Trends in hospital admissions for fractures in England, 1989–90 to 1997–98

Sooria Balasegaram and Azeem Majeed,
National Statistics and
Halina Fitz–Clarence,
University College London Hospitals NHS Trust

The objectives of this study were to examine recent trends in admission rates for fractures in England and to estimate future trends for people aged 45 years and over. The study confirmed that fractures remain an important cause of ill–health and mortality, particularly among the elderly. Age-standardised rates of admissions for fractures increased from 1989–90 to 1997–98. Most of the increase occurred in the first three to five years of the study and may be mainly due to improvements in the completeness of coding of hospital admissions data. Admission rates for fractures changed little between 1994–95 to 1997–98. Because there will be a large increase in the number of elderly people in the population, if steps are not taken to tackle their underlying causes, fractures will impose an increasing burden on the public, society and the NHS. In line with recommended practice, efforts need to be focused on reducing fall–related injuries in the elderly, preventing and treating osteoporosis, and encouraging people to adopt healthier lifestyles including participation in regular exercise.

Introduction

Osteoporosis is a major public health problem. Its main clinical manifestation is through fractures, often precipitated by minimal or very minor trauma, such as a fall from a standing height (see Box one). For example, about 70 per cent of fractures in women aged 45 and over are thought to be due to underlying osteoporosis.[1] Consequently, osteoporosis-induced fractures impose a considerable burden on individuals, carers, and health and social services. These fractures cause a large numbers of admissions to NHS hospitals and reduce the quality of life of patients. Osteoporosis is particularly common in the elderly and because of the increasing number of elderly in the population, the burden of disease on society caused by osteoporosis will increase further unless action is taken to prevent this.

Most of the previous research on disease caused by osteoporosis has examined fractures of the hip, and to a lesser extent, fractures of the wrist and vertebrae (spine), as these are the commonest sites for osteoporotic fractures. For these sites, Melton and colleagues estimated a lifetime risk of fracture of 40 per cent in women and 13 per cent in men.[2] This ignores the impact of other fractures and hence under–estimates the true lifetime risk of suffering a fracture. A few other studies have estimated the incidence of fractures in defined populations in Britain in the last two decades. Donaldson and colleagues used data from outpatients and inpatients to estimate the incidence of fractures in Leicester from 1980–82.[3] More recently, Singer and colleagues report data from accident and emergency departments in Edinburgh for 1992–3.[4] Johansen and colleagues estimated the incidence of all fractures in England and Wales by extrapolating data for 1994–95 from the Accident and Emergency Department in Cardiff.[5] They estimated the overall all-ages annual incidence of fractures to be 21 per 1,000. All of these previous studies have noted an increase in fracture rates from the fourth decade onwards in women and in later life in men, resulting in a decrease with age in the ratio of male to female fracture rates.

None of these previous studies tried to measure the number of hospital admissions caused by fractures. The costs of inpatient care are a major component of the total costs of fractures to the NHS. Moreover, additional costs may be generated from delays in discharging elderly patients who have suffered a fracture because of problems in arranging multidisciplinary community care services for older people. The National Priorities Guidance from the Department of Health aims for a reduction in delayed discharges in people aged over 75 years to 11 per cent in 2000–01 and 9 per cent in 2002–03.[6] Hence, it is important to examine trends in admissions for fractures among older patients to help plan the medical and rehabilitation services required. Furthermore, because many fractures are caused by a simple fall,[7] the government's public health strategy, Our Healthier Nation, has highlighted deaths from falls in elderly people as a major part of the strategy to reduce deaths from accidents.[8] Hence, it is important to also establish trends in falls that lead to admissions for fractures in this group. In this paper, we use routine hospital admissions data to describe trends in hospital admissions for fractures and related falls, and estimate the future number of admissions from these conditions.

Methods

Hospital episode statistics have been collected since the 1987–88 financial year and are collected on all admissions to NHS hospitals.[9] Before this, routine hospital data were available as the Hospital Inpatient Enquiry, which was based on a 10 per cent sample of admissions. The unit of measurement for inpatient activity is the finished consultant episode, which relates to the care given under one hospital consultant. Because patients may be transferred from the care of one consultant to another during one admission, each admission can generate several episodes. However, 95 per cent of admissions generate only one episode. During each episode, up to seven diagnoses can be recorded, one main diagnosis and up to six secondary diagnoses. Other information, such as address, age, sex, place of discharge and length of stay are also recorded. Diagnoses were coded using the Ninth Revision of the International Classification of Diseases (ICD–9) until 1994–95, and the Tenth Revision (ICD–10) from 1995–96 onwards.

