PROJECTIONS OF OECD HEALTH AND LONG-TERM CARE PUBLIC EXPENDITURES

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This paper proposes a comprehensive framework for projecting public health and long-term care expenditures. Notably, it considers the impact of demographic and non-demographic effects for both health and long-term care. Compared with other studies, the paper extends the demographic drivers by incorporating death-related costs and the health status of the population. Concerning non-demographic drivers, for health care the projection method accounts for income elasticity and a residual effect of technology and relative prices. For long-term care, the effects of increased labour participation, reducing informal care, and wage inflation are taken into account. Following this approach, public health and long-term care expenditure are projected for all OECD countries for the years 2025 and 2050. Alternative scenarios are simulated, in particular a "cost-pressure" and "cost-containment" scenario, together with sensitivity analysis. Depending on the scenarios, the total health and long-term care spending is projected to increase on average across OECD countries in the range of 3.5 to 6 percentage points of GDP for the period 2005-2050.

1. Motivation and main findings

1. Public spending on health and long-term care is a major source of fiscal pressures in most OECD countries, amounting to, on average, some 7 per cent of GDP in 2005. Evolution has been uneven over time: following rapid growth during the 1970s, public spending slowed down for several decades. However, a recent acceleration (Figure 1) has raised concern about likely future trends.

2. This paper attempts to respond to these concerns by considering a number of factors likely to drive public spending on health and long-term care over the period to 2050.[1] In projecting drivers of this spending, two important distinctions are made:

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The views expressed are those of the authors and do not reflect those of the OECD or its Member countries.

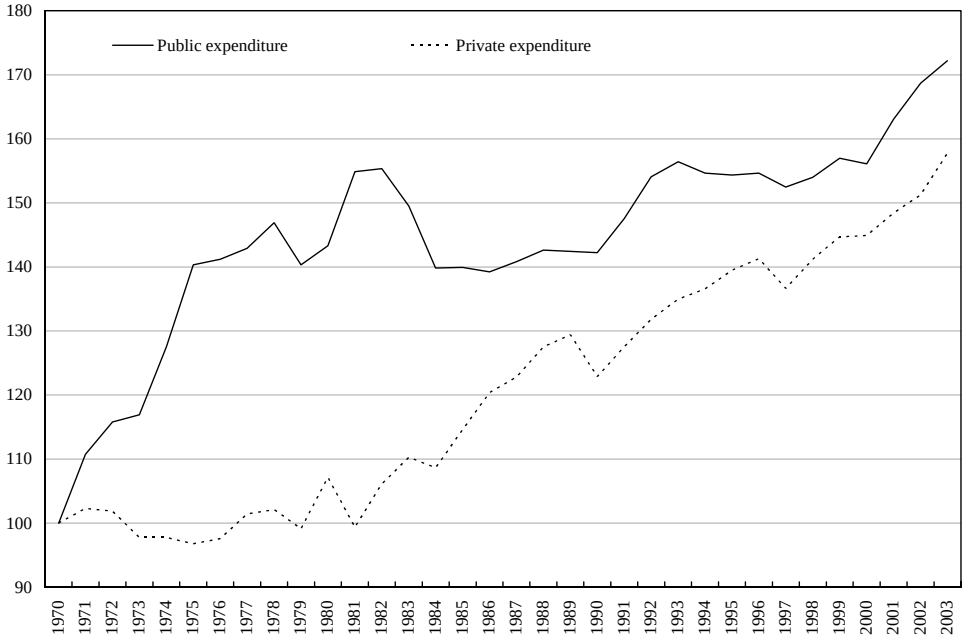
[1] This paper only deals with public spending. Private spending added another 2 per cent of GDP on average to expenditure on health and long-term care in 2005. While it could be argued that private and public

(continues)

Figure 1

Evolution of Public and Private OECD Health Spending*

(index 1970 = 100)(percent of GDP)



* Unweighted average of available OECD countries.
Source: OECD Health Database (2005).

- Expenditures on long-term care and on health care (both preventive and acute) are examined separately,
- For both health and long-term care, the impacts of ageing and non-demographic factors are brought separately into the analysis.

3. The projections rely on a uniform cross-country framework, in contrast with an earlier OECD exercise.[2] The latter essentially gathered country-specific projections, provided by national authorities, produced on the basis of an agreed set of macroeconomic and demographic assumptions. The current projections are more homogeneous, but at the cost of simplifying the description of national health and long-term care arrangements. The main purpose is to bring out in a stylised and tractable way the key mechanisms at work. The inherent uncertainties surrounding this approach are addressed by analysing the sensitivity of the projection results to changes in the assumptions concerning the main drivers of expenditure.

expenditures are not separable, it is implicitly assumed here that private health spending arises from individual choices and, therefore, could be treated like any other consumption item.

[2] For details on this earlier project see Dang *et al.* (2001).

4. In broad terms, the principal forces driving these projections are (see main text for detail):

- *Health care, demographic factors:* a rising share of older age groups in the population will put upward pressure on costs because health costs rise with age. However, the average cost per individual in older age groups should fall over time for two reasons:
  - Longevity gains are assumed to translate into additional years of good health ("healthy ageing); and
  - Major health costs come at the end of life. Insofar as increasing longevity means that more individuals "exit" an age group by living into an older group (rather than "exit" by dying), average costs of the group in question will fall.
- *Health care, non-demographic factors:* health care costs have typically grown faster than income (even as incomes have increased). This is generally held to be due to the effect of technology and relative-price movements in the supply of health services. Disentangling these factors is beyond the scope of current analysis and indeed is dealt with only modestly in the literature. Hence, two scenarios are assumed in the projections here:
  - A "cost pressures" scenario in which it is assumed that, for given demography, expenditures grow 1 per cent per annum faster than income. This corresponds to observed trends over the past two decades.
  - A "cost-containment" scenario in which (unspecified) policy action is assumed to curb this "extra" expenditure growth such that it is eliminated by the end of the projection period (2050).
- *Long-term care, demographic factors:* dependency on long-term care will tend to rise as the share of old people in the population increase. This effect is mitigated somewhat by the likelihood that the share of dependents per older age group will fall as longevity increases due to "healthy ageing".
- *Long-term care, non demographic factors:* expenditures are likely to be pushed up by a possible "cost disease" effect, *i.e.* the relative price of long-term care increasing in line with average productivity growth in the economy because the scope for productivity gains in long-term care is more limited.[3] This effect is assumed to be fully operative in the "cost pressure" scenario but to be partially mitigated[4] by (unspecified) policy action in the "cost containment" scenario.

5. As noted, two main sets of scenarios were simulated, one in which no policy action is assumed, the "cost pressures" scenario, and a "cost-containment scenario" that embodies the assumed effects of policies curbing expenditure growth. As mentioned above, these policies are not modelled explicitly. Finally, sensitivity tests were carried out to assess the robustness of the results to key assumptions.

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[3] Note that empirical evidence on the income elasticity of long-term care spending simply does not exist, and in most scenarios it is assumed to be zero.

