Health Costs, Innovation and Ageing

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Peter Sheehan

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Centre for Strategic Economic Studies
Victoria University of Technology
PO Box 14428 Melbourne City MC VIC 8001 Australia
Telephone +613 9248 1340
Fax +613 9248 1350

Email: csesinfo@vu.edu.au
Website: http://www.cfses.com

Introduction

Effective innovation in health care – whether in drugs, devices, procedures or in public health processes – continues to produce major improvements in human welfare. The health of the citizens of the major developed countries has improved markedly in recent decades, and this is true also of Australia. For both men and women, age-standardised death rates have fallen rapidly in Australia over the past two decades. Life expectancy has increased, as deaths from heart and respiratory diseases have declined sharply and methods for treating cancer have improved. This improvement has been particularly striking for men, for whom age standardised death rates fell by 35.7% between 1981 and 2000, nearly as much as they did in the six decades from 1921 to 1981. The decline in death rates has if anything accelerated in recent years, falling 10% for men and 8.8% for women between 1997 and 2000 (AIHW 2002).

Debates about Australian health issues often take place in an atmosphere of crisis, and there are indeed real problems to address. But it is worth recalling that, among developed countries, the Australian health system delivers better than average outcomes at or below average costs. In 1997, age standardised death rates for men were lower than in all OECD countries other than Japan, while for women they were lower than in all OECD countries other than Japan and France (AIHW 2002). Total Australian health expenditure, at 9% of GDP in 2000-01, is at about the average of the major countries excluding the USA, and below the average if the USA is included. In part these good outcomes with moderate costs reflect the relatively equitable nature of the Australian system, apart from the continuing tragedy of aboriginal health.

While there can be no doubt about the overall economic and social benefits of innovation in health, the effect of that innovation on health costs is more complex. Some innovations lead to better health and to lower costs, either directly or indirectly, while others produce better outcomes at additional net cost. For example, some drugs, perhaps such as anticoagulant therapy, lower health costs in the fairly short-term, because they are cheap relative to the costs of the conditions that they delay or prevent. Some others, such as anti-hypertensive drugs, increase health costs in the short term but can reduce them substantially in the longer term. Others again, such perhaps as widely administered cholesterol lowering agents, undoubtedly reduce costs in the long term but probably not enough to generate a net reduction in overall health costs. Finally, many drugs increase human welfare but at the price of an unambiguous increase in health costs (Kleinke 2001).

In these circumstances it is difficult to be clear about the impact of accelerating innovation in health care on long-term health costs. The process of ageing that is taking place in many developed countries, and that will continue over the next decades, further clouds the

situation. Per capita health costs increase with age, especially over about 50 years of age, so that ageing is widely expected to add to health costs. On this basis there seems to be a growing consensus that health costs will increase rapidly as a share of GDP in many countries over the next few decades. In some cases measures are being taken to stop this occurring, or to contain the extent of the increase. Such measures were a central feature of the 2002-03 Australian Budget. The Commonwealth Government's *Intergenerational Report* highlighted health costs, and particularly drug costs, as the main threat to the long-term budget position, and a range of initiatives were implemented to meet this threat.

The national and international discussion to date about future health costs places great emphasis on the costs of both innovation and ageing, but little emphasis on the cost benefits of innovation, both in general and in reducing the costs to be borne by health systems as a result of ageing. This paper looks, in a very preliminary fashion, at the links between innovation, ageing and the future trend in health costs.