We obtained information on all admissions due to fractures or and falls leading to a fracture in people aged 45 years and over in England from 1989–90 to 1997–98 (the latest year for which data were available) from the Department of Health. We started our study in the 1989–90 financial year to avoid inaccuracies arising from the change from the Hospital Inpatient Enquiry system to the Hospital Episode Statistics system. We collected data on broad anatomical categories of fractures, as this would reduce the errors due to misclassification between fracture sites and also from random variation for sites with a relatively small number of fractures. Grimley Evans and colleagues have documented misclassification relating to hip and other femoral fractures.[10] It is likely that misclassification also happens with fractures at other sites. Hence, we grouped the ICD-9 diagnoses into all fractures (codes 800–829), upper limb fractures (810–819), spine and trunk fractures (805–809) fractures of the lower limb excluding femur (822–829), and fractures of the femur (820–821). The corresponding ICD–10 codes are: all fractures (all following codes and S02); upper limb fractures (T10, T023, T024, S42, S52, S62); spine and trunk fractures (T08, S12, S22, S32), fractures of the lower limbs excluding femur (T12, T023, T025, S82, S92), and fractures of the femur (S72).

We collected information on patients aged 45 and above as osteoporosis is rare in earlier age groups. We restricted our data to the first episode in each admission. Thus, the number of episodes can be used as a measure of the number of admissions. We used only the first diagnosis in each episode to minimise the effect of readmissions for a prior fracture. We also obtained information on whether the fracture was associated with a fall as many fractures in the elderly are preceded by a fall.

Using National Statistics population estimates for England, we calculated age specific fracture admission rates. We also calculated age standardised admission rates, standardised to the 1997 population to adjust for changes in the age and sex structure of the population between 1989–90 and 1997–98. We then estimated the number of admissions for the years 2011–12 and 2021–22, based on current admission rates, using National Statistics population projections.

Results

Admissions for all fractures

There were 89,488 admissions in women and 32,408 admissions in men to NHS hospitals in England in 1997–98 for all fractures (excluding skull) in people aged 45 years and over. Between 1989–90 and 1997–98, age–standardised admission rates increased from 63 to 88 per 10,000 in women and from 29 to 37 per 10,000 in men. This increase mainly took place between 1989–90 to 1993–94 and there was relatively little change in the following four years other than for a decrease in rates in 1995–96. Similar trends were seen for admission rates for each fracture site. Admission rates were similar in men and women aged 45–64 years and then increased rapidly with age in both sexes but more rapidly in women than in men (Table 1).

Table 1 **Admission rates for all fractures per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates**

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	19.5	24.6	25.1	26.1	28.1	27.1	25.1	26.2	25.1
65–74	51.1	59.7	66.1	69.7	73.5	73.6	69.1	74.6	71.1
75–84	131.5	155.4	173.6	183.6	192.7	187.8	176.9	189.4	185.9
85 and over	291.3	338.9	372.6	399.1	403.0	389.8	379.8	420.4	418.8
45 and over total	**62.7**	**74.4**	**81.3**	**86.0**	**89.7**	**87.5**	**82.9**	**89.5**	**87.5**
Men									
45–64	20.9	24.3	24.9	26.2	27.5	26.1	22.3	23.3	23.8
65–74	22.7	27.3	30.0	31.0	33.5	31.1	29.3	30.5	31.0
75–84	53.5	61.6	70.5	70.9	79.8	78.5	69.1	71.9	72.7
85 and over	143.1	164.7	179.0	193.2	199.8	188.2	175.3	233.1	239.1
45 and over total	**28.5**	**33.2**	**35.6**	**37.1**	**39.7**	**37.8**	**33.5**	**36.4**	**37.1**

