggests that either the case-mix has changed only for the most acute cases or performance issues are driven by inpatient bed availability. It is also apparent that there is a step-change in the risk of breaching when patients are around 15 years old – which might reflect the presence of dedicated children's A&E departments and the tendency for inpatient paediatric units to operate at lower bed occupancy rates than adult wards.

Age-specific breach rates were applied to the mix of patients who attended A&E in 2012/13. So, if people in 2012/13 were just as likely to wait longer than four hours as they were in 2011/12, the overall performance for 2012/13 would have been 93.7 per cent. However, the actual performance was worse, at 93.1 per cent, and standardising for age only explained 11 per cent of the increase in breaches. So, while the changing ages of people attending A&E appeared to have contributed to a decline in performance, this did not fully explain it.

Changes in the proportion of patients with long-term conditions in A&E

One of the reasons the age distribution is so important is its association with morbidity and in particular people with a number of different concurrent long-term health problems. By looking at previous inpatient activity we are able to estimate which patients in A&E have some of the most common long-term conditions. Figure 4.3 shows the number of A&E attendees in each age group who had no, one or multiple long-term conditions.

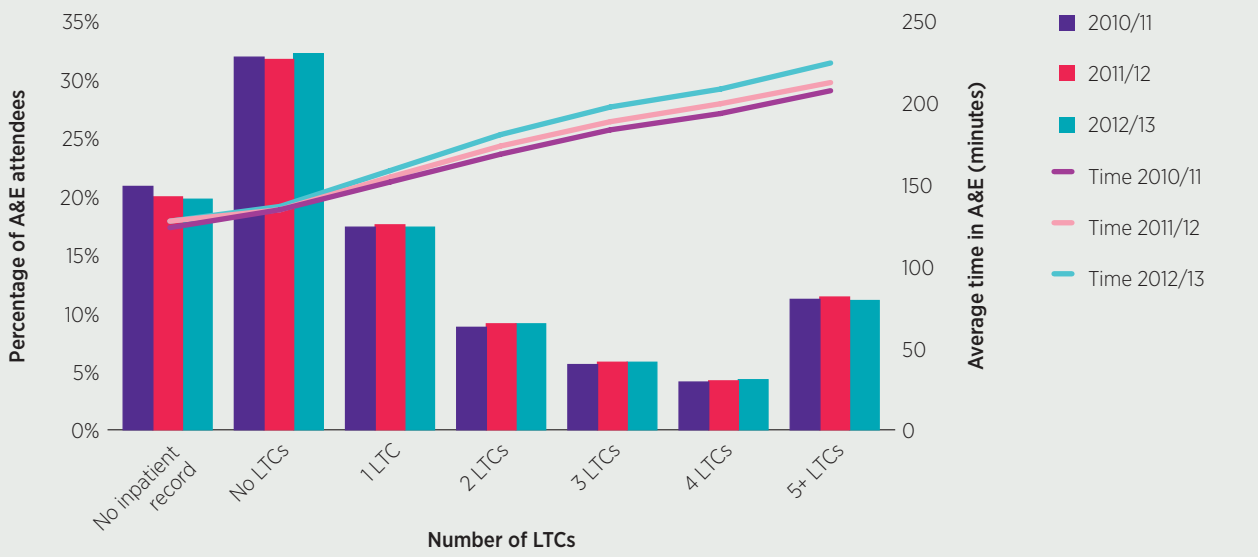
Figure 4.3: Distribution of long-term conditions (LTCs) by age of A&E attendee, 2012/13



The chances of an A&E attendee having a long-term condition (assessed using individual hospital inpatient histories) increased dramatically with age, with A&E users aged 45 and over being more likely than not to have at least one of these.

But does the presence of long-term conditions necessarily mean a patient will spend longer in A&E? The lines on Figure 4.4 show the mean time patients spent in A&E by the number of these conditions, between 2010/11 and 2012/13. In 2012/13, people with an inpatient history of one such condition spent an average of 22 minutes longer in A&E than those whose inpatient history did not indicate any. Those with two long-term conditions waited an average of 44 minutes longer than those with none. This being so, is it possible that an increase in attendances by people with long-term conditions significantly contributed to the decline in performance in winter 2012/13?

Figure 4.4: Distribution of number of long-term conditions among attendees at major A&E departments in 2010/11, 2011/12 and 2012/13



The columns in Figure 4.4 show the distribution of the number of patients with long-term conditions attending A&E between 2010/11 and 2012/13, with 95 per cent confidence intervals. In 2012/13, nearly half of attendances at A&E (48 per cent) were by patients who had at least one of these conditions. However, this proportion was very similar to previous years (47 per cent in 2010/11) and standardising by conditions does not explain any more of the increase in breaches than standardising by age alone. The argument that there has been a higher incidence of these conditions in A&E is not supported, at least when long-term conditions are assessed using inpatient histories.

Neither the age distribution of people in the department (that is, the proportion of people aged 65 and over) nor the proportion of people with one or more long-term conditions changed noticeably as department occupancy increased, relative to what would be expected for the time of day.

Other expressions of case-mix

There are other sub-groups of A&E users that can be used to infer case-mix. For example, the most serious cases treated in A&E are generally those brought in by ambulance. The number of these cases as a proportion of the overall A&E workload changed little between 2010/11 and 2012/13, from 29 to 30 per cent.

The A&E HES data include some limited information on diagnoses and treatments. The quality with which these are recorded has changed dramatically over time, so the incidence of diagnoses is not a reliable comparison. However, the distribution of diagnoses and treatments that were recorded did not appear to have changed much year on year. Based on these facts, there is little evidence to suggest that the complexity or acuity of cases seen in A&E had changed over this time.

The Department of Health's response also highlighted the need to reduce repeated visits to A&E. This is of interest not because re-attenders wait longer, but because their health need was not satisfactorily resolved following the first visit. This in turn represents an opportunity for the healthcare system to reduce pressure on A&E by eliminating the need for repeat attendance. In 2012/13, 15.7 per cent of all major A&E attendances resulted in another attendance within 30 days. However, rates of re-attendance changed little from 2010/11 (15.5 per cent), suggesting that while repeat attendances might represent an opportunity to reduce pressure on A&E, it was unlikely to have been causing the pressure in the first place. While some people do use A&E very frequently (for example, more than 10 times a year), they represent a small fraction of total service use – 2.6 per cent of all major attendances in 2012/13.

