

Proximal femoral fracture in Northern Ireland between 1985-1997 – trends and future projections

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SUMMARY

The aims of this study were to identify changing trends with time of the incidence of proximal femoral fracture and to enable future number of hip fractures to be projected. Hospital theatre records in Northern Ireland were surveyed in 1985, 1991, 1994 and 1997 to establish the number of surgical procedures for proximal femoral fracture. The age and sex specific rates for males and females aged 50+ years were calculated. Analysis of age and sex specific incidence rates was undertaken using linear regression and Poisson regression.

A 1.6% increase per annum (95% CI 1.0 – 2.2) was noted in males and females from 1985 to 1997. Projected increases in rates of proximal femoral fracture were calculated using population projection for 2001, 2006, 2011 and 2016. Modelling (a) assuming the age standardised rates in 1997 remain static and continue predicted a 55% fracture increase in males and a 29% increase in females by 2016, (b) assuming the secular increases continued predicted a 93% fracture increase in males and a 67% increase in females and (c) assuming further linear growth on a log-scale predicted a fracture increase in males of 135% and 99% in females.

The number of proximal femoral fractures in Northern Ireland is increasing faster than that anticipated due to demographic changes alone, supporting a secular increase which was evident throughout the period of time studied, in contrast to that reported from other regions in the United Kingdom.

INTRODUCTION

Proximal femoral fracture is a common injury in elderly people with a current mortality at six months in females of 16% and in males of 43% in Northern Ireland.¹ There is also significant morbidity with 83% of those who previously lived at home returning home after four months and 7% requiring long term nursing care.² The clinical resources required for acute care are considerable with utilization of 25%³ of acute orthopaedic beds, with additional need for rehabilitation and long term community care support. The cost has been calculated at £12,000 per fracture.⁴

While the resource implication of increasing numbers of proximal femoral fractures as a result of demographic increase in the number of elderly people is recognised⁵, the incidence of proximal femoral fracture appears to be increasing more rapidly than that attributable to demographic

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ageing of the population alone.⁶⁻¹¹ The rise in age specific incidence of proximal femoral fracture has been reported to be levelling off in England and Wales¹², Minnesota¹³ and Australia.¹⁴ Considerable regional differences in age-standardised hip fracture rates exist with the highest rates in North Europe.¹⁵ The explanation of such differences between regions and trends with time remains unresolved, with dietary, environmental, skeletal structure¹⁶ and cohort effects¹⁰ as possible contributory factors. Comparative information within the United Kingdom is limited.

Many United Kingdom studies have used Hospital Activity Analysis derived data to determine changes in incidence. Inaccuracies in coded records have been reported from a number of countries¹⁷ and thus may not accurately capture and reflect the true incidence of hip fracture. They have been previously shown in Northern Ireland to incorrectly code 6% and fail to code 8% of cases.¹⁸ An alternative data source was therefore considered in Northern Ireland involving theatre procedure records of proximal femoral fracture fixation. Subjects managed conservatively will not be captured, but over 95% of subjects with proximal femoral fracture receive surgical as opposed to conservative management, and non-operative management has remained at less than 5% over the time period studied.^{2,18} Utilising theatre record books in Northern Ireland was, therefore, more likely to reduce coding errors and more accurately identify proximal femoral fracture subjects than Hospital Activity Analysis returns. The relatively small and stable geographical population of 1.6 million people in Northern Ireland also assists in accurate identification of proximal femoral fracture numbers with surgical treatment carried out in a defined small number of acute hospital locations.

A study was therefore undertaken to gather information from theatre record books to establish the age specific incidence of proximal femoral fracture, identify changing trends with time of the incidence of proximal femoral fracture, and to enable future projections of proximal femoral rates to assist in planning and provision of health care.

METHODS

A survey of all theatre records of hospitals in Northern Ireland undertaking operative management of proximal femoral fracture in 1985,

1991, 1994 and 1997 was carried out. The ten hospitals providing operative treatment were individually visited and data recorded directly from theatre registers (RAW, DS) and entered on to a database. Details of age, sex, operative procedures and date of surgery of proximal femoral fracture were obtained.