Table 2 Admissions for fractures of the femur per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	3.8	4.6	4.6	4.4	4.4	4.0	3.7	4.0	4.0
65–74	20.4	23.4	26.1	26.6	27.4	27.7	25.3	27.9	26.8
75–84	74.9	89.5	100.4	104.1	107.7	104.1	98.6	105.3	104.9
85 and over	197.5	228.2	253.0	271.1	269.7	258.2	253.6	276.6	275.6
45 and over total	**31.9**	**37.4**	**41.4**	**43.2**	**43.9**	**42.4**	**40.5**	**43.8**	**43.4**
Men									
45–64	2.5	3.0	2.9	2.8	3.0	2.9	2.8	2.9	2.8
65–74	8.5	10.1	10.9	11.7	12.3	11.5	11.7	11.7	12.0
75–84	29.5	34.4	40.2	41.0	45.5	44.5	40.3	41.5	43.4
85 and over	93.0	71.1	119.6	129.8	132.4	124.9	118.7	135.3	142.3
45 and over total	**9.5**	**10.1**	**12.2**	**12.8**	**13.6**	**13.0**	**12.3**	**13.0**	**13.4**

Figure 1 Admission rates for fractures and falls in women by age group using average rates for 1996–98

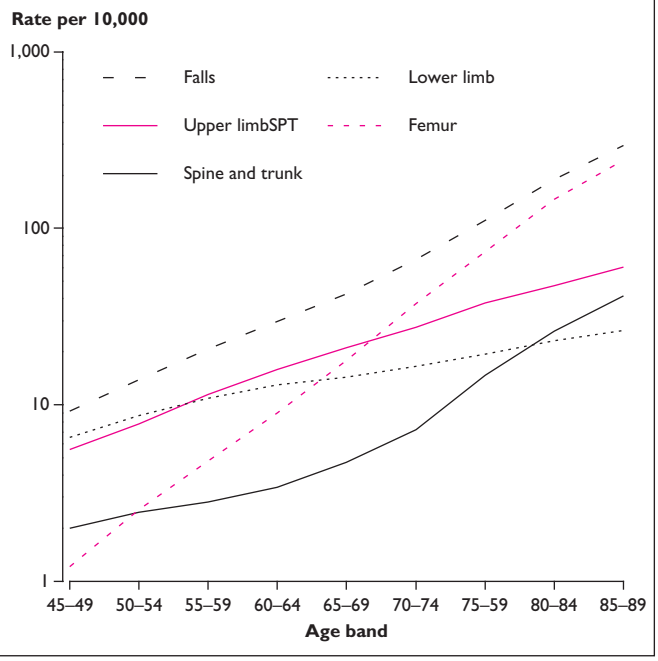
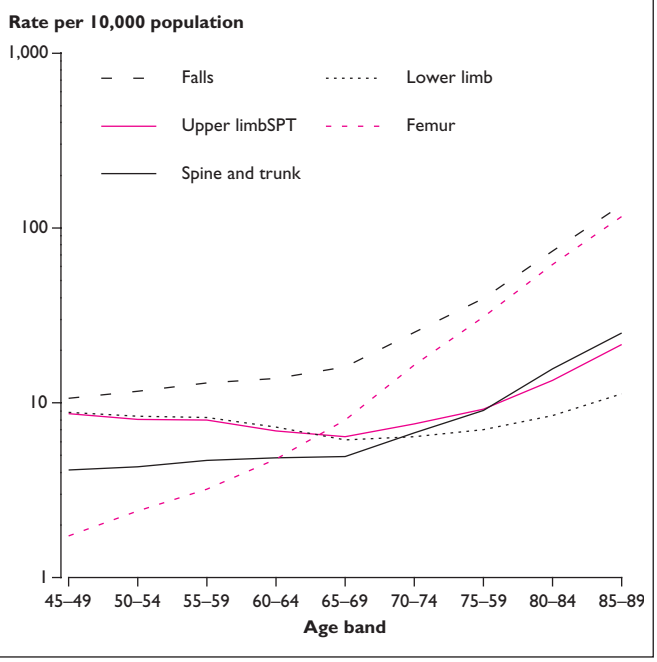


Figure 2 Admission rate for fractures and falls in men



Fractures of the femur

There were 44,456 admissions in women and 11,753 admissions in men to NHS hospitals in England in 1997–98 for fractures of the femur in people aged 45 years and over. Between 1989–90 and 1997–98, age–standardised admission rates increased from 32 to 43 per 10,000 in women and from 10 to 13 per 10,000 in men. Admission rates were higher in women than in men in all age–groups and increased more rapidly with age in both women (Figure 1) and men (Figure 2) than for fractures at any other site. In 1997–98, age–standardised admission rates were over three times as high in women than in men (Table 2).

Fractures of the lower limb excluding femur

There were 14,085 admissions in women and 7,031 admissions in men to NHS hospitals in England in 1997–98 for fractures of the lower limb (excluding femoral fractures) in people aged 45 years and over. Between 1989–90 and 1997–98, age-standardised admission rates increased from 10 to 14 per 10,000 in women and from 6 to 8 per 10,000 in men (Table 3). Admission rates were higher in women and increased more rapidly with age than in men (Figure 1).

