King's Fund

Managing the Pressure

Emergency hospital admissions in London, 1997–2001

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Summary

- Pressures in the NHS arising from emergency admissions are due in part to demands upon the service, the supply of resources available to meet the demands, and the way in which supply and demand are managed.
- The work presented here is a relatively simple analysis of demand for care. Emergency admissions for residents of the London NHS region in London's acute trusts were examined for the years 1997/8 to 2000/01.
- The main dataset used for the analysis, containing information about hospital admissions, is reasonably complete. There were relatively minor departures from expected trends in 18 out of the 28 NHS trusts, with serious gaps in the data (February and March 1998 and the same period in 1999) in only one NHS trust (in the West End of London).
- The total number of emergency admissions declined from 465,000 in 1997/8 to 446,000 in 2000/01.
- Over the Christmas and New Year bank holidays, the number of elective admissions dropped to nearly zero, and in three of the four study years emergency admissions also dropped, only to rebound at the end of the holiday period.
- Excluding day cases, the number of bed days used (a measure of the resources used in hospitals) was higher for emergency than elective cases at all times during the year. The total number of bed days used for both types of admission dropped over Christmas and New Year bank holidays, but was highest in the first two weeks of January largely because of the higher number of emergency cases. The total number of bed days used is also high in June and July, due to a slight increase in elective and emergency cases.
- Emergency admissions for respiratory disease show the most seasonal variation, with a peak in early January. No other disease group shows an obvious seasonal pattern of admissions, except for injuries and poisonings which have a slight preponderance in the summer.
- The volume of admissions for respiratory disease peaks at almost the same time every year, not only in London but also across England. The timing of the greatest pressures on the NHS from emergency admissions is therefore predictable. The timing of the peaks over the Christmas period is likely to be related less to the prevalence of illness (including influenza) or the weather, but more with the existence of bank holidays at that time of the year, and related factors such as access to ambulatory NHS care

and social support before, during and after this period. Many of these factors are amenable to management by the NHS and social services departments.

- The *size* of the peak in the number of emergency admissions for respiratory disease over Christmas appears to be strongly and positively associated with GP consultation rates for influenza and influenza-like illness. The latter is unlikely to be a useful warning sign of the volume of emergency admissions to hospital, since the consultation rates peak two weeks *after* the peak in emergency admissions.
- The greatest use of resources (bed days) in acute hospitals during December and January is by older people, in particular those with chronic respiratory conditions and 'acute on chronic' disease. The three main respiratory illnesses involved are chronic obstructive pulmonary disease, pneumonia and other acute lower respiratory infections.
- Older patients with chronic respiratory disease are identifiable in advance of winter, particularly by staff working in primary care. As such they could be the subject of much more proactive, rather than reactive, management throughout the winter months in order to reduce the risk of an emergency admission. Such proactive management could include not just immunisation against influenza at the right time, but also regular weekly (if not daily) review during the critical few weeks in December and January, and early intervention where appropriate. This must be a key role for primary care, with support from acute hospitals, social services, community health services and possibly NHS Direct.
- The analysis also suggested that the volume of emergency admissions is particularly high in some locations in London in winter, particularly in the East End of London.
- To help manage winter pressures arising from emergency admissions we suggest the following priorities for London's NHS:
    - focus on the management of older patients with chronic respiratory disease
    - work with staff in selected acute hospitals and general practices this winter to understand more the dynamics of demand for and supply of NHS care in the period December and January
    - ensure good access to primary care, community health services, NHS Direct and social services during the winter bank holidays, and ensure that the public knows how best to use those services

- consider supporting primary care staff this winter to identify older patients most at risk of an emergency admission for respiratory disease, and to design robust and proactive packages of care aimed to reduce emergency admissions in these patients. Involve other services where appropriate and analyse the outcome of any new interventions (ideally across PCG/Ts using emergency admissions as a measure) using HES data or data collected on computer systems in primary care
- ensure highest levels of immunisation for influenza in older people in the East End of London
- commission further research on winter pressures that combines a focus not just on demands for care, but also on the supply of resources (e.g. staff and beds, availability of primary care staff) and the management of both.

1. Introduction

The continuing rise in emergency admissions in the NHS is well documented[1,2,3] and so are the pressures on acute hospital trusts associated with it. Far from being a purely winter phenomenon, in recent years pressures associated with emergency admissions appear to occur all year round, though the most acute problems tend to be reported in winter, particularly in early January.

Such pressures on acute trusts are due to a variety of factors, including the **demands** for health care (for example arising from increased illness), the available **supply** of health care resources to cope with the demands (for example the number of staff or beds available), and how the demands and supply of resources are **managed**. Recent guidance and advice from the Department of Health has addressed all three elements.[4]

The analysis presented in this report focuses on the demands for emergency care. The analysis was funded by the London Regional Office of the NHS Executive and the King's Fund. The broad aim of the work was to help to inform the preparations by local health economies to manage emergency pressures in winter. The specific objectives of the analysis were:

- to identify the level of and trends in emergency admissions across London over time
- to identify the weeks in which emergency admissions are at their highest, by acute trust
- to identify the main clinical conditions causing the emergency admissions, particularly in winter
- to identify which types of patients are most likely to be admitted as an emergency
- to identify in which locations in London emergency demands are highest
- to identify which general practices appeared to have the highest admission rates (age and sex adjusted) for emergency admissions
- to identify any way of warning health economies as to when emergency admissions are likely to peak, and the likely level of emergency admissions.

The analysis draws on health service and other data routinely collected across London from 1997/8 to 2000/01.

2. Methods

(a) Sources of data

Hospital Episode Statistics (HES) data were obtained for four years, April 1997 to March 2001, from the NHS-Wide Clearing Service (NWCS). The data contained all admissions during the study period for residents living within the boundaries of the London region, and also for people living outside the boundaries who were registered with a general practice whose facilities were located within the London boundary. The data fields contained in the dataset are shown in Appendix 2. Two key fields requested were the General Practitioner (GP) practice code (in unencrypted form) and the residence of each patient admitted (by electoral ward and by census enumeration district).

To identify whether there were any serious gaps in the dataset, the total number of admissions per week were analysed by NHS trust and by London borough of residence. The results are shown in Appendix A for selected locations, and for all locations at http://www.kingsfund.org.uk/eHealthCarePolicy/html/london.html. Overall, the results show that there were serious data errors in one acute hospital in west London, with major gaps in the data in February and March 1998 and the same period in 1999. There were relatively minor departures from expected trends in 18 out of the 28 NHS trusts. Further details are available on the web site.

(b) Data validation

The dataset was supplied in 'pre-HES' format, it was validated and cleaned following the rules published by the Department of Health.[5]

(c) Identifying emergency admissions by cause

The HES dataset contained one record for each finished consultant episode (FCE). The FCEs were converted into admissions by using the field 'episode order'. Over 90 per cent of all admissions consisted of only one FCE. HES data also records the 'method of admission', which was used to identify emergency admissions, elective admissions, maternity admissions, and 'other' admissions (mainly transfers from other hospitals).

The record for each FCE can include up to 24 clinical codes – 12 diagnostic codes and 12 procedure codes. Since 1996/7, the diagnostic codes follow the ICD-10 standard classification,[6] whereas procedures carried out on the patient are classified according to the OPCS-4 system.[7] The first diagnostic code of the first episode of the admission normally indicates the condition that is the reason for the admission.

(d) Identifying emergency admissions by place, and calculating admission rates

Each HES record contained a data field showing the electoral ward of residence of the patient (derived from the postcode of residence on the original hospital record). The ward code was used to assign admissions to electoral wards in London. Admission rates were standardised by age and sex using the direct method,[8] using 1991 census data at ward level for the 32 London boroughs and at district level for the City of London. Because of the special circumstances of the City of London, i.e. a very low resident population with a comparatively high number of wards for such a small district, it was treated as a single geographical unit.

Each HES record also contained a data field showing GP practice code. The practices were identified using codes obtained from the NHS Organisation Codes Service (OCS). This process resulted in a successful match of 1810 out of the 1874 GP practice codes appearing on the HES dataset. Many of the remaining practices were small (list size under 200) or attached to institutions such as prisons or nursing homes. Data on list size and breakdown by age and sex for all GP practices in England were supplied by the Department of Health for the dates October 1997, October 1998 and October 1999. Using the data for October 1998, age and sex standardised admission rates per GP practice for the four-year period were calculated using the direct method of standardisation.