The population of Northern Ireland at the different sampling times and population projections for 2001, 2006, 2011 and 2016 were obtained from the Office of the Registrar General in Northern Ireland.⁵ This allowed the age and sex specific rates to be calculated in five year bands for 50-90+ years of age. Analysis of age and sex specific incidence rates was undertaken using linear regression and poisson regression to identify changes between the sampling points.

RESULTS

The age-specific rates of proximal femoral fracture for males and females are recorded for the years 1985, 1991, 1994 and 1997 (Table I). This reveals a 1.6% increase per annum (95% CI 1.0 – 2.2) in both sexes. The increase per annum was similar in both sexes. The rate of increase is greater with increasing age and this trend was noted within both, males and females (Figure 1).

The projected increases in rates of proximal femoral fracture were calculated using the age 50+ years population projections for 2001 (males 214,000, females 261,000), 2006 (males 233,000, females 275,000), 2011 (males 254,000, females 297,000) and 2016 (males 277,000, females 323,000). This was firstly modelled assuming the age standardised rates present in 1997 remained static, secondly assuming the continuing secular increases within each age and sex sub-group at time points 1985, 1991, 1994 and 1997, and thirdly based on exponential growth (i.e. linear growth on a log scale, or equivalently, a constant percentage increase per annum). (Table II).

The first projection equated to a 55% increase in males (348 → 540) and a 29% increase in fractures in females (1275 → 1642) from the year 1997 to 2016. (Figure 2).

The second projection equated to an increase in fractures of 93% (348 → 670) in males and in females of 67% (1275 → 2130) from the years 1997 to 2106.

The third projection equated to an increase in males of 135% (348 → 820) and in females of 99% (1275 → 2540) from the years 1997 to 2016.

TABLE 1

Annual incidence rates for fractures of the proximal femur by age group over the period 1985-1997

Age Group (years)	Males (rate/100,000)				Females (rate/100,000)			
	1985	1991	1994	1997	1985	1991	1994	1997
50-54	26	29	17	28	55	43	30	39
55-59	23	46	28	49	97	88	71	47
60-64	37	53	47	56	101	97	134	80
65-69	99	88	59	133	168	185	170	196
70-74	190	173	151	202	382	387	393	414
75-79	243	242	386	412	741	833	833	912
80-84	662	610	803	643	1247	1419	1666	1527
85-89	1207	1207	1386	1298	2175	2278	2541	2607
90+	1930	1576	1878	2101	2623	3292	3381	4714
Total Fracture No.	230	257	292	348	870	1037	1182	1275