Fractures of the upper limb

There were 21,741 admissions in women and 8,044 admissions in men to NHS hospitals in England in 1997–98 for fractures of the upper limb in people aged 45 years and over. Between 1989–90 and 1997–98, age-standardised admission rates increased from 13 to 21 per 10,000 in women and from 5 to 9 per 10,000 in men (Table 4). Admission rates were higher in women than in men in all age–groups and increased more rapidly with age in women (Figure 1) than in men (Figure 2).

Fractures of the spine and trunk

There were 9,289 admissions in women and 5,584 admissions in men to NHS hospitals in England in 1997–98 for fractures of the spine and trunk in people aged 45 years and over. Between 1989–90 and 1997–98, age-standardised admission rates increased from 7 to 9 per 10,000 in women and from 5 to 6 per 10,000 in men (Table 5). Admission rates were higher in men than in women among 45–64 year olds and similar in 65–74 year olds. Among older patients, admission rates were higher in women.

Table 3 Admission rates for lower limb fractures (excluding femur) per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	6.5	8.4	8.5	9.2	10.2	9.8	9.1	9.6	9.2
65–74	10.6	12.9	14.2	14.7	15.8	15.3	14.9	15.4	15.3
75–84	14.5	17.4	18.6	19.9	21.7	20.8	19.9	21.5	20.4
85 and over	18.4	20.5	24.0	25.7	26.9	24.2	23.7	29.6	30.3
45 and over total	**9.5**	**11.7**	**12.4**	**13.2**	**14.4**	**13.7**	**13.1**	**14.1**	**13.8**
Men									
45–64	6.9	8.1	8.1	8.4	8.7	8.2	8.0	8.4	8.2
65–74	4.5	5.6	6.1	6.4	6.9	6.4	6.3	6.3	6.2
75–84	5.7	7.1	7.7	7.2	8.5	8.4	7.5	7.9	7.2
85 and over	8.7	11.5	12.2	11.0	11.4	11.9	10.3	24.4	22.8
45 and over total	**6.3**	**7.5**	**7.8**	**7.9**	**8.4**	**7.9**	**7.7**	**8.3**	**8.0**

Table 4 Admissions for upper limb fractures per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	5.9	7.8	8.2	8.8	9.6	9.5	9.7	10.0	9.3
65–74	14.2	17.1	19.0	20.9	22.7	23.3	23.0	25.4	23.1
75–84	26.3	30.3	33.8	37.5	40.8	40.5	39.8	42.7	41.1
85 and over	38.4	47.0	51.6	54.7	57.0	61.0	58.9	68.6	66.4
45 and over total	**13.2**	**16.1**	**17.6**	**19.1**	**20.7**	**21.0**	**20.8**	**22.6**	**21.2**
Men									
45–64	4.6	5.4	5.8	6.6	7.4	7.1	7.3	7.8	8.2
65–74	3.8	4.6	5.2	5.3	6.0	6.1	5.9	6.9	7.0
75–84	6.8	7.5	8.3	9.1	10.4	10.7	10.2	11.1	10.5
85 and over	14.7	17.6	18.3	19.0	21.5	21.1	21.6	42.7	43.4
45 and over total	**5.0**	**5.8**	**6.3**	**7.0**	**7.8**	**7.7**	**7.8**	**8.9**	**9.2**

Table 5 Admission rates for spine and trunk fractures per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	2.3	2.5	2.6	2.5	2.7	2.6	2.5	2.6	2.6
65–74	4.7	5.1	5.6	6.3	6.3	6.0	5.9	5.9	5.9
75–84	13.7	15.8	18.0	19.1	19.6	19.9	18.6	19.9	19.5
85 and over	34.0	39.3	40.2	43.4	44.9	42.4	43.5	45.5	46.5
45 and over total	**6.8**	**7.7**	**8.3**	**8.8**	**9.0**	**8.8**	**8.6**	**9.0**	**9.0**
Men									
45–64	3.9	4.4	4.3	4.5	4.7	4.5	4.2	4.4	4.5
65–74	4.3	5.1	5.4	5.4	6.0	5.2	5.4	5.6	5.9
75–84	9.0	9.9	11.4	10.8	12.2	11.9	11.1	11.4	11.6
85 and over	21.7	23.3	23.2	27.8	28.5	25.5	24.7	30.6	30.6
45 and over total	**5.1**	**5.7**	**5.9**	**6.1**	**6.5**	**6.1**	**5.8**	**6.2**	**6.4**