[4] It is arbitrarily assumed that the relative price changes by only half of productivity growth elsewhere in the economy.

Table 1

Public Health and Long-term Care Spending

(percent of GDP)

Country	Health care			Long term care			Total		
		2050			2050			2050	
	2005	Cost-pressure	Cost-containment	2005	Cost-pressure	Cost-containment	2005	Cost-pressure	Cost-containment
Australia	5.6	9.7	7.9	0.9	2.9	2.0	6.5	12.6	9.9
Austria	3.8	7.6	5.7	1.3	3.3	2.5	5.1	10.9	8.2
Belgium	5.7	9.0	7.2	1.5	3.4	2.6	7.2	12.4	9.8
Canada	6.2	10.2	8.4	1.2	3.2	2.4	7.3	13.5	10.8
Czech Republic	7.0	11.2	9.4	0.4	2.0	1.3	7.4	13.2	10.7
Denmark	5.3	8.8	7.0	2.6	4.1	3.3	7.9	12.9	10.3
Finland	3.4	7.0	5.2	2.9	5.2	4.2	6.2	12.2	9.3
France	7.0	10.6	8.7	1.1	2.8	2.0	8.1	13.4	10.8
Germany	7.8	11.4	9.6	1.0	2.9	2.2	8.8	14.3	11.8
Greece	4.9	8.7	6.9	0.2	2.8	2.0	5.0	11.6	8.9
Hungary	6.7	10.3	8.5	0.3	2.4	1.0	7.0	12.6	9.5
Iceland	6.8	10.7	8.9	2.9	4.4	3.4	9.6	15.2	12.3
Ireland	5.9	10.0	8.2	0.7	4.6	3.2	6.7	14.5	11.3
Italy	6.0	9.7	7.9	0.6	3.5	2.8	6.6	13.2	10.7
Japan	6.0	10.3	8.5	0.9	3.1	2.4	6.9	13.4	10.9
Korea	3.0	7.8	6.0	0.3	4.1	3.1	3.3	11.9	9.1
Luxembourg	6.1	9.9	8.0	0.7	3.8	2.6	6.8	13.7	10.6
Mexico	3.0	7.5	5.7	0.1	4.2	3.0	3.1	11.7	8.7
Netherlands	5.1	8.9	7.0	1.7	3.7	2.9	6.8	12.5	9.9
New Zealand	6.0	10.1	8.3	0.5	2.4	1.7	6.4	12.6	10.0
Norway	7.3	10.7	8.9	2.6	4.3	3.5	9.9	15.0	12.4
Poland	4.4	8.5	6.7	0.5	3.7	1.8	4.9	12.2	8.5
Portugal	6.7	10.9	9.1	0.2	2.2	1.3	6.9	13.1	10.4
Slovak Republic	5.1	9.7	7.9	0.3	2.6	1.5	5.4	12.3	9.4
Spain	5.5	9.6	7.8	0.2	2.6	1.9	5.6	12.1	9.6
Sweden	5.3	8.5	6.7	3.3	4.3	3.4	8.6	12.9	10.1
Switzerland	6.2	9.6	7.8	1.2	2.6	1.9	7.4	12.3	9.7
Turkey	5.9	9.9	8.1	0.1	1.8	0.8	6.0	11.7	8.9
United Kingdom	6.1	9.7	7.9	1.1	3.0	2.1	7.2	12.7	10.0
United States	6.3	9.7	7.9	0.9	2.7	1.8	7.2	12.4	9.7
Average	**5.7**	**9.6**	**7.7**	**1.1**	**3.3**	**2.4**	**6.7**	**12.8**	**10.1**

Source: Secretariat calculations.

6. The projections for health and long-term care expenditures yield the following stylised results (Table 1):

- In the "cost-pressure" scenario average health and long-term care spending across OECD countries is projected to almost double from close to 7 per cent of GDP in 2005 to some 13 per cent by 2050.
- In the "cost-containment" scenario, average expenditures would still reach around 10 per cent of GDP by 2050,[5] or an increase of 3½ percentage points of GDP.
- Non-demographic factors (including effects from technology and relative prices) play a significant role in upwards pressure on long-term care expenditures, and indeed are the most important driver of the increase in health-care expenditure.

7. These average results hide striking differences across countries (Figure 2). In the cost-containment scenario, a group of countries stands out with increases of health and long-term care spending at or above four percentage points of GDP, over the period 2005-50. It includes rapidly ageing countries (Italy, Japan, Spain), countries that will experience a dramatic change in their population structure (Korea, Mexico, Slovak Republic), and countries with currently low labour participation, which may face a substantial increase in the demand for *formal* long-term care (Italy, Ireland, Spain). In contrast, Sweden is in the lowest range with an increase below two percentage points of GDP. This country is in a mature phase of its ageing process and already spends a relatively high share of GDP on health and long-term care.

8. Despite the uncertainties, sensitivity analysis suggests the results are fairly robust in key respects. For example, under the assumption of "healthy ageing" changes in longevity will have only a modest effect on spending. However, the projections for spending on long-term care are sensitive to the future development of participation rates for the working-age population because higher participation reduces the capacity for "informal" care. An alternative scenario, where participation rates in countries where they are currently low converge towards levels in high-participation countries, has spending on long-term care rising by an additional 1-2 per cent of GDP on average, but much more in some countries.[6]

9. The paper follows the structure displayed in Figure 3. It begins with health care expenditure, decomposing demographic and non-demographic expenditure

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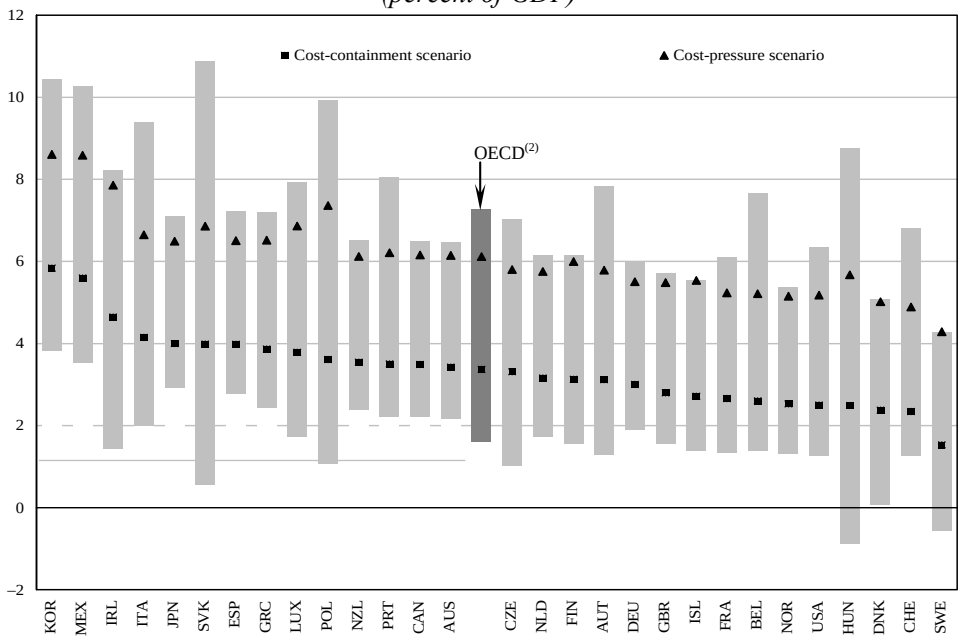
[5] As a comparison, on the basis of pure demographic effects, Dang *et al.* (2001) concluded that the expenditure on health and long-term care for a group of OECD countries would increase from 6 per cent of GDP in 2000 to 9 to 9½ per cent of GDP in 2050. A similar study by the EC-Economic Policy Committee (2001), focusing on the EU15 area, calculated that the expenditure on health and long-term care would increase from 6½ per cent in 2000 to 8½ to 9 per cent in 2050. Calculated in the same way, the ageing effect was estimated to be of comparable size also in Canada (Health Canada, 2001). These orders of magnitude are comparable with the results of the present study, but the underlying drivers are rather different. For an update of the assumptions and projection methodologies see EC-Economic Policy Committee (2005).