(e) Data analysis

The HES dataset was held on Microsoft Visual FoxPro, and the extracts were analysed in Microsoft Excel and SPSS 9. Maps were generated in MapInfo 6.0 and Vertical Mapper 3.0.

3. Results

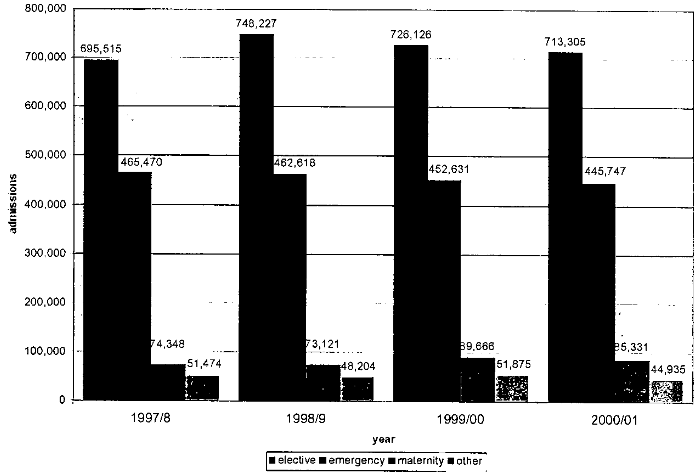
The full dataset contained 5.8 million records representing all FCEs of London residents plus those of patients registered with a London GP practice for the four years 1997/8 to 2000/01. Of these, 5.2 million were admissions of London residents, i.e. the first episode in a spell.

Of all admissions of London residents, 55.1 per cent were classified as elective, 34.9 per cent as emergency, 6.2 per cent as maternity and 3.8 per cent as 'other'.

Analyses in sections (a) to (e) refer to London residents only.

Figure 1

Yearly number of admissions by admission method

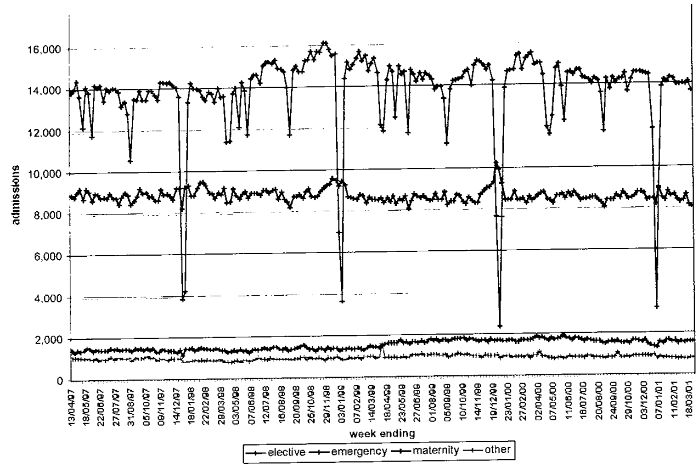


(a) Overall trends in admissions

Figure 1 shows the total number of admissions in each of the four categories by year. The number of elective admissions rose from 695,500 in 1997/8 to 748,200 in 1998/9 then fell again in the following two years. Emergency admissions, however, fell in each consecutive year from 465,470 in 1997/8 to 445,747 in 2000/01, a decrease of 4 per cent over three years. Maternity admissions rose from 74,358 to 85,331 over this period, while 'other' admissions declined slightly.

The slight fall in emergency and elective admissions over time may be real, or it might be due to inaccurate data collection across acute London trusts, particularly in the last two years. As noted above, the HES dataset obtained was cleaned according to guidelines from the Department of Health. Inspecting the data more closely, it appeared that data from one trust, Chelsea and Westminster, had significant shortfalls in the number of admissions particularly in the years 1999/2000 and 2000/01. But excluding the data from this trust made little impact on the overall trend shown in Figure 1.

Figure 2
Weekly number of admissions by admission method



(b) Weekly and daily trends

Figure 2 shows the number of admissions in each category for all London residents by week of admission for the last four years.

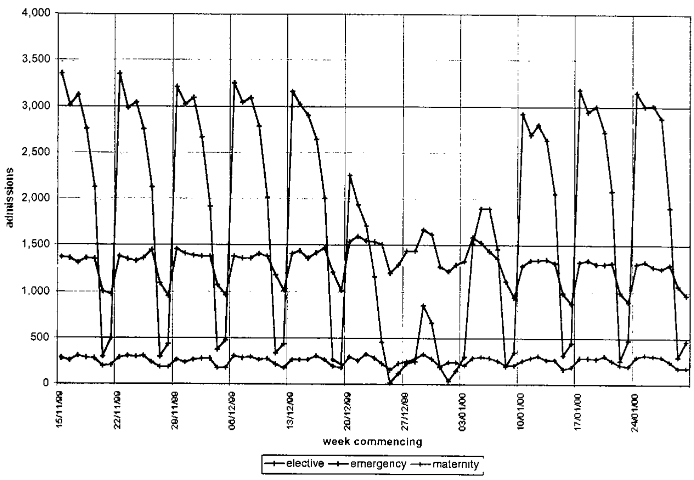
For elective cases (which include day cases), the downward spikes correspond to weeks that include bank holidays: the Easter, May and August bank holidays and Christmas and New Year. For emergencies, there seems to be a corresponding dip in admissions over each bank holiday, except in the Christmas period. Over Christmas, emergency admissions peaked, in particular in the winters of 1998/9 and 1999/2000. The highest peak in emergency admissions occurred in 1999/2000, when there was also a lower than average dip in elective admissions. For maternity and 'other' admissions there is no obvious weekly pattern.

This figure suggests that fewer elective admissions are booked during bank holidays than at other times, especially over Christmas. The reason why some elective admissions occur over these periods may be because the admission was very urgent or urgent and couldn't wait. For emergency admissions in most years there was a slight dip in admissions over the Christmas period and then an increase at the end of the holiday period, possibly as patients' relatives and primary care services hold off an emergency referral to hospital until the end of the Christmas period. The exception appears to be 1999/2000, when there was a sharp increase in the number of emergency admissions at the same time as the drop in electives. This was probably due to a sharp increase in the number of admissions for respiratory disease related to influenza, probably in older patients (see Sections (d) and (e) below).

We examined this winter period more closely by examining the daily pattern of emergency and elective admissions. The results are shown in Figure 3.

The daily pattern shows a marked difference between weekdays and weekends. For elective admissions, the weekday level was highest on Mondays, gradually dropping off towards the weekend. During the period of ten weeks in October and November 1999, the number of elective admissions for London residents dropped to an average of 280 on Saturday and 480 on Sunday. The pattern for emergencies was similar, with a weekday level of about 1300 per day, dropping to 1000 on Saturdays and 900 on Sundays. Maternity admissions also dropped at weekends by about 90 per day to an average level of 160, presumably because of a drop in elective admissions, for example for caesarean section.

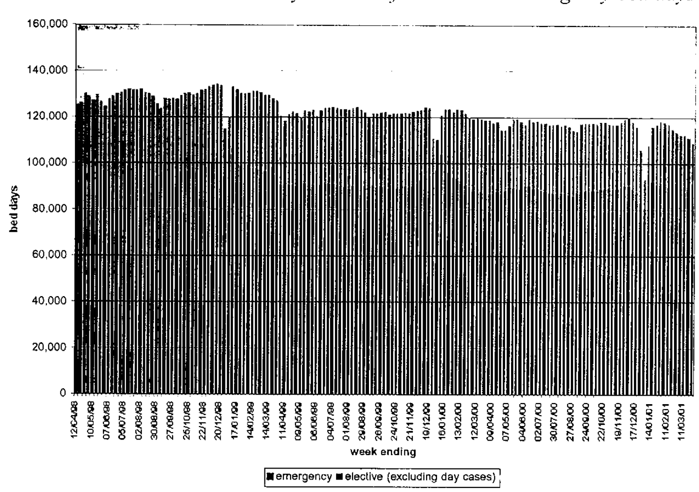
Figure 3
Daily number of admissions by admission method for the period 15 November 1999 to 30 January 2000



Of particular interest here is the period around Christmas. The number of elective admissions dropped virtually to zero on Christmas Day and New Year's Day, though there was a rise between these two periods. In 1999, emergencies were higher during the holiday period, particularly just before Christmas, between Christmas and New Year, and just after the New Year. Figure 2 suggests that this pattern was slightly unusual, with emergency admissions peaking in early January in the other years examined.