Falls associated with a fracture

There were 67,923 admissions in women and 20,723 admissions in men to NHS hospitals in England in 1997–98 for falls that led to a fracture in people aged 45 years and over. Between 1989–90 and 1997–98, age-standardised admission rates increased from 38 to 66 per 10,000 in women and from 13 to 23 per 10,000 in men. Admission rates increased rapidly with age and were over twice as high in women as in men (Table 6). In women, rates increase exponentially with age from age 45–49 years onwards (Figure 1) whereas in men the increase in rates accelerates from age 65–69 years onwards (Figure 2). The percentage of fractures associated with a fall increased with age in both men and women and was consistently higher in women than in men (Figure 3).

Projected number of admissions

The number of admissions for 1997–98 for all fractures and for fractures associated with a fall are shown in Table 7 along with the projected number of admissions for 2011–12 and 2021–22 if there is no change in age–specific admission rates. The number of admissions to NHS hospitals in England for fractures among people aged 45 years and over is projected to increase in men from 32,408 in 1997–98 to 39,613 in 2011–12 (+22 per cent) and to 45,610 in 2021–22 (+41 per cent). In women, the number of admissions is projected to increase from 89,488 in 1997–98 to 96,779 in 2011–12 (+8 per cent) and to 107,851 in 2021–22 (+21 per cent).

Figure 3 Percentage of admissions for fractures that are associated with a fall

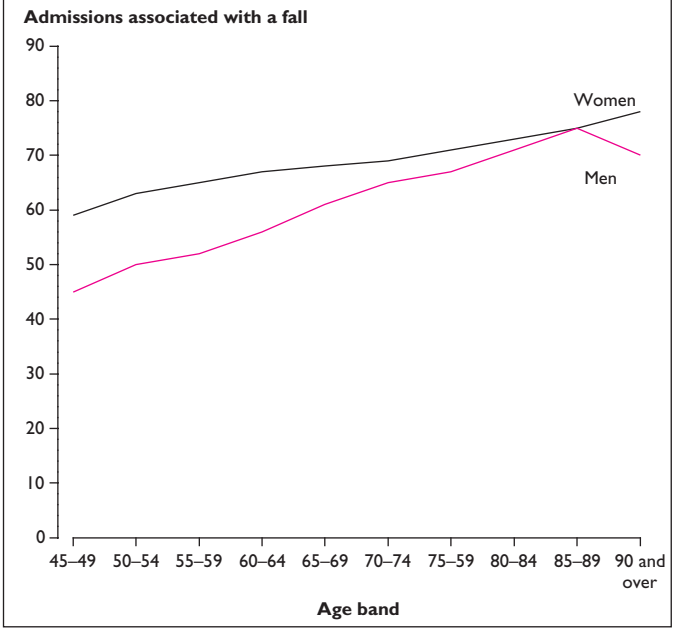


Table 6 Admissions for falls leading to a fracture per 10,000 population, England 1989–90 to 1997–98: age specific and age–standardised rates

	Year								
Age	1989–90	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Women									
45–64	9.8	12.9	15.1	15.8	18.5	19.3	14.9	17.8	16.7
65–74	29.5	35.1	44.4	46.8	54.2	58.6	45.8	55.9	52.8
75–84	82.4	95.2	124.6	131.4	147.7	155.8	123.4	146.0	143.4
85 and over	190.7	218.5	276.8	292.9	319.9	334.6	274.9	336.2	335.3
45 and over total	**38.0**	**44.8**	**56.7**	**59.8**	**67.4**	**71.1**	**56.6**	**68.2**	**66.4**
Men									
45–64	7.5	9.6	11.0	11.9	13.6	14.2	10.1	12.1	12.1
65–74	11.3	13.9	17.8	18.5	22.1	22.1	17.1	20.0	20.5
75–84	30.6	34.7	46.7	46.8	57.9	60.6	45.3	52.1	52.3
85 and over	90.1	100.0	127.9	139.6	151.0	156.7	125.8	174.6	181.3
45 and over total	**13.3**	**16.0**	**19.9**	**20.9**	**24.4**	**25.3**	**18.9**	**23.0**	**23.3**

