Will there be enough people to care?

Notes on workforce implications of demographic change 2005–2050

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Introduction

The challenges facing the development of human resources for health are not new, but they are rapidly changing. Looking back to some of the previously unimaginable transformations that have been seen over the last few decades – technological advances, radically improved communications and global mobility – we can start to imagine the changes that may be on the horizon. Some of them are unpredictable and difficult to quantify, but others – such as the changes in the future demographic landscape – are easier to foresee. Human resource planning must adapt to these changes.

The shift towards more personal, individualized health care, coupled with the increase in long-term care needs, is a strong driver that pushes towards the expansion of the health workforce. The health sector has been at the forefront of job creation in the European Union, for example (European Commission, 1999). There is a growing dynamism, mostly at the local level, and many new initiatives from which new products and new services have emerged. The EU expects a 16% growth over five years in e-health, private medical insurance, outsourcing of services and cross-border health provision (Accenture and Lisbon Council, 2006).

Demography will be a key driver of human resource needs for health. An increasing proportion of people living longer and requiring health care for greater periods of time will increase overall demand for care, including for costly treatment. This will coincide with the increasing dependency ratios that will inevitably follow plummeting fertility rates – first in developed countries and later, more catastrophically, in poorer countries. Two simultaneous trends can be seen in all countries: first, because of demographic changes, a shrinking of the overall workforce from which formal health workers can be drawn; and second, a breakdown in the family ties that could previously be relied on to provide informal care for the elderly.

Demographic trends into the future are reasonably predictable in richer countries, given continued low fertility. Assuming that the United Nations Statistical Office projections of future populations are reliable into the next few decades, it is possible to model the demand for health care and the health workforce required to meet this demand from now up to 2050. This paper aims to calculate the workforce implications of these demographic changes by projecting future health workforces for developed economies, including Europe, Japan, Australia, New Zealand, the United States of America and Canada.

Population ageing

The phenomenon of population ageing in many developed countries has been studied widely. The proportion of the population aged 65 or over will increase rapidly over the coming decades, augmented by the large cohort of “baby-boomers” born in the two decades after the Second World War. The effect of this trend towards a more elderly population is predicted to have implications in many areas, including social welfare, productivity, competitiveness, economic growth and health.

Health systems will be greatly influenced by the ageing revolution because of the increase in use of health care by the growing proportion of the elderly (Angus et al., 2000; European Commission, 2001). A vital aspect of any health system is the workforce, which will also have to adapt to the changing requirements placed on it. Many national countries produce projections of the number of health workers that will be needed over the next few decades, usually based on the premise that the current level of care must be maintained (e.g. Cooper et al., 2002; Productivity Commission, 2005).

Further studies have indicated that the simple mechanical effect of ageing on the demand for health care is not the greatest contributor to the increase in need for human resources for health. The need for more health workers is driven more by increased use and newer forms of technology, greater education of the elderly implying greater knowledge regarding treatments and their rights, and higher levels of wealth of the elderly. Estimates that study only the demographic impact will therefore underestimate the true impact of the ageing population.

Projections for human resources for health have sometimes acknowledged that the required increase in the health workforce sits awkwardly with both the anticipated falling population and reduced numbers of individuals of working age. However, no studies have actually measured the increase in the proportion of the active population that will need to be health workers in order to maintain health care at its current levels.

It is well known that health service use increases as age increases. Per capita, the elderly use a greater amount of health care than any other age group, except for newborn infants (Mayhew, 2000). As age increases, the ability to carry out common daily tasks decreases – until a point is reached where intensive caring is needed, either in a residential home or a hospital. Increasing service use, especially in societies where high levels of care are demanded by the population, results in increasing demand for health care workers. Even though the number of births is falling in many countries, the reduction in the amount of care needed for newborns is likely to be outweighed by the increase in care needed over a longer period for the elderly (Mayhew, 2000).