Both Figures 2 and 3 show that, during the Christmas period, the number of emergency admissions never rose as much as the electives fell. Even in periods when there were a high number of emergency admissions there was a much greater drop in electives (probably as day cases were cancelled). This suggests that there might be some spare capacity (beds or staff) from elective wards to deal with emergencies. However, since emergency cases tend to stay in hospital longer than electives, simply comparing the number of elective and emergency admissions might be misleading. Instead it would be more useful to examine the pattern of bed days used by each type of admission, and to see whether the total number of bed days increased, reduced or stayed the same over the winter period.

Figure 4
Weekly number of elective and emergency bed days



To do this, the weekly number of bed days used by emergency and elective cases was calculated. Elective day cases were excluded from the analysis, because the resources for day cases (particularly beds and staff) were less likely to be available for use by emergency patients should the need have arisen. The results over the period 1998/9 and 1999/2000 are shown on the previous page in Figure 4.

The figure shows that the total number of bed days across London was largely due to emergency cases rather than electives, and was clearly due to emergency cases staying longer in hospital. The figure also shows that the total number of weekly bed days was generally higher throughout 1998/9 compared to 1999/2000, and this appears to be due to an increase in emergency bed days in 1998/9. Apart from the Christmas period, the period with the next highest total number of bed days was June and July, which explains why many hospitals report pressures from emergency admissions 'beyond winter'. In theory these pressures may be more manageable during the summer months because the number of emergency admissions and bed days is lower than during the winter period. But in practice many hospitals will be striving to keep the number of elective admissions high to meet waiting list targets.

Table 1
Percentage of admissions by ICD-10 chapter

ICD-10 chapter		emergency	elective
19	Injury, poisoning and certain other consequences of external causes	14.48	1.47
9	Diseases of the circulatory system	13.37	5.93
18	Symptoms, signs and abnormal clinical and laboratory findings	13.15	6.46
10	Diseases of the respiratory system	12.56	2.82
11	Diseases of the digestive system	9.34	13.55
14	Diseases of the genitourinary system	5.76	13.44
2	Neoplasms	5.41	19.36
15	Pregnancy, childbirth and the puerperium	4.51	3.45
5	Mental and behavioural disorders	4.36	0.95
1	Certain infectious and parasitic diseases	2.82	0.65
13	Diseases of the musculoskeletal system and connective tissue	2.61	7.13
12	Diseases of the skin and subcutaneous tissue	2.59	3.07
6	Diseases of the nervous system	2.22	1.67
3	Diseases of the blood and disorders involving the immune mechanism	2.15	2.66
4	Endocrine, nutritional and metabolic diseases	1.60	1.10
7	Diseases of the eye and adnexa	0.64	5.31
16	Certain conditions originating in the perinatal period	0.48	0.08
17	Congenital malformations, deformations and chromosomal abnormalities	0.33	1.16
8	Diseases of the ear and mastoid process	0.29	1.06

The number of bed days indeed dropped across London for the two weeks after Christmas, and this was due to a reduction in both elective and emergency bed days. Most hospitals tend to discharge as many patients as possible over Christmas, then re-admit some of this group in the first week of January. In the two weeks following the Christmas period, there was an increase in the number of emergency bed days, though because the number of elective bed days was not yet as high as at other times of the year the total number of bed days did not exceed the level before the Christmas period. This may also be because hospitals are at or near full capacity just after Christmas and cannot accommodate more elective or emergency cases. If there is excess capacity in acute trusts during the year, it is most likely to be available during the week of Christmas Day and the following week, and least available during the subsequent two weeks (in early January), when 'winter pressures' will be at their highest.

(c) Main clinical conditions associated with emergency admissions

The HES dataset contained up to 12 diagnostic codes, as noted above. The ICD-10 system classifies diseases into 19 broad groups, identified as 'chapters'. Using the main diagnosis from each first episode in each admission, Table 1 above shows the proportion of admissions for London residents for each of the 19 ICD-10 chapters. The chapters are ranked in descending order of the proportion of emergency admissions.

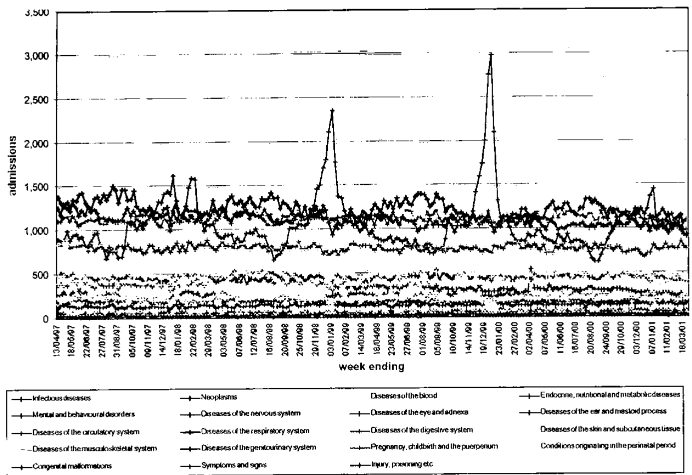
The table shows that injuries and poisonings, symptoms, and diseases of the circulatory and respiratory system were the most common causes of emergency admissions. 'Symptoms' are not specific to any particular condition, and are normally coded on HES data when no clear diagnosis has been made at a point soon after discharge, when the clinical coder assigns the ICD-10 codes to the admission.

To try to identify the specific diseases or conditions causing emergency admissions, ICD-10 chapters were further divided into subchapters. The ten most common reasons for emergency admissions by subchapter are listed in Table 2.

Table 2
Ten most common ICD-10 subchapters leading to an emergency admission

ICD-10 subchapter	% of all emergency admissions
Chronic lower respiratory diseases	4.86
Ischaemic heart disease	4.83
Other forms of heart disease	4.18
Symptoms involving the circulatory/respiratory system	3.79
Symptoms involving the digestive system and abdomen	3.76
General symptoms and signs	3.46
Pregnancy with abortive outcome	2.90
Injuries to the head	2.64
Influenza and pneumonia	2.45
Other acute lower respiratory infections	2.38

Figure 5
Weekly number of emergency admissions by ICD-10 chapter



The table shows that respiratory conditions (acute and chronic) were the single main cause of emergency admissions during the four-year study period.

(d) Seasonality and emergency admissions

To help identify which diseases showed a seasonal pattern of emergency admission, the weekly number of emergency admissions were plotted first by ICD-10 chapter. Figure 5 reveals that emergency admissions for diseases of the respiratory system (ICD-10 chapter 10) show the most pronounced seasonal variation, with a December 1999 peak of 320 admissions per day, compared to a low point in August 1999 of 110 per day. Emergency admissions for respiratory diseases tended to peak in late December or early January. The peak was particularly high in the winter of 1999/2000, was lowest in the winter of 2000/01, and showed a double peak pattern in 1997/8 (with peaks in December and February). The timing of these peaks corresponds to the increase in emergency bed days in the two weeks in early January seen in Figure 4.

Emergency admissions for 'injury, poisoning and certain other consequences of external causes' (chapter 19) showed the second most pronounced seasonal pattern, but this time with a summer peak of 195 and a winter low of 145 in 1999. The other ICD-10 chapters do not show any obvious seasonal variation over the four years.

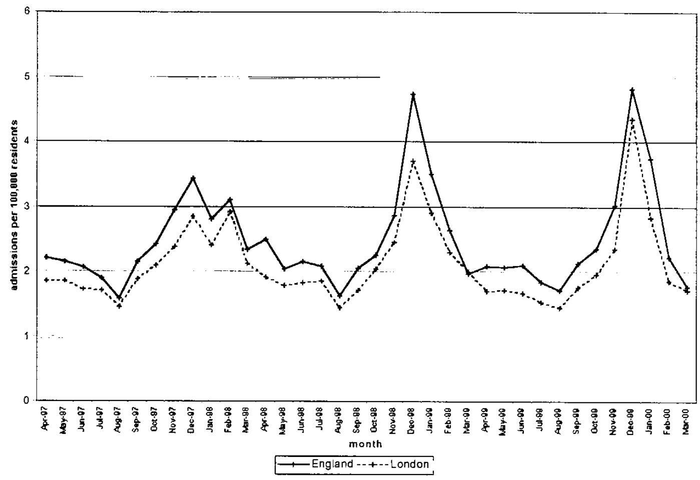
Emergency admissions were also analysed by ICD-10 subchapter. The largest seasonal variation was observed for the following groups of conditions (ranked in descending order of magnitude):

- Chronic lower respiratory diseases (winter peak)
- Influenza and pneumonia (winter peak)
- Other acute lower respiratory infections (winter peak)
- Acute upper respiratory infections (winter peak)
- Non-infective enteritis and colitis (March peak)
- Injuries to the elbow and forearm (summer peak)
- Intestinal infectious diseases (March peak)
- Other viral diseases (winter peak).

