The impact of ageing on expenditures in the National Health Service

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Abstract

Background: health policy makers in many countries have expressed concern over the pressures that increased numbers of older people will exert on health care costs. Previous studies have shown that, in addition to increasing size of older populations, per capita expenditures have risen disproportionately among the old compared to the middle age groups. Documentation of such trends is essential for more accurate projection of health expenditures.

Objective: we examined detailed national age-specific expenditure trends for England and Wales, comparing findings with Canada, Japan, and Australia.

Methods: we obtained total health expenditures for each age group from the UK Department of Health for time periods 1985–87 to 1996–99. We examined changes in age-specific per capita expenditure, population demographics, and the allocation of national expenditures to the different age groups. We then determined the association of changes in population, age structure, and age-specific per capita expenditure to increases in national health care expenditure for England and Wales, comparing results to Canada, Japan, and Australia.

Results: per capita health expenditures in England and Wales increased by 8% for ages 65 and over, compared to 31% for ages 5–64. Hence the proportion of total expenditures allocated to the population aged 65 and over decreased from 40% to 35%, a trend most noticeable for non-acute hospital costs. Demographic shifts and population growth accounted for only 18% of the observed increases in health care expenditures in England and Wales, compared to 68%, 44%, and 34% in Japan, Canada, and Australia respectively.

Conclusions: in contrast to other countries, England and Wales had slower rises in per capita costs and a decreasing proportion of national expenditures allocated to older people. These differences invite future research into the actual demand drivers of these costs.

Keywords: health expenditures, aging, demographic trends

Introduction

Health policy makers in many countries have expressed concern over the pressures that ageing populations will exert on rising health care costs [1]. However, of many cross-national studies that have examined the determinants of health care expenditures in developed countries, only one found the age structure of the population (usually measured by the percentage of population over age 65) to be a consistently significant explanatory variable alongside the effects of income, lifestyle characteristics, and environmental factors [2–10].

In order to examine more closely the influence of population demographics on health expenditures within particular countries, researchers have plotted health service use and/or cost against age, and used the resulting age-use and age-cost curves to quantify the relationship between age and utilisation or cost. Applying these utilisation and cost patterns to demographic structures over time enables calculation of the impact of changing demographics on health care utilisation and cost. Most studies employing this approach, however, have in fact found the effects of aging on health care costs to be marginal, ranging from 0.3% to 0.8% annual expenditure growth [11–13].

However, in determining the effect of demographics on health care expenditure, it is also important to recognise that age-specific utilisation patterns change among the different age groups over time. Accounting for such utilisation alterations will provide for more accurate expenditure projections. Several national studies have begun to look at the age-cost relationship in a time series manner, and have consistently shown that expenditures have increased disproportionately.
among the very young and the very old in comparison to those in the middle age groups [12, 14–17]. Additionally, examination of available data from the Organisation of Economic Cooperation and Development (OECD) shows that, in developed countries, per capita costs for populations aged 65 and over have generally increased at the same rate or more rapidly than among those under age 65. The UK is the only OECD country with available data that does not fit into this pattern, having a disproportionately smaller increase in per capita costs for the older age groups compared to the younger age groups (Figure 1).

Is the UK truly an exception in the trends of health care costs for the older age groups? This study used more detailed data on age-specific National Health Service (NHS) expenditures in England and Wales to analyse cost trends among the different age groups over time. Findings for England and Wales were then compared with similar detailed data from Canada, Japan, and Australia, to determine the relative contribution of population growth, demographic changes, and per capita expenditure changes to observed increases in the national health care expenditures of these countries from the 1980s to 1990s.

**Methods**

Data were collected from the Department of Health for the two main components of NHS care, Hospital and Community Health Services (HCHS), and Family Health Services (FHS). For overall HCHS expenditures, the Department of Health provided per capita expenditure figures for seven age groups, from the years 1980–81 to 1998–99. These data were derived from two different sets of expenditure figures collected from the various Trusts and Health Authorities in England and Wales, and divided into age groups using age-specific activity figures from the Department of Health. Expenditure figures for individual sectors of HCHS services were available for a limited number of fiscal years, 1986–87 and 1993–94 to 1998–99. The Family Health Services programme budget was provided from 1975 to the present, but no age-specific breakdown was directly available. Instead, we used the General Household Survey (GHS), a survey distributed throughout Great Britain via face-to-face interview by the Office of National Statistics, to calculate the distribution of General Practitioner consultations by age of GHS respondent. We then used this distribution to model FHS expenditure distribution by age group, assuming that the age-specific pattern of GP consultations, whose costs (including prescriptions) account for 86% of total FHS expenditures, approximates the distribution of all FHS services.