1. The Rotation from Labour to Technology in Health

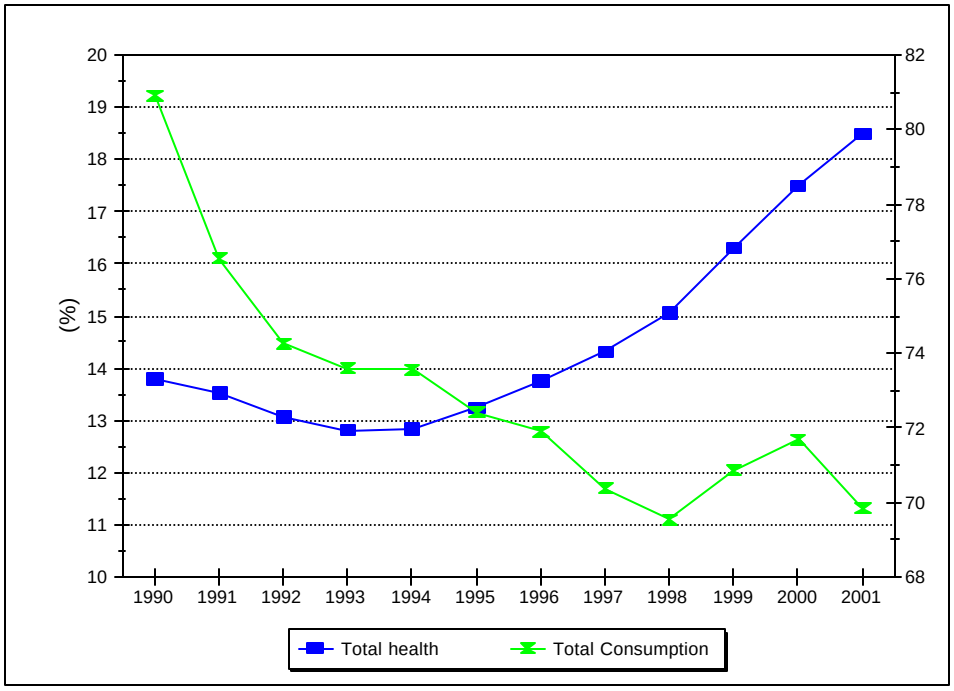
It is widely acknowledged that the health sector is in a period of radical innovation. These changes are generating what Kleinke (2001) refers to as a systematic rotation from medical labour to medical technology, from labour to capital. While the trends are obscured by many other factors, it seems clear that we are experiencing a rapid shift from reliance on labour intensive procedures to a much greater reliance on technology, as embodied in drugs, equipment and procedures. This basic shift has been occurring for a long time, but it has accelerated markedly over the past decade.

In the economy as a whole, powerful forces are driving a shift from goods to services, from goods producing to service industries. Notable among these are the concentration of productivity gains from new process technologies in the goods industries, the resulting rising price of labour relative to that of goods, and the increasing consumer preference for services as incomes rise. But the pattern in health is different, with radical technological innovation leading to a shift in spending in health towards goods from services, in contrast both to the earlier trends in health care and to broader trends in consumer spending.

One illustration of these trends is given in Chart 1, which shows the ratio of goods to services consumer spending on medical services for the USA since 1990, together with the same ratio for consumer spending as a whole. Medical services have been a classic services industry, with spending on goods being less than 12% of spending on services in 1990, by comparison with 74% for consumer spending as a whole. But trends during the 1990s have been very different. Whereas the ratio of goods to services continued to fall for total consumer spending, falling from 81% in 1990 to less than 70% in 2001, the ratio rose

significantly for medical services after 1993. This simple fact brings out the extent of the difference between health and other sectors over the past decade.

Chart 1. Ratio of spending on goods to spending on services, medical mervices and total consumer spending, USA, 1990-2001



Source: US National Accounts and OECD (2002).

Behind these changes, of course, lie major scientific advances and the R&D effort that has been under way to convert them into new products. As noted elsewhere, R&D spending by drug companies in USA and Europe leapt to US$40 billion in 2002, up from only US$15.4 billion in 1990. Many new drugs have become available over the past decade, and the next decade or so will see the pace of change in health care step up further, driven by growth in new drugs and therapies. Thus this rotation from medical labour to medical technology, from labour to capital, is likely to be a continuing factor over the next decade or so.

