

Education and debate

How many, how old, how soon?

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These four articles are based on presentations to be given at a BMJ conference next Tuesday. "Medicine in an Ageing Society" will consider what demographic change means for medical practice, medical education, and medicine's institutions

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The changes in the age structure of human populations are unprecedented and continuing. They represent great successes and achievements in health and social development such that more people than ever before are likely to survive to old age. However, such changes also bring new demands, since most societal institutions evolved with different age structures in the population. These demands affect all aspects of society, including employment, taxation, pensions, education, and, not least, health. We need to develop and plan institutions and policies across the whole of society that are able to address the requirements of an ageing society. Appropriate planning requires some estimation of the future. Central is the question of what the numbers and proportions of people of different ages are likely to be, and over what period. In this article I present population projections for the United Kingdom and discuss some possible implications for health.

Methods

I obtained age specific population projections to 2066 for the United Kingdom from the Office for National Statistics.¹ The methods used for the projections are described in detail in the publication.¹ Briefly, these extrapolate trends from a number of components of population change including baseline population, birth rate, death rate, and net migration and rely on several explicit underlying assumptions about average completed family size, expectation of life based on mortality, and net migration.

To give some examples of the health implications of these population changes, I then obtained age specific prevalences and incidences for various diseases from published sources. These rates were applied to the projected numbers of people in different age groups for men and women at older ages in order to estimate future trends in absolute numbers of people with these various conditions. I also obtained age and sex specific prevalence rates for different markers of disability. Rates of people who reported they were unable to carry out four activities of daily living (bathing, transfer from bed, feeding, getting to the toilet) were taken from Bone et al,² who derived rates from the General Household Survey for England and Wales in different years. I also used rates for self reported illness by cause based on 1989 survey data for Great Britain.³ For examples of specific conditions, I used age and sex specific hip fracture incidence rates for 1956 and 1993 in Oxford⁴ and prevalence of age specific dementia.⁵

Summary points

The number of people aged 60 years and over in the United Kingdom is projected to increase from 12 million (20% of the population) in 2001 to 18.6 million in 2031 (30%)

The numbers of people with various chronic diseases and disabilities are also projected to increase two to threefold

Morbidity projections are highly sensitive to small changes in incidence and prevalence of disease

Large secular trends in incidence and prevalence of many diseases indicate modifiable environmental determinants

Identification of causes and prevention of the conditions leading to serious disability must be a high priority

Population projections

Data from the Office for National Statistics show that the number of people aged 16 years and under fell from about 14.3 million (25% of the population) in 1971 to 12 million (21%) in 1996 and is projected to continue to fall to about 10 million (17%) in 2061.¹ In contrast, the number of people aged 65 years and over increased from 7.4 million (13% of the population) in 1971 to 9.2 million (16%) in 1996 and is projected to continue to increase steadily to 14.5 million (24%) in 2061. Thus, the relative proportions of old and young will reverse; in 2015 there will be roughly equal proportions of people under 16 and over 65 years of age, and thereafter people over 65 will outnumber those under 16.

The table shows examples of population projections under different assumptions. Variations in mortality have the greatest effect on the numbers of older people, but although absolute numbers vary, the overall pattern of increase in the numbers and proportions of older people is highly consistent.

In 1991, in England and Wales, the total expectation of life at 65-74 years was 14.2 years for men and 17.9 years for women; healthy life expectancy (that is, without limiting long standing illness) was 7.9 years for men and 9.8 years for women.² Thus, about

half the remaining years were spent with some limitation. All ages are likely to experience an increase in expectation of life over the next 30 years.¹

Figure 1 shows the numbers of people in the United Kingdom aged 60 years and over from 1996 to 2066 by five year age groups.¹ Numbers are projected to rise by about 50% from 2001, reaching a peak in about 2036. The greatest rise in absolute number, about 3 million, is seen in the 65-74 year age group in 2036, but the greatest proportional rise is in the oldest age group, 90 years and over, which is projected to double in number from about 400 000 in 2001 to 800 000 in 2036.