[6] However, higher participation rates are likely to have positive effects on public budgets which, depending on how they come about, may more than offset the effect via long-term care spending.

Figure 2

Total Increase in Health and Long-term Care Spending, 2005-50[(1)]

(percent of GDP)



(1) The vertical bars correspond to the range of the alternative scenarios, including sensitivity analysis. Countries are ranked by the increase of expenditures between 2005 and 2050 in the cost-containment scenario. Turkey was not included because data limitations made it impossible to calculate one of the scenarios.

(2) OECD average excluding Turkey.

Source: OECD calculations.

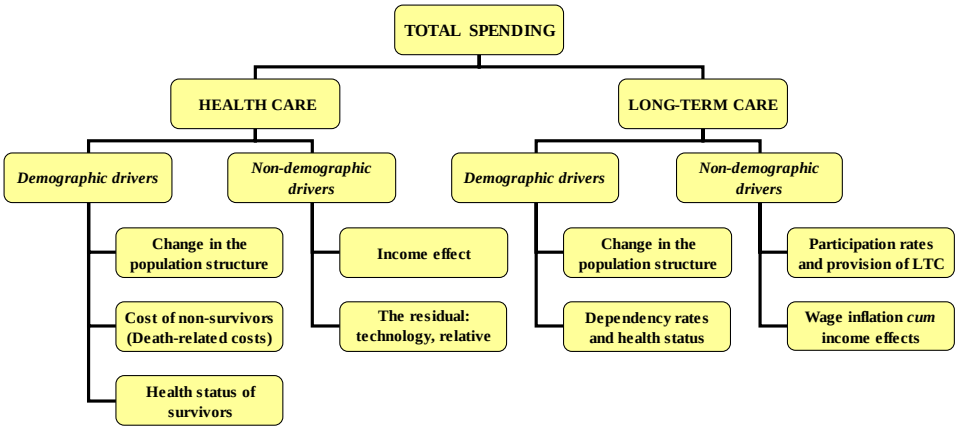
drivers, discusses the main mechanisms at work in each case, and describes the projection framework. Alternative projection scenarios are then presented, followed by a discussion of the sensitivity of the results to key assumptions. The same sequence applies to long-term care expenditures.

2. Health care

10. Looking at the recent past, expenditures on health care have increased in terms of their share in GDP. Given that pure demographic factors have so far been weak, this upward trend in spending is probably due to the increased diffusion of technology and relative price changes. Two important questions are then: how will these typically non-demographic drivers behave in the future and will the projected change in demographic trends create additional expenditure pressures?

Figure 3

Drivers of Total Health and Long-term Care Spending: Key Components



2.1 Projecting demographic drivers of expenditure

11. While the effect of ageing on public health expenditures per capita has been weak in the past,[7] it is commonly expected that it will increase in the future. This assessment is based on the combined effect of the projected increase in the share of old people and the tendency for health expenditures per capita to increase with age.[8]

12. In this study expenditure profiles are a central piece of the projection framework (Figure 4). Average health expenditures by age group are relatively high for young children; they decrease and remain stable for most of the prime-age period, and then start to increase rapidly at older ages.[9]

13. For any given year, the population can be divided into two segments: the survivors and the non-survivors. Each of these segments of the population has a

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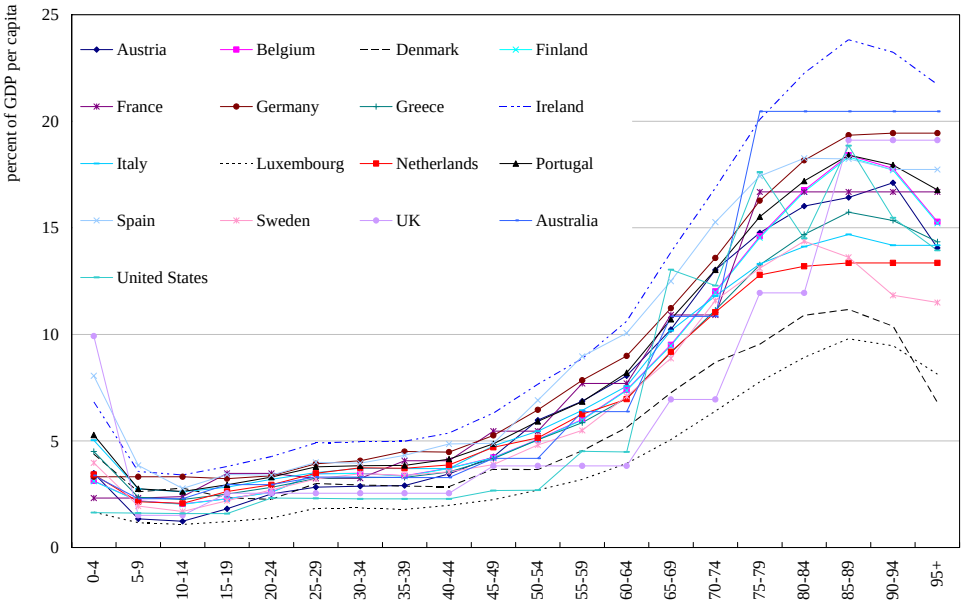
7 See Culyer (1990), Gerdtham *et al.*, (1992), Hitiris and Posnett (1992), Zewifel *et al.* (1999), Richardson and Roberston (1999), Moise and Jacobzone (2003) and Jönsson and Eckerlund (2003).

8 Across all health expenditure types, expenditure on those aged over 65 is around four times higher than on those under 65. The ratio rises to between six to nine times higher for the older groups (Productivity Commission, 2005; OECD Health Database, 2005).

