

Trends in the treatment of osteoporosis and types of drug treatments prescribed in general practice in England and Wales, 1994 to 1998

Katie Bailey, Charlotte Ellis
Office for National Statistics,
Azeem Majeed
School of Public Policy,
University College London

INTRODUCTION

Osteoporosis causes considerable morbidity and mortality in the United Kingdom (UK).¹ Osteoporosis is particularly common among the elderly and increases the risk of fracturing a bone, particularly fractures of the wrist, hip and spine. These fractures often occur after minor trauma that would not lead to a fracture in people not affected by the condition. Osteoporosis is a painful and debilitating condition, and costs the NHS over £940 million annually.² In the UK, it results in over 200,000 fractures each year (including 60,000 hip and 50,000 wrist fractures). In 1997–98, there were about 44,500 admissions in women and 11,800 admissions in men to NHS hospitals in England for fracture of the femur and hip in people aged 45 years and over.³ Of these fractures, 90 per cent are in people over 50 and 80 per cent are in women. The cost of treating a fractured hip is about £4,800 and one in five of these patients require long term residential care (costing £19,000 per year).⁴ Further details about osteoporosis are given in Box 1.

The National Service Framework (NSF) for Older People aims to reduce injuries resulting from falls and states that all Primary Care Trusts (PCTs) should have falls services in place by 2005. It recommends that strategies to prevent osteoporosis should focus on selective case finding, identifying those at high risk (particularly those with multiple risk factors).⁵ The NSF refers to the Royal College of Physicians (RCP) guidelines on the management of osteoporosis.² These were based on the recommendations of an advisory group on osteoporosis and were updated in 2000.⁶

We used data from the General Practice Research Database (GPRD) to examine the age- and sex- specific prevalence of treated osteoporosis and the prescribing of different types of drugs to osteoporosis patients between 1994 and 1998. The analyses also include prevalence and prescribing by deprivation category.

This paper examines trends in the treatment of osteoporosis in general practice in England and Wales from 1994 to 1998. The data come from 210 general practices that contributed to the General Practice Research Database. The age-standardised treatment rate (treated prevalence) of osteoporosis rose from 3.6 to 7.2 per 1,000 females and from 0.4 to 0.9 per 1,000 males, between 1994 and 1998.

Biphosphonates were the most commonly prescribed drugs, used in 59 per cent of female and 77 per cent of male patients in 1998. The percentage of osteoporosis patients prescribed biphosphonates and vitamin D increased over time. In contrast, prescribing of hormone replacement therapy remained stable and calcium-prescribing rates fell. The treated prevalence of osteoporosis was substantially lower than estimates from surveys. This suggests that most people with osteoporosis in general practice are not identified or prescribed drug treatments.

Box one

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 aged over 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.

DIAGNOSIS

A variety of bone mass measurement techniques predict fracture but a gold standard diagnostic test is needed. Currently total hip bone mineral density measurement by dual energy x-ray absorptiometry (DEXA) scanning is recommended² as it is predictive of neck and hip fractures (which lead to the highest morbidity, mortality and cost). The World Health Organisation radiological criteria are often used to make the diagnosis.⁷⁻⁹ The literature also documents widespread incomplete case finding and treatment.¹⁰⁻¹⁴

PREVENTION AND TREATMENT

Prevention and treatment of osteoporosis consists of lifestyle and drug interventions. Preventative lifestyle interventions include regular weight-bearing exercise, dietary calcium, moderate alcohol intake and smoking cessation.⁶ Drug treatments include hormone replacement therapy, biphosphonates, calcitonin, calcium and vitamin D.⁶ Published studies have estimated the prevalence of osteoporosis using a range of approaches.

AIMS

The main aim of the study was to investigate trends in the treatment of osteoporosis in general practice in England and Wales. Then within that to explore: prescribing trends in the different types of drug treatments, the magnitude of interpractice variation in age-standardised treated

prevalence rates, and the association between treated prevalence and the level of deprivation in the practice area.

METHODS

Data source

The study data come from 210 practices in England and Wales contributing to the GPRD. All 210 practices contributed data to the GPRD throughout the study period 1994-98 and their data passed quality checks. The practices' combined population of 1.4 million patients had a similar age-sex composition to that of England and Wales in 1998.¹⁵ Practices vary in size from single-handed practices to those with six or more partners. Compared with the national average, GPRD practices have a slightly larger proportion of practices with four or more partners and a lower proportion of single-handed GPs. In terms of socio-economic characteristics, the GPRD population over-represents areas classified as 'lower status owner-occupier' or 'deprived industrial areas' and under-represents 'deprived city areas', 'inner city estates' and 'prosperous areas'.

Case selection criteria for osteoporosis

We identified patients with treated osteoporosis using a combination of diagnostic and treatment criteria. GPs contributing to the GPRD are only required to record a diagnosis of a chronic or recurrent condition at the date of original onset of the condition. Therefore, we selected all patients with a diagnosis of osteoporosis ever recorded, that is all patients with an appropriate diagnosis made up to and including December 31 in the relevant analysis year. In addition, selected patients were required to have had treatment with vitamin D, calcium supplements, oestrogens/ hormone replacement therapy (HRT), biphosphonates or calcitonin during the analysis year.

Definition of rates

Firstly we calculated the prevalence of treated osteoporosis per 1,000 patients by age and sex, in each of the years 1994 to 1998. We then calculated the directly age-standardised prevalence by applying the age-specific rates, by 5-year age groups up to 84 and then 85 and over, to the European standard population.