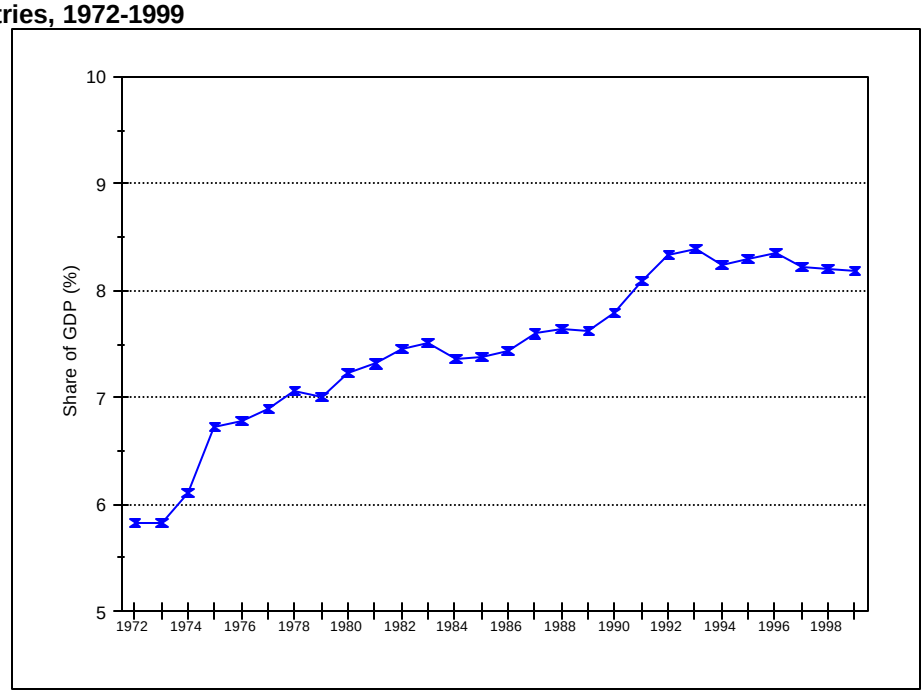
2. Projecting Health Costs – The New Consensus?

In the past few years there seems to have been a consensus emerging in many countries that the next few decades will see a major increase in health costs as a share of GDP, and policy initiatives are beginning to be taken as a result of this perception. For example, in Australia the Commonwealth Government (2002) released with the 2002-03 Budget a document entitled *Intergenerational Report*, which examined the impact of ageing and other factors on Commonwealth Government finances over the longer term. It found that, in the absence

of policy change, Government expenditure would need to rise by about 5% of GDP by 2040, almost entirely because of increases in health costs. As a result the Government proposed an increase in pharmaceutical co-payments and other measures to reduce the cost of drugs.

In the UK, the 2002-03 budget was associated with the release of the *Wanless Report* (Wanless 2002) on the future of the National Health Service. The Report concluded that, if the UK was to have a high quality health system by international standards, total health spending as a share of GDP would need to rise from about 7.5% in 2000-01 to between 10.5% and 12.5% of GDP by 2022-23. As a result, taxes were increased in the 2002-03 budget to fund substantial increases in health spending. In the USA, the latest projections from the Centers for Medicare and Medicaid Services suggest that national health expenditure as a share of GDP in the USA will rise from 13.2% in 2002 to 17.0% in 2011. Thai Than Dang et al. (2001) review projections for a broader range of countries, to a similar effect.

Chart 2. Health spending as a share of GDP, unweighted average of twenty OECD countries, 1972-1999



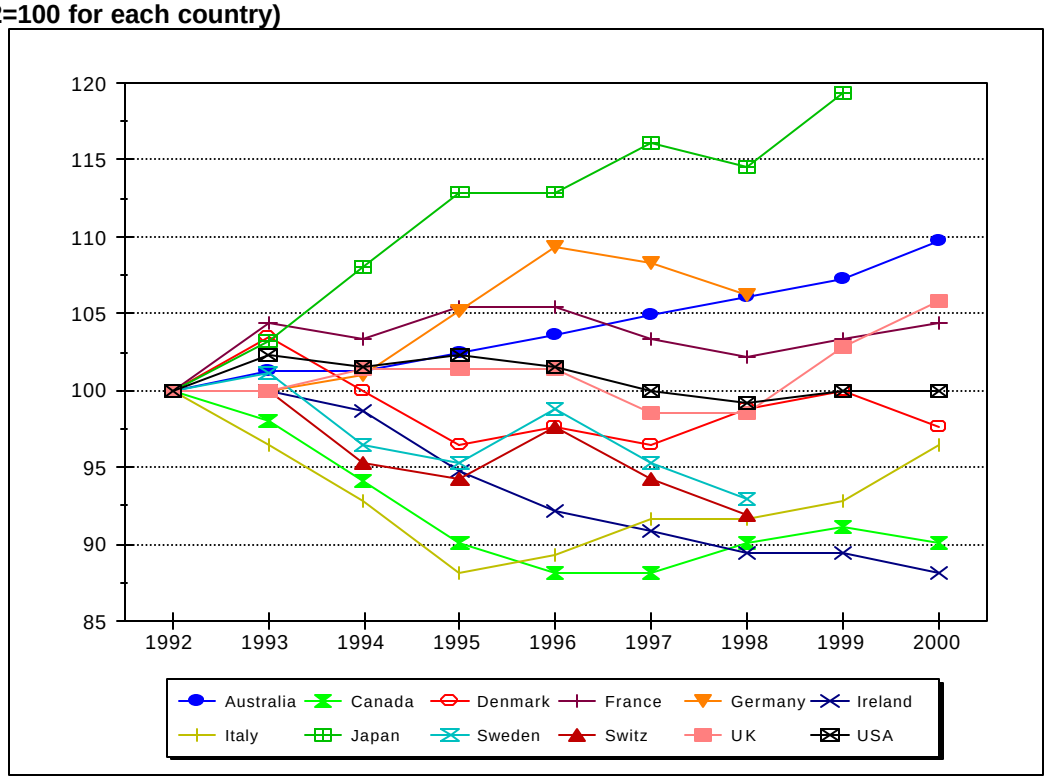
Source: OECD (2002) and AIHW(2002); only 17 countries available for 1999.