Summary

A&E departments see more older people than they did previously and rates of attendances for older people are growing disproportionately. Average waiting times in A&E increase notably with age. The shift in age distribution of A&E users appears to account for 11 per cent of the increase in patients breaching the four-hour target between 2011/12 and 2012/13.

A&E waiting times also increased with the number of long-term conditions with which a patient had been diagnosed. However, the proportion of people with one or more long-term condition attending A&E did not change notably between 2010/11 and 2012/13 – meaning that the presence of long-term conditions is unlikely to have contributed to the decline in performance against the four-hour target. Other expressions of case-mix also showed no particular change over time.

5

Results – what was the influence of environmental factors?

The final set of factors put forward to explain the dip in A&E performance relates to the influence of external factors on A&E attendance. These include the prolonged winter experienced in 2012/13 and the ability to access primary care services.

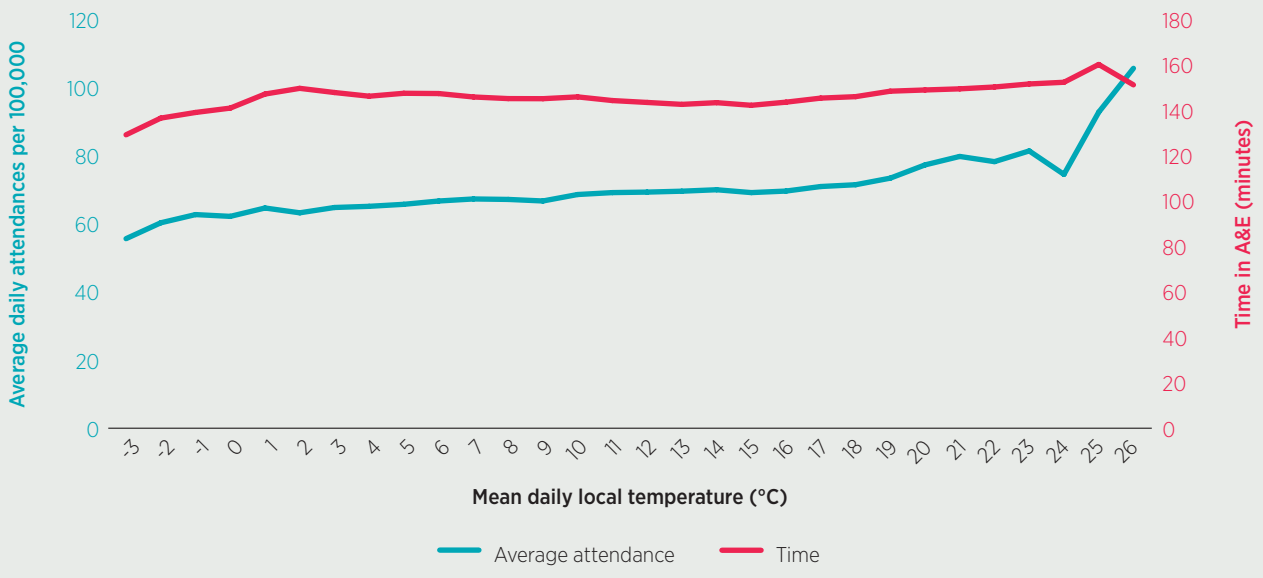
Impact of climate – air temperature

> 'Last year's long cold snap placed a huge amount of strain on emergency care units across the country'
> *Accident Waiting to Happen* (NHS Confederation, 2013, p. 3)

A number of studies have looked at how the weather can affect use of emergency services. It is a common perception that long periods of cold weather lead to increased service use, whether it be for conditions directly linked to temperature or a cumulative effect reducing patients' resilience (Ye and others, 2012). We therefore examined whether daily average air temperature could have played a significant part in the increased demand on A&E.

All A&E attendances between January and December 2011 were mapped to the mean daily temperature of the attendee's local small area (Met Office, 2012). Figure 5.1 shows the relationships between temperature and the unadjusted rate of attendance, and average time spent in A&E.

Figure 5.1: Unadjusted attendance rate and average A&E wait as a function of mean daily temperature in 2011



Average time spent in A&E (and therefore adherence to the four-hour target) is clearly affected by changes in temperature – but the relationship is not straightforward. The average waiting time has a cold peak at 2°C (151 minutes) and a warm peak at 25°C (161 minutes).

While this could be interpreted as increased health demand being driven by both high and low temperatures, time in A&E begins to fall again as temperatures fall below 2°C. A possible explanation for this is the relationship between temperature and the rate of attendance at A&E. Each one-degree increase in temperature is associated with a 1 per cent increase in attendance, meaning that fewer people attend A&E when temperatures are very low. It should be noted that this is not the same as saying there is less health need in colder weather, as mortality is known to increase in colder weather (Office for National Statistics, 2013). The decrease in attendances could be related to reduced ability/inclination to seek help from A&E in very cold weather.

Why do people spend longer in A&E on cold days? Patients are significantly more likely to be admitted to an inpatient bed when temperatures are low (see Table 5.1). This suggests that air temperature is related to the frequency of A&E attendances, although it should be remembered that temperature is acting as a proxy for many other seasonal effects such as winter snowy/icy conditions and summer sports injuries.