Secondly we examined the prescribing of specific types of drugs to patients identified earlier in the study as having treated osteoporosis. More specifically we calculated the percentage of patients with treated osteoporosis prescribed vitamin D, calcium, oestrogens/ HRT, biphosphonates and calcitonin. These drug treatments are not mutually exclusive and patients can be prescribed one or more of the drugs during a year. As with prevalence, these percentages are presented by age and sex and also as directly age-standardised rates, using the age distribution of patients with treated osteoporosis in 1994 to determine the age distribution of the standard population.

Inter-practice variation

We calculated the age-standardised prevalence of treated osteoporosis and the percentage of patients with the condition prescribed vitamin D and biphosphonates individually for each of the 210 practices. This analysis was carried out separately for males and females in 1998. The inter-quartile range (25th to 75th percentiles) gives an indication of the range of prevalence of treated osteoporosis amongst the 210 practices after excluding those practices at the extremes of the distribution. All 210 practices had a list size of more than 1,000 patients in 1998.

Deprivation analyses

Deprivation categories were derived using the Townsend Material Deprivation Score.¹⁶ This is a composite score calculated using information on unemployment, overcrowding, car availability and home ownership derived from census data. The higher the score, the greater the level of relative deprivation in that area. Each ward in England and Wales was allocated a Townsend score. These scores were then placed in ascending order along with the total population of each ward in 1991. The wards were then put into 5 groups (quintiles), each group containing 20 per cent of the population of England and Wales in 1991. A range of Townsend scores describes each of these population quintiles. Each of the study practices was allocated to a quintile on the basis of the Townsend Score of the ward in which it was located. The quintiles are labelled Q1 to Q5: Q1 contains the least deprived wards and Q5 the most deprived. We used data from 209 practices in the deprivation analyses, as it was not possible to obtain ward information for one of the practices.

The prevalence of treated osteoporosis and prescribing of vitamin D, biphosphonates, calcium, calcitonin and oestrogens/ HRT were calculated by age, sex and deprivation quintile. The overall rates in the deprivation analyses were also directly age-standardised.

Time trends

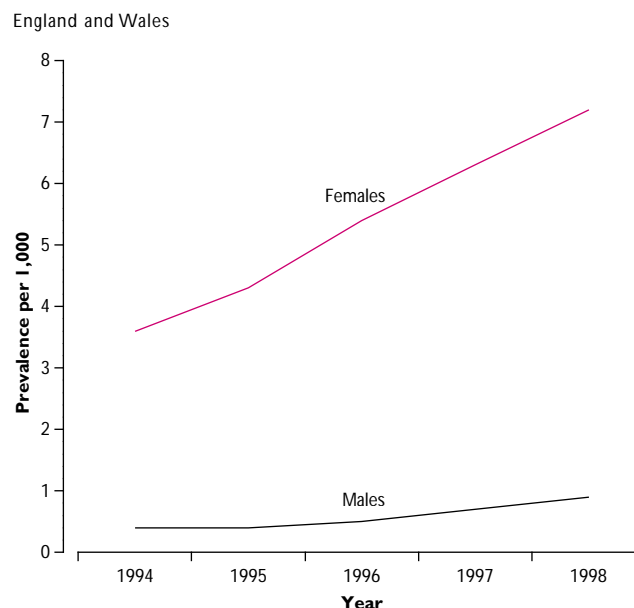
Each age-standardised rate is presented with a 95 per cent confidence interval. For prevalence or prescribing rates that exhibited an upward (or downward) trend throughout the study period we examined whether the confidence intervals in 1994 and 1998 overlapped. If the confidence intervals did not overlap then we concluded that there was a significant increase (or decrease) in the rate between 1994 and 1998.

RESULTS

Prevalence

As expected, our study showed that the diagnosis and treatment of osteoporosis is most common in elderly women. The prevalence of treated osteoporosis was much higher among females than males throughout the study period (Figure 1). The age-standardised prevalence of treated disease rose significantly from 3.6 to 7.2 per 1,000 for females and from 0.4 to 0.9 per 1,000 for males between 1994 and 1998. These results represent increases of 98 per cent and 134 per cent for females and males respectively (Table 1).

Figure 1 Age-standardised prevalence of treated osteoporosis by sex, 1994 to 1998



Source: General Practice Research Database

Age-specific prevalence in females ranged from 0.1 per 1,000 among those aged 0–34 to 43.5 per 1,000 among those aged 75–84 in 1998 (Table 1). Prevalence for females increased at all ages between 1994 and 1998. Prevalence of treated osteoporosis also increased with age in males. In 1998 prevalence peaked at 7.2 per 1,000 patients in men in the 85 and over age group.

Prescribing

In each study year calcitonin was prescribed to less than one per cent of males and females identified as having treated osteoporosis and thus we will not consider this drug further in our analysis. Generally, a higher percentage of males than females with treated osteoporosis were prescribed vitamin D, calcium and biphosphonates during the study period (Table 2).