Age-specific expenditure figures were averaged over the time periods 1985–87 and 1996–99 to reduce the effect of year-to-year fluctuations. Mid-year population figures for England and Wales from the Office of National Statistics, based on 1991 census data, were similarly manipulated to determine demographic changes. To enable comparisons across years, all cost figures were brought to 1998–99 prices using HCHS deflators provided by the Department of Health. The ratio of per capita expenditures for age group 65 and over versus age group 5–64 was calculated to

![Figure 1](image.png)

**Figure 1.** Time trends in per capita expenditure for the 65 and older age group versus the under 65 age group, OECD data.
assess the relative changes in these age-specific costs over time.

Comparable national age-specific health expenditures over time were also obtained from the departments of health of Japan, Canada, and Australia, and costs were examined for 12-year time periods that matched as closely as possible with that used for the England and Wales analysis (Table 1). Following the methodology of previous studies, we determined for each country the association of changes in population, age structure, and age-specific per capita expenditure to increases in national health care expenditure [13, 14, 18, 19].

Results

National expenditure and population trends

Holding prices constant at 1998–99 (£), NHS expenditures for England and Wales for both HCHS and FHS increased from £25.5 billion in 1985–1987 to £32.7 billion in 1996–99, a 28% increase in real terms (Table 2). England and Wales experienced a 4.3% increase in its total population during this period, from 47 million to 49 million. The population aged 65 and over experienced a 6% increase, but over time the portion of the population in the older age groups stayed relatively constant, increasing slightly from 15.5% to 15.7%. Within the older population, however, there was a demographic shift over time, with a rise in the proportion of oldest old (age 85 and over) and a corresponding decrease in proportion of youngest old (age 65–74).

Per capita expenditures by age group

As can be seen in the age-cost curves (Table 2, Figure 2), the old and the young were higher cost patients than the middle age groups, particularly for HCHS per capita costs. The composition of NHS costs were also slightly different among age groups, with HCHS costs comprising 84% of combined expenditure for those aged 65 and over, compared to 68% and 66% of combined costs for those aged 0–4 and 5–64, respectively. Within the older age groups as well, costs were more concentrated in HCHS in the oldest old, at 94% of combined costs for age group 85 and over, compared to 77% of combined costs for age group 65–74.

Changes in age-cost patterns over time

Combined NHS per capita expenditure did not exhibit the previously documented time trend of larger cost increases in the older age groups as compared to the middle age groups (Table 2, Figure 2). Instead, the middle age groups had increases in their per capita costs while the oldest old had a decrease, and the next oldest age group had almost no change. As a result, the traditional U-shape of the age-cost curve, with the very young and very old having the highest per capita costs, became slightly more shallow over time, as the per capita costs of the oldest age group decreased while the costs of the middle age groups rose. Unfortunately, the Department of Health programme budget does not permit separation of these cost changes into changes in cost per day versus changes in length of stay, since length of stay was used to allocate the programme budget costs to each population age group.

The trend in combined NHS expenditures was mainly influenced by the pattern of changes in HCHS expenditures, where older populations had a decrease in per capita costs over time compared to an increase in the costs of the middle age populations. FHS expenditures exhibited the predicted trend of a steepening of the age-cost curve, although the shape of the curve was less pronounced than that for HCHS expenditures. Breakdown of HCHS services into acute care (acute inpatient and outpatient) and non-acute care (all other HCHS services) revealed that the age-cost curve for acute care steepened, while the curve of non-acute care did not. In turn, the change in acute costs was wholly due to a steepening of the age-cost curve for acute inpatient costs.

Turning to the ratio of per capita expenditure in the older ages versus the middle ages, it can be seen that a person from the older age group had up to 5 times the average per capita cost as someone from the middle age group. However, the ratios decreased over time, most noticeably for HCHS expenditures, because of the slower rise in costs in the older age groups (Table 2).