Table 5.1: Percentage of inpatient admittances according to mean daily air temperature

Air temperature	Percentage of inpatient admittances	95% confidence interval*
Under 5°C	26.2%	±0.07%
Between 5 and 15°C	24.9%	±0.03%
Warmer than 15°C	23.6%	±0.05%

*Measures the reliability of the predicted value; smaller range = more reliable prediction

So could differences in winter temperature explain the change in performance between 2011/12 and 2012/13? The precise daily temperature information analysed above is only available up to the end of 2011. However, up-to-date daily temperatures are available for the Central England Temperature (CET), representative of a roughly triangular area of the United Kingdom enclosed by Lancashire, London and Bristol (Met Office, 2014). The 2011 data were used to form a small area-based distribution of temperature around CET – 50 per cent of lower super output areas (LSOAs) lie within ±1.5°C of CET, with a further 30 per cent within ±2.8°C. Further, the performance against the four-hour target in 2011 was calculated for each tenth of a degree between -2 and 26°C. This allowed us to construct an expected performance for each day, based on the predicted number of LSOAs at any given temperature.[1] Monthly observed and expected performance is shown in Figure 5.2.

1. 2011 $R^2 = 0.25$.

Figure 5.2: Observed and expected performance against the four-hour target. Expected performance is based on temperature

Observed performance closely tracked what is expected during the summer months in both 2011 and 2012 (2010 was strongly affected by the previous target for A&E performance of 98 per cent). Actual performance was somewhat worse than expected in December and January each year, indicating that dips in winter performance are not wholly explained by temperature effects.

Monthly temperatures between September and April were an average of 2.1°C colder in 2012/13 than they were in 2011/12. Despite this, the performance in the second half of 2012/13 was notably worse than would be expected even after adjusting for temperature. Based on temperature alone the expected performance between September 2012 and April 2013 was 93.2 per cent, whereas the observed performance was 91.8 per cent. Comparing this with the same period in 2011/12 suggests that lower temperatures explain only 19 per cent of the decline in performance.

Impact of access to/satisfaction with GP service

> 'Fundamental changes mean joined-up care – spanning GPs, social care and A&E departments – overseen by a named GP. Many vulnerable people end up in A&E simply because they cannot get the care and support they need elsewhere.'
> Jeremy Hunt, Secretary of State for Health (Department of Health, 2013a)

Previous studies have shown that A&E demand is linked to the ability to access (and satisfaction with) GP services. Practices with poor access and low satisfaction scores in the GP patient survey are associated with increased A&E attendances (Cowling and others, 2013). Despite the perception of A&E as an out-of-hours service, 61 per cent of major A&E users arrive between 8am and 6.30pm.

Rates of A&E attendance and breaches of the four-hour target were calculated at GP practice level for 2011 and 2012. The association between these measures and three access and satisfaction scores from the GP patient survey in those years was then explored using a multivariate linear regression. The patient survey measures used were:

- proportion of respondents rating their overall experience of their practice as 'very good'
- proportion rating their practice as 'very easy' or 'fairly easy' to reach by telephone
- proportion agreeing that their practice opened at times convenient for them.

Some factors known to reduce the likelihood of attending A&E were also adjusted for, namely the age and deprivation of the population, as well as their distance from the nearest A&E unit. The full results of the regression model are presented in Appendix C. It should be noted that we do not know the degree to which those using A&E and those responding to the GP practice survey overlap.

The 2011 model performed moderately in predicting rates of A&E attendance.[1] The results show that, after adjusting for the age structure of the population, the proportion of respondents rating their overall experience of their practice as 'very good' was statistically significantly associated with lower rates of A&E attendance. The same was also true of the proportion of respondents rating their practice as 'very easy' or 'fairly easy' to reach by telephone. Intriguingly, the proportion who agreed that their practice opened at times convenient for them was significantly associated with increased attendances.

However, the model performed poorly when predicting the percentage spending more than four hours in A&E.[2] This implies there is no meaningful relationship between perceived quality of GP services and breaches of the four-hour target in A&E, and therefore changes in these scores are unlikely to have influenced achievement of the target in 2012/13.

Summary

Colder temperatures are associated with longer A&E waiting times, but the effect is complex and linked to changes in attendance patterns. The winter months in 2012/13 were colder than those in 2011/12, but this appears to explain no more than 19 per cent of the decline in A&E performance over this period. While patient satisfaction with access to their GP appears to be linked with rates of attendance at A&E, there is no evidence for patient satisfaction being associated with achievement of the four-hour target.

1. $R^2 = 0.418$, $p < 0.0001$.
2. $R^2 = 0.068$, $p < 0.0001$.

6
Discussion

Average waits in major A&E departments have increased year on year since April 2010, and patients attending in 2012/13 waited an average of 11 minutes longer than those in 2010/11. These relatively small but sustained increases in average waits are also reflected in the growth in the minority of patients whose journeys through A&E took longer than four hours from September 2012 onwards. The proportion of patients completing their visits within four hours remains around 93 per cent – stubbornly below the target of 95 per cent.

There are many debates about the clinical validity of the 'four-hour target'; however, it is clear that use of this target has transformed the way A&E services operate in England. The four-hour target has become totemic in the minds of many policy-makers and members of the public as an indicator for performance of the NHS in general, despite being modified to 95 per cent and combined with other measures (to reduce the distorting effects of an isolated target) in 2010.

Recently, a range of reports on urgent and emergency care services highlighted several underlying potential reasons for the decline in performance against the four-hour target. However, many of the arguments were based on anecdotal evidence. Indeed, the report of the Health Select Committee (House of Commons Health Committee, 2013) accused the NHS of not having the information it needed to accurately analyse the cause of the problem.

This study used a novel approach exploiting de-identified person-level data to test the potential impact on time spent in A&E and breaches of the four-hour target of some commonly proposed factors: A&E capacity; changes in case-mix; and external factors such as ambient temperature and availability of GP services. We were particularly interested in testing whether these factors could explain the recent patterns of A&E activity.

We found that:

- The number of people attending major A&E departments has increased in line with population growth, and the reported dramatic increases in A&E attendances applied to minor A&E units only. Despite this, it is major units that struggle to meet the four-hour target. The number of major A&E units has fallen by about 8 per cent since 2003 (Roberts and others, 2014).
- The number of people being treated at any one time in England's A&E units increased by around 8 per cent between 2010/11 and 2012/13. Occupancy levels in excess of what a department would usually expect for a given time of the week are associated with longer average waiting times, and increased likelihood of breaching the four-hour target.
- A&E departments see more older people than they did previously. The shift in age distribution of A&E users appears to account for 11 per cent of the increase in patients breaching the four-hour target between 2011/12 and 2012/13. However, the proportion of people attending A&E who had long-term conditions did not change notably between 2011/12 and 2012/13 – meaning that

presence of long-term conditions is unlikely to have contributed to the decline in performance against the four-hour target. Other expressions of case-mix also showed no particular change over time.