To estimate the requirements for human resources for health in the future is exceedingly complex, because of the many unknown factors regarding this topic. Technological changes, new treatments, changes in social attitude and changes in government policy will all influence the numbers of health workers in a country. However, changes to the demographic profile of countries and regions can be modelled fairly accurately over the next 50 years. By means of a number of assumptions, the demographic effect on the health workforce can be isolated. The demographics of ageing are more easily predicted than other determinants of the demand for health care workers, so analysing this effect is a good basis from which to begin.

Methods

A number of distinct steps are needed in order to model the size of the health workforce required up to 2050 and to estimate the proportion of the active workforce that will need to be health workers to meet this demand. Different aspects that were needed were projections for the future population of the countries in the analysis, the active workforce in each country and the number of people employed in the current heath system. This study will look at countries in the more developed world. For the purpose of this analysis, the countries in the more developed world are all those in Europe[1], split into four regions; Japan; Australia and New Zealand; and North America (Canada and the United States of America).

Population projections were taken from the *United Nations population prospects: 2004 revision* (United Nations, 2004). The medium fertility variant was used in all calculations. This assumes that fertility in all countries converges towards a level of 1.85 children per woman. In the countries in this analysis this assumption results in a rising fertility rate in most countries to reach this level, as currently the fertility levels are lower than 1.85 infants per woman. In only five countries does this result in a fall in the fertility rate (Albania, Iceland, Ireland, New Zealand and the United States of America), and of these five countries only Albania has fertility above replacement level (defined as a fertility rate of 2.1 births per woman). The notion of a fertility "rebound" to a fertility level of 1.85 is not universally accepted, and if fertility does not rise in the manner suggested to the proposed rate, then the medium United Nations projection will overestimate the population in the countries that currently have low fertility levels. Alternative population projections that use different fertility levels (lower and higher than the medium projection) were used to test the sensitivity of the model to different assumptions.

The economically active population is defined as the number of people who make up the labour supply in a specified time period. This includes both employed and unemployed persons but excludes

[1] The countries included as Europe were selected following the United Nations definition of the European region, including the Russian Federation, Belarus and Ukraine, but excluding Turkey. For a full list, please go to: http://unstats.un.org/unsd/methods/m49/m49regin.htm.

students, retired persons and people who conduct only domestic duties in their own households (International Labour Organization, 2007). Exact definitions of the different groups of people included and excluded from the active population differ between countries. The numerator of the activity rate is the number of people economically active in the population. The denominator, however, can be defined in three different ways: the total population of the country, the population aged over 15 or the population aged 15 to 64. The population aged 15 to 64 was used in this study. The current number of economically active people in each country was obtained from the International Labour Organization (ILO), and the activity rate calculated from these figures. The ILO also publishes projections on the number of economically active people up to 2020. As there are no projections for after 2020, the trends observed between 2015 and 2020 were used to project the active population for the years 2021 to 2050.

Estimates for the current number of health workers in each country in the region were obtained from the *World health report 2006: working together for health* (World Health Organization, 2006). These figures were computed by the World Health Organization and may differ from the estimates made by the individual countries. The categories of health workers in these estimates include doctors, nurses, midwives, pharmacists, dentists and support staff (e.g. management, laboratory technicians and public and environmental health workers). The WHR06 does not provide estimates for the number of support staff in many of the more developed countries. As these workers make up a large proportion of the health workforce, it is vital to include estimates of their numbers in any projections. To estimate the numbers in each country without an estimate for the support workers, the average ratio of health professionals to the support workers was taken from four developed countries with this information (Australia, New Zealand, the United Kingdom and the United States of America). From this it was estimated that for every one health professional there are 1.85 health support workers. This result was used to estimate the total health workers in all countries, with the number of health professionals increased by a factor of 1.85 to obtain the final number used in the calculations.