9 The data is based on the EU-AGIR Project; see Westerhout and Pellikaan (2005). The complete expenditure profiles were only available for a subset of OECD countries. A number of different adjustments and estimations were made in order to derive these curves for other OECD countries. Moreover, for some countries only total costs were available and thus health care had to be separated from long-term care. For 12 countries, the data were simply not available. In this case, the expenditure curves were estimated by adjusting expenditures as a spline function of age, based on available data, and were calibrated on the basis of total health expenditures derived from OECD (2005a). These estimation procedures are described in detail in OECD(2006), Annex 2A.

Figure 4

Public Health Care Expenditure by Age Groups*



* Expenditure per capita in each age group divided GDP per capita.
Source: ENPRI-AGIR, national authorities and Secretariat calculations.

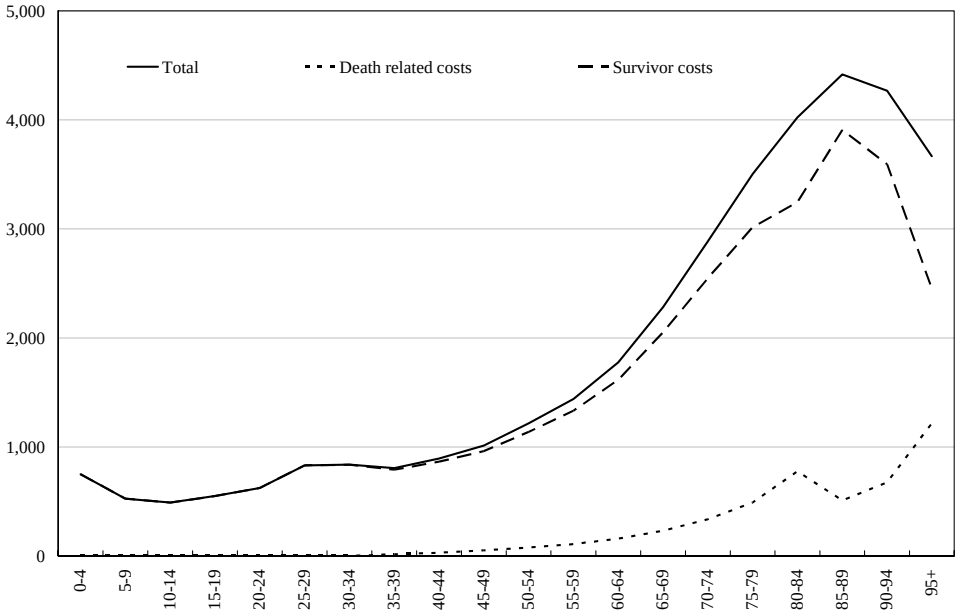
specific cost curve. The *non-survivors'* cost curve can be estimated by multiplying the estimated costs of death by age group by the number of deaths per age group. In line with evidence that health costs are concentrated in the proximity to death (*i.e.*, they are "death-related"; Seshamani and Gray, 2004; Batljan and Lagergren, 2004), the cost of death was proxied by the health expenditure per capita for the oldest age group (95+) multiplied by a factor (equal to 4 for an individual between 0 to 59 years old and declining linearly to 1 afterwards). The *survivors*' cost curve can then be derived from the difference between the total cost curve and the non-survivor curve (see OECD, 2006, Annex A2). An example of this split is given for one country, Finland, in Figure 5. Using this framework, health expenditures for survivors and non-survivors can be projected separately in a more meaningful way.

14. The shape of the aggregate cost curves can be explained by movements across age groups in health care expenditures for these two segments of the population. Indeed, the upward shape of the average cost curve reflects the fact that mortality rates are higher for older age groups. At the same time, the fact that the cost curves tend to peak and then decline at very old ages can be explained by considerations related to the cost of death. While the probability of dying increases with age, the costs of death tend to decline steadily after young and prime ages (Aprile, 2004).

Figure 5

Finland – Breakdown of the Health Care Cost Curve*

(dollars per capita)



* Expenditure per capita in each age group.
Source: ENPRI-AGIR and Secretariat calculations.

Finally, the little spike in health expenditures at the youngest age is related in part to infant mortality being higher than prime-age mortality.

15. Noteworthy, the death-related costs hypothesis has logical implications for the health status of *survivors*. In the extreme case where health costs are only death-related, there are only two outcomes: an individual either dies or survives in good health. To be consistent over time the projected increase in life expectancy must be accompanied by an equivalent gain in the numbers of years spent in good health. Otherwise, an increasing share of the population living in "bad health" would emerge. Average health care costs would then cease to be mainly driven by the costs of death, as initially assumed.

16. Thus, the death-related costs hypothesis implies that longevity gains are translated into years in good health. Under this "healthy ageing" scenario, the cost curve for *survivors* is allowed to shift rightwards, progressively postponing the age-related increases in expenditure.[10] This development tends to reduce costs compared

[10] In contrast, in a "pure demographic" approach to health care expenditures, the cost curves would not shift rightwards with ageing, reflecting the implicit assumption of unchanged health status at any given age.
(continues)

with a situation in which life expectancy would not increase. Other health status scenarios have been envisaged in previous research (see Box 1) and the projections in this paper test the sensitivity of the results to these alternative assumptions.

17. As regards *non-survivors*, two different demographic effects are at play. On the one hand, the number of deaths is set to rise due to the *transitory* effect of the post-war baby-boom. On the other hand, if mortality falls over time, due to a *permanent* increase in longevity, fewer will be at the very end of life in each given year, mitigating health care costs.[11] The total effect on public health care expenditures will depend on the relative size of these effects.

Box 1

Longevity and health status scenarios

Different health status scenarios have been envisaged in the literature. In an "expansion of morbidity" scenario (Grunenberg, 1977), the share of life spent in bad health would increase as life expectancy increases, while a "compression of morbidity" scenario (Fries, 1980) would mean the opposite. Currently, equilibrium between longevity and morbidity is observed in many OECD countries. Accordingly, and striking a compromise between the expansion and compression scenarios, Manton (1982) put forward the "dynamic equilibrium" hypothesis where longevity gains are translated one-to-one into years in good health (hereafter, referred as "healthy ageing").

In this context, Michel and Robine (2004) proposed a general approach to explain why countries may shift from an expansion to a contraction of morbidity regime, or achieve a balanced equilibrium between longevity gains and the reduction of morbidity. They identified several factors at work: i) an increase in the survival rates of sick persons which would explain the expansion in morbidity; ii) a control of the progression of chronic diseases which would explain a subtle equilibrium between the fall in mortality and the increase in disability; iii) an improvement in the health status and health behaviour of the new cohorts of old people which would explain the compression of morbidity, and eventually; iv) the emergence of very old and frail populations which would explain a new expansion in morbidity. Depending on the relative size of each of these factors, countries could evolve from one morbidity regime to another.

When the cost curves stay put in presence of longevity gains, the share of life lived in "bad health" increases when life expectancy increases.