These findings suggest that management of respiratory diseases in winter, particularly over the December–January period, will be crucial if NHS acute trusts are to be able to manage winter pressures arising from emergency admissions. More specifically, effective management of people with chronic respiratory disease should be a priority.

Figure 6

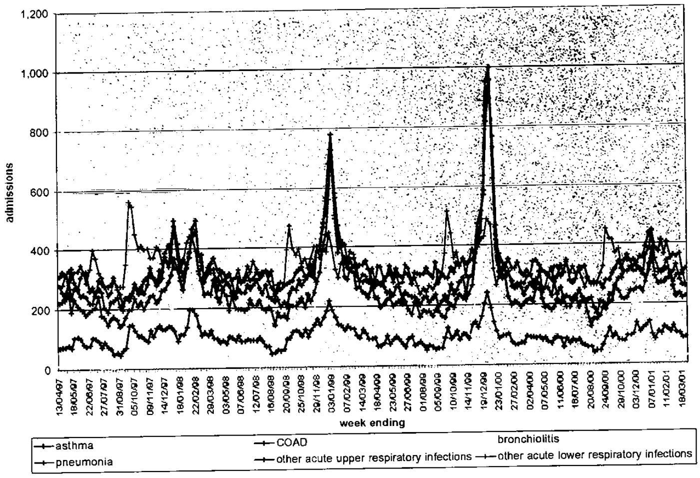
Average daily number of respiratory admissions by month per 100,000 population, comparing London with England as a whole



To investigate how far patterns in the data shown above for London residents were similar to data across England as a whole, a monthly count of emergency admissions for respiratory disease was obtained for England, 1997/8 to 1999/2000. Figure 6 shows that the pattern of emergency admissions across London and England is remarkably similar, with the admission rate for England slightly higher than that for London (both rates shown are not age/sex standardised). The peaks occur at almost exactly the same time of the year in London as across the whole of England. The double peak in admissions in 1997/8 in London is also seen across England.

This figure raises interesting questions, in particular why should the peaks in emergency admission for respiratory disease occur at almost identical times across England as in London? Whilst viruses, in particular influenza, can spread rapidly across large geographical spaces, resulting in greater demand for emergency admissions at a similar time, it is unlikely that any virus would strike at almost exactly the same time each year. Similarly it is arguably unlikely that cold weather (also associated with viral illness) would occur across the country at the same time each year. It may be that the peaks in observed admission rates relate less to levels of illness and more to factors related to the Christmas holiday and early January period. For example, it may be that community support, in the form of primary care and social services, is less available for patients during this period, particularly older patients (see section below). Or possibly that relatives visiting older people over Christmas might refer their relative to A&E at the end of the Christmas period in which the older person was seen to be frail and not coping well. To understand this more fully, the types of patients admitted were identified and examined next.

Figure 7
Weekly number of emergency admissions for six respiratory diseases



(e) Which types of patients are likely to be admitted as an emergency?

Which diseases?

We analysed in more detail admissions for the six specific clinical codes that showed the most pronounced seasonal pattern. These were: J06 (other acute upper respiratory infections), J18 (pneumonia), J21 (bronchiolitis), J22 (other acute lower respiratory infections), J44 (chronic obstructive airways disease (COAD)) and J45 (asthma).

The weekly number of emergency admissions for these six conditions for 1997/8 to 2000/01 is shown in Figure 7.

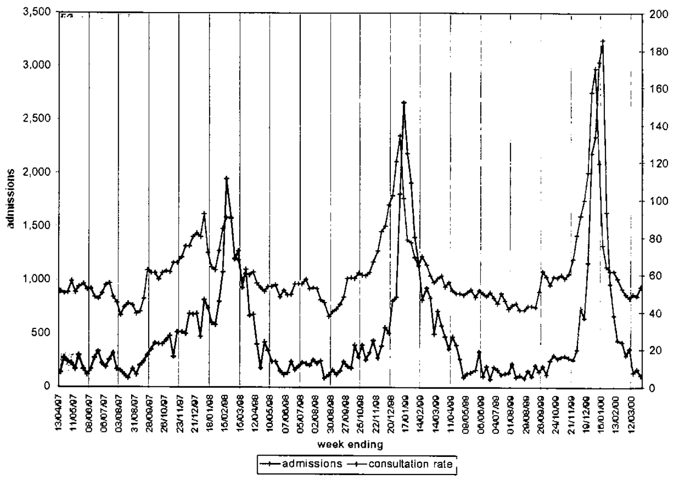
The figure shows several points of interest. First, emergency admissions for asthma tended to peak each year in September, and in some years there was also a peak in December. It is not clear why there should be a peak in September. There is some evidence to suggest that wheezy conditions such as COAD may be coded as asthma,[9] so some of the admissions coded as asthma in older people could possibly be due to COAD (possibly the December peak – see below). Second, emergency admissions for bronchiolitis peaked towards the beginning of December each year. Third, the largest peak in admissions occurred at the end of December or beginning of January for pneumonia, COAD and other upper and lower respiratory infections. Fourth, the pattern was very similar across all four years, the main difference being that the number of admissions for pneumonia, COAD and other upper and lower respiratory infections is much higher in 1998/9 and 1999/2000. If winter pressures are highest in December and early January, this is in part due to patients with chronic respiratory disease, and probably with 'acute on chronic' disease.

To investigate whether this pattern of admissions could be related to the weekly prevalence of influenza virus, the number of emergency admissions for respiratory disease were compared to weekly numbers of GP consultations for influenza and influenza-like illness for the three years 1997/8 to 1999/2000. The data on GP consultations were available for the south of England, rather than London, and were obtained from the Public Health Laboratory Service (PHLS) from the weekly returns service of the Royal College of General Practitioners. Figure 8 shows the result.

The figure shows that the pattern of consultations and admissions is remarkably similar. Both lines peaked at a similar time in December, with the peak in consultations lagging about two weeks behind the admissions. Interestingly, the double peak in admissions noted earlier for the winter of 1997/8 is not exactly reflected in the number of consultations, which showed a high number in February 1998 but not in December 1997.

Figure 8

Weekly number of emergency admissions in London for respiratory disease compared to GP consultations per 100,000 population for flu and flu-like illness in the south-east of England



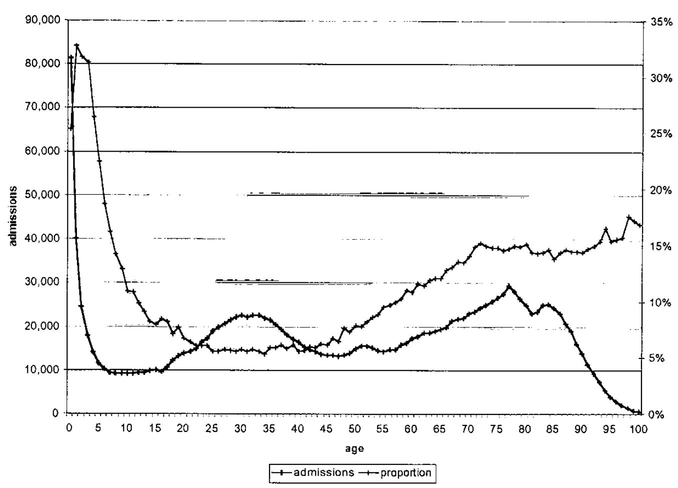
These data suggest that, although the level of GP consultation rates for influenza and influenza-like illness appear to be an indicator of the level of emergency admissions for respiratory disease, the rates would not be useful as an early warning sign since they peak after admissions. Why this should be so is not clear. It may relate to difficulties patients experience accessing primary care, community services or social services over the Christmas period, which result in patients not being managed in the community but being admitted via casualty departments.

Which ages?

The pattern of emergency admissions by age was examined. The results for all four study years combined are shown in Figure 9.