- The winter months in 2012/13 were colder than those in 2011/12, but this appears to explain no more than 19 per cent of the decline in A&E performance over this period. There is no evidence that patient satisfaction with access to their GP is associated with achievement of the four-hour target.

It appears that while changing age distributions and weather patterns play a part, these cannot explain all the differences. We noted an increase in relative occupancy, and that occupancy levels and breaches of waiting time targets are closely related. While this is not unexpected – crowded departments take longer to process patients and treating patients slower leads to greater occupancy – it is significant that we have confirmed an increase in occupancy because treatment in crowded A&E departments is known to be associated with declines in patient experience and safety (Sprivulis and others, 2006; Carter and others, 2014).

For those running a service there are two key considerations: first, the staffing available to treat patients in a timely fashion to avoid further crowding; and second, the physical facilities (for example, the number of bays) available to process enough patients simultaneously to stay on top. Our analysis is based on comparing department occupancy with what would be usual for that time of the week. A measure of capacity relative to 'normal' doesn't account for how close an A&E might be to its physical or staffing limits. It is not possible to gauge 'A&E capacity' from national data, nor do we know the number of bays in each department or the staffing levels on each shift.

However, while the mechanism is likely to be real, the answer is not as straightforward as it seems. First, it is not necessarily the case that the absolute number of people in the department increases waits. Some of the longest waits were observed when the department had the lowest total occupancy – we assume that these arose as a result of issues with staffing capacity rather than physical capacity. Around one quarter of breaches happened when the department was less occupied than would be expected – meaning that crowding is not the only driver of long A&E waits. This may be explained by the inherent variability in the resources required for each A&E case. For example, a patient requiring resuscitation can occupy the same number of staff as would be needed to treat five major cases or 25 minor injuries. The arrival of two resuscitation cases could therefore have a major impact on patient flow within a department.

Second, high levels of relative occupancy are symptoms rather than a cause. We noted that the age distribution and morbidity of patients (which might imply a more complex treatment path) in the department did not appear to influence relative occupancy. Though we found some evidence of patients waiting longer in A&E because inpatient beds were not available, this was difficult to detect in summary measures. Each department only admits a small number of patients every hour (1.6 on average), which means comparing observed and expected inpatient admissions creates a lot of 'noise' in the data. For example, those instances we were able to see were periods when no inpatients were admitted – but there may be many other times when departments are still admitting some inpatients but not as many as they need to, which our data are not sensitive enough to detect. Some further evidence was found by considering the association between A&E waits and daily discharge ratio at hospital trust level.

To better understand the underlying causes of high relative occupancy, the NHS needs access to reliable data on A&E staffing levels and the local availability of inpatient beds.

One conclusion we are able to draw with regard to inpatient bed availability is that the impact of rising relative occupancy on waiting time is the same for both admitted and non-admitted patients. It might have been assumed that patients who will ultimately be admitted would wait longer when there is a lack of inpatient beds, while those not requiring admission would leave the department at a similar rate to normal. This behaviour is not observed, suggesting that lack of inpatient beds – if that is indeed the cause of high relative occupancy – reduces the speed at which the department can see all of its patients. It might also suggest that streaming mechanisms to ensure flows of minor injuries can continue when the 'majors' part of a department is blocked, might not be operating as effectively as would be expected.

25
Number of additional major A&E units required to accommodate extra attendance by 2013/14, if occupancy rates had remained at 2003/04 levels.

Even with these caveats, the pattern of rising occupancy levels deserves serious attention from policy-makers. In 2003/04, major A&E units saw 12.7 million patients – an average of around 63,000 patients per unit. To accommodate the 14.3 million attendances in 2012/13 at the same level of occupancy would have required building an additional 25 major A&E units, yet the number of major A&E units has decreased slightly since 2003 (Roberts and others, 2014). The fact that the NHS has coped with increasing demand up to 2012 without increasing capacity is testament to the improvements made in the productivity of A&E services in the last decade, of which the establishment of clinical decision units and streaming systems were key features. The recent decline in the achievement of the four-hour target, though important, does not yet represent a return to the 'corridors of shame' of the 1990s (Mason and others, 2012).

High occupancy in emergency departments is a well-recognised international problem (Pines and others, 2011) and there is a wide range of established solutions. Many of these look at ways to make the treatment of patients more efficient – to reduce blockages and speed throughput. For example:

- increasing the use of senior clinicians for decision-making, putting an emphasis on resolving cases in a single assessment where possible (Emergency Care Intensive Support Team, 2011; Health Foundation, 2013; White and others, 2010)
- better alignment between capacity and demand, such as availability of tests out of hours and improved access to inpatient beds (Health Foundation, 2013; Morris and others, 2012; Moskop and others, 2009; Munro and others, 2006)
- streamlining and rationalisation of processes – including streaming in A&E and improving discharge planning to maximise inpatient bed availability (Emergency Care Intensive Support Team, 2011; Health Foundation, 2013; Morris and others, 2012)
- adjusting the design and physical layout of the A&E unit (Morris and others, 2012).

However, evaluations of these approaches are limited and there is little high-quality evidence (Boyle and others, 2012). Crucially, the College of Emergency Medicine (CEM) recommends that as well as these initiatives trusts should have robust systems to understand the level of occupancy in their A&E units and have pre-defined thresholds and responses for when the A&E units become 'full' (College of Emergency Medicine, 2012).

The obvious answer might appear to be increasing the capacity of A&E and recently some limited central funds have been earmarked (Department of Health, 2013b). However, the ability to access more funding will have to compete with other health service priorities and comes at a time when the NHS is currently enduring an unprecedented period of cost constraints which may last for many years to come (Roberts and others, 2012). It will be difficult to fund significant increases in England's A&E capacity and, even if funds were made available, the CEM already reports difficulties in recruiting senior A&E doctors for the existing units (College of Emergency Medicine, 2013b). It is important to note that many of the limiting factors are influenced by other areas of the hospital, such as the availability of inpatient beds and diagnostic tests.