11 See for example Fuchs (1984), Zwiefel *et al.* (1999), Jacobzone (2003) and Gray (2004).

2.2 Projecting non-demographic drivers of expenditure

18. Income growth is certainly the main non-demographic driver of expenditures, although the vast literature on this topic is still somewhat inconclusive on the precise value of the income elasticity (see OECD, 2006, Annex 2B). Two insights can, nevertheless, be drawn. First, income elasticity tends to increase with the level of aggregation, implying that health care is both "an individual necessity and a national luxury" (Getzen, 2000). Second, without reliable price data for health-related goods and services, the high income elasticities (above unity) often found in macro studies may result from the failure to control for true price effects. In this context, the most reasonable approach seems to assume unitary income elasticity and, subsequently, to test the sensitivity of the projections to this assumption.

19. After controlling for demographic and income effects, a residual expenditure growth can be derived. Between 1981 and 2002 (Table 2), public health spending grew on average by 3.6 per cent per year for OECD countries,[12] of which 0.3 percentage point was accounted by pure demographic effects[13] and 2.3 percentage points by income effects (assuming unitary income elasticity). Thus, the residual growth can be estimated at around 1 per cent per year. Over an extended sample, 1970-2002, the residual growth would much higher to reach 1.5 per cent per annum (Table 3). This difference reflects the implementation of cost-containment policies over part of the 1980s and the 1990s that curbed the strong residual growth of the 1970s (Box 2).

20. What are the factors underlying this residual expenditure growth? The main culprits seem to be technology and relative prices.[14] Indeed, the gains in health status discussed above do not only arise from improvements in lifestyle (Sheehan, 2002; Cutler, 2001), but also from advances in medical treatment/technology. The latter, however, do not come free of economic cost. Technical progress can be cost-saving and reduce the relative price of health products and services, but its impact on expenditure will depend on the price elasticity of the demand for health care. If it is high, a fall in prices will induce a more than proportionate rise in demand, increasing expenditures.[15] Even if prices do not fall, new technologies may increase

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[12] This estimate was carried out for total health spending given that the split between health care and long-term care expenditures is not available in time series for historical data. Given the low share of public long-term care expenditure to GDP in 2000 (typically below 1 per cent of GDP; OECD, 2005b), this approximation of the residual growth seems reasonable.

[13] To simplify calculations, the effect of past ageing does not incorporate "healthy longevity" and "death-related cost" as is done in the projections. In any event, the ageing effect was small and would have even been even smaller if a more sophisticated method had been applied. If anything, ceteris paribus, ignoring these past factors is likely to have lead to a downward bias in the estimated residual.

[14] See Fuchs (1972) and Mushkin and Landefeld (1979). More recently, there has been a renewal of interest in this approach, see Newhouse (1992), KPMG Consulting (2001), Wanless (2001), Productivity Commission (2005a-b).

[15] For example, Dormont and Huber (2005) found that in France the unit price of certain surgical treatments, such as cataract, decreased whereas the frequency of the treatments increased significantly. Such effects can explain much of the recent upward shift in the health care cost curves in France.

Table 2

Decomposing Growth in Public Health Spending,[*] 1981-2002[**]

	Health spending	Age effect	Income effect[***]	Residual
Australia (1981-2001)	3.6	0.4	1.8	1.4
Austria	2.2	0.1	2.1	0.0
Belgium (1995-2002)	2.9	0.4	1.7	0.6
Canada	2.6	0.4	1.7	0.6
Czech Republic (1993-2002)	2.7	0.4	2.8	–0.4
Denmark	1.3	0.1	1.7	–0.5
Finland	2.6	0.3	2.1	0.2
France	2.8	0.2	1.6	1.0
Germany	2.2	0.2	1.2	1.0
Greece (1987-2002)	3.4	0.4	1.3	0.8
Hungary (1991-2002)	1.5	0.3	2.8	–1.5
Iceland	3.5	0.1	1.5	1.9
Ireland	3.9	0.1	4.9	–1.0
Italy (1988-2002)	2.1	0.7	1.7	–0.1
Japan (1981-2001)	3.8	0.4	2.2	1.1
Korea (1982-2002)	10.1	1.4	6.1	2.4
Luxembourg (1981-2002)	3.8	0.0	3.9	–0.1
Mexico (1990-2002)	4.5	0.7	0.5	2.4
Netherlands (1981-2002)	2.6	0.3	1.9	0.3
New Zealand	2.7	0.2	1.5	1.0
Norway	4.0	0.1	2.5	1.5
Poland (1990-2002)	3.1	0.5	3.2	–0.6
Portugal	5.9	0.4	2.6	2.8
Slovak Republic (1997-2002)	2.1	0.5	4.2	–1.5
Spain	3.4	0.3	2.3	0.8
Sweden	1.5	0.1	1.7	–0.4
Switzerland (1985-2002)	3.8	0.2	0.8	2.9
Turkey (1984-2002)	11.0	0.3	2.3	8.3
United Kingdom	3.4	0.2	2.3	1.0
United States	4.7	0.1	2.0	2.6
Average	**3.6**	**0.3**	**2.3**	**1.0**

[*] Total public health spending per capita.
[**] Or the longest overlapping period available.
[***] Assuming an income elasticity of health expenditure equal to 1.

Source: OECD Health Database (2004), ENPRI-AGIR and Secretariat calculations.

Table 3

Decomposing Growth in Public Health Spending,[*] 1970-2002[**]

	Health spending	Age effect	Income effect[***]	Residual
Australia (1971-2001)	4.0	0.5	1.7	1.7
Austria	4.2	0.2	2.5	1.5
Belgium (1995-2002)	2.9	0.4	2.2	0.6
Canada	3.1	0.6	2.1	0.4
Czech Republic (1993-2002)	2.7	0.4	2.8	–0.4
Denmark (1971-2002)	1.9	0.2	1.6	0.1
Finland	3.4	0.6	2.4	0.5
France	3.9	0.3	1.9	1.6
Germany	3.7	0.3	1.6	1.9
Greece (1987-2002)	3.4	0.4	2.1	0.8
Hungary (1991-2002)	1.5	0.3	2.8	–1.5
Iceland	6.1	0.1	2.7	3.2
Ireland	5.3	0.0	4.4	0.9
Italy (1988-2002)	2.1	0.7	2.2	–0.1
Japan (1970-2001)	4.9	0.6	2.6	1.8
Korea (1982-2002)	10.1	1.4	6.0	2.4
Luxembourg (1975-2002)	4.2	0.0	3.3	0.7
Mexico (1990-2002)	4.5	0.7	1.7	2.4
Netherlands (1972-2002)	3.3	0.4	2.0	0.9
New Zealand	2.9	0.2	1.2	1.4
Norway	5.4	0.1	3.0	2.2
Poland (1990-2002)	3.1	0.5	3.2	–0.6
Portugal	8.0	0.5	2.9	4.4
Slovak Republic (1997-2002)	2.1	0.5	4.2	–1.5
Spain	5.4	0.4	2.4	2.5
Sweden	2.5	0.3	1.6	0.7
Switzerland (1985-2002)	3.8	0.2	0.9	2.9
Turkey (1984-2002)	11.6	0.3	2.1	8.3
United Kingdom	3.8	0.1	2.1	1.5
United States	5.1	0.3	2.1	2.7
Average	**4.3**	**0.4**	**2.5**	**1.5**

[*] Total public health spending per capita.
[**] Or the longest overlapping period available.
[***] Assuming an income elasticity of health expenditure equal to 1.