Figure 9

Number of emergency admissions by age and proportion of which are respiratory in nature



The figure shows that the highest number of emergency admissions occurred in those aged under five years. Emergency admissions were lowest for those aged between 20 and 50, after which they steadily rose until age 75 then dropped again, presumably as the population size declines. The proportion of all emergency admissions due to respiratory conditions was at its highest in the under five years group, at over 30 per cent. Further analysis of the data showed that the most common reasons for admission for respiratory disease in this age group were bronchiolitis, asthma, and diseases coded as 'other acute respiratory infections'. The proportion of emergency admissions due to respiratory disease dropped in those aged 10–50 years, only to rise again from age 50. In those over 65 years the main cause of admission in London residents was chronic obstructive airways disease, pneumonia, and 'other acute lower respiratory infections'.

Figure 10
Average length of stay and total bed days for respiratory disease by age

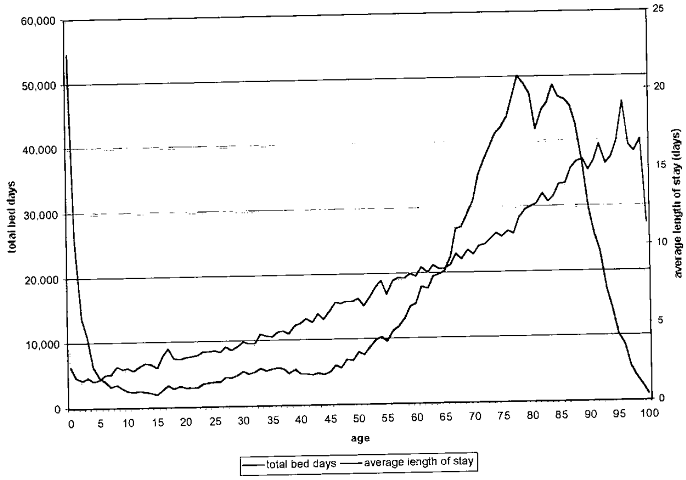
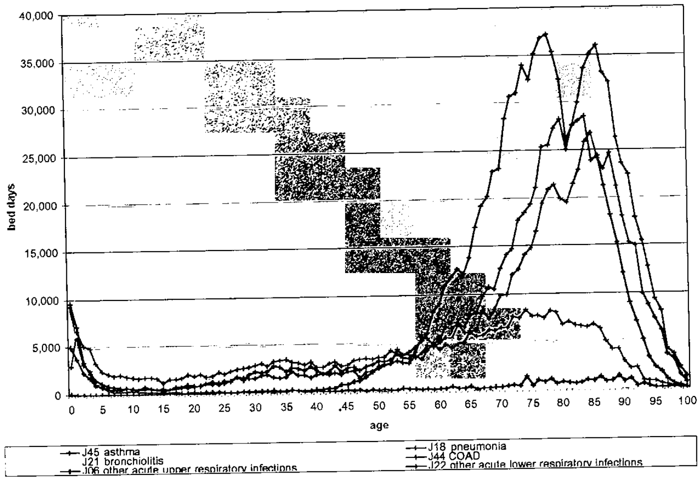


Figure 10 shows the average length of stay of patients admitted with respiratory disease as an emergency, and the number of bed days utilised by age. Young children occupied a high number of bed days (due to the high volume of admissions), but the average length of stay was low – not more than two or three days. For those aged about 60 and over, there were a relatively lower number of admissions, but a very high number of bed days used by these patients, because the average length of stay rose steadily with age (reaching a peak of 17 days at the age of 95). Emergency admissions for older patients were thus likely to require more hospital resources during admission than younger, and to contribute more to 'winter pressure'.

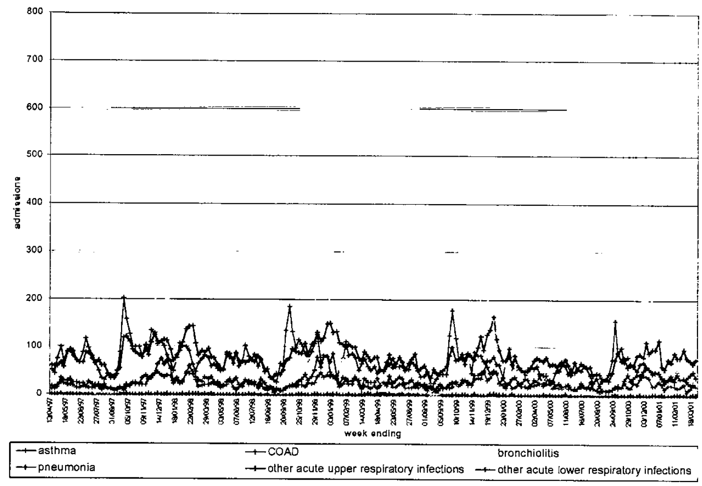
Figure 11
Number of bed days by age for six main emergency respiratory conditions



The number of bed days used by patients admitted with respiratory disease as emergencies, by age, was examined further using the six most common respiratory conditions causing admission. Figure 11 shows the results using data for all four study years combined.

The figure shows that three conditions in older people were the cause of most bed days used: chronic obstructive airways disease, pneumonia and 'other acute lower respiratory infections'. It may be that the last two of these conditions are in fact the same illness, but just coded slightly differently on HES data. It may also be that cases admitted with these two conditions also have COAD – having 'acute on chronic' respiratory disease. Figure 7 above showed that emergency admissions for these three conditions peaked during the most pressurised period in the NHS – early January.

Figure 12
Number of admissions for six main respiratory conditions for patients aged up to 5



The number of bed days was high in the very young, principally due to bronchiolitis (Figure 7 showed that the peak in admissions for this condition occurred in early December). The number of bed days due to asthma showed a double peak – in the young (around age two years) and in the old (around age 75 years). Figure 7 above showed that the peak of emergency admissions for asthma occurred in September and during the Christmas period. The admissions for childhood asthma peaked in September whereas those for older people peaked in December, and that some of the latter may well be coded as asthma instead of COAD and vice versa.[9]

Figures 12 and 13 show more clearly the weekly pattern of emergency admissions by age by specific respiratory condition. Figure 12 shows the pattern for those aged up to 5, Figure 13 for those aged 51–80 years.

Figure 13
Number of admissions for six main respiratory conditions for patients aged 51–80

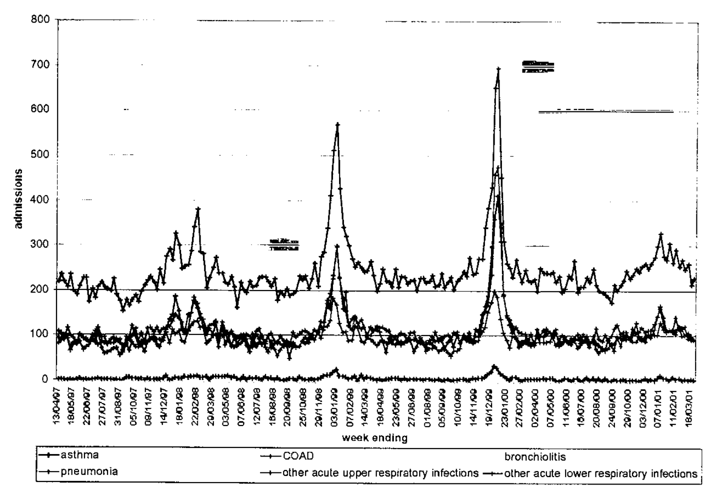


Figure 12 clearly shows the peaks in admissions due to asthma in September – a much smaller peak is seen in early December, particularly in 1997/8 and 1998/9. Admissions due to bronchiolitis tend to occur in early December, and those for 'other acute upper respiratory infections' over Christmas. There was double peak in the number of admissions for the latter in December and February 1997/8. The pattern of admissions for pneumonia and 'other acute lower respiratory infection' largely followed that for 'other acute upper respiratory infections'. As expected, admissions for chronic obstructive airways disease were zero or near zero.

Figure 13 clearly shows that the number of admissions for COAD was highest in this age group, with the peak in December. This peak was highest in 1999/2000 and lowest in 2000/01. There was a double peak pattern in December 1997 and February 1998, as shown earlier. The admissions for pneumonia and 'other acute lower respiratory infections' were lower (each approximately half of those for COAD), but showed the same weekly pattern. The peaks for asthma were much lower still but again showed the same pattern. Admissions for 'other acute upper respiratory infections' were very low, but again there was a peak in December.