'the NHS may have to tolerate reduced target achievement levels for some time to come'

If the capacity of A&E cannot be increased then another option is to either reduce demand or tackle it elsewhere. Many health policies are bolstering investment in services that deliberately seek to reduce the need for emergency care – especially with regard to the management of long-term conditions. In theory, initiatives such as better integration of care and case management should reduce the frequency with which people have the crises that lead them to A&E. However, reviews have found that, however laudable these aims, there are few hard and fast interventions that are known to reduce emergency care needs that can be implemented quickly enough and on a large scale (Bardsley and others, 2013; Purdy and others, 2012).

Diverting demand for minor urgent care into other services has been the main focus of efforts to reduce pressure on A&E over the last five years, and it is established that around 25 per cent of cases seen in A&E could have been dealt with elsewhere (Urgent and Emergency Care Review Team, 2013a). Many initiatives to direct less serious cases away from A&E and into community or minor A&E services have been tested. However, there is limited evidence of the effectiveness of these programmes in reducing attendances at A&E (Ismail and others, 2013). The services are typically well used, but either by patients who would not otherwise have used the system or by patients who later visit A&E anyway (Coleman and others, 2001; Rosen, 2014).

Increasing the availability and efficacy of less serious unplanned care is an approach that features heavily in NHS England's Urgent and Emergency Care Review, although this will take time to roll out. The focus needs to be on completing treatments in as few steps as possible. But to understand whether it is achieving this aim the NHS needs to be better able to access linked person-level data from primary, community and secondary care services – not to mention ambulance services and pharmacists.

If capacity cannot be increased, existing capacity is not better aligned with demand and alternative services will take time to establish themselves with the public, the NHS may be left with just one radical option: to move away from the four-hour target, or at least be prepared to tolerate reduced achievement levels for some time to come. This is likely to be supported in many quarters where it is felt that the target represents an arbitrary threshold and had been shown to distort patterns of care (Mason and others, 2012) – though not to the detriment of quality or safety (Weber and others, 2012). There is noted variation between trusts in the percentage of patients leaving A&E between 230 and 240 minutes – the last 10 minutes before breaching the four-hour target (Longman, 2011). Those with high percentages tend to have technically better performances on the target, but may have designed their processes in such a way that focuses on getting patients out before four hours rather than as quickly as possible. It seems reasonable to

assume that these trusts are at greatest risk of significant target breaches as the pressure on A&E continues to rise – meaning performance may deteriorate even further.

It might be time to move the focus on to other quality indicators for A&E, such as the number of people leaving the department before being seen or the percentage of eligible patients having heart treatment within 90 minutes of arriving at the hospital (Cooke, 2014). Alternatively, the NHS might decide to endure low achievement of the four-hour target because, while waiting times increase slightly, they are not seen as the most critical element of the whole emergency care system. Arguably the persistent trend for rates of emergency inpatient admissions to increase well in excess of population growth (Blunt and others, 2010), or the estimated nearly £2 billion spent on inpatient treatment for conditions that are potentially preventable (Bardsley and others, 2013), are more pressing concerns for the emergency care system in England.

However, the four-hour target has played an important role in managing emergency care and has led to a significant reduction in waiting times. The UK experience has been noted to the extent that healthcare systems in Australia, New Zealand and Canada are currently introducing time-based targets for A&E (Mason and others, 2012). The significance of the four-hour target for politicians is also worth noting. It has been reported recently that chief executives of hospitals failing to achieve 95 per cent were receiving personal telephone calls from the Secretary of State during the winter of 2013 (Campbell, 2013). The enhanced A&E quality metrics introduced in 2011 (Health & Social Care Information Centre, 2013b) have yet to achieve a similar standing with the public and have not been similarly performance managed. One possibility might be to extend the target time for minor cases, where it is experience rather than outcome that will be adversely affected by longer waits.

In summary, the NHS is faced with options that are unaffordable (increasing A&E capacity), unsuccessful (diverting people away from A&E) or unpalatable (giving up on the four-hour target). While there are many ways our understanding of the breadth of quality across urgent care can be improved, giving up on achieving the four-hour target because it is increasingly challenging is unlikely to be the right answer. NHS England's system-wide view and in-depth process may mean that its plans for significant change in urgent care services will succeed in diverting activity away from A&E where others have not, but this will clearly take some time. In the interim, it appears that the additional £500 million and extra attention given to A&E in 2013 (as well as the mild winter) helped to avoid the 2013/14 crisis predicted by many. Short-term solutions such as this can help, and understanding the precise causes of declining performance (as explored in this study) is essential for these efforts. Also, there may still be basic actions that can be taken in some trusts to further increase efficiency as many organisations appear to struggle to implement and sustain the Emergency Care Intensive Support Team's best practice recommendations (Edwards, 2013; see Box 6.1). The question is whether these short-term efforts will be sufficient to sustain quality in A&E over the next few years until the effects of the Urgent Care Review are felt; and what will we do if demand for A&E is not ultimately reduced?

Whatever route is ultimately taken to address the long-term issues for urgent care, it is essential that we continue to monitor the many dimensions of quality of care delivered inside A&E and outcomes across the whole system for patients who use urgent care services.

Box 6.1: Effective approaches in urgent and emergency care – priorities within acute hospitals (Emergency Care Intensive Support Team, 2011)

1. There should be an early senior review of all patients along all parts of the pathway.
2. Maintain the momentum of care – there should be a senior review of every inpatient's care plan every day.
3. Get patients on the right pathways – manage patients in 'flow streams'.
4. Work together systematically and predictably – implement internal professional standards.
5. Plan and manage capacity to meet demand.
6. Manage variation in discharge planning.
7. Avoid unnecessary overnight stays – implement ambulatory emergency care.

References

Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N and Camargo CA Jr (2003) 'A conceptual model of emergency department crowding', *Ann Emerg Med*, 42(2):173–80.