A number of methods are available to estimate the required health workforce. A simple method is to extrapolate the current growth in the health workforce until 2030. Current growth is estimated to be 2.6% a year (Accenture and Lisbon Council, 2006). Assuming that this rate of growth remains constant, by 2030 the share of the total workforce in Europe that will be employed in the health sector will more than double. However, this method of calculation does not take into account that health service usage is not constant throughout life. Young infants and the elderly use more services than older children and adults. This information must be used in order to produce an accurate estimate of the changes over time.

In order to do this, a health care use profile throughout life was calculated using the results of a study into health expenditure by age conducted in the United Kingdom (Mayhew, 2000). Although health expenditure is not an exact proxy of health care use, it is assumed that there is a close association between expenditure and use. Relative expenditure was reported for every five-year band of age group until age 85 compared to the 0 to 4 age group. For all adults aged over 85 the same relative expenditure was assumed. The utilization profile was constructed directly from this expenditure profile, although the reference group was taken to be the 5 to 14 age group, which showed the lowest expenditure on health care for all ages. The profile used is displayed in Table 1. The relative utilization shown was applied to all countries in the analysis. This assumes that the relative use of health services is the same for each age group and it is not assumed that the level of health care use is the same in each country.

Table 1. Relative health care use by age

Age group	Relative use of health care
0-4	2.50
5-14	1.00
15-44	1.33
45-64	2.05
65-74	4.25
75-84	8.00
85+	13.80

Source: Authors' calculations from Mayhew (2000) data.

The numbers of health care workers needed up to 2050 are calculated from the information obtained above. By means of the population projections, the number of "health care utilization units" for each five-year age group can be calculated by multiplying the population in the age group by the utilization profile shown in Table 1 for each year up to 2050. The ratio of health care workers to utilization units for 2005 is easily calculated and, with the assumption that the current level of health care workers is adequate for the needs of the individual country and is not expected to increase or decrease, this ratio is applied to the future year's health care utilization unit totals. It is therefore simple to calculate the numbers of health care workers needed to keep the ratio of human resources to utilization units constant. The percentage of the active population that is engaged in the health care sector for each year in the analysis is also straightforward to calculate.

Results

According to the United Nations population medium variant projection (2004) the population of Europe and Japan has already peaked and will fall throughout the period 2005 to 2050. In Europe this is due mainly to the falling population in eastern Europe. In southern Europe the population is projected to start falling after 2015, while in western Europe the population will fall after 2030. Northern Europe grows, albeit slowly, throughout the period in question. Similarly, the population of Australia/New Zealand and North America is also projected to grow each year until the end of the projection period (Table 2).

Table 2. Population projections for Europe, Japan, Australia/New Zealand and the USA/Canada

	Population in millions			
	2005	**2015**	**2025**	**2050**
Eastern Europe	297.3	283.3	267.1	223.5
Northern Europe	95.8	97.1	101.7	105.6
Southern Europe	149.4	150.9	148.9	138.7
Western Europe	185.9	188.4	189.6	184.5
Japan	128.1	128.0	124.8	112.2
Australia/New Zealand	24.2	26.6	28.9	32.7
USA/Canada	330.6	360.9	388.0	438.0

Source: United Nations (2004).

There is a large increase in the proportion of both persons over 65 and persons over 80 in the population in all regions. Japan has the highest proportion of elderly and very elderly; it is projected that by 2050 more than a third of the population will be over the age of 65, and for every person over

80 years there will be only 5.5 people younger than this age. The United States of America and Canada have the lowest percentage of over-65s, although it is still projected that in 2050 more than a fifth of the population will be over this age (Table 3).