Which locations?

The dataset included the code of the electoral ward of residence of the patient. This field was used to generate a series of maps showing age-sex standardised rates per 1000 population for each ward in London, using data for the whole four-year period combined.

The result for all admissions (emergency, elective, maternity and 'other') is shown in Figure 14. Relatively high admission rates were seen around St Helier Hospital in south London and higher than average rates in east and south-east London, and in Ealing. The affluent areas around Kensington and Chelsea have low admission rates. The admission rates will be positively affected by a number of factors apart from the prevalence of ill-health, for example socio-economic deprivation, the proportion of the population from black and minority ethnic groups, access to hospital facilities (including beds), access to and quality of primary care, community health care, and support from social services.

Figure 14
Age-sex standardised admission rates – all admissions

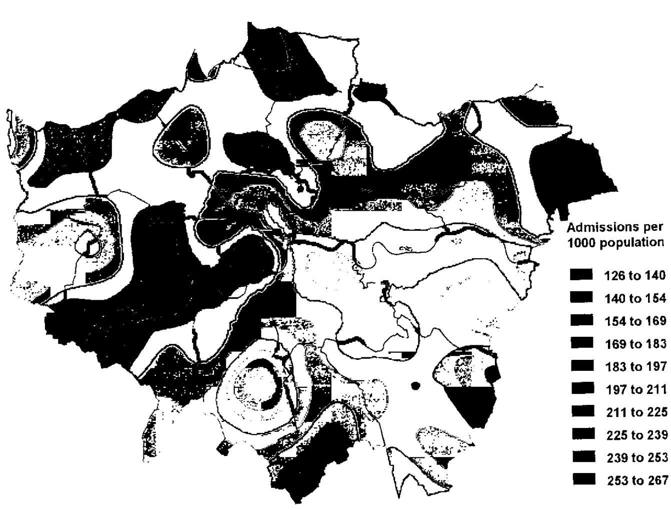
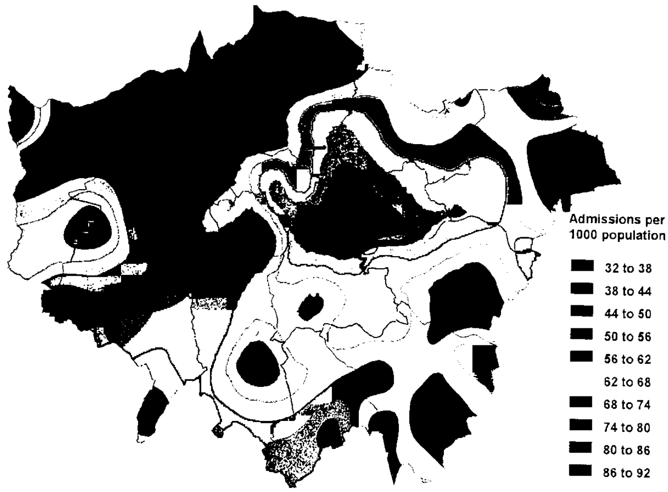


Figure 15 shows the results for emergency admissions only. Note that the scale on this map is different from the previous one.

The map shows relatively higher rates of emergency admission in east London.

Figure 16 shows how far the higher rates observed in east London were due to admissions for respiratory disease. Note the scale of the map. Again higher rates were seen across east London.

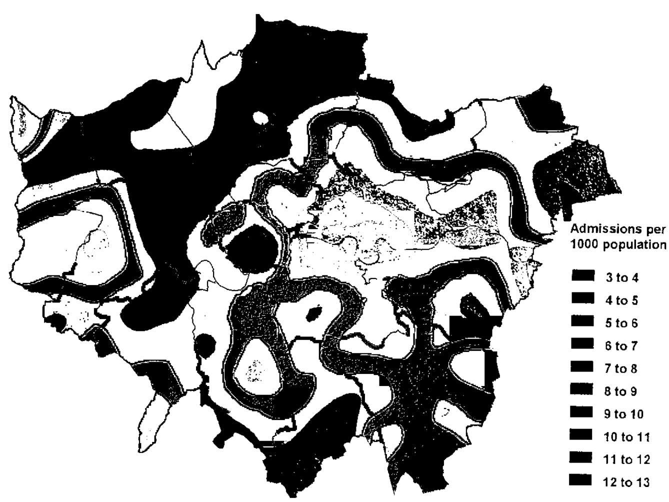
Figure 15
Age-sex standardised admission rates – emergency admissions



To illustrate the difference in emergency admission rates for respiratory disease between summer and winter, and to identify in which locations in London residents had a high risk of admission, emergency admission rates for the summer period June to September were mapped alongside those for the winter months (November to February). The results are shown in Figures 17 and 18, and the maps are constructed to the same scale.

As noted above, there may be many reasons for the higher rates of emergency admission in east London. For example, this area is known to have a high proportion of residents from black and minority ethnic groups, residents who are socio-economically deprived, and who have access to poorer quality primary care facilities.

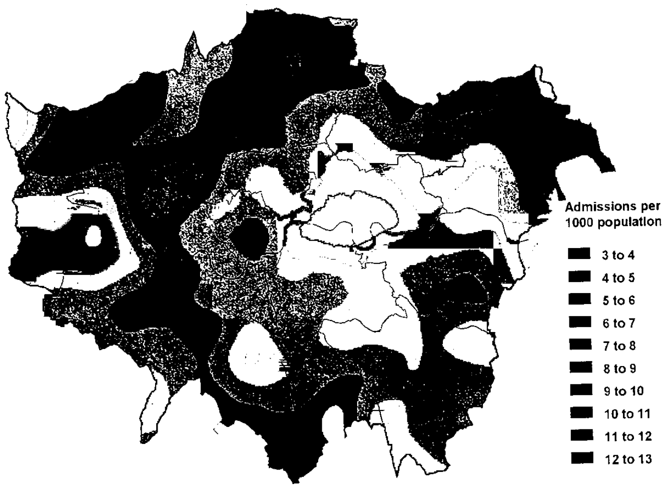
Figure 16
Age-sex standardised admission rates – emergency admissions for respiratory disease



(f) Emergency admissions by general practice

Emergency admissions for respiratory diseases were mapped according to which practice the admitted patient was registered with. As noted in the methods section, age-sex standardised rates were calculated using practice list information obtained from the Department of Health, and

Figure 17
Age-sex standardised admission rates – emergency admissions for respiratory disease in summer



1810 out of 1874 practices in London are represented. Each coloured dot on the map represents a single general practice, the colours corresponding to the rate of admission calculated.

In themselves, the results shown in Figure 19 do not add a great deal to the maps shown earlier; for example, higher admission rates are shown in east London and lower in north-west London. The rates are also more susceptible to errors, because data on practice registered populations is still thought to be inadequate, in part due to the mobility of the population. However, the population data used are based on returns made by practices to the relevant local health authorities, and therefore represent the best data currently available. One point of interest about the map is that there are some areas in which practices with high rates sit next to practices with much lower rates, even after adjusting for age and sex. Again there may be many reasons for this, and a next step in the analysis would be to conduct a multivariate analysis to help identify the reasons for such variations.