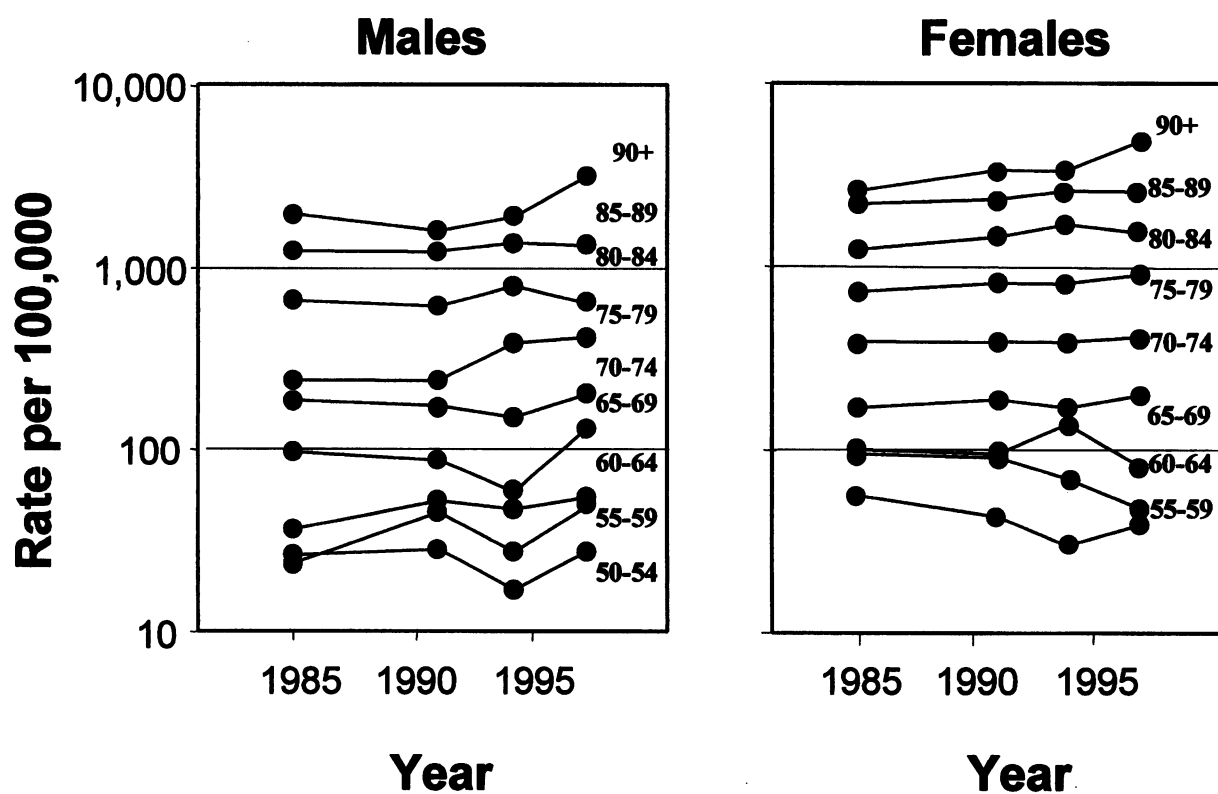


Fig 1. Trends in age specific fracture rates from 1985-1997 for males and females aged 50+ years.

TABLE 2

Projected increase in number of hip fractures in Northern Ireland in males and females age 50+ years from 2001 to 2016 using a) age-specific rates in 1997, b) linear projection, c) exponential growth rate.

	MALES			FEMALES			TOTAL MALES AND FEMALES		
	a Projected from age- specific rates in 1997	b Projected from linear growth model	c Projected from exponential growth model	a Projected from age- specific rates in 1997	b Projected from linear growth model	c Projected from exponential growth model	a Projected from age- specific rates in 1997	b Projected linear growth model	c Projected from exponential growth model
2001	365	370	380	1339	1410	1450	1704	1780	1830
2006	437	480	510	1440	1640	1740	1877	2120	2250
2011	470	550	620	1539	1870	2090	2009	2420	2710
2016	540	670	820	1642	2130	2540	2182	2800	3360