Table 3. Proportion of the population aged over 65 and over 80

	Age	2005	2025	2050
Eastern Europe	Over 65	14.2	18.8	26.1
	Over 80	*2.4*	*3.5*	*6.8*
Northern Europe	Over 65	15.8	20.1	23.9
	Over 80	*4.3*	*5.4*	*8.9*
Southern Europe	Over 65	17.5	22.8	32.5
	Over 80	*4.1*	*6.5*	*12.1*
Western Europe	Over 65	17.4	23.1	27.7
	Over 80	*4.4*	*6.7*	*11.5*
Japan	Over 65	19.7	29.1	35.9
	Over 80	*4.8*	*10.6*	*15.3*
Australia/New Zealand	Over 65	12.6	19.0	23.7
	Over 80	*3.4*	*4.7*	*8.7*
USA/Canada	Over 65	12.4	18.0	21.1
	Over 80	*3.6*	*4.2*	7.5

The standard health care use profile was applied to the population projections for each region for the years 2005 to 2050 to obtain the number of health care utilization units required at in each time period. The results indicated that more health care will be needed as time progresses in all areas apart from eastern Europe, which is unsurprising due to the higher proportion of elderly in each region. For eastern Europe the amount of health care needed is fairly stable, because the increasing ageing population is projected to be balanced by a reduction in the total population.

The number of human resources working in the health sector in 2005 was estimated to be 23.8 million in Europe, 4.3 million in Japan, 16.4 million in North America and 0.9 million in Australia/New Zealand. Taking the ratio of health workers to utilization units in 2005 and calculating the number of workers needed in the other years to maintain this ratio, the number of workers required increases. The increase in Europe is the smallest, with an increase of 23% needed in the resources needed to maintain the current ratio of health care workers to health care use between 2005 and 2050. This hides some major disparities between the regions. In eastern Europe the number of health workers needed increases by only 0.9% between 2005 and 2015, while in the other three regions the numbers increase by about 35%. Japan requires an increase of 34% over the same period. North America and Australia/New Zealand show much larger increases, with the percentage rise estimated at 66% and 84%, respectively. The actual numbers of health workers needed in different years are shown in Table 4.

Table 4. Projected number of health care workers required to maintain current levels of care

	Health care workers ('000's)			
	2005	**2015**	**2025**	**2050**
Eastern Europe	7891	7892	7937	7964
Northern Europe	3198	4232	4612	5460
Southern Europe	4553	5000	5315	6190
Western Europe	7450	8191	8815	10 135
Japan	4318	4990	5508	5792
Australia/New Zealand	910	1067	1250	1675
USA/Canada	17 143	19 411	22 249	28 887

The proportion of the active population who are health care workers is similar in Japan and Australia/New Zealand, with 7.0% and 7.5%, respectively. In Europe, the northern and western regions have more than 8% of the active population in health care, while in the eastern and southern regions the percentage is 5.6% and 6.8%, respectively. In North America the corresponding figure is 10.2%. Due to the changing demographic profile in the different regions under analysis, with a vastly increasing number of over-65-year-olds, if the proportion of people in the workforce who work in the health sector remains constant, there will be a drop in the ratio of health workers to citizens over 65 years of age. Table 5 shows the percentage fall in the ratio of health workers to over-65s for a selection of years until 2050 in each of the regions.

Table 5. Percentage decrease in ratio of health workers to over-65s (assuming that the proportion of the active population who are health workers remains constant)

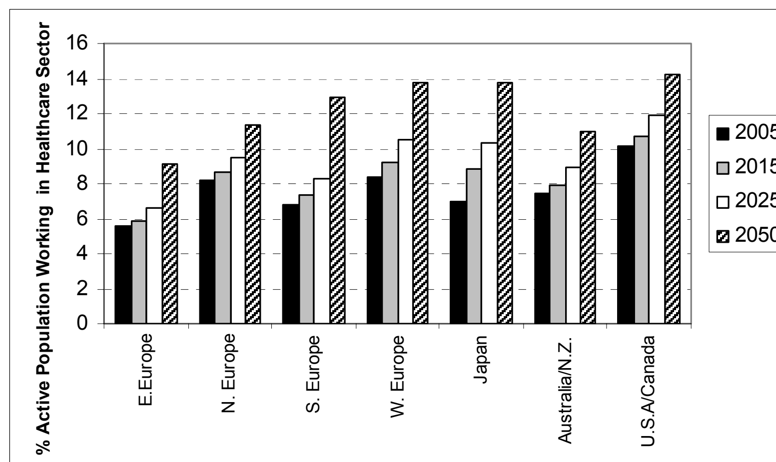
	Percentage decrease in ratio compared to 2005 (%)		
	2015	**2025**	**2050**
Eastern Europe	2.6	29.1	55.7
Northern Europe	13.6	25.1	40.0
Southern Europe	10.7	26.8	58.6
Western Europe	12.9	30.2	47.9
Japan	30.0	39.5	56.9
Australia/New Zealand	18.7	37.0	51.3
USA/Canada	15.5	36.0	47.2