Table 7 Projections for 2011–2 and 2021–2: number of admissions in England for fractures and admissions related to a fall leading to a fracture

	Admissions for fractures				Admissions for falls leading to a fracture		
	All fractures projections				Falls projections		
Age	1997–98	2011–12	2021–22		1997–98	2011–12	2021–22
Women							
45–64	14,184	17,619	18,046		9,445	11,872	12,159
65–74	15,948	17,357	20,923		11,857	12,960	15,622
75–84	30,543	29,801	34,683		23,552	22,973	26,736
85 and over	28,813	32,001	34,200		23,069	25,606	27,365
45 and over total	**89,488**	**96,779**	**107,851**		**67,923**	**73,410**	**81,882**
Men							
45–64	13,325	16,387	17,135		6,762	8,393	8,776
65–74	5,801	6,701	8,188		3,831	4,412	5,391
75–84	7,470	8,533	10,388		5,373	6,160	7,499
85 and over	5,812	7,992	9,899		4,407	6,023	7,461
45 and over total	**32,408**	**39,613**	**45,610**		**20,373**	**24,988**	**29,127**
Total	**121,896**	**136,392**	**153,462**		**88,296**	**98,398**	**111,009**

Discussion

This study confirms that fractures are an important cause of morbidity among the elderly and that admissions for fractures impose a considerable burden on the NHS. Age-standardised admission rates for fractures and for falls related to fractures and osteoporosis increased in both men and women between 1989–90 to 1997–8. However, most of this increase occurred in the first five years of the study period, between 1989–90 to 1993–94. There was then a marked decrease in admission rates in 1995–96 which was probably due to the change to using ICD-10 instead of ICD-9 to code diagnostic data.

This study provides important baseline admission rates for groups of fractures. The data on falls gives an indication of the number of fractures that may have been caused by a fall. Of note is that admission rates for fractures in women start to increase from age 45 years onwards for most fracture groups. Although osteoporosis is viewed traditionally as an older women's disease, this finding suggests that attention must also be paid to detecting and treating osteoporosis even in this relatively young age group. In men, admission rates begin to increase more rapidly from age 65–69 years onwards when osteoporosis may start to have a greater impact. The fall in admissions for upper limb, spine and trunk, and lower limb fractures (excluding femur) before this age in men may relate to the decline with age in road traffic accident related fractures.

One strength of this study is that it uses data for the whole of England. By combining fractures at individual sites into larger groups, we will also have minimised coding errors between fractures at different sites, for example the miscoding of hip fractures as fractures of the femur. This is also the first comprehensive national analysis of admissions for fractures and hence the study provides important baseline information on the burden of disease caused by fractures and on the impact at a population level of the various initiatives aimed at reducing this burden.

Hospital episode statistics do have some limitations and these should be borne in mind when interpreting the results of the study. Firstly, the data only relate to hospital admissions and hence ignore fractures treated only in accident and emergency and then in outpatient departments. As fractures of the femur are almost invariably admitted to hospital, admissions for this diagnosis give a measure of the fracture incidence rate but for other groups of fractures, this is not the case. For example, Garraway and colleagues found that only 24 per cent of patients with limb fractures were admitted to hospital.[11] Moreover, only 35 per cent of vertebral fractures are clinically diagnosed, and only about 8 per cent will result in a hospital admission.[12] However, there are already several studies describing fracture incidence in various areas in Britain[3-5, 13] but there has been less work on admissions for fractures and thus our study addresses this gap.

Secondly, there may be coding inaccuracies in routine data such as hospital episode statistics. For example, during the early years of the system, coding may not have been 100 per cent complete. This may be the reason why we have found a consistent increase in the standardised rate of admissions which occurred mainly in the first three to five years of the study. Thirdly, there was a change from ICD-9 to ICD-10 in 1995–96. We found that this change was associated with a consistent decrease in admission rates for fractures in this year which may be due to this coding change. Another inconsistency which may relate to this coding change is the sharp increase in fractures of the upper limb in the 90 and over age group in both males and females in 1996–7 and 1997–8. These changes appear to be isolated, and thus may not reflect a true increases in rates. Finally, we only used first episodes and the main diagnosis in these episodes. This means that episode rates are a good measure of admission rates (because second and subsequent episodes are not included) and that we have minimised readmissions (because only the main diagnosis was used to identify cases). This may have resulted in the number of admissions being under-estimated but the effect of this is not likely to be large.