Source: OECD Health Database (2004), ENPRI-AGIR and Secretariat calculations.

demand by increasing the variety and quality of products.[16,17]

21. In projecting public health care expenditures, two alternative scenarios were envisaged for the future: one in which the residual effect of technology and prices continues to rise at the historical rate and another in which this rate declines over time due to cost containment policies. Should the country-specific historical growth rates in the residual be used to project expenditures? There are least two reasons for questioning this choice. First, in countries where cost-containment policies have resulted in a low or negative residual (e.g., Austria, Denmark, Ireland, Italy, Sweden) there could be a trend reversal, e.g. because new personnel has to be attracted or run-down facilities renewed. Second, in countries where the residual growth was very high (e.g., Portugal, Turkey, United States) it may seem likely that cost-containment policies will be implemented in the future. These effects would lead to a certain cross-country convergence of the expenditure residual over time. Therefore, in most of the projection scenarios, an OECD *average* residual was preferred to project expenditures.

Box 2

Cost-containment policies in OECD countries: An overview*

Faced with unsustainable growth in health care spending over the 1960s and 1970s, governments initially aimed at containing it through various kinds of macroeconomic restrictions. These policies often created allocative problems of their own. Wage and price controls had negative consequences on the supply of health while top-down spending constraints also discouraged providers to increase output or to enhance productivity.

More recently, the focus turned to more efficient provision of care. Nonetheless, while spending growth has slowed considerably over the past two

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16 This is equivalent to say that the "true" relative price of health care *vis-à-vis* all other goods in the economy decreases. Consider for example the case of a demand for variety model with a CES utility function: $U = \sum_i x_i^{(\sigma-1)/\sigma}$, where $\sigma > 1$ is the elasticity of substitution among products. To simplify, let us assume price symmetry ($p_i = p, \forall_i$). The true composite price index is then equal to $P^* = n^{(1-\sigma)} p$. With two types of composite goods, say health (H) and all other goods (O), the true relative price would be: $P^*_H / P^*_O = (n_H / n_O)^{(1-\sigma)} (p_H / p_O)$. Thus, even if the usual price ratio (p_H / p_O) remains constant, the "true" relative price P^*_H / P^*_O would decrease when the pace of product creation in the health sector is much faster than in the rest of the economy.

17 Some governments are attempting to introduce such quality adjustments in the measure of output (and hence prices) of public services. See Grice (2005) for a discussion on this point based on the Atkinson Review, prepared for the UK Office for National Statistics.

decades, studies using statistical tests of the impact of budgetary caps or other policies to limit spending provide little evidence of a strong impact. In some cases, the reduction of health care costs has been achieved by transferring spending to other areas, such as long-term care. Supporting this view is the fact that countries that have been most effective at controlling health care spending are also the ones where long-term care expenditures have increased most rapidly.

Macroeconomic cost-containment initiatives

Wage controls have been used in public integrated systems in both the hospital and the ambulatory sector where health care personnel are paid on a salary basis (Denmark (hospitals), Finland, Ireland (hospitals), Spain, Sweden and the United Kingdom (hospitals)). Such policies were part of a broader public sector restraint rather than specific to the health sector.

Price controls have been widely used, particularly in areas where governments set prices administratively or have oversight on prices agreed between health care purchasers and providers. A number of countries have set fees directly (e.g., Australia, Belgium, France, Japan, Luxembourg and Canada). In others, prices have been automatically adjusted to offset volume overrun so as not to exceed a fixed budget ceiling (e.g., Germany (ambulatory care), Austria (hospital care), Hungary (outpatient care), and recent Belgium reforms). Administrative price setting has probably been most widespread for pharmaceutical drugs.

Limits in most countries on entry to medical schools are an important factor affecting the growth of the number of medical professionals. The number of new doctors per capita has slowed as a result. There have also been reductions in support staff (Canada, Sweden). Policies to restrain supply have actually led to supply shortages in, for example, Canada, the United Kingdom and Denmark and waiting lists are a common feature across OECD countries. In countries like Finland, France and Korea an upward pressure on wages has unfolded.

Hospital supply policies have encouraged a reduction in the number of beds per capita and concentrated acute care in larger hospital units so as to achieve economies of scale and scope. Nonetheless, the level of acute-care beds per capita remains relatively high in some countries (such as Austria, the Czech Republic, Germany, Hungary and the Slovak Republic).

Budgetary caps or controls have been a widely used instrument for controlling expenditure. In general, policies to control and reshape supply and to cap spending in the hospital sector appear to have been more successful than for ambulatory care or pharmaceutical drugs. Spending control through budgetary

caps also appears to have been most successful in countries such as Denmark, Ireland, New Zealand and the United Kingdom where integrated models of health-care financing and supply are (or were) the rule and in mainly single-payer countries, such as Canada, where health-care budgets are generally explicitly set through the budget process.

Cost sharing has been an increasingly common feature over the 1980s and, particularly, the 1990s. Greater cost-sharing has mainly affected pharmaceuticals, while patient payments for inpatient and doctors visits have been less widespread (Sweden, Italy, France). This is presumably connected to the higher price elasticity for pharmaceutical drugs than for ambulatory and, particularly, for hospital care.

Improving cost-efficiency at the micro level

Ambulatory care is of key importance to the overall efficiency and effectiveness of health-care systems; it usually is the place where contact between patient and health care personnel is first established and ambulatory care is generally less expensive than hospital care. The gate-keeping role of general practitioners (GPs) has been encouraged in some countries (United Kingdom, New Zealand, Norway, United States and France). In Eastern European countries, the ambulatory sector has been shifted from the public sector to private practitioners in the course of the 1990s and, in some cases, they are now paid on a capitation basis.

Hospital sector reforms concern first and foremost the separation of purchasers and providers within public integrated systems. Purchasers/funders of health care are responsible to the budgetary authorities for cost control and to patients for the quality and accessibility of care. A significant number of countries with integrated systems have now moved in this direction (Australia, United Kingdom, New Zealand, Sweden, Italy, Portugal and, more recently, Greece). More active purchasing has also occurred in countries with public contract models (Germany, Belgium). The role of purchasers has been enhanced in the United States. The contracting out of selected activities has increased, where these can be provided more cheaply externally. Finally, a limited number of countries (the United States, the United Kingdom, Sweden, the Czech Republic and New Zealand) have experimented with greater competition among hospitals as a means of inducing improvement in efficiency, quality, and responsiveness.

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* This Box is based on and draws extensively on Docteur and Oxley (2003).