The proportion of economically active workers is projected to grow in Japan and Australia/New Zealand, but to fall marginally in Europe and North America. Europe has the lowest level of 15- to 64-year-olds currently active, with 69.4%, while the United States of America and Canada have the highest proportion, with 74.6%. The proportion of the economically active population who work in the health sector will need to rise dramatically in order to maintain current levels of care. It is estimated that in Japan by 2025, 10.3% of the active population will need to be health workers to maintain the current levels of care. By 2050 this figure is 13.8%. In the three other regions the increases are not as large, although still substantial (Table 6). The changing proportion of the active population needed to work in the health sector is also shown in Figure 1.

Table 6. Projections of the percentage of economically active people needed to be health workers to maintain current levels of care

	Health care workers ('000's)			
	2005	**2015**	**2025**	**2050**
Eastern Europe	5.55%	5.82%	6.61%	9.13%
Northern Europe	8.20%	8.64%	9.45%	11.31%
Southern Europe	6.83%	7.38%	8.33%	12.91%
Western Europe	8.42%	9.22%	10.50%	13.80%
Japan	6.99%	8.83%	10.32%	13.75%
Australia/New Zealand	7.48%	7.94%	8.96%	10.96%
USA/Canada	10.17%	10.71%	11.94%	14.22%

Figure 1. Percentage of the active population needed to work in the health sector by year and region



Sensitivity analysis

The results above are predicated on a number of assumptions. The predictions were tested for sensitivity to changes to these assumptions. The changes to the assumptions included:

- different fertility projections;
- different health care utilization ratios (the difference between ages in the utilization of health care is reduced, giving a "conservative" estimate of health care required);
- health care utilization changing over time to account for healthy ageing;
- assuming that growth in the need for health care follows past trends;
- increased growth in the active population over time.

The following tables for each region show the changes to the estimates if different fertility assumptions are made (following the "low" and "high" estimates of the United Nations population projection 2004 revision (Table 7)). Also shown is the use of the conservative estimate of utilization, which halves the differences in utilization between ages. Figure 2 shows the difference in the projected number of health care workers required for all of Europe and the United States of America/Canada between the full and conservative estimates for health care use.

Table 7. Percentage of active population needed under various assumptions

Eastern Europe	2005	2015	2025	2050
Medium	5.55	5.82	6.61	9.13
Low	5.55	5.82	6.72	11.04
High	5.55	5.82	6.51	7.72
Conservative	5.55	5.74	6.39	8.40

Northern Europe	2005	2015	2025	2050
Medium	8.20	8.63	9.45	11.31
Low	8.20	8.63	9.57	13.03
High	8.20	8.63	9.34	9.96
Conservative	8.20	8.51	9.18	10.61

Southern Europe	2005	2015	2025	2050
Medium	6.83	7.38	8.33	12.91
Low	6.83	7.38	8.44	15.19
High	6.83	7.38	8.21	11.19
Conservative	6.83	7.20	7.97	11.72