A key finding of this study is that age adjusted rates of admissions for fractures in people aged 45 years and above have stabilised over the last five years. There is already some evidence that the rate of admissions for fracture of the femur in England and Wales may be stabilising.[14] Other reasons for the lack of change in admission rates must also be considered. It may be that there are small changes in admission rates which are not apparent with the time-scale of the study. Also, increases in rates in some fractures within our groups may be offset by decreases in rates of other fractures in the same group, thus producing no net secular change. However this is unlikely to produce the consistent findings of a stable rate in the last five years within all our groups of fractures.

The finding that the rise in fracture admissions in women precedes the average age of the menopause concurs with the incidence rates for fractures reported in previous studies.[4, 5, 11] Similar patterns of the age related increases in men have also been seen in these studies. Age dependent increases in hospital admission relate in part to changes in the incidence and severity of the primary illness requiring admission but also to other factors. Issues such as support available at home, comorbidity and concurrent medication are also important. The largest age dependent increase in fracture admission rates is for fractures of the femur, where admissions are most likely to approximate to incidence and where changes relating to age such as osteoporosis, neuromuscular deterioration and risk of falling are most marked.

We have also documented the association of falls with age and admissions. Winner and colleagues have also shown an age related increases in falls consistent with patterns of distal forearm fracture in women, but they noted a decrease in incidence rates in the age group 55–59 to 70–74.[15] By contrast, our data show a consistent rise in admissions with age. Hospital discharge data from Finland show an increase in falls to 1995.[16] Our rates of admissions from falls in England are lower than that in Finland, but their data relate to all admissions from falls and not just those that result in a fracture.

The projections for the future number of admissions from fractures show that fractures will continue to be an increasing burden on inpatient services. There is evidence that exercise and home assessments can reduce the risk of falls in older people.[7] Regular exercise can also help reduce osteoporosis and fractures among the elderly.[17] There have been a number of steps taken by government agencies to tackle this problem. The Department of Trade and Industry has set out practical steps in their campaign to reduce falls in the elderly.[8] Department of Health guidelines outline strategies for osteoporosis prevention and treatment.[18] The Our Healthier Nation strategy has also targeted the prevention of falls in the elderly.[8]

It remains important to focus efforts on the prevention of injuries due to falls and osteoporosis in primary care to reduce this burden on the public, society and the NHS. In line with recommended practice, attention must also be paid to effecting lifelong changes in physical activity and the adoption of healthier lifestyles in addition to any measures by health services or other partnership organisations in health improvement programmes. Finally, the in–hospital care of patients admitted with fractures also needs to be a priority, particularly among elderly patients who have the greatest risk of admission and the highest death rates from fractures.

Box one

Osteoporosis

What is osteoporosis?
Osteoporosis is a disease that thins and weakens bones to the point where they break easily, especially bones in the hip, spine, and wrist. Osteoporosis is called the "silent disease" because people with it may not notice any symptoms. People can lose bone over many years but not know they have osteoporosis until a bone breaks. Osteoporosis and the fractures it leads to impose a considerable burden on people's health, society and the NHS. The causes of osteoporosis are not fully understood. We do know that when women go through menopause, levels of the female hormone oestrogen drop. Lower hormone levels can lead to bone loss and osteoporosis. Other causes of bone loss and osteoporosis include a diet too low in calcium and not getting enough exercise.

Who gets osteoporosis?
About one out of every two women and one in eight men over age 50 years will have an osteoporosis–related fracture. Women who have a family history of osteoporosis, an early menopause, or who have small body frames are at greatest risk. Men have less risk of getting osteoporosis because they do not have the same kinds of hormone losses as women. Osteoporosis can occur at any age but the risk increases with age.

How is osteoporosis diagnosed?
Losing height or breaking a bone may be the first sign of osteoporosis. Doctors use several different tests to find osteoporosis. The dual energy x–ray absorptiometry (DEXA) scan is the most exact way to measure bone density in the wrist, hip, and lower spine.

How is osteoporosis prevented?
Osteoporosis is preventable. A diet that is rich in calcium and vitamin D and a lifestyle that includes regular weight–bearing exercise are the best ways to prevent osteoporosis.

How is osteoporosis treated?
Treatment of osteoporosis aims to stop bone loss and prevent falls. Falls often cause broken bones that can result in an admission to hospital or a long–term disabling condition. Doctors sometimes prescribe oestrogen to replace the hormones lost during menopause in women and to slow the rate of bone loss. This treatment is called hormone replacement therapy (HRT). Other groups of drugs used to treat osteoporosis include bone modifying agents such as the biphosphonate agent Alendronate (Fosomax).