Table 1 Prevalence of treated osteoporosis per 1,000 patients, by age and sex, 1994 and 1998

England and Wales

	0–34	35–44	45–54	55–64	65–74	75–84	85 and over	Crude rate	Age-standardised rate	LCL [*]	UCL [†]
Females											
1994	0.1	0.4	3.0	11.1	16.6	19.2	15.8	4.7	3.6	3.5	3.8
1998	0.1	1.1	5.7	19.1	35.2	43.5	34.0	9.8	7.2	7.0	7.4
% change 1994–98	85.2	139.3	92.3	72.2	111.7	126.5	115.7	108.3	97.6		
Males											
1994	0.0	0.1	0.2	0.8	1.7	2.6	4.6	0.4	0.4	0.3	0.4
1998	0.0	0.2	0.8	1.8	3.5	5.8	7.2	1.0	0.9	0.8	0.9
% change 1994–98	110.7	322.0	399.0	139.9	106.8	122.5	55.6	142.5	134.1		

^{*} LCL = Lower Confidence Limit of the age-standardised rate.

[†] UCL = Upper Confidence Limit of the age-standardised rate.

Source: General Practice Research Database

Biphosphonates were the most commonly prescribed drug group throughout the study period for both sexes (Figures 2a and 2b). In 1998, 59 per cent of females with treated osteoporosis received a prescription for this drug from their GP compared with 28 per cent for oestrogens/ HRT, 20 per cent for calcium and 16 per cent for vitamin D. Among the males in the study identified as having treated osteoporosis, 77 per cent were prescribed biphosphonates, 22 per cent calcium and 20 per cent vitamin D. Of the drug types analysed, prescribing levels of biphosphonates increased the most (30 per cent and 23 per cent increases for females and males respectively).

Vitamin D was the only other drug type analysed for which prescribing levels increased (by 28 per cent among females and 31 per cent among males). However, despite these increases, vitamin D still remained the least commonly prescribed drug in 1998 of the four treatments examined. Prescribing levels of calcium fell significantly for both sexes between 1994 and 1998 and prescribing levels of oestrogens/ HRT for females remained fairly stable.

For females, age-specific prescribing of biphosphonates generally increased with age and peaked in the 75–84 age group with GPs

Table 2 Prescribing of specific types of drugs for patients with treated osteoporosis, by age and sex, 1994 to 1998

England and Wales

		0-34	35-44	45-54	55-64	65-74	75-84	85 and over	Crude rate	Age-standardised rate	LCL [†]	UCL [†]	
Females													
Percentage prescribed vitamin D	1994	5.9	9.7	5.8	7.2	11.8	17.2	20.3	12.3	12.7	11.3	14.0	
	1995	17.6	12.2	8.6	9.4	15.7	16.8	24.3	14.7	15.0	13.7	16.3	
	1996	20.0	28.3	10.1	10.8	17.3	18.6	22.4	16.3	16.6	15.5	17.8	
	1997	33.3	31.8	10.8	12.7	16.5	18.3	22.1	16.6	16.8	15.7	17.8	
	1998	22.2	22.8	11.5	12.8	14.5	18.7	24.0	16.2	16.2	15.3	17.2	
	% change 1994-98	-	135.9	100.3	78.2	22.4	8.4	18.3	31.7	28.0			
	Percentage prescribed calcium	1994	23.5	29.0	21.5	27.3	34.2	43.3	41.6	34.4	35.1	33.1	37.0
1995		41.2	18.4	19.2	23.3	27.6	35.7	33.3	28.5	28.8	27.2	30.5	
1996		35.0	23.3	18.7	16.2	23.7	27.6	29.9	23.3	23.5	22.2	24.8	
1997		37.5	23.5	16.1	15.4	21.3	22.4	26.7	20.5	20.8	19.6	21.9	
1998		55.6	26.1	13.7	15.1	20.1	20.1	24.8	19.3	19.5	18.5	20.5	
% change 1994-98		-	-10.1	-36.3	-44.6	-41.4	-53.6	-40.5	-43.8	-44.4			
Percentage prescribed oestrogens/ HRT		1994	52.9	61.3	79.1	56.0	25.4	6.5	1.0	30.6	28.4	26.9	29.9
	1995	29.4	57.1	74.1	62.5	25.1	8.0	0.8	31.4	29.2	28.0	30.4	
	1996	45.0	48.3	72.5	61.4	25.1	8.2	3.9	31.0	23.9	22.8	25.0	
	1997	16.7	48.2	73.2	59.0	25.8	7.9	4.2	30.2	28.9	27.8	30.0	
	1998	16.7	51.1	68.4	54.5	25.4	7.9	2.8	27.8	27.5	26.5	28.5	
	% change 1994-98	-	-16.6	-13.5	-2.6	-0.1	21.9	175.1	-9.0	-3.2			
	Percentage prescribed biphosphonates	1994	17.6	16.1	22.5	34.5	51.4	53.4	47.7	44.7	45.5	43.6	47.5
1995		29.4	20.4	23.5	33.8	57.0	59.3	51.9	48.5	49.7	47.9	51.4	
1996		15.0	31.7	26.3	36.2	61.5	64.8	57.8	53.1	53.9	52.4	55.4	
1997		25.0	28.2	29.2	39.9	62.3	67.8	61.3	55.5	56.2	54.8	57.5	
1998		33.3	26.1	35.0	43.6	64.2	70.4	62.9	58.7	58.9	57.7	60.2	
% change 1994-98		-	61.7	55.7	26.5	25.0	31.9	31.9	31.4	29.5			
Males													
Percentage prescribed vitamin D	1994	20.0	25.0	9.1	13.2	14.7	17.6	28.6	16.7	15.5	10.5	20.4	
	1995	16.7	18.2	29.4	16.3	18.1	18.6	38.5	20.8	20.2	15.1	25.2	
	1996	28.6	25.0	19.4	20.3	25.0	21.3	26.9	22.8	22.6	18.0	27.3	
	1997	12.5	23.1	19.3	17.1	21.4	19.8	28.6	20.4	20.4	16.6	24.2	
	1998	41.7	14.3	20.3	19.1	20.1	18.1	27.9	20.2	20.3	16.9	23.7	
	% change 1994-98	-	-	-	45.4	36.8	2.7	-	21.5	31.0			
	Percentage prescribed calcium	1994	60.0	0.0	45.5	36.8	35.3	51.0	52.4	41.9	40.9	34.1	47.7
1995		66.7	18.2	29.4	30.2	25.3	32.2	23.1	28.6	28.5	22.7	34.2	
1996		57.1	16.7	27.8	23.7	19.0	28.8	34.6	25.3	24.9	20.1	29.7	
1997		50.0	15.4	22.8	27.6	20.7	23.3	25.7	23.6	23.6	19.6	27.7	
1998		50.0	19.0	17.4	26.1	17.1	22.8	25.6	21.8	21.7	18.2	25.1	
% change 1994-98		-	-	-	-29.2	-51.6	-55.2	-	-48.0	-46.9			
Percentage prescribed biphosphonates		1994	40.0	75.0	81.8	73.7	61.8	52.9	42.9	60.6	62.4	56.1	68.8
	1995	33.3	72.7	82.4	79.1	66.3	66.1	61.5	68.6	68.9	63.0	74.7	
	1996	42.9	75.0	75.0	71.2	73.0	63.8	57.7	68.8	68.9	63.7	74.0	
	1997	50.0	84.6	77.2	76.3	75.0	74.1	57.1	73.7	73.5	69.4	77.7	
	1998	58.3	90.5	78.3	78.3	79.9	75.2	58.1	76.4	76.5	73.0	80.0	
	% change 1994-98	-	-	-	6.2	29.3	42.0	-	26.1	22.5			