Disability projections

Figure 2 shows the projected numbers of people aged over 65 unable to perform four activities of daily living independently for 1996-2066. Projections are based on published estimates, which showed a fall in the number of such people over the past two decades.² Thus, based on 1976 prevalence estimates, the numbers of people unable to perform the four activities of daily living will

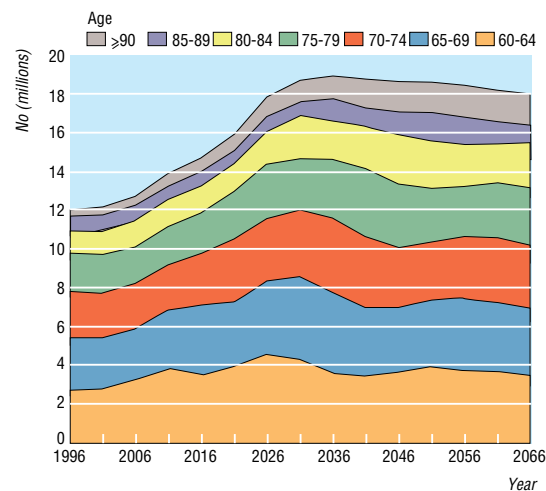


Fig 1 Projected numbers of people aged 60 years and over in the United Kingdom, 1996-2066¹

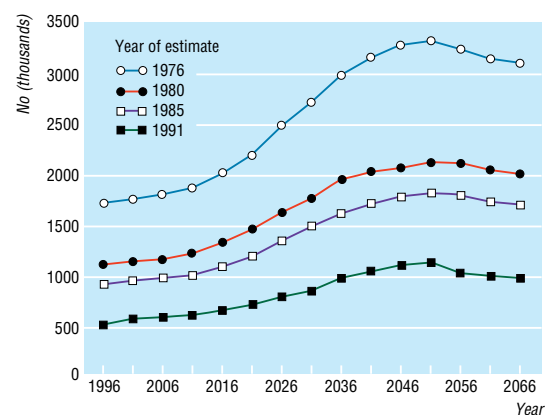


Fig 2 Projected numbers of people aged over 65 years in United Kingdom, 1996-2066, unable to perform activities of daily living independently, based on estimates from different years²

Table 1 Effect of changing assumptions about population structure on projections of age distribution of the population in 2021 and 2036, United Kingdom¹

Assumptions	Total population (1000s)		% aged ≥65+		No of dependants/1000 people of working age	
	2021	2036	2021	2036	2021	2036
Principal projection	62 244	62 656	19.2	24.4	587	710
Low fertility, low mortality, low migration	59 566	57 941	20.4	27.2	571	726
High fertility, high mortality, high migration	64 875	67 395	18.1	21.8	604	699

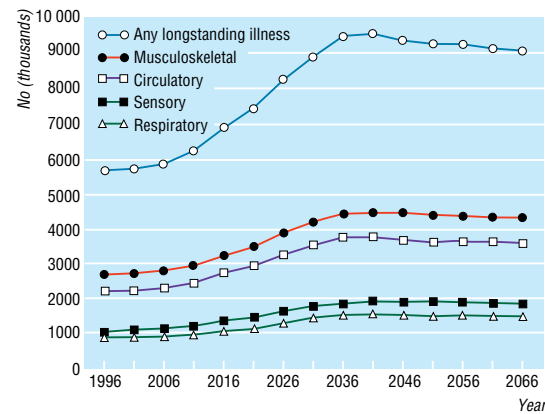


Fig 3 Projected number of people aged 65 or over with chronic illness in United Kingdom, 1996-2066, based on reported prevalences in 1989³

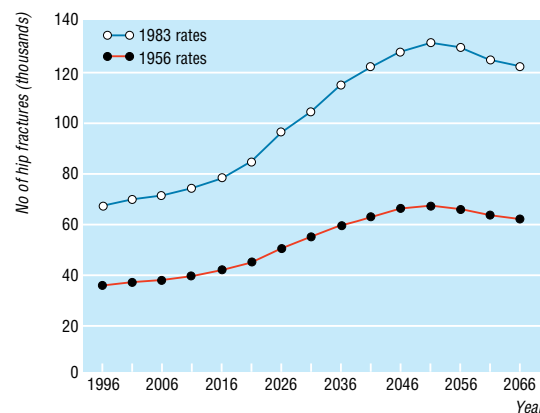


Fig 4 Estimated numbers of hip fractures in people aged over 60 in United Kingdom, 1996-2066, based on rates from 1983 and 1956⁴

rise from about 1.7 million in 1996 to nearly 3.5 million in 2051. However, if 1991 figures are applied, the numbers will rise from 0.5 million in 1996 to 1 million by 2036. Figure 3 shows the projected numbers of men and women aged over 65 years with illnesses by cause, based on self-reported prevalences in 1989.³

Figure 4 shows the estimated numbers of hip fractures in people aged over 60 years based on age specific incidences from Oxford for 1983 and 1956.⁴ From the 1956 incidences, the number of hip fractures will increase from about 40 000 annually in 1996 to about 68 000; if 1983 rates are applied the number of hip fractures will increase to 80 000 in 2021 and 130 000 in 2051. A similar pattern is seen