One puzzling aspect of the emerging consensus about increasing health costs driven by innovation and ageing is that there is little evidence that these factors generated increasing health costs, as a share of GDP, in the 1990s. Chart 2 shows the unweighted average, for 20 OECD countries, of total health expenditure as a share of GDP. After rising from less that 6% in the early 1970s to 8.3% by 1992, this average was effectively stable after 1992.

There is no indication here of a secular upward shift of health spending as a share of GDP in the 1990s, such as might justify the consensus about rising health costs. The chart also reminds us that movements in the ratio of health expenditure to GDP can as much reflect changes in GDP as in health spending, with the increases in the ratio in the recessions the early 1970s and the early 1990s being particularly noticeable. One of the main features of health spending appears to be a relative invariance to cyclical fluctuations in the economy. Thus the stability of the ratio during the period since 1992 can be partly ascribed to the strong economic growth in most countries over that time.

Chart 3 provides an individual country approach to this matter, showing health expenditure as a share of GDP (expressed as an index, 1992 = 100) for 12 OECD countries from 1992 to 1999. It shows no overall trend over this period, with some countries increasing and others falling. Six countries including Australia had (or were likely to have had) lower health spending by this measure in 2000 than in 1992; one (USA) had the same level in both years and five had (or were likely to have had) high levels. The biggest increase is to be found in Japan, which must in part reflect the continuing recession in that country during much of the 1990s. The biggest fall was in Ireland, by far the most rapidly growing of the 12 countries over this time.

Chart 3. Health spending as a share of GDP, 12 OECD countries, 1992-2000 (index 1992=100 for each country)