Bardsley M, Blunt I, Davies S and Dixon J (2013) 'Is secondary preventive care improving? Observational study of 10-year trends in emergency admissions for conditions amenable to ambulatory care', *BMJ Open*, 3(1).

Blunt I, Bardsley M and Dixon J (2010) *Trends in Emergency Admissions in England 2004–2009: Is greater efficiency breeding inefficiency?* Nuffield Trust.

Boffey D (2013) 'Fears grow over renewed crisis in A&E this winter', *The Guardian*, 7 September. Available at: www.theguardian.com/society/2013/sep/07/fears-grow-renewed-crisis-ae-winter .

Boyle A, Beniuk K, Higginson I and Atkinson P (2012) 'Emergency department crowding: time for interventions and policy evaluations', *Emerg Med Int*, 2012:838610.

Campbell D (2013) 'Jeremy Hunt personally calls hospital bosses over A&E times', *The Guardian*, 22 November. Available at: www.theguardian.com/politics/2013/nov/22/jeremy-hunt-hospital-personal-calls-times .

Carter EJ, Pouch SM and Larson EL (2014) 'The relationship between emergency department crowding and patient outcomes: a systematic review', *J Nurs Scholarsh*, 46(2):106–15.

Coleman P, Irons R and Nicholl J (2001) 'Will alternative immediate care services reduce demands for non-urgent treatment at accident and emergency?', *Emerg Med J*, 18(6):482–7.

College of Emergency Medicine (2012) *Crowding in Emergency Departments*. Available at: http://secure.collemergencymed.ac.uk/code/document.asp?ID=6296 .

College of Emergency Medicine (2013a) *10 Priorities for Resolving the A&E Crisis*. Available at: http://secure.collemergencymed.ac.uk/Shop-Floor/Professional%20Standards/10%20 priorities%20for%20Emergency%20Medicine/ .

College of Emergency Medicine (2013b) *Stretched to the Limit*. Available at: http://secure. collemergencymed.ac.uk/code/document.asp?ID=7461 .

Cooke (2014) 'Intelligent use of indicators and targets to improve emergency care', *Emerg Med J*, 31(1):5–6.

Cowling TE, Cecil EV, Soljak MA, Lee JT, Millett C, Majeed A, Wachter RM and Harris MJ (2013) 'Access to primary care and visits to emergency departments in England: a cross-sectional, population-based study', *PLoS One*, 12;8(6):e66699.

Department of Health (2011) *Quarterly Monitoring of A&E*. Available at: http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/en/ Publicationsandstatistics/Statistics/Performancedataandstatistics/AccidentandEmergency/ index.htm .

Department of Health (2013a) *Hunt – NHS Must Fundamentally Change to Solve A&E Problems*. Available at: www.gov.uk/government/news/hunt-nhs-must-fundamentally-change-to-solve-ae-problems .

Department of Health (2013b) 'Prime Minister announces £500 million to relieve pressures on A&E'. Available at: www.gov.uk/government/news/prime-minister-announces-500-million-to-relieve-pressures-on-ae .

Department of Health (2013c) *Reference Costs 2012–13*. Available at: www. www.gov.uk/ government/uploads/system/uploads/attachment_data/file/261154/nhs_reference_ costs_2012-13_acc.pdf .

Dorrell S (2013) *Report on Urgent and Emergency Services*. Available at: www. www.parliament. uk/business/committees/committees-a-z/commons-select/health-committee/news/13-07-23-urgemrepcs/ .

Downing A, Wilson RC and Cooke MW (2004) 'Which patients spend more than 4 hours in the Accident and Emergency department?', *J Public Health (Oxf)*, 26(2):172–6.

Edwards N (2013) *Urgent and Emergency Care: Improving urgent and emergency care performance across NHS South of England*. The King's Fund.

Emergency Care Intensive Support Team (2011) *Effective Approaches in Urgent and Emergency Care: Priorities for acute hospitals*. NHS IMAS.

Health & Social Care Information Centre (2013a) *Focus On Accident and Emergency*. Available at: www.hscic.gov.uk/catalogue/PUB13040/acci-emer-focu-on-2013-rep-V2.pdf .

Health & Social Care Information Centre (2013b) *Provisional Accident and Emergency Quality Indicators*. Available at: www.hscic.gov.uk/catalogue/PUB11098 .

Health Foundation (2013) *Flow Cost Quality*. Available at: www.health.org.uk/areas-of-work/programmes/flow-cost-quality/ .

Hoot NR and Aronsky D (2008) 'Systematic review of emergency department crowding: causes, effects, and solutions', *Ann Emerg Med*, 52(2):126–36.

House of Commons Health Committee (2013) *Urgent and Emergency Services: Second report of session 2013–14*. The Stationery Office.

Ismail SA, Gibbons DC and Gnani S (2013) 'Reducing inappropriate accident and emergency department attendances: a systematic review of primary care service interventions', *Br J Gen Pract*, 63(617):e813–20.

Longman H (2011) *A&E: Is there a better way?* Available at: www.patient-access.org.uk/wordpress/wp-content/uploads/2013/03/AE-is-there-a-better-way-HL-v3.pdf .

Mason S, Weber EJ, Coster J, Freeman J and Locker T (2012) 'Time patients spend in the emergency department: England's 4-hour rule-a case of hitting the target but missing the point?', *Ann Emerg Med*, 59(5):341-9. doi: 10.1016/j.annemergmed.2011.08.017.

McGirr (2014) 'Evening admissions to hospital (ward admission time) exhibit up to a three days longer length of stay than morning admissions', *HSJ*.

Met Office (2012) UKCP09: *Gridded observation data sets*. Available at: www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/ .

Met Office (2014) *Hadley Centre Central England Temperature (HadCET) dataset*. Available at: www.metoffice.gov.uk/hadobs/hadcet/ .

Morris ZS, Boyle A, Beniuk K and Robinson S (2012) 'Emergency department crowding: towards an agenda for evidence-based intervention', *Emerg Med J*, 29(6):460–6.