Figure 18
Age-sex standardised admission rates – emergency admissions for respiratory disease in winter

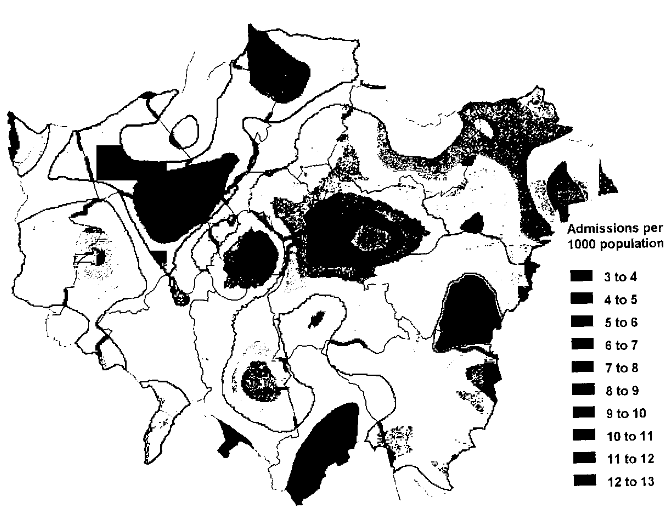
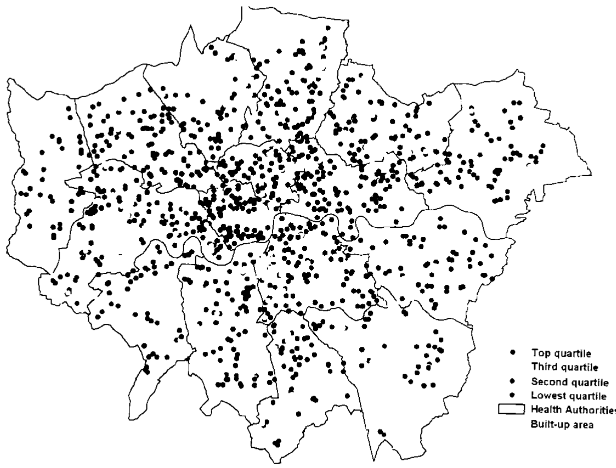


Figure 19
Age-sex standardised admission rates – emergency admissions for respiratory disease by general practice



4. Discussion

(a) Main findings

The work presented here represents a relatively simple analysis of HES data. Nevertheless it reveals the strong influence of respiratory conditions, particularly chronic disease in older people, on the demand for NHS resources in winter. This finding has been well documented elsewhere.[10,11] In the main body of this report the results are presented for the region as a whole. In Appendix 1, similar results are shown for selected NHS trusts and London boroughs. On the web site (http://www.kingsfund.org.uk/eHealthCarePolicy/html/london.html), the main results are shown for all London's acute NHS trusts and boroughs, with brief notes attached. The findings are similar across trusts and boroughs as for the region as a whole.

We have shown how the number of emergency admissions for respiratory disease peaks at almost the same time every year in London, and have provided evidence that this pattern is repeated throughout the country. The timing of the greatest pressures on the NHS from emergency admissions is therefore predictable. We suggest that the specific timing of the peaks in emergency admissions over the Christmas period is related less to the prevalence of illness (including influenza) or the weather, but has more to do with the existence of bank holidays at that time of the year, and related factors such as access to ambulatory NHS care and social support before, during and after this period. Many of these factors are amenable to management by the NHS and social services departments.

The size of the peak in the number of emergency admissions for respiratory disease over Christmas appears to be strongly associated with the level of GP consultation rates for influenza and influenza-like illness. We have shown that the consultation rate is unlikely to be a useful warning sign of the volume of emergency admissions, since the rates peak two weeks after the peak in emergency admissions.

Looking at resource use, we were able to show that the greatest use of resources (bed days) in acute hospitals during the winter months is required by older people, in particular those with chronic respiratory conditions and 'acute on chronic' disease. Patients aged 60 and over used 75 per cent of the total bed days of all patients admitted as an emergency with respiratory disease during the four years. The three main respiratory illnesses involved were chronic obstructive pulmonary disease, pneumonia and 'other acute lower respiratory infections'. The average length of stay for these elderly patients was as high as 17 days, compared with an average length of stay of about four days for a patient with respiratory disease aged 30.

Older patients with chronic respiratory disease are identifiable in advance of winter, particularly by staff working in primary care. As such they could be the subject of much more proactive, rather than reactive, management throughout the winter months in order to reduce the risk of an emergency admission. Such proactive management could include not just immunisation against influenza at the right time, but also regular weekly (if not daily) review during the critical few weeks in December and January, and early intervention where appropriate. This must be a key role for primary care, with support from acute hospitals, social services, community health services and possibly NHS Direct.

The analysis also suggested that the volume of emergency admissions was high in some areas in winter, in particular the East End of London. While winter pressures arise from factors relating to demands for care (for example the number of emergency admissions and bed days used), the supply of available resources, and how demands for and supply of resources are managed, it may be that winter pressures are not necessarily as great in the East End as elsewhere in London. Nevertheless it will be important to target some of the limited resources for managing winter pressures on specific parts of the East End, in particular to support primary care.

(b) Limitations of the analysis

Any analysis based on using HES data has limitations due to inadequacies in the dataset. It was obvious from the review of data from one hospital in the West End, that the total count of admissions on HES data was likely to be much lower than in reality. Other hospitals had shortfalls in data to a much lesser degree as shown in Appendix 1 (see the web site mentioned earlier in this section). For example, Figures 14 to 19 show consistently lower admission rates than many other areas of London (something noticed in other research[12]), which may indicate a shortfall in data in the local trust. However, HES represents the only source of routine data on admissions and bed days and as such is a valuable resource that could be exploited far more completely and usefully than at present. The main limitations in our analysis will arise from missing records and inconsistencies in clinical coding. Studying the weekly number of admissions by NHS trust and by borough (see Appendix 1 for selected sites and the web site for all NHS trusts and boroughs in London) suggests that, despite serious errors in one NHS trust, shortfalls in the numbers of admissions were not large enough to significantly alter the results presented in this report.

To identify the main groups of diseases causing emergency admissions we had to rely upon the clinical codes recorded on HES data. Clinical coding has long been thought to be suspect although is likely to improve over time.[9] However, it is more likely that coding is accurate at higher levels of aggregation (for example ICD-10 chapters and subchapters) than for specific diseases; as such we argue that the data shown on respiratory diseases are likely to present a sufficiently accurate picture of the burden and type of respiratory disease over time and geographical location to act upon. Age and postcode are usually accurately and completely recorded on HES.

For the analysis presented in the results sections (a) to (e), data on admission for people resident within the geographical boundary of the London NHS region to an NHS hospital anywhere in the country were examined – not the admissions of everyone admitted to London's hospitals over the period. As such, the number of admissions shown in some of the figures will be slightly lower than experienced in most London acute trusts, although for most the proportion of non-London residents admitted over the study period was small – approximately 1.1 per cent.

Census data from 1991 were used to calculate the age-sex adjusted admission rates. The data were old and the population of London is likely to have changed over ten years. Population estimates (which include some adjustment for migration) could have been used instead of the 1991 census figures, though we had no reason to believe that these would be any more appropriate as a denominator to calculate the rates.

The analysis presented in the results section (f) show age-sex adjusted rates of emergency admission by general practice. As noted, data used in the denominator – populations registered by GP practice – are susceptible to error, in part because of the great mobility of population in some areas. However, these data are the best that are available, and comparing Figure 19 with Figure 16 shows a similar pattern of emergency admissions by place across the city, using different sources of data for the denominator. We suggest that the results could be used appropriately to raise questions and should herald further analysis by general practice within the region.

(c) Main messages for the NHS in London

To help manage winter pressures arising from emergency admissions we suggest the following priorities:

- focus on the management of older patients with chronic respiratory disease
- work with staff in selected acute hospitals and general practices this winter to understand more the dynamics of demand for and supply of NHS care in the period December and January
- ensure good access to primary care, community health services, NHS Direct and social services during the winter bank holidays, and ensure that the public knows about the levels of access

- consider supporting primary care staff this winter to identify older patients most at risk of an emergency admission for respiratory disease, and to design robust and proactive packages of care aimed at reducing emergency admissions in these patients, and involve other services where appropriate.
- analyse the outcome of these new interventions (ideally across primary care groups/trusts using emergency admissions as a measure) using HES data or data collected on computer systems in primary care
- ensure the highest levels of immunisation for influenza in older people in the East End of London
- commission further research on winter pressures that combines a focus not just on demands for care, but also on the supply of resources (e.g. staff and beds, availability of primary care staff), and the management of both.