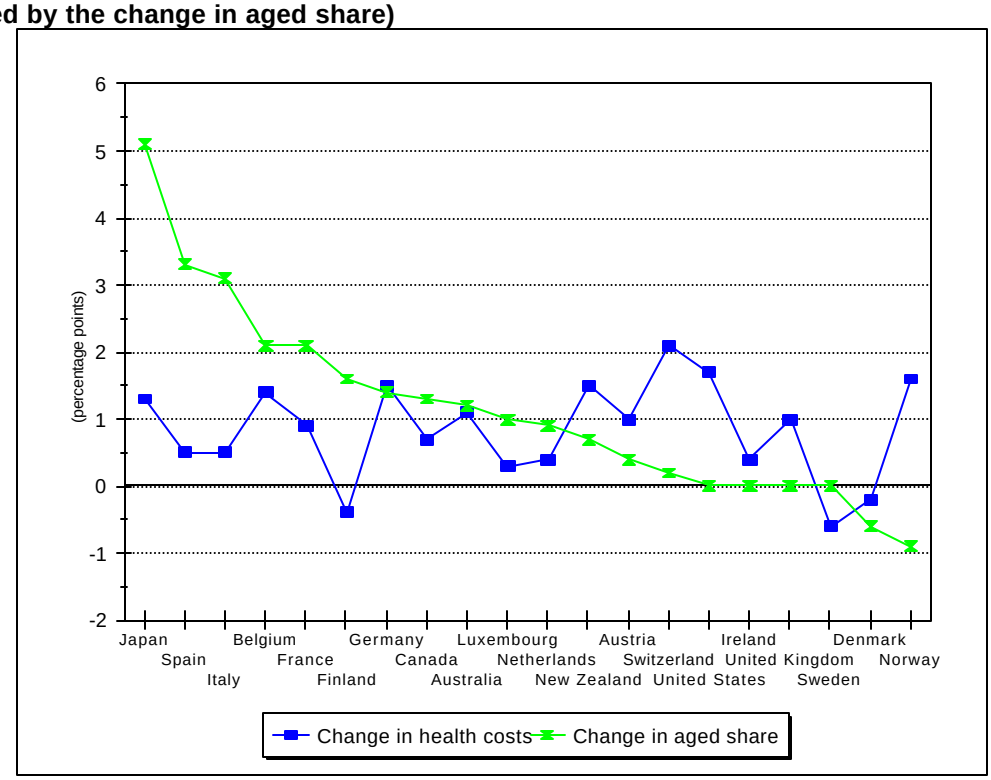


Source: OECD (2002).

One of the purported reasons for expecting increasing health costs is the ageing of the population. But there is an extensive literature casting doubt on this proposition, and ageing has been taking place in many OECD countries for some time. One simple way of looking at this issue is again to look at the aggregate data. Chart 4 shows, for the same 20 countries as included in Chart 2 over the period 1989-99, the change in health spending as a share of GDP and the extent of ageing of the population, as measured by the increase in the share of persons aged 65 years and over in the total population. In each case the figures shown are changes, measured in terms of percentage points. The country observations are sorted from left to right in terms of the extent of ageing, that is in terms of the increase in the share of the 65 years and over group in the total population.

For fourteen of the twenty countries there was population ageing by this measure, and only in Denmark and Norway did the 65 years and over share fall. There is, however, no evidence of any correlation between the two variables (correlation coefficient 0.04). The five countries with the greatest degree of ageing had about the average increase in health spending, while the country where the aged share fell most (Norway) had one of the biggest increases in the share of health spending in GDP.

Chart 4. Change in health spending (as a share of GDP) and in the proportion of the population over 65 Years, selected OECD countries, 1989-1999 (sorted by the change in aged share)

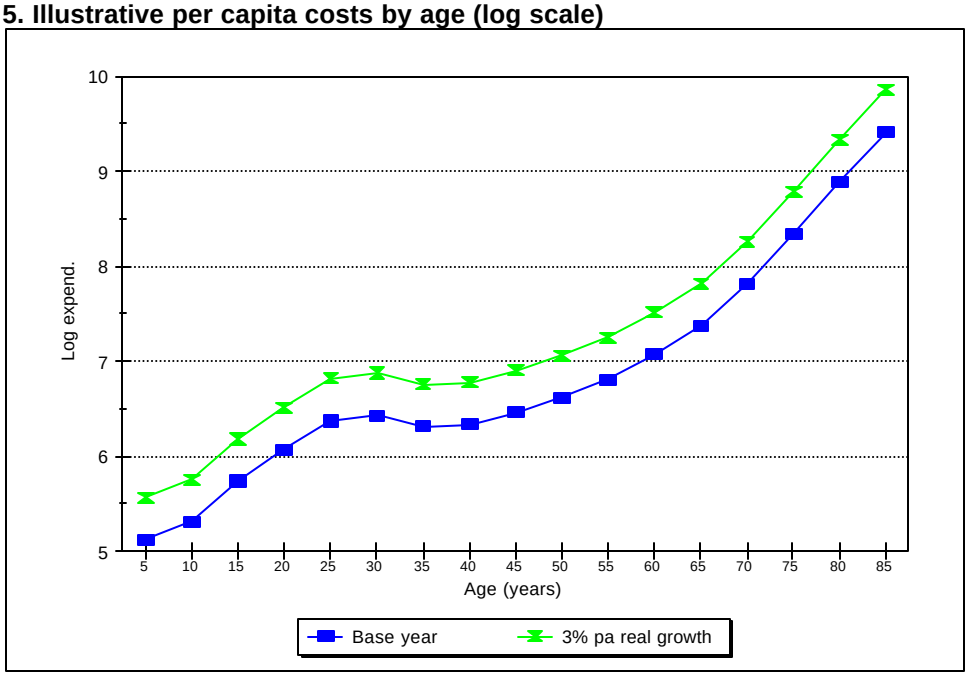


Source : OECD (2002).