Moskop JC, Sklar DP, Geiderman JM, Schears RM and Bookman KJ (2009) 'Emergency department crowding, part 2-barriers to reform and strategies to overcome them', *Ann Emerg Med*, 53(5):612–7.

Munro J, Mason S and Nicholl J (2006) 'Effectiveness of measures to reduce emergency department waiting times: a natural experiment', *Emerg Med J*, 23(1):35–9.

NHS Confederation (2013) *Emergency Care: An accident waiting to happen?* Available at: www.nhsconfed.org/Publications/briefings/Pages/Emergency-care.aspx .

NHS England (2013a) *GP Patient Survey Results: National reports and data*. Available at: www.gp-patient.co.uk/ .

NHS England (2013b) *Understanding Winter Pressures in A&E Departments*. Available at: www.england.nhs.uk/wp-content/uploads/2013/11/wint-press-rep.pdf .

NHS England (2014) *Weekly A&E SitReps 2013–14*. Available at: www.england.nhs.uk/statistics/statistical-work-areas/ae-waiting-times-and-activity/weekly-ae-sitreps-2013-14 .

Office for National Statistics (2013) *Excess Winter Mortality in England and Wales, 2012/13 (Provisional) and 2011/12 (Final)*. Available at: www.ons.gov.uk/ons/dcp171778_337459.pdf .

Pines JM, Hilton JA, Weber EJ, Alkemade AJ, Al Shabanah H, Anderson PD, Bernhard M, Bertini A, Gries A, Ferrandiz S, Kumar VA, Harjola VP, Hogan B, Madsen B, Mason S, Ohlén G, Rainer T, Rathlev N, Revue E, Richardson D, Sattarian M and Schull MJ (2011) 'International perspectives on emergency department crowding', *Acad Emerg Med*, 18(12):1358–70.

Purdy S, Paranjothy S, Huntley A, Thomas R, Mann M, Huws D, Brindle P and Elwyn G (2012) *Interventions to Reduce Unplanned Hospital Admission: A series of systematic reviews*. Bristol University.

QualityWatch (2013) *Is the Quality of Care in England Getting Better? QualityWatch annual statement 2013*. Health Foundation and Nuffield Trust.

Roberts A, Blunt I and Bardsley M (2014) *Focus On: Distance from home to emergency care.* QualityWatch. Health Foundation and Nuffield Trust.

Roberts A, Marshall L and Charlesworth A (2012) *A Decade of Austerity? The funding pressures facing the NHS from 2010/11 to 2021/22*. Nuffield Trust.

Rosen R (2014) *Meeting Need or Fuelling Demand? Understanding the impact of improved access to primary care*. Nuffield Trust.

Sprivulis PC, Da Silva JA, Jacobs IG, Frazer AR and Jelinek GA (2006) 'The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments', *Med J Aust*, 184:208–12.

Urgent and Emergency Care Review Team (2013a) *High Quality Care for All, Now and for Future Generations: Transforming urgent and emergency care services in England: The evidence base from the Urgent and Emergency Care Review*. NHS England. Available at: www.england.nhs.uk/wp-content/uploads/2013/06/urg-emerg-care-ev-bse.pdf .

Urgent and Emergency Care Review Team (2013b) *Transforming Urgent and Emergency Care Services in England: Urgent and Emergency Care Review - End of Phase 1 Report*. NHS England. Available at: www.nhs.uk/NHSEngland/keogh-review/Documents/UECR.Ph1Report.FV.pdf .

Vermeulen MJ, Ray JG, Bell C, Cayen B, Stukel TA and Schull MJ (2009) 'Disequilibrium between admitted and discharged hospitalized patients affects emergency department length of stay', *Ann Emerg Med*, 54(6):794–804.

Weber EJ, Mason S, Freeman JV and Coster J (2012) 'Implications of England's four-hour target for quality of care and resource use in the emergency department', *Ann Emerg Med*,60(6):699–706.

White AL, Armstrong PA and Thakore S (2010) 'Impact of senior clinical review on patient disposition from the emergency department', *Emerg Med J*, 27(4):262–5, 296.

Ye X, Wolff R, Yu W, Vaneckova P, Pan X and Tong S (2012) 'Ambient temperature and morbidity: a review of epidemiological evidence', *Environ Health Perspect*, 120(1):19-28. doi: 10.1289/ehp.1003198. Epub 8 August 2011.

Appendix A: Full methods

Data sources

The analysis was based on pseudonymised person-level hospital episode statistics (HES) A&E data from April 2010 to March 2013. The analysis used only attendances at major A&E departments, defined as AEDEPTTYPE = 1. These datasets create a single record for each A&E attendance and record basic information such as age, sex, area of residence, and time and method of arrival and departure.

Although these detailed A&E datasets were introduced in 2007/08, when earlier years are compared with other measures of A&E attendance[1] which were based on aggregate returns from each trust, it is clear that the completeness of the new dataset has improved substantially over time and for the earlier years a large proportion of attendances were not captured (Table A.1). For this reason we have focused on data from 2010/11 onwards.

Table A.1: Major A&E attendances captured in the HES dataset

	QMAE*	NHS England	HES	HES completeness
2007/08	13,395,275		12,532**	n/a
2008/09	13,426,136		4,914,251	37%
2009/10	13,618,300		9,519,018	70%
2010/11	13,931,715		12,621,201	91%
2011/12		14,095,073	13,947,320	99%
2012/13		14,293,618	14,269,286	100%

*Quarterly Monitoring of A&E.
**Likely to be due to significant under-use of the AEDEPTTYPE field in this year.

In order to look at the rates of A&E attendance we used population denominators drawn from the Office for National Statistics mid-year population estimates of local authority of residence,[2] and deprivation measured by Indices of Multiple Deprivation 2010.[3] The patient's area of residence at the time of admission was derived from the lower layer super output area (LSOA) recorded in the HES.

1. Department of Health Quarterly monitoring of A&E and NHS England Weekly A&E SitReps
2. www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population+Estimates
3. www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf

Mean daily temperatures (average of maximum and minimum temperature) were obtained from the Meteorological Office UKCP09 dataset.[1] This provides data on a 5×5km resolution grid covering the whole of the UK between 1 January 2011 and 31 December 2011. Mean daily temperature was mapped to the person using the temperature of the 5km square grid closest to the population-weighted centroid of each individual's LSOA of residence at the time of attendance.