Distribution of national expenditures across age groups

The combined effects of demographic and age-specific cost changes over time led to a shifting of health expenditures in England and Wales away from the

<table>
<thead>
<tr>
<th>Sector covered</th>
<th>Japan</th>
<th>Canada</th>
<th>Australia</th>
<th>England and Wales</th>
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<tr>
<td>Inpatient service fees</td>
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<tr>
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<td>✓</td>
<td>x</td>
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<td>✓</td>
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<td>Drug costs</td>
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older age groups and toward the middle age groups. In 1985–87, there was a noticeable concentration of expenditures in people aged 65 and over, who made up 15.5% of the population but consumed 40.2% of total health services. However, by 1996–99 this proportion had fallen to 35.6%, shifting instead towards increased expenditure allocation for the middle age groups. Looking at HCHS and FHS costs separately,
one can see opposite expenditure allocation patterns; where the proportion of HCHS expenditures devoted to a particular age group increased over time, the proportion of FHS expenditures to that age group usually decreased, and vice versa (Table 3).

### Components of the rise in health expenditures 1985–87 to 1996–99

Due to the stable age structure of the population, only 3% of the growth of health expenditures between 1985–87 and 1996–99 in England and Wales were related to demographic shift. There was also relatively little effect of population growth in the time period, compared to the very large increases in per capita costs, which contributed to an overwhelming 78% of the rise in health care costs in the time period.

### International comparisons

A comparison with Japan, Canada, and Australia demonstrates that the experiences of these countries are quite different to England and Wales. While per capita costs for the 65 and over age group rose by 8% in England and Wales—a rate slower than that of the middle age groups—per capita cost increases in Japan, Canada, and Australia were larger in the 65 and over age group, at 12%, 20%, and 56% respectively (Figure 3). Hence, the proportion of national expenditures devoted to the population aged 65 and over increased in all of these countries, from 36–46% in Japan, 34–39% in Canada, and 20–25% in Australia. Additionally, all three countries had larger proportions of their national health expenditure changes predicted by demographic shift and population growth, at 68% of the observed increase for Japan, 44% for Canada, and 34% for

### Table 3. Distribution of health expenditures across age groups

| Among total population | 0–4 | 5–15 | 16–44 | 45–64 | 65–74 | 75–84 | 85+ | Among older ages | 65–74 | 75–84 | 85+
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</thead>
<tbody>
<tr>
<td>% of combined NHS expenditure</td>
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<td></td>
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</tr>
<tr>
<td>1985–87</td>
<td>6.4</td>
<td>7.4</td>
<td>26.1</td>
<td>19.7</td>
<td>16.0</td>
<td>17.6</td>
<td>6.7</td>
<td>39.8</td>
<td>43.6</td>
<td>16.6</td>
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<td>7.9</td>
<td>6.1</td>
<td>28.6</td>
<td>21.9</td>
<td>13.7</td>
<td>14.5</td>
<td>7.3</td>
<td>38.6</td>
<td>40.8</td>
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<td>2.4</td>
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<td>−3.0</td>
<td>0.7</td>
<td>−1.2</td>
<td>−2.8</td>
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<td>% of HCHS expenditure</td>
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<td>6.2</td>
<td>22.2</td>
<td>19.1</td>
<td>17.8</td>
<td>21.2</td>
<td>8.4</td>
<td>37.5</td>
<td>44.7</td>
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<td>20.4</td>
<td>14.7</td>
<td>17.0</td>
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<td>35.7</td>
<td>41.2</td>
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<td>3.6</td>
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<td>−4.2</td>
<td>1.1</td>
<td>−1.9</td>
<td>−3.5</td>
<td>5.3</td>
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<tr>
<td>% of FHS expenditure</td>
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<td></td>
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<tr>
<td>1985–87</td>
<td>10.3</td>
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<td>36.9</td>
<td>21.5</td>
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<td>54.5</td>
<td>36.7</td>
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<tr>
<td>1996–99</td>
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<td>1.8</td>
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</table>

**Figure 3.** Percentage change in per capita costs by age group.
Australia (Figure 4). One common pattern among the countries, however, was a shift over time away from inpatient care for those aged 65 and over; in England and Wales, HCHS dropped from 86% of per capita cost to 84%, paralleling drops in Japan (from 57–51%) and Canada (from 52–48%).