Thus there are some puzzles about the common view that health costs are likely to rise sharply as a share of GDP, and it is worth looking at the methodology of the studies referred to above. Indeed, a reasonably common methodology is used for these projections. The distribution of health costs by age is first estimated for the base year. Then some assessment is made about the growth of those per capita expenditures over the projection period, reflecting increased costs for new technologies and other factors. As few countries have historical data on health costs by age, this usually involves the assumption that aggregate rates of real per capita health costs (for particular components of health costs) will apply across the age groups. The projected rates of growth for the future are then drawn from recent historical experience.

This approach is illustrated in Chart 5. The bottom curve in Chart 5 represents the distribution of health costs by age for the base year, in this case drawing on data for the Netherlands. As previously noted, health costs increase rapidly with age, both in youth and over about 50 years of age. The upper curve in Chart 5 shows the effect of a 3% per annum uniform growth is costs across all age groups for 15 years. The resulting level of per capita health costs for each age group is then applied to the projected population for that age group, to generate total health costs for the projection period.

Chart 5. Illustrative per capita costs by age (log scale)



Source: Based on data for the Netherlands (Polder et al. 2002).

The methodology adopted in the Australian *Intergenerational Report* for the Pharmaceutical Benefits Scheme (PBS) can be used as an illustration. The per capita cost to the Commonwealth of the PBS varies greatly by the age of the beneficiary, but little historical

information is available on costs by age over time. Thus a single historical growth rate of real per person PBS costs, adjusted for the changing age structure of the population, is calculated for the period 1983-84 to 2005-06 (the latter to take account of the projected effects of the 2002-03 budget measures). This single rate (5.64% per annum) is then applied to current levels of per capita PBS costs by age group, to calculate future per capita costs for each age group. Using projections of population by age and of the CPI, the total projected cost of the PBS is then calculated. Commonwealth spending on hospital and health services is estimated in the same fashion, whereas medical benefit payments are estimated using age-specific real per capita growth rates.

There are two notable, and related, things about this method of projection. One is that, while the costs of continued technological innovation in health care are recognised, through the projected growth in real per capita costs, no specific recognition is given to the cost benefits of that innovation other than those implicit in the historical data. The other is that, while the ageing of the population presumably reflects in part the fact that people are healthier and hence live longer, this fact has no impact on the structure of health costs over time. The remainder of this paper explores the implications of these two points.

3. Innovation and Health Costs

There is now a growing literature about the benefits of technological and policy innovation in health, in various dimensions. For example, Murphy and Topel (1999) have examined the value of medical research by estimating the economic and social value of the increased longevity to which it has given rise. Among studies focusing on specific health areas, Cutler and McClellan (2001) examine the impact of technological change in the treatment of five conditions – heart attacks, low-birthweight, depression, cataracts and breast cancer – to determine whether the benefits of increased spending exceeds the costs. Using a value for an additional year of life of $100,000, they find that for four of the five treatments benefits substantially outweighed costs, while for the fifth (breast cancer) costs and benefits were approximately equal. The benefits being considered here are, of course, total social benefits, rather than that specific component of benefits that involves lower health costs.

In several studies, Lichtenberg (1996, 1999) has undertaken a cross-sectional analysis across diseases of the impact of the development and diffusion of drugs on the demand for hospital care and related services, and on the reduction of life-years lost through illness. The former study finds a strong link between increased drug usage and reduced demand for hospital admissions and inpatient surgical procedures, implying that a $1 increase in pharmaceutical expenditure is associated with a $3.65 reduction in other health costs. The later study finds that about 45% of the variation across diseases in the reduction in mortality in the USA over the period 1970-91 is explained by the use of new drugs. Valuing an additional life year at $25,000, this implies a social rate of return to pharmaceutical

innovation of about 40% per annum. In a more recent study (Lichtenberg 2001), using the 1996 Medical Expenditure Panel Survey for the USA, he has claimed strong support for the hypothesis that 'the replacement of older by newer drugs results in reductions in mortality, morbidity and total medical spending' (p. 250).

While it is clear that medical innovation has both social and financial benefits, the net financial impact of these innovations on overall health costs is far from clear. But it is, at the very least, a highly dubious assumption that the costs of innovation will continue to increase in line with historical trends, but that there will be not cost benefits of this innovation other than those implicit in the historical growth rates.