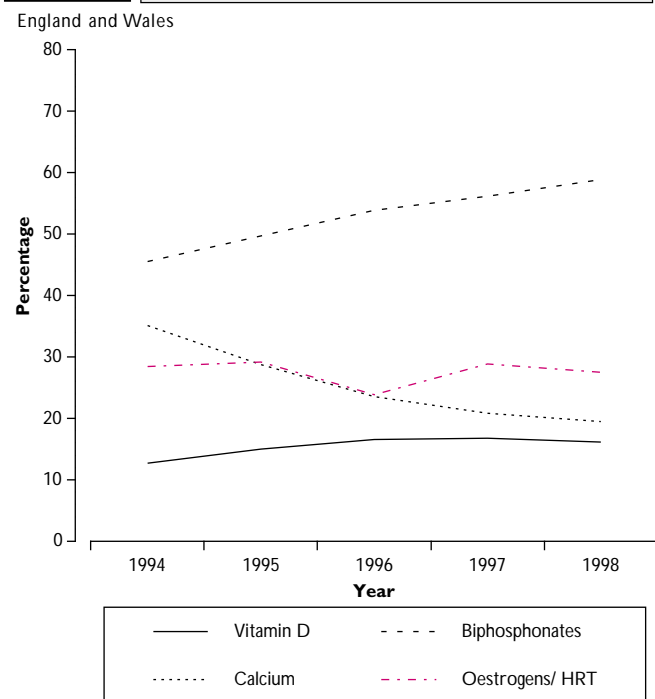
[†] LCL = Lower Confidence Limit of the age-standardised rate.

[†] UCL = Upper Confidence Limit of the age-standardised rate.

Rates calculated with fewer than 25 cases of treated osteoporosis are shown in italics. Their reliability may be affected by the small number of cases. When either the 1994 or 1998 rate is based on fewer than 25 cases, no figure is given for the percentage change (shown by -).

Source: General Practice Research Database

Figure 2a Prescribing of specific types of drugs to females with treated osteoporosis, 1994 to 1998



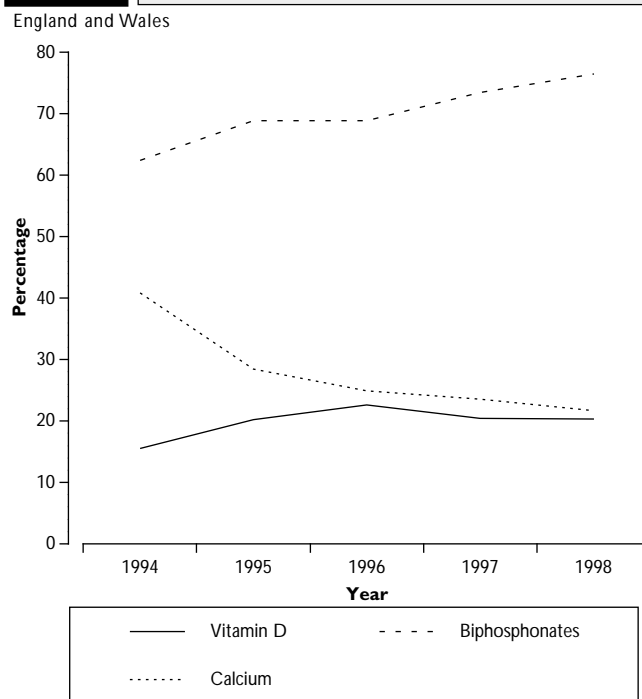
Source: General Practice Research Database

prescribing the drug to 70 per cent of females with treated osteoporosis in this age group in 1998. Levels of vitamin D prescribing in females show less variation with age.