Daily temperatures are available free of charge on a 5km square grid, but only up to 31 December 2011. For days after 1 January 2012 we used the Central England Temperature[2] with an approximate LSOA-level distribution based on the detailed 2011 data.

Information on co-morbidities was drawn from the diagnosis field of inpatient HES data from April 2001 to March 2013, and linked to the A&E data using the pseudonymous patient identifier.

Data on the accessibility of GP practices were taken from the GP Patient Survey[3] covering the periods July to March in 2011/13 and 2012/13. These were mapped to A&E attendance using the GP practice code recorded in the HES data.

A list of A&E departments active in April 2013 was obtained from NHS Choices.[4]

Analytical techniques

The gridded temperature data from 2011 were used to calculate the mean temperature for each LSOA on each day. Performance against the four-hour target for each temperature was also measured. The resultant average daily distribution of LSOA temperatures about the median England temperature was applied to daily CET values from 2012 onwards. Expected A&E performance was calculated as the average performance over the interquartile range LSOA temperatures (50 per cent) and average performances over the lower decile to lower quartile (15 per cent) and upper quartile to upper decile (15 per cent). The expected performance was then inflated to 100 per cent (under the assumption that extremes of the distribution cancel each other out).

Individual attendances were mapped to A&E departments using the provider site code in the HES data. Where this was not sufficient (in other words, site was recorded as a generic trust-wide code), attendances were assigned based on the provider trust's code. Where a trust operated two or more major A&E departments, the department geographically closest to the population-weighted centroid of each individual's LSOA of residence at the time of attendance was selected.

A running total of department occupancy at any given point in time was calculated by monitoring arrival and departure times for each patient in each department.

Long-term conditions were defined by the presence of certain diagnostic codes in the inpatient data at any point between April 2001 and March 2013. This reflects

1. www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/
2. www.metoffice.gov.uk/hadobs/hadcet/
3. www.gp-patient.co.uk
4. Personal communication.

the fact that while the presence of a long-term condition might not have been noted in hospital until a certain point, the patient was most likely suffering from the condition for much longer, and this could possibly have influenced earlier A&E attendances. Our list of long-term conditions is set out in Table 2.1 on page 13. The number of long-term conditions was analysed as a simple count, which was capped at five long-term conditions.

Waiting time was defined as the time between arrival in the department (ARRIVALTIME) and time of departure from the department (DEPTTIME), adjusting for departures that occur after midnight. In a tiny fraction of cases this produces unfeasibly long waiting times, which are most likely to be the result of data errors. For this reason waiting times were capped at 600 minutes when calculating average waits.

The occupancy of each A&E unit was calculated by counting each patient in and out of each unit using the A&E department code and times of arrival and departure. This process was calculated for 15-minute 'slots' between 1 April 2010 and 31 March 2013, and equivalent to taking a national bed census every 15 minutes.

Analysis was performed in SAS v9.4 and Microsoft Excel.

Appendix B: A&E population visit rates

Table B.1 sets out the change in the numbers of people attending A&E between 2010/11 and 2012/13, and the increase that would be expected based on the change in England's population between those years.

Table B.1: Observed and expected increase in major A&E attendance by age between 2010/11 and 2012/13, in thousands

	2010/11 (uplifted)	Observed 2012/13	Absolute increase	%	Increase above expected	%
	Male					
Under 5s	809	837	28	3%	0	0%
5–14	804	751	-53	-7%	-56	-7%
15–29	1,683	1,568	-115	-7%	-139	-8%
30–49	1,748	1,717	-31	-2%	-27	-2%
50–64	918	965	47	5%	34	4%
65–84	951	1,065	114	12%	57	6%
85+	233	283	50	22%	30	12%
	Female					
Under 5s	626	655	29	5%	7	1%
5–14	610	603	-7	-1%	-11	-2%
15–9	1,595	1,636	41	3%	35	2%
30–49	1,539	1,605	66	4%	64	4%
50–64	841	895	54	6%	40	5%
65–84	1,045	1,149	104	10%	62	6%
85+	458	523	65	14%	52	11%

Interestingly, male use of major A&E between the ages of 5 and 49 actually fell between 2010/11 and 2012/13.

Appendix C: Regression models on rates of A&E attendance and target achievement

The table below presents the results of linear regression models exploring the contribution of satisfaction with primary care services to rates of attendance at A&E and breaches of the four-hour target. The models were run at GP practice level and also included the age distribution of the GP practice list, distance to the nearest A&E department, and deprivation of the A&E attendees.

Table C.1: Regression models on rates of A&E attendance and proportion of attendees breaching the four-hour A&E waiting target, July 2011 to March 2012

	A&E attendance		Proportion of A&E attendees breaching the four-hour target	
	R^2	P	R^2	p
	0.4181	<.0001	0.0676	<.0001
	beta	P	beta	p
Intercept	0.1744	<.0001	0.02039	0.2983
Percentage aged 0–4	0.10033	0.2735	0.10053	0.0531
Percentage aged 15–29	-0.12281	0.0007	0.03626	0.0765
Percentage aged 30–54	-0.0014	0.9694	0.03683	0.0758
Percentage aged 55–84	-0.01105	0.7933	-0.00657	0.7835
Percentage aged 85 and over	0.23393	0.0143	0.69777	<.0001
Average distance to A&E (km)	-0.00430	<.0001	0.00076	<.0001
Index of Multiple Deprivation score	0.00221	<.0001	-0.00014	<.0001
Overall experience very good	-0.02247	0.001	-0.01656	<.0001
Convenient opening times	0.04838	<.0001	-0.00345	0.5442
Easy to reach by telephone	-0.02373	0.0001	0.00521	0.1319

About the author

Ian Blunt is a Senior Research Analyst at the Nuffield Trust. He leads a range of quantitative analyses making use of large administrative datasets. Recent examples include an evaluation of an 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 help target inspections.

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