2.3 Combining demographic and non-demographic drivers

22. To sum up, defining HE, Y and N as real health care expenditures, real income and population, respectively; and, ε the income elasticity of health expenditures, the growth of health expenditures can be decomposed as follows:

$$\Delta \log\left(\frac{HE}{N}\right) = \Delta \log(\textit{adjusted age factor}) + \varepsilon \cdot \Delta \log\left(\frac{Y}{N}\right) + \Delta \log(\textit{residual}) \qquad (1)$$

or expressed in share of expenditure to GDP:

$$\Delta \log\left(\frac{HE}{Y}\right) = \Delta \log(\textit{adjusted age factor}) + (\varepsilon - 1) \cdot \Delta \log\left(\frac{Y}{N}\right) + \Delta \log(\textit{residual}) \qquad (2)$$

23. The mechanical effect of population ageing on expenditures can be interpreted as first moving up along the cost curve, assuming that the age profile of expenditures remain constant over time (Figure 6, Panel 1). This age factor is then adjusted by incorporating the healthy longevity hypothesis, corresponding to a rightward shift of the cost curve (Figure 6, Panel 2).[18] As mentioned above, this shift implies that older people still cost more than the young, but at progressively older ages. Finally, the cost curve may shift upwards (Figure 6, Panel 3) due to non-demographic drivers (income and the residual).

24. Once the total logarithmic growth rates are estimated for each country, the projection framework computes the changes in expenditure shares to GDP considering a common starting point. The latter is computed as the cross-country average share of public health care spending in GDP in 2005, thus can be viewed as a sort of OECD representative country. The changes in expenditure calculated from this common base are then added to the country-specific initial shares to obtain future projected ratios of expenditure to GDP. This method has two advantages. Over the long run, it makes the projections more comparable across countries, as the effects of the different mechanisms at work during the projection period are isolated from the impact of the initial conditions.[19] Moreover, it allows a certain catch-up across countries in the ratios of public health care expenditures to GDP.

25. Additional exogenous assumptions underlying the projections for both health and long term care are listed in Box 3 (more details are also provided in OECD, 2006, Annex 2B).

2.4 Alternative scenarios for OECD countries

26. The framework described above was used to project expenditures over the period 2005-50. In the main scenarios, the income elasticity is set to one, thus

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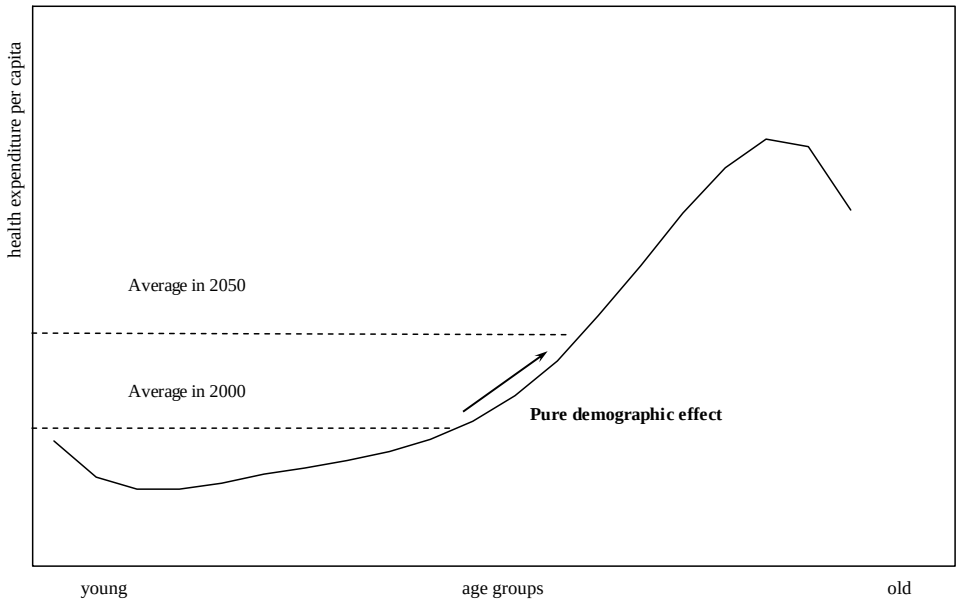
[18] See OECD (2006), Annex 2A for more details.

[19] Without this specification, spending patterns of countries with equivalent expenditure drivers would diverge in terms of share of expenditure to GDP merely due to different initial expenditure to GDP ratios.

Figure 6

Shifts in Expenditure Profiles, Ageing and Non-ageing Effects
(1) Pure Ageing Effect



(2) Ageing Effect Adjusted for Death-related Costs and Healthy Longevity

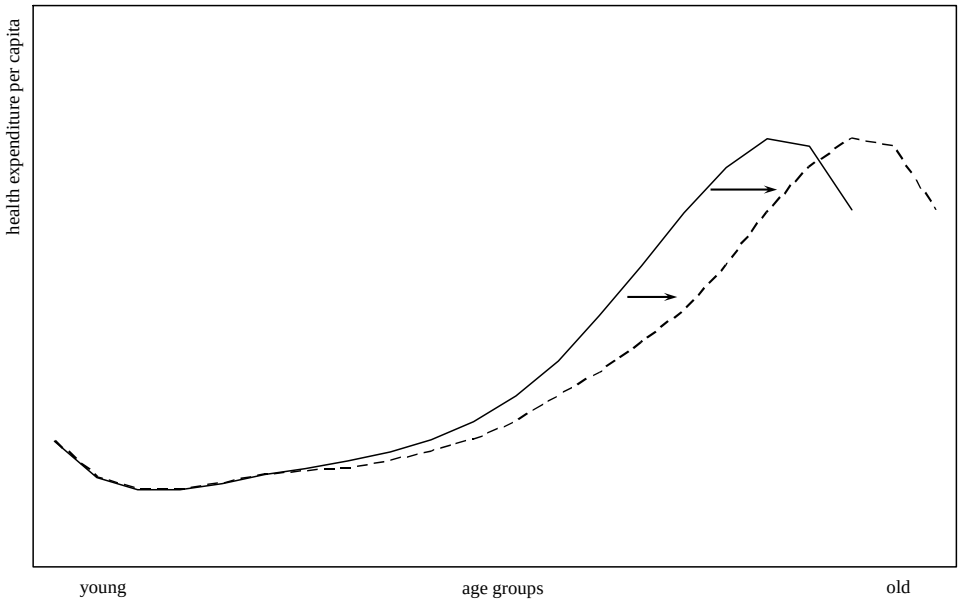
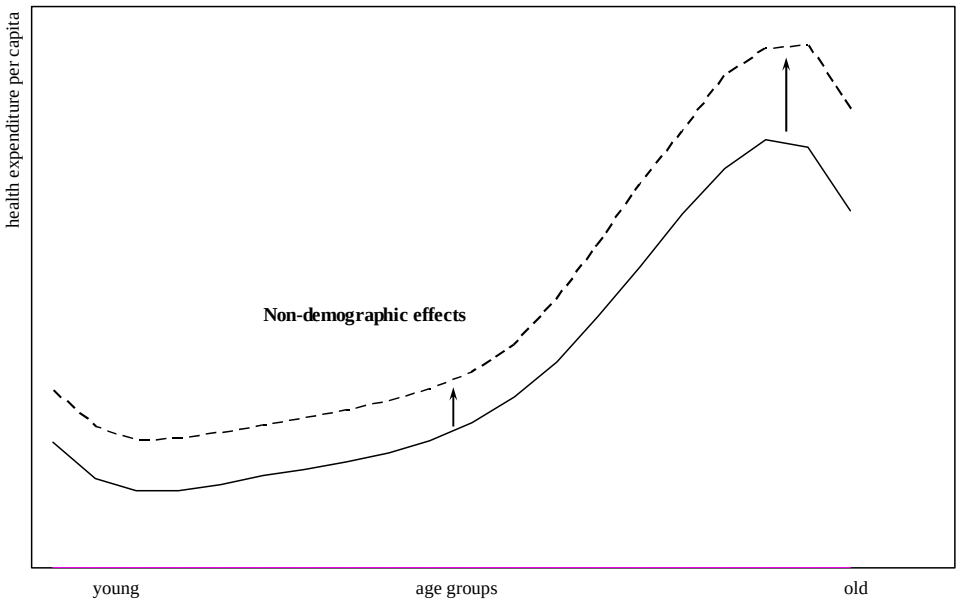