Inter-practice variation

The median age-standardised treated prevalence in the 210 practices was greater for females than for males. In 1998 the median prevalence was 6.3 per 1,000 for females compared to 0.7 per 1,000 for males (Table 3). The inter-quartile range in the 210 practices was 4.8 to 8.5 per 1,000 among females and 0.2 to 1.2 per 1,000 among males. Similarly the median percentage of patients prescribed vitamin D and biphosphonates was much higher among females than males. The full range and the effects of extreme values can be seen in Figures 3 and 4.

Figure 2b Prescribing of specific types of drugs to males with treated osteoporosis, 1994 to 1998



Source: General Practice Research Database

Deprivation analyses

In 1998, the prevalence of treated osteoporosis in females varied randomly across the deprivation quintiles (Table 4). Overall age-standardised prevalence was lowest in quintile one (the least deprived quintile) but only significantly higher in quintiles 2 and 4. For the three oldest age groups the prevalence of treated disease was lowest in the most deprived quintile. As for prevalence, no clear patterns emerged across the deprivation categories in the prescribing analyses.

DISCUSSION

Main findings

The prevalence of treated osteoporosis as a measure in this study reflects ascertainment, recording and treatment rates rather than the true prevalence of osteoporosis. For both sexes and all age groups the treated prevalence increased over time. The increase in treated

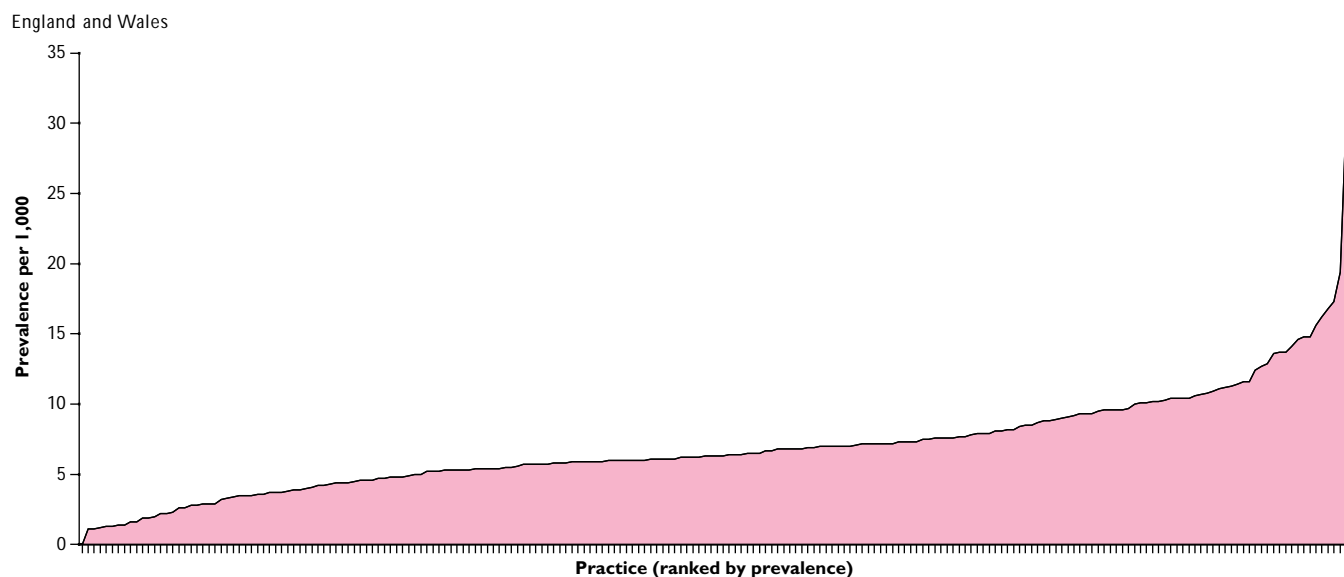
Table 3 Inter-practice variation in the age-standardised prevalence of treated osteoporosis and percentage prescribed selected drugs in 210 practices, 1998

England and Wales				
	Median	Range	25th percentile	75th percentile
Females				
Prevalence per 1,000	6.3	0.0-30.2	4.8	8.5
Percentage prescribed vitamin D	11.6	0.0-55.2	4.2	19.1
Percentage prescribed biphosphonates	50.5	0.0-88.4	34.8	62.6
Males				
Prevalence per 1,000	0.7	0.0- 3.3	0.2	1.2
Percentage prescribed vitamin D	0.0	0.0-44.3	0.0	8.4
Percentage prescribed biphosphonates	15.9	0.0-83.3	0.0	30.2

Source: General Practice Research Database

Figure 3

Age-standardised prevalence of treated osteoporosis in females in 210 practices, 1998