4. Ageing – Older Later or Older Longer?

These issues about innovation come into specific focus when the impact of ageing is being considered. While the ageing phenomenon in developed countries partly reflects the past pattern of birth rates, innovation in health policy and in health technology has been a central factor in improved health outcomes and increased life expectancy. This question then arises: does increased life expectancy lead to a much longer period of high health costs in old age, or does it delay the period of high health costs. Put another way, the question is whether, in terms of health and health costs, ageing involves becoming old later or being old longer. In terms of Chart 5, this question is whether the shape of the age-specific cost curve remains fixed, and perhaps shifts up over time, or whether the curve, at the older age-groups, shifts outward to the right over time.

There are three types of partial information available in relation to this question, and all provide some indication that ageing involves, in health cost terms, becoming old later. The first is a body of work that highlights the fact that, on average, the majority of an individual's health costs are concentrated in the years prior to death, implying that these costs are deferred as life expectancy increases. Secondly, there are a number of studies of changes in the health of older persons, which show a significant decline in disability levels by age group over time. These include results from the Framingham Heart Study (Allaire et al. 1999) and analysis of the National Long Term Care Survey (Manton et al. 2001), both for the USA.

However, the most direct way to address this issue is to analyse data on changes in real health costs by age over an extended period of time. To our current knowledge the only country for which such data are available is the Netherlands (Polder et al. 2002), and the data for 1984, 1994 and 1999 have been provided to us. While there has been an increase of about 2.6% per annum in real health costs in the Netherlands between 1988 and 1999, the rate of increase varies greatly over age groups (Chart 6). With the exception of persons 25-35 years, the increase in real age-specific health costs declines steadily with age, being much smaller for the over 55 years age groups that for younger age groups. This is consistent

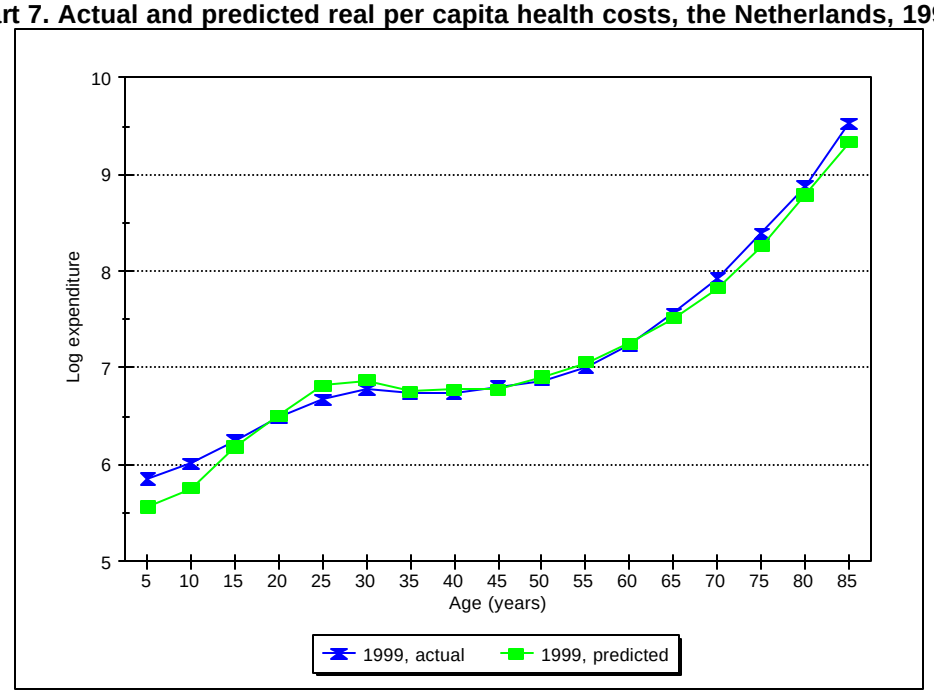
with an effect of innovation in policy and technology in increasing life expectancy and deferring health costs. That is, in allowing individuals to become older later in terms of health, lifestyle and health costs, rather than simply to be older longer.

Chart 6. Change in real health costs by age group, the Netherlands, 1988-1999

Source: Polder et al. (2002).

The changes in real per capita health costs shown in Chart 6 can be considered as reflecting the joint impact of the two factors: a general increase in real health costs across all age groups (the upward shift of the curve) and the deferring of the health costs of ageing (the shift of the curve to the right at the older age groups). It is a complex task to determine the relative importance of these two factors, but Chart 7 reports the results of one experiment. This shows that the pattern of age-specific changes in real health costs is quite well explained by a simple model in which there is a uniform 3% per annum increase in real health costs across all age groups, together with a five year shift in age-specific health costs after age 45 years. While by no means a precise estimate, this experiment suggests that the evolution of health costs over time can indeed be thought of as reflecting both a general upward move in the age-specific cost curve and a shift of that curve to the right at older age groups, as medical innovations and other factors allow older people to lead healthier lives, which are less costly in terms of health costs.