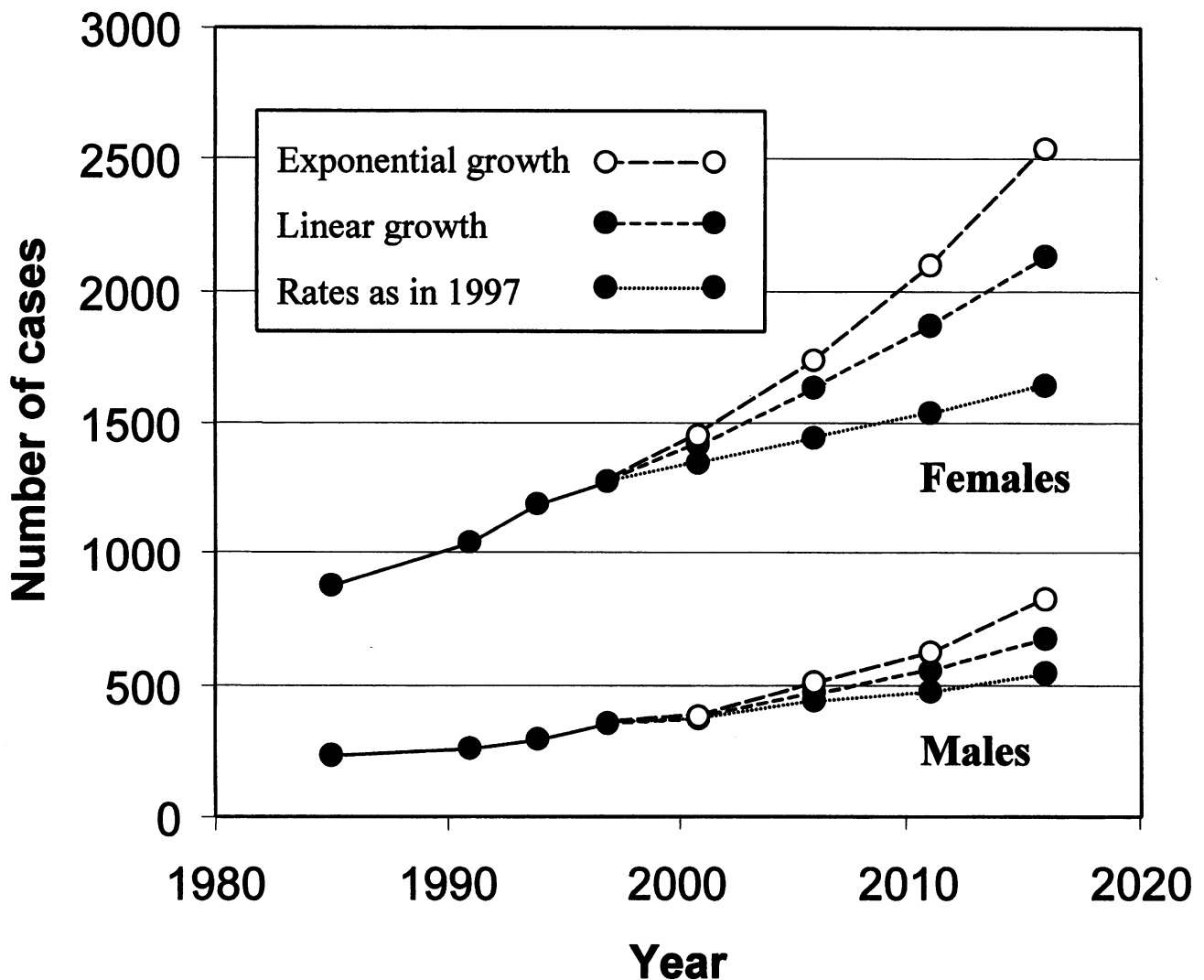


Fig 2. Projected increase in number of hip fractures in Northern Ireland in males and females age 50+ years from 2001 to 2016 using three assumptions

DISCUSSION

This analysis confirms that there is an increase in the proximal femoral fracture rate in Northern Ireland from 1985 to 1997 that exceeds that expected from demographic ageing of the population alone. This secular increase of 1.6% per annum occurred in both sexes and is greater in the older age groups studied but is equivalent in males and females. This is similar to the pattern reported from Finland.¹⁹ This may be due to a cohort effect but the data available is insufficient to allow more detailed analysis or to confirm that there was a significant reduction in hip fracture incidence in younger women age 50 to 64 years (Figure 1). Across the time period studied there is evidence that the secular increase of 1.6% remains constant, and it is thus more likely that the incorporation of a secular increase of 1.6% per annum will accurately predict the future number of proximal femoral fractures. Assuming the absence of a further secular increase after 1997 and adopting 1997 age-standardised rates this would nonetheless result in significant increase in fractures of 55% in males and 29% in females by the year 2016. The higher increase in anticipated proximal femoral fractures in males than females has also been reported from Sweden.²⁰

The health costs of the projected increase in proximal femoral fractures are significant. The current cost in Northern Ireland for 1623 fractures in 1997 was £19.5 million assuming the cost of £12,000 per fracture,³ which is predicted to rise to the equivalent of £33.6 million in 2016 to treat the 2800 fractures projected. There is therefore a pressing need to elucidate the causes of the current secular increase and to clarify our understanding of possible environmental, nutritional behavioural and genetic influences. Similarly possible causes of the absence of a levelling off of age-specific incidences of proximal femoral fracture in Northern Ireland in comparison to that reported for England and Wales¹² merits further study.

In summary the number of proximal femoral fractures in Northern Ireland is increasing faster than that anticipated due to demographic change alone, supporting a secular increase which was evident throughout the time period studied, in marked contrast to that reported for some other regions in the United Kingdom.

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