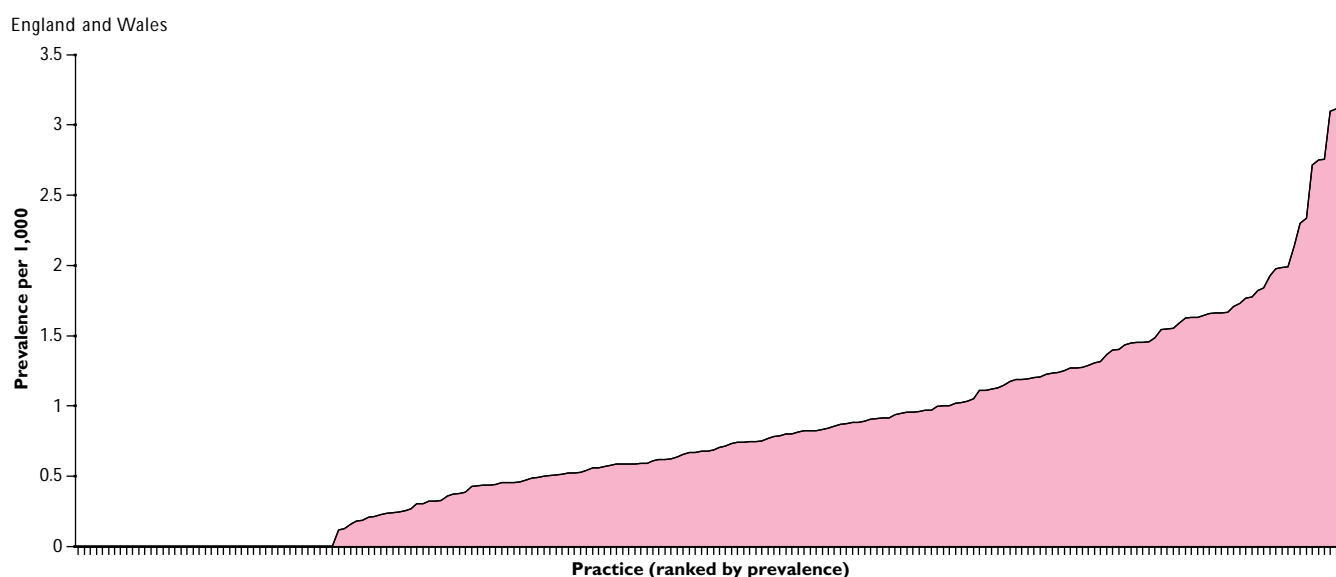
Source: General Practice Research Database

prevalence over a relatively short time period is more likely to be due to improved ascertainment, recording and treatment than a true increase in the underlying prevalence of osteoporosis. The age-standardised percentage of females and males treated with biphosphonates increased. There was a small but significant increase in the proportion of females treated with vitamin D. The proportion of females treated with HRT remained stable. For both sexes the proportion treated with calcium fell significantly. The treated prevalence of osteoporosis was, as expected, much lower in males than females (0.9 versus 7.2 per 1,000 in 1998). However, despite the lower treatment rates in males, prescribing levels

of biphosphonates and vitamin D were higher for males than females with osteoporosis throughout the study. Moreover, the age-standardised percentage of males on biphosphonates and vitamin D at the start of the study period (62.4 per cent and 15.5 per cent in 1994) was similar to that of the females at the end (58.9 per cent and 16.2 per cent in 1998). This may be a reflection of gender differences in co-morbidity. However as effective treatment for males with osteoporosis is not established, they may be more likely to receive a specialist opinion possibly making their management more up-to-date.

Figure 4

Age-standardised prevalence of treated osteoporosis in males in 210 practices, 1998



Source: General Practice Research Database

Table 4 Prevalence and management of females with treated osteoporosis, by deprivation category, 1998

England and Wales		Crude rate	Age-standardised rate	LCL [*]	UCL [†]
Prevalence per 1,000	Q1 (least deprived)	9.3	6.4	6.0	6.9
	Q2	11.4	7.9	7.5	8.4
	Q3	9.4	6.9	6.6	7.3
	Q4	10.5	7.5	7.1	7.9
	Q5 (most deprived)	8.1	6.8	6.4	7.2
Percentage of treated osteoporosis patients prescribed vitamin D	Q1 (least deprived)	13.9	13.8	11.2	16.3
	Q2	18.2	18.3	16.2	20.4
	Q3	13.8	13.6	11.8	15.4
	Q4	16.6	16.5	14.6	18.4
	Q5 (most deprived)	17.3	17.3	15.1	19.6
Percentage of treated osteoporosis patients prescribed oestrogens/ HRT	Q1 (least deprived)	26.4	26.4	23.5	29.2
	Q2	31.0	30.2	28.0	32.3
	Q3	27.0	26.6	24.6	28.6
	Q4	29.3	29.6	27.4	31.7
	Q5 (most deprived)	24.1	23.3	21.1	25.5
Percentage of treated osteoporosis patients prescribed bisphosphonates	Q1 (least deprived)	60.4	60.2	56.7	63.7
	Q2	56.8	57.1	54.5	59.6
	Q3	61.1	61.7	59.3	64.2
	Q4	58.6	58.8	56.3	61.3
	Q5 (most deprived)	56.6	56.9	54.0	59.9

* LCL = Lower Confidence Limit of the age-standardised rate.

† UCL = Upper Confidence Limit of the age-standardised rate.

Source: General Practice Research Database

There was considerable inter-practice variation in treated prevalence for females (0 to 30.2 per 1,000 in 1998). Again this variation is more likely to reflect differences in recording, ascertainment and treatment than genuine differences in prevalence. These in turn will reflect how the level of interest in this condition differs between practices. There was no trend in prevalence of treated disease or use of drug type by deprivation category.