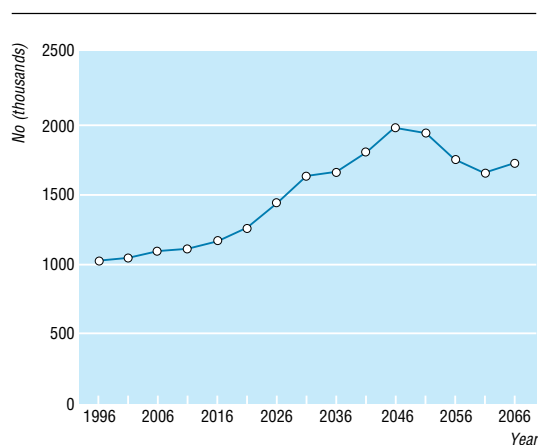


Fig 5 Estimated number of people aged over 60 with dementia in United Kingdom, 1996-2021

for dementia, with the number of cases projected to double from one million in 1996 to two million in 2051 (fig 5).

Implications

No one can predict the future, but it is possible to make population projections based on past and current consistent trends in birth and death rates. Although these projections rely on assumptions and are subject to some variation, they are fairly robust, and it is clear that without unforeseen major upheavals the numbers and proportions of people aged 65 years and over are likely to rise substantially over the next few decades. The projected increase in life expectancy, even at older ages, means that the proportion and absolute duration of healthy life expectancy remains an important issue.

These population trends have huge implications for health and health care. The incidence of many chronic diseases and prevalence of disability increase with increasing age. Thus, the increasing numbers of older people will mean a concomitant increase in disability and illness, in particular in those chronic diseases and conditions associated with ageing such as dementia, musculoskeletal diseases, cardiovascular diseases, and sensory impairment. Health and social systems will need to address the treatment and care of the increasing numbers of people with these problems.

However, the projections of numbers of people with disability and illness are very sensitive to small

changes in incidence and prevalence, as shown above. The estimates given here are not unrealistic as the rates they are based on are those that have been observed in Britain at various times. There is encouraging evidence that, at least in some aspects, the functional health of the population is improving. The proportion of men and women at any particular age who require help with four activities of daily living halved between 1976 and 1991. The effect of this change in age specific prevalence is over a threefold difference, or about 2 million, in the projected numbers of people who require help in these activities. Thus, if apparent favourable trends in some measures of objective functional health continue, this could greatly reduce the future numbers of people who may have compromised function. Conversely, in the United Kingdom the age specific rate of hip fracture has increased hugely; however, if in the next decade it were possible to return to the rates observed in 1956, this would substantially reduce the impending epidemic of hip fractures predicted. Similarly even a 1-2% decrease in prevalence of dementia could decrease numbers by 20 000. A great deal of evidence exists that modifiable environmental and lifestyle factors are important determinants of these conditions.^{6 7} Understanding the causes and prevention of chronic disease and disability and maintaining good health in ageing populations must therefore be a high priority.

Population projections can help us plan for the future: they can identify future needs and where resources are likely to be required. They can also highlight areas where interventions are likely to have most impact and where research and training needs should be emphasised.

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- 4 Jorm AF, Korten AE, Henderson AS. The prevalence of dementia: a quantitative integration of the literature. *Acta Psychiatr Scand* 1987;76:465-79.
- 5 Boyce WJ, Vessey MP. Rising incidence of fracture of the proximal femur. *Lancet* 1985;i:150-1.
- 6 Khaw KT. Healthy aging. *BMJ* 1997;315:1090-6.
- 7 Chapuy MC, Arlot ME, Duboeuff F, Brun J, Crouzet B, Arnaud S, et al. Vitamin D3 and calcium to prevent hip fractures in elderly women. *N Engl J Med* 1992;32:1637-42.

One hundred years ago

The coal-smoke nuisance

One of the miseries caused by coal smoke in the atmosphere of London and other cities where coal is improperly burnt, is the delay in transit which ensues during fogs such as those experienced on one or two days recently in the metropolis. That this is a very serious evil to the enormous number of clerks and others employed in London who live in the suburbs can be appreciated, when it is realised that on one of the railway lines to the south of the Thames some trains were two hours in doing a "half-hour" journey in the last fog. As we have stated before, we can never hope to do away altogether with fogs in London, owing partly to the proximity of the Thames, even if all smoke were

banished from its atmosphere; but, under such an improved condition as that supposed, the fogs would be far less dense than they are at present, and they would be white, not loaded with black smoke. The delay in the train service would be correspondingly improved. The great loss of precious time inflicted on the travelling public during the black fogs of winter is probably not sufficiently considered in the enumeration of the evils of the smoke nuisance. This particular evil, however, is evidently to be fought in more ways than one, and the Great Eastern Railway has notified that it will make special train arrangements during foggy weather. (*BMJ* 1899;ii:1695)