Key Findings

- Age standardised admission rates for fractures have changed little between 1994–95 to 1997–98. Because of the increasing number of elderly in the population, if steps are not taken to tackle the underlying causes of fractures and reduce admission rates, fractures will impose an increasing burden on society and the NHS.
- The number of admissions to NHS hospitals in England for fractures among people aged 45 years and over is projected to increase in men from 32,408 in 1997–98 to 45,610 in 2021–22 (+41%). In women, the number of admissions is projected to increase from 89,488 in 1997–98 to 107,851 in 2021–22 (+21 per cent).
- Admission rates for fractures and falls in women rise exponentially with age from age 45 years onwards except for fractures of the spine and trunk, where there is a more gradual increase until age 70–74 years.
- Admission rates in men for upper limb, lower limb excluding femur and spine and trunk fractures decrease slightly from age 45–49 to 65–69 years. Rates of admissions for fractures of the femur in men rise from age 45–49 years onwards, with a more rapid increase after age 65–69.

References

1. Iskrant AP and Smith RW JR. Osteoporosis in women 45 years and over related to subsequent fractures. *Public Health Rep* 84 (1969), 33–8.
2. Melton LJ III, Chrischilles EA, Cooper C et al. How many women have osteoporosis? *Journal of Bone and Mineral Research* 7(9) (1992), 1005–1010.
3. Donaldson LJ, Cook A and Thomson RG. Incidence of fractures in a geographically defined population. *Journal of Epidemiology and Community Health* 44 (1990), 241–245.
4. Singer BR, McLauchlan GJ, Robinson CM and Christie J. Epidemiology of fractures in 15,000 adults: the influence of age and gender. *J. Bone Joint Surg* BR 80(2) (1998), 243–8.
5. Johansen A, Evans RJ, Stone MD, Richmond PW, Lo SV, Woodhouse KW. Fracture incidence in England and Wales: a study based on the population of Cardiff. *Injury* 28 (1997), 655–60.
6. Department of Health. *National Priorities Guidance 2000/01–2002/03 Health Services Circular/Local Authority Circular*. Department of Health (London: 1999).
7. NHS Centre for Reviews and Dissemination. Preventing falls and subsequent injury in older people. *Effective Health Care, NHS Centre for Reviews and Dissemination, York* 1996 2(4).
8. Department of Health. *Our Healthier Nation*. White paper. Department of Health (London: 1999).
9. Majeed A. Hospital admissions data: why are they collected? *Clinician in Management* 7 (1998), 160–166.
10. Grimley Evans J, Seagroatt V, Goldacre MJ. Secular trends in proximal femoral fracture, Oxford Record Linkage Study area and England 1968–8. *Journal of Epidemiology and Community Health* 51 (1997), 424–429.

11. Garraway WM, Stauffer RN, Kurland LT and O'Fallon WM. Limb fractures in a defined population. 1. Frequency and distribution. *Mayo Clinic Proc* 54 (1989), 701–7.
12. Cooper C, Melton LJ. Vertebral fractures. *BMJ* 304 (1992), 793–794.
13. O'Neill TW, Felsenberg D, Varlow J, Cooper C, Kanis JA, Silman AJ and the European Vertebral Osteoporosis Study Group. The prevalence of vertebral deformity in European men and women: the European Vertebral Osteoporosis Study. *J Bone Mineral Res* 11 (1966), 1010–8.
14. Spector T, Cooper C, Lewis AF. Trends in admission for hip fractures in England and Wales *BMJ* 300 (1990), 1173–4.
15. Winner SJ, Morgan CA, Grimley Evans J. Perimenopausal risk of falling and incidence of distal forearm fracture. *BMJ* 298 (1989), 1486–1488.
16. Kannus P. Fall induced injuries in elderly people. *Lancet* 350 (1997), 1174.
17. Kannus P. Preventing osteoporosis, falls and fractures among elderly people. *BMJ* 318 (1999), 205–206.
18. Department of Health. *Clinical guidelines for strategies to prevent and treat osteoporosis. Recommendations and summary*. Department of Health (London: 1998).

Correspondence to:
Dr Balasegaram
Room B7/04
National Statistics
1 Drummond Gate
London SW1V 2QQ

Tel. 020 7533 5108
Fax. 020 7533 5252
Email. joy.m.marshall@ons.gov.uk