Chart 7. Actual and predicted real per capita health costs, the Netherlands, 1999



Source: Polder et al. (2002) and estimates of the author.

This is also a topic where research is far from complete. My tentative conclusion is that there is indeed evidence that ageing involves a substantial element of getting older later rather than simply being old longer. As a consequence, a methodology that applies constant rates of growth of health costs across age-groups to projected population movements may be seriously deficient.

5. Understanding Australian Health Expenditure

Through most of the 1990s real expenditure in the Australian health sector has been growing at just on 5% per annum. As this rate is somewhat faster than that of real GDP growth, and is less affected by economic cycles than the overall economy, health spending is rising over time as a share of GDP in this country. But, as noted earlier, the population is gaining improved health outcomes, in terms of increasing life expectancy and declining death rates for major disease types, from this expenditure. Nor is there any clear evidence that the growth of these costs will accelerate sharply in coming decades, either as a result of population ageing or of increasing costs of medical innovation. Why, then, is there such serious concern about the escalating costs of health care?

In Australia's case, at least, this seems to be more due to the differential incidence of health costs on various funding parties. In particular, a high proportion of health costs is met through government budgets and the Commonwealth is carrying an increasing share of those

government costs. In particular, the Commonwealth meets over 90% of the costs of pharmaceuticals subject to benefits and, in gross terms these costs are rising rapidly.

Table 1. Total Australian health expenditure, by source of funds, current prices as a share of GDP, 1990-91 to 2000-01 (%)

Year	Commonwealth Government				State and Local Government	Non-government	Total
	Pharmaceuticals	Rebates and tax expenditures	Other	Total			
1990-91	0.31	0.02	2.99	3.32	2.00	2.54	7.86
1991-92	0.32	0.02	3.15	3.49	2.00	2.66	8.16
1992-93	0.38	0.02	3.19	3.59	1.93	2.73	8.24
1993-94	0.42	0.02	3.30	3.74	1.76	2.79	8.28
1994-95	0.44	0.02	3.26	3.72	1.79	2.80	8.32
1995-96	0.50	0.02	3.26	3.78	1.84	2.75	8.37
1996-97	0.51	0.02	3.21	3.74	1.94	2.85	8.53
1997-98	0.50	0.10	3.22	3.82	2.03	2.76	8.62
1998-99	0.52	0.19	3.27	3.98	2.02	2.73	8.74
1999-00	0.56	0.27	3.32	4.15	2.07	2.63	8.85
2000-01	0.62	0.34	3.33	4.29	2.03	2.72	9.04

Source: AIHW (2002).

Table 1 provides a simplified, summary view of the distribution of health costs, and identifies two items – pharmaceutical benefits paid by the Commonwealth and rebates and tax expenditures – as two major components of growth in gross costs. Since 1992-93, for example, over 80% of the growth in health expenditure as a share of GDP can be ascribed, in gross terms, to these two items. This is not to say, having regard to the points made above, that they were such heavy net contributors to the growth in costs, for they may generate cost savings or additional expenditures elsewhere in the system. But in the first instance they are both met by the Commonwealth, and provide the main reason why the Commonwealth's share of total health costs increased from 43.6% in 1992-93 to 47.5% in 2000-01. Indeed, between 1992-93 and 1996-97 the Commonwealth's share of health costs was steady, but it jumped by nearly 4 percentage points between 1996-97 and 2000-01.

One might well argue that it is good to have an industry growing by 5% per annum, especially when that growth is relatively stable over the cycle and when it appears to be delivering clear increases in human welfare. But when governments largely fund that industry, and one level of government is responsible for the major growth sectors, the position is less satisfactory. It is likely that budget pressures on that level of government may lead to short tem decisions which are not optimal in terms of the national response to innovation and

ageing. There are powerful reasons, connected with the central importance of equitable access to health care, for the extent of government involvement evident both in Australia and in many other countries. Even so, the structure of Australian health expenditure seems to present more serious issues than the level of that expenditure.

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