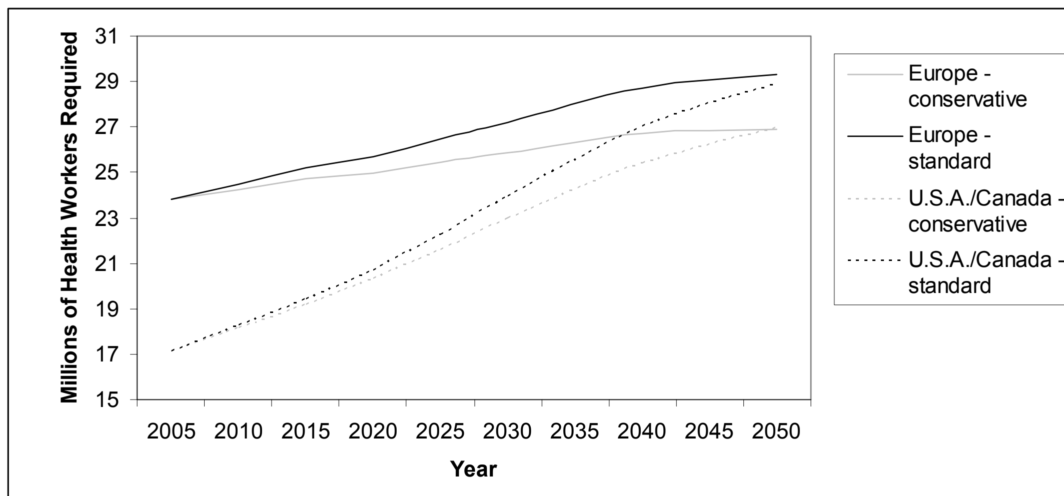
Western Europe	2005	2015	2025	2050
Medium	8.42	9.22	10.50	13.80
Low	8.42	9.22	10.63	15.91
High	8.42	9.22	10.38	12.19
Conservative	8.42	9.01	10.08	12.74

Japan	2005	2015	2025	2050
Medium	6.99	8.83	10.32	13.75
Low	6.99	8.83	10.47	16.24
High	6.99	8.83	10.18	11.90
Conservative	6.99	8.50	9.64	12.42

North America	2005	2015	2025	2050
Medium	10.17	10.71	11.94	14.22
Low	10.17	10.71	12.08	16.28
High	10.17	10.71	11.81	12.57
Conservative	10.17	10.59	11.59	13.28

Australia/New Zealand	2005	2015	2025	2050
Medium	7.48	7.94	8.96	10.96
Low	7.48	7.94	9.06	12.48
High	7.48	7.94	8.86	9.75
Conservative	7.48	7.78	8.59	10.05

Figure 2. Projected number of health care workers required in 2005–2050 for Europe and North America: different health care utilization profiles used



Discussion

This analysis raises some important issues regarding the provision of health care in the first half of the 21st century. The method used to estimate the increase in health workers needed is simplistic, with many alternative drivers of health care requirements omitted. These alternative drivers were excluded in order to identify the influence of a factor that can be fairly accurately be modelled in the short term, namely demographic change. This was conducted in order to isolate the demographic effect and to highlight the need to look at the impact and the effect of health care on other systems, as opposed to analysing the impact in isolation.

It is simple to conclude that larger numbers of health workers are required to meet increasing demand for health care from the escalating numbers of elderly in the various regions of the world. Arguments could be made that healthy ageing and technological advancement may mitigate the increase in demand somewhat, and further studies are required to investigate this. However, assuming that there is an increase in workers required, this must be placed in the context of a shrinking or only slowly growing active population. It is therefore likely to prove difficult to recruit these health workers. The situation is exacerbated by the current age profile of the health workforce, with many current health workers close to retirement. So the percentage of new entrants into the workforce who will need to be recruited to meet demand will be higher than the actual percentage of workers indicated above.

The purpose of this paper is not to present a definitive picture of health worker requirements up to 2050, but only to study the potential demographic impact. However, this analysis can provide the basis upon which many scenarios can be based to present alternative plausible outcomes of the effect of the ageing population on health care requirements. Future health care requirements must be considered as a priority for governments in countries in which the proportion of the elderly is quickly rising. This must be conducted with reference to other systems that will influence the availability of health care workers.

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