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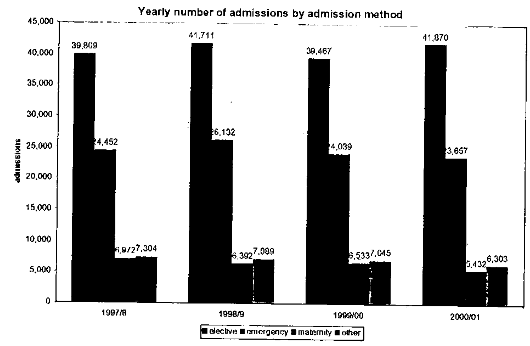
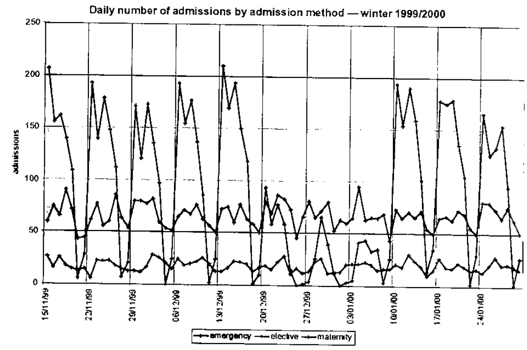
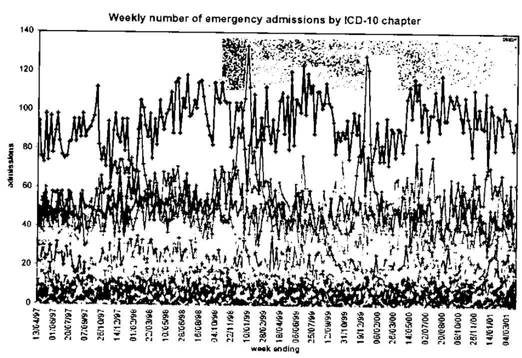
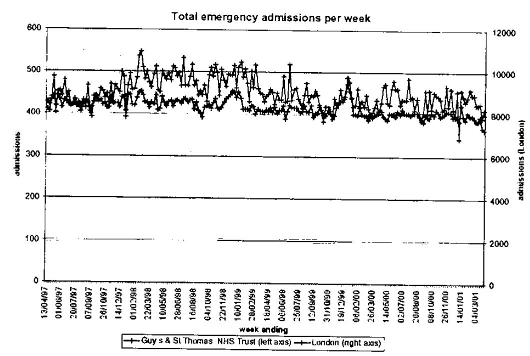
Appendix 1: Summary graphs for selected boroughs and NHS trusts

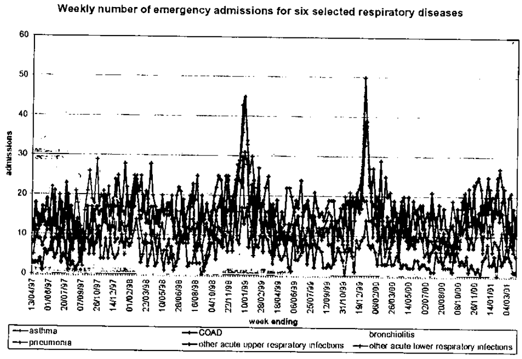
a: Guy's and St Thomas' NHS Trust

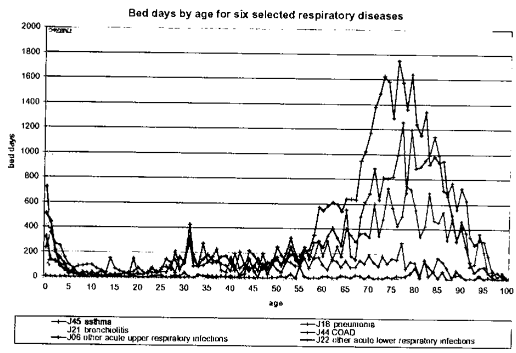




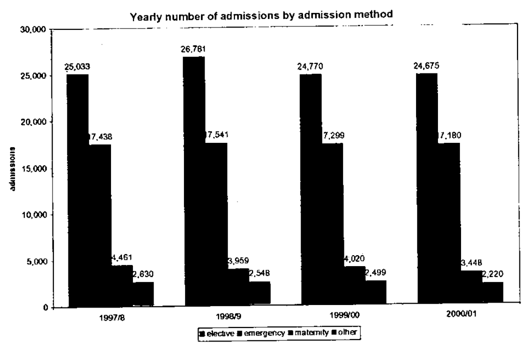


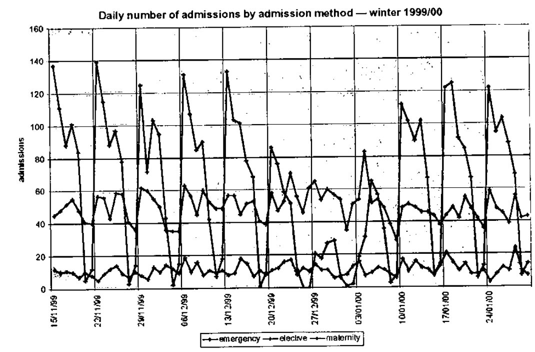


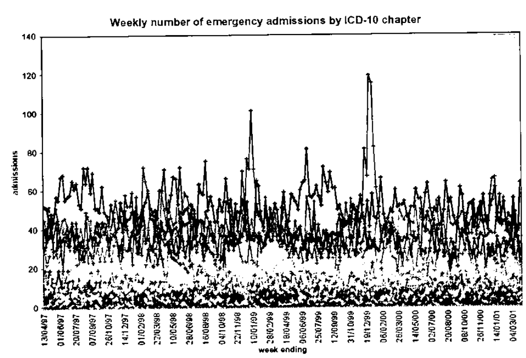


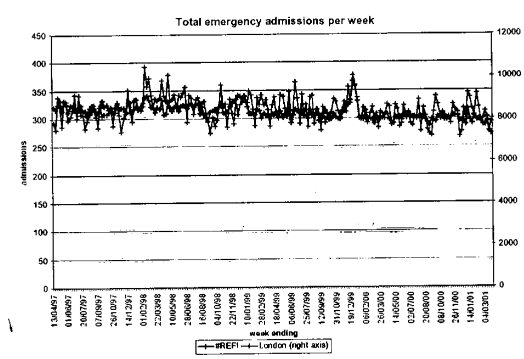


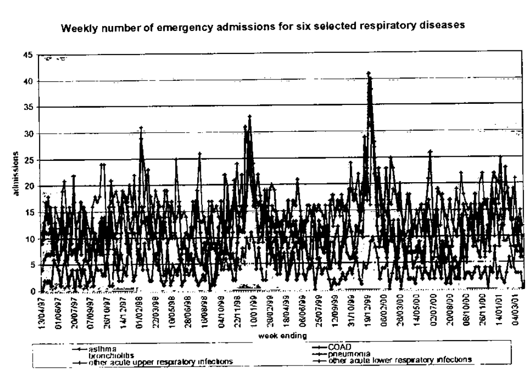
b: London Borough of Southwark

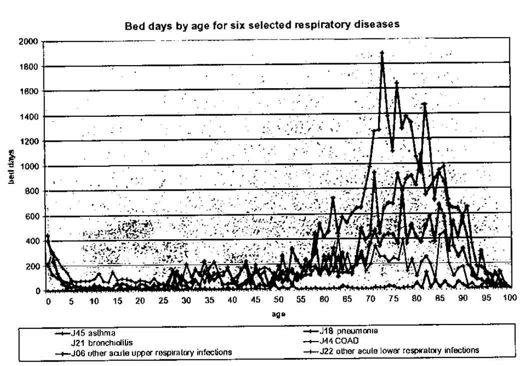












Appendix 2: List of fields in HES dataset used

name	description
ADMIDATE	admission date
ADMIMETH	admission method
EPISTART	episode start date
EPIEND	episode end date
EPIDUR	episode duration
EPIORDER	consultant episode number
DISDATE	date of discharge
DISDEST	discharge destination
SPELDUR	spell duration
STARTAGE	age
SEX	sex
ETHNOS	ethnicity
EDCODE	ED code
DIAG01	diagnostic code 1
DIAG02	diagnostic code 2
DIAG03	diagnostic code 3
DIAG04	diagnostic code 4
DIAG05	diagnostic code 5
DIAG06	diagnostic code 6
DIAG07	diagnostic code 7
DIAG08	diagnostic code 8
DIAG09	diagnostic code 9
DIAG10	diagnostic code 10
DIAG11	diagnostic code 11
DIAG12	diagnostic code 12
OPER01	procedure code 1
OPER02	procedure code 2
OPER03	procedure code 3
OPER04	procedure code 4
OPER05	procedure code 5
OPER06	procedure code 6
OPER07	procedure code 7
OPER08	procedure code 8
OPER09	procedure code 9
OPER10	procedure code 10
OPER11	procedure code 11
OPER12	procedure code 12
MAINSPEF	consultant specialty function code
PRCODEOLD	original provider code
PRCODENEW	2001 provider code
SITERET	site code
PROVSPNO	provider spell number
GPPRAC	GP practice code
PCGCODE	PCG code
RESHA	HA of residence
DCHAPTER	ICD-10 chapter
DSUBCHAPT	ICD-10 subchapter

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