Strengths and weaknesses and comparison with other studies

Osteoporosis is an important public health issue and these data from primary care are important for clinicians, PCTs, and the Department of Health. Previous studies validating the clinical data recorded in the GPRD show that the recording of diagnoses is accurate.¹⁷ As a result of the large number of cases included, our study provides reliable estimates of treatment rates by age and sex. We were able to examine time trends in the prevalence of treated osteoporosis using the GPRD. However, there are some differences between the GPRD patient population and patients nationally in terms of practice characteristics and the different 'area types' represented. These differences should be taken into account when generalising the findings.

There are limitations to our work caused by the relatively strict case selection criteria. A proportion of the patients receiving treatment for osteoporosis may not have their diagnosis recorded. Another group of patients may have been diagnosed and started on treatment and subsequently discontinued it. Compliance with HRT in particular, is known to be problematic.¹⁸⁻²¹ Neither of these groups of patients are included in our analysis of treated prevalence in this study. Ideally a true prevalence would be presented along with the proportion offered treatment as well as those currently on treatment.

This study could not consider lifestyle interventions (such as smoking cessation or increased weight-bearing exercise) because in the past,

these data were not well recorded on practice computers. As regards the trends in vitamin D and calcium prescribing, the study could not take into account supplements bought over the counter or increased dietary intake. Osteoporosis patients are a heterogeneous group because of the association of the condition with a range of other disorders and treatments, in particular treatment with corticosteroids. Also, the drug classes included in our study have other rarer indications, for example Paget's disease or hypercalcaemia of malignancy.

The data are taken from a period preceding the RCP guidelines published in 1999.² There was no agreed population level indicator of good prescribing practice for osteoporosis during the study period. The optimum treatment has become less clear since the Medicines Control Agency recommended more caution in the prescribing of HRT.²² Some subgroups, in particular younger age groups and those treated with calcitonin, were too small for useful analysis.

Our case definition is different from that used in many published studies, which tend to use radiological criteria for the diagnosis irrespective of prescribed treatment.⁷⁻⁹ Using a prevalence rate based on general practitioners' treatment of osteoporosis will generate a figure lower than true prevalence because the diagnosis may not always be made or recorded and a proportion of patients will not currently be prescribed treatment. One American study found the recorded prevalence was less than 10 per cent of that expected and only 36 per cent of those with the diagnosis recorded were on appropriate treatment.¹² The difference between our study's prevalence figures and published prevalence estimates (for patients of a similar age and sex) was of a comparable order of magnitude, that is less than 10 per cent of that expected (4 compared to 148 per 1,000).⁷ This gives an estimate of the unmet need for the diagnosis and treatment of osteoporosis in primary care.

Ascertainment of osteoporosis is known to be low in both primary¹² and secondary care,^{10,11,14} even following a fracture.^{14,23} Moreover, within the

group diagnosed with the condition, it is not always actively managed. This includes management with prescribed drugs. One previous study found trends in prescribing for bisphosphonates and vitamin D that agreed with our GPRD findings.¹¹ In this comparison study bisphosphonate prescriptions increased from 1.3 per cent in 1988 to 34.9 per cent in 1997 and vitamin D prescriptions increased from 14.2 per cent in 1988 to 26.2 per cent in 1997. However calcium prescribing did not change significantly – our study identified a significant fall. Another study had also documented marked variation in diagnosis and treatment of osteoporosis in primary care.²⁴

Implications for clinical practice

The increase between 1994 and 1998 in the prevalence of treated osteoporosis and the change in the types of drugs used have implications for health service costs and workload. The marked inter-practice variation in the prevalence of treated osteoporosis suggests that clinicians and PCTs should review their procedures in this area against NSF recommendations. In particular, they need to examine practices' awareness of locally agreed protocols based on the RCP guidelines. Coding of osteoporosis on practice computers also needs to be improved.

Comparison of our study findings and published prevalence estimates suggests that a significant proportion of patients with osteoporosis are not diagnosed and treated with prescribed drugs. As well as incomplete ascertainment and management, this may also be due to a lack of compliance with prescribed treatment. Although there were marked differences in the proportion of patients treated with each type of drug by sex, no association with deprivation was found. There is uncertainty nationally about the optimum treatment for osteoporosis in the light of recent recommendations about HRT.

This study examines prevalence before the introduction of the RCP guidelines. The guidelines will have increased the workload associated with osteoporosis by raising awareness of the condition and highlighting the evidence gathered thus far. Adequate resources will need to be made available for the identification of patients, diagnosis and prescribed drugs.

Implications for future research

In the future, a similar study could be repeated to assess the impact of the RCP guidelines and the NSF requirements for osteoporosis.^{2,5,6} It would be useful to compare the radiological and recorded prevalence of osteoporosis in England and Wales and describe the co-morbidity associated with osteoporosis. A previous study used the GPRD to examine the relationship between osteoporosis treatment and fractures.²⁵ Further analysis exploring the relationship between practice characteristics and treated prevalence of osteoporosis at a practice level could be considered. A future study could look at 'high-risk' groups for fractures as well as patients with recorded diagnosis of osteoporosis. This latest study provides a rationale for examining ascertainment and prescribing for osteoporosis and also the presence of and mechanism for gender inequalities in treatment rates.

CONCLUSIONS

The prevalence of treated osteoporosis is rising. The type of drugs and pattern of prescribing varies by age, sex and between practices. However the low treated prevalence found in this study suggests that most patients with osteoporosis remain undiagnosed and/or untreated.

ACKNOWLEDGEMENTS

We thank Sue Davies and the Morbidity and Health Care Team at the Office for National Statistics for their detailed comments and Dr Maggie Bruce for her advice.