Discussion

In contrast to the findings of previous studies, this analysis of health expenditure data has found that in England and Wales the high cost older age groups did not have larger increases in their medical costs than the middle age groups. In fact, for combined NHS expenditures and for HCHS expenditures, the oldest old had decreases in their real per capita costs, while the other age groups experienced real cost increases. Coupled with a stable demographic structure, this pattern of per capita expenditure changes led to a decrease in the proportion of national health care expenditures allocated to the older age groups over time. However, it is interesting to note that this levelling out of expenditure allocation among the age groups is primarily due to the shifting of costs away from the older populations for non-acute hospital care. FHS costs and acute inpatient care still demonstrated steepening of the age-cost curves, such that the older ages had larger increases in costs than the middle age groups.

The different patterns of change for age-specific health care costs among the health care sectors may reflect differing health service needs of the age groups. For instance, the continued disproportionate cost increases among older populations for services such as acute inpatient care may reflect an increased need among those age groups for hospital treatment, while acute outpatient services may not demonstrate as consistent a relationship between need for care and patient age. It is also possible that the different health care sectors have employed different patient management schemes, whereby cost-controlling measures have kept down costs for non-acute care of older populations, but have not impacted on acute inpatient or GP care. Also of concern is the possibility of decreased access to care for older patients. A preliminary study has demonstrated significantly decreased rates of exercise tolerance tests and coronary angiographies, but similar rates of coronary artery bypass grafts, for older patients compared to younger patients with similar clinical need [20].

There may also be increased shifting of older patients from non-acute HCHS care into other social care settings, including residential and nursing home accommodation. Data from Laing and Buisson (1999) in fact demonstrate that from 1988 to 1998, the market value of the nursing and residential care sector for older populations has increased by 43%, from £5.1 billion to £7.3 billion, while the value of long stay hospital care in the NHS decreased by 52%, from £2.2 billion to £1.1 billion (holding prices constant at 1998–99 (£)) [21]. Undoubtedly some service substitution out of the NHS into other sectors has occurred; unfortunately, national expenditure data on long term care is not readily available for international comparisons. The counteracting patterns of HCHS and FHS expenditure distribution over time—such that an increase in HCHS expenditure concentration in one age group in the population is countered by a decrease in concentration of FHS expenditures in that age group, and vice versa—may also be indicative of service substitution.
Are the trends on aging and health care expenditures seen in England and Wales mirrored in other countries? The comparison of demographic and expenditure time trends in Japan, Canada, and Australia undertaken here reveals that England and Wales may be the exception rather than the rule. These other countries had much larger associations of demographic shift and population growth with changes in national health expenditure over time than England and Wales. Additionally, all three demonstrated much more pronounced increases in per capita expenditures in the older age groups than the UK. Such findings point to differences in the cost pressures facing health care systems of different countries, and also call into question potential differences in policy and clinical practice in treating older populations.

The data presented on patterns of age-specific expenditure over time, in conjunction with information on population demographic trends and changes in age-specific morbidity, can more accurately project changes in national health care expenditure for England and Wales in the coming decades. However, the differential changes in costs for older populations over time across countries prompt the question of the actual driving forces of health care costs in this age group. In particular, several studies have asserted that the observed relationship between health expenditure and age can be partly explained by the concentration of health expenditures in the period immediately prior to death [22–26]. Hence, the higher health costs associated with older populations may not be due to age per se, but rather due to increasing proximity of death at the older ages. More research is needed in this area to provide a stronger theoretical framework for the effect of age on health care demand.

Key points

- In England and Wales, the population aged 65 and over have per capita health expenditures that are three times higher than expenditures for the population aged 5–64.
- In recent decades, these per capita costs have risen more slowly in older age groups than in middle age groups, with the exception of acute inpatient services and family health services.
- As a result, the proportion of national expenditures allocated to the population aged 65 and over decreased from 40–35% between 1986 and 1999, and changes in population size and demographic structure have only contributed to 18% of observed increases in health expenditures in this time period.
- This finding directly contrasts with similar data in Canada, Japan, and Australia—where the older populations have had the most rapid rises in health care costs—indicating possible differences in patient management and access to care for older patients across these countries.

- Analysing time trends in age-specific per capita expenditure can provide data for more accurate projections of future health care expenditures, but additional research into the actual demand drivers of health care costs for the aged is needed.

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References


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