Key findings

- The prevalence of treated osteoporosis increased steadily between 1994 and 1998 for both sexes, and prevalence is highest in older women.
- Comparison of the study findings and published prevalence estimates suggest that a large proportion of patients with osteoporosis are not diagnosed and treated with prescribed drugs.⁷
- For both sexes the percentage of patients with osteoporosis prescribed bisphosphonates and vitamin D increased significantly whereas the percentage prescribed calcium fell significantly. Calcitonin was rarely prescribed.
- In females, the proportion treated with oestrogens/ HRT remained stable.
- Treated prevalence was lowest in females in the least deprived quintile, however, no clear prevalence or prescribing patterns existed across the deprivation categories.

REFERENCES

1. Peel N and Eastell R (1995) ABC of Rheumatology: Osteoporosis. *BMJ* **310**, 989–992.
2. Royal College of Physicians (1999) *Osteoporosis: Clinical guidelines for prevention and treatment*, Royal College of Physicians: London.
3. Balasegaram S and Majeed A (2000) Trends in hospital admissions for fractures in England, 1989–90 to 1997–98. *Health Statistics Quarterly* **07**, 10–17.
4. Department of Health (1998) *Strategy to prevent fractures caused by osteoporosis*. HSC1998/124, Department of Health: London.
5. Department of Health (March 2001) *National Service Framework for Older People*, Department of Health: London.
6. Royal College of Physicians and Bone and Tooth Society of Great Britain (2000) *Osteoporosis Clinical guidelines for prevention and treatment: Update on pharmacological interventions and an algorithm for management*, Royal College of Physicians: London.
7. Petley G W, Cotton A M, Murrills A J, Taylor P A, Cooper C, Cawley M I *et al* (1996) Reference ranges of bone mineral density for women in southern England: the impact of local data on the diagnosis of osteoporosis. *British Journal of Radiology* **69(823)**, 655–60.
8. Ballard P A, Purdie D W, Langton C M, Steel S A and Mussurakis S (1998) Prevalence of osteoporosis and related risk factors in UK women in the seventh decade: osteoporosis case finding by clinical referral criteria or predictive model? *Osteoporosis International* **8(6)**, 535–9.
9. Siris E S, Miller P D, Barrett-Connor E, Faulkner K G, Wehren L E, Abbott T A *et al* (2001) Identification and fracture outcomes of undiagnosed low bone mineral density in postmenopausal women: results from the National Osteoporosis Risk Assessment. *JAMA* **286(22)**, 2815–22.

10. Ulahannan T J and Lavelle L A (1997) Is systematic osteoporosis prevention and detection possible in a district hospital? *J Clinical Effectiveness* **2**(2), 43–6.
11. Onder G, Pedone C, Gambassi G, Landi F, Cesar M, Bernabei R *et al* (2001) Treatment of osteoporosis among older adults discharged from hospital in Italy. *Eur Jrm Clin Pharmacology* **57**(8), 599–604.
12. Gehlbach S H, Fournier M and Bigelow C (2002) Recognition of osteoporosis by primary care physicians. *Am Pub Hlth* **92**(2), 271–3.
13. Solomon D H, Levin E and Helfgott S M (2000) Patterns of medication use before and after bone densitometry: factors associated with appropriate treatment. *Journal of Rheumatology* **27**(6), 1496–500.
14. Juby A G and De Geus-Wenceslau C M (2002) Evaluation of osteoporosis treatment in seniors after hip fracture. *Osteoporosis International* **13**(3), 205–10.
15. Office for National Statistics (2000) *Key Health Statistics from General Practice 1998*, Series MB6 No 2. Office for National Statistics: London.
16. Townsend P, Phillimore P and Beattie A (1998) *Health and Deprivation: inequalities and the North*, Croom Helm: London.
17. Hollowell J (1997) The General Practice Research Database: quality of morbidity data. *Population Trends* **87**, 36–40.
18. Barlow D H, Brockie J A and Rees C M P (1991) Study of general practice consultations and menopausal problems. Oxford General Practitioners. Menopause Study Group. *BMJ* **302**, 274–6.
19. Wilkes H C and Meade T W (1991) Hormone replacement therapy in general practice: a survey of doctors in the MRC's general practice research framework. *BMJ* **302**, 1317–20.
20. Sinclair H K, Bond C M and Taylor R J (1993) Hormone replacement therapy: a study of women's knowledge and attitudes. *Br J Gen Pract* **43**, 365–70.
21. Stadberg E, Mattsson L-A and Misom I (1997) Women's attitudes and knowledge about the climacteric period and its treatment. A Swedish population based study. *Maturitas* **27**, 109–16.
22. Medicines Control Agency. *Hormone Replacement Therapy (HRT): updated information for women*. Available at URL: <http://www.mca.gov.uk/> (accessed 24 May 2002).
23. Sahota O, Worley A and Hosking D J (2000) An audit of current clinical practice in the management of osteoporosis in Nottingham. *Jrn Pub Hlth Med* **22**(4), 466–72.
24. Saadi H, Litaker D, Mills W, Kippes C, Richmond B and Licata A (1999) Practice variation in the diagnosis and treatment of osteoporosis: a case for more effective physician education in primary care. *Jrn Womens Hlth & Gender-Based Med* **8**(6), 767–71.
25. Van Staa T P, Abenhaim L and Cooper C (1998) Use of cyclical etidronate and prevention of non-vertebral fractures. *Br J Rheumatology* **37**, 87–94.