Figure 6 (continued)

Shifts in Expenditure Profiles, Ageing and Non-ageing Effects
(3) Non-ageing Drivers



income effects are not creating additional pressures in terms of expenditure shares to GDP. The main assumptions underlying each projection scenario are listed in Table 4.

2.4.1 Demographic effects

27. As discussed above, demographic effects on public health care expenditures can be decomposed into the health care costs for survivors, the adjustment for "healthy ageing" and the death-related costs, as shown in Panel A of Figure 7. The pure ageing effect can be quite large in some countries, but it tends to be compensated by a better health status. The death-related costs account only for a small fraction of the increase in expenditures as a share of GDP. In level terms, they increase from around 5 per cent of total health care spending in 2005 to 7 per cent by 2050.

28. The total effect of demographics on health care expenditures displays a wide cross-country dispersion. It ranges from virtually zero in Sweden to 1.6 percentage points of GDP for Korea. This can be related to differences in evolving population structures, as displayed by the changes in old-age dependency ratios (Panel B of Figure 7).

Box 3

Exogenous variables and assumptions underlying the projections

The projections require a set of exogenous data, as follows:

(1) Population projections (*N*). The population projections were gathered by the OECD Directorate on Employment, Labour and Social Affairs, directly from national sources. Given that the underlying assumptions on fertility and life expectancy are not necessarily uniform across countries (see Oliveira Martins *et al.*, 2005 for a discussion), this paper also uses a population maquette (Gonand, 2005) to test the sensitivity of the results to uniform longevity assumptions for a selected group of countries.

(2) Labour force projections (*L/N*) rely on previous OECD work (Burniaux *et al.*, 2003). These projections are constructed in the basis of a, so-called, cohort approach. They correspond to a baseline scenario, *i.e.* the impact of current policies is assumed to influence labour participation over the next decades, but no additional assumptions are made concerning future policy changes.

(3) Labour productivity (*Y/L*) growth is assumed to converge linearly from the initial rate (1995-2003) to 1.75 per cent per year by 2030 in all countries, except former transition countries and Mexico where it converges only by 2050.

The projected GDP per capita is directly derived from the above exogenous variables (*Y/N = Y/L x L/N*). This simple framework is not supposed to capture in the best way productivity differentials across countries, but to isolate, as far as possible, the effect of ageing and other demographic factors on the projections.

29. However, on average, the demographic effect only accounts for a small increase in expenditure, from 5.7 per cent in 2005 to 6.3 per cent by 2050, or 0.6 percentage points of GDP (Table 5). Admittedly, the "healthy ageing" assumption may render the simulation of demographic effects relatively optimistic, but this is in line with observed patterns of health status regimes in many OECD countries. For some countries, such as Australia, the healthy ageing hypothesis may seem less plausible in view of past trends and, therefore, the sensitivity of the results to this assumption was tested below.

Table 4

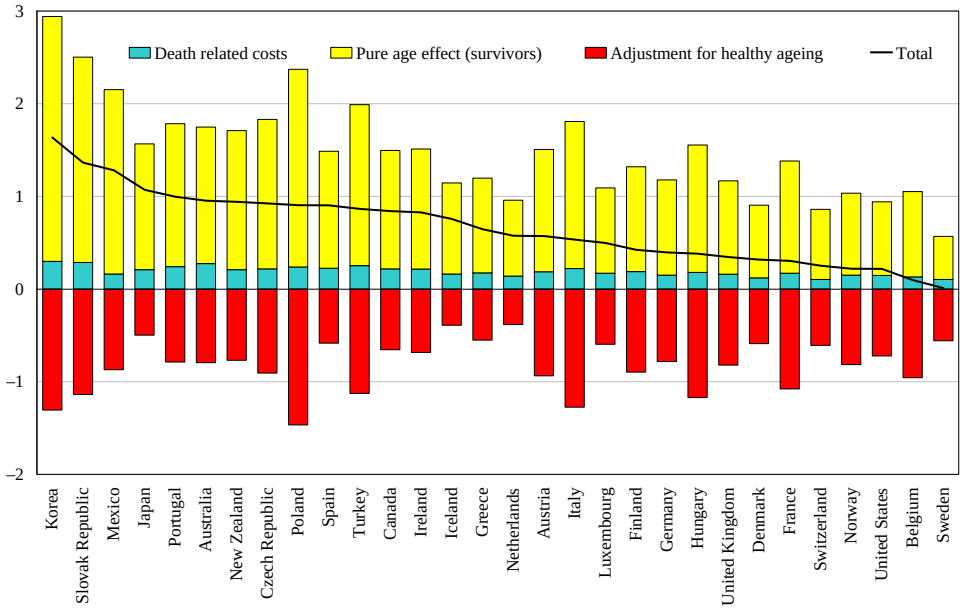
Assumptions Underlying the Alternative Projection Scenarios: Health Care

Scenarios	Health Status	Income elasticity	Expenditure residual
Demographic effect	Healthy ageing: longevity gains are translated into equivalent additional years in good health	Income elasticity is equal to 1	n.a.
Cost-pressure scenario	Healthy ageing: longevity gains are translated into equivalent additional years in good health	Income elasticity is equal to 1	**The expenditure residual grows at 1 per cent per year over the projection period**
Cost-containment scenario	Healthy ageing: longevity gains are translated into equivalent additional years in good health	Income elasticity is equal to 1	Residual growth is equal to 1 per cent in 2005 and converges to 0 by 2050 (transversality condition)
Country-specific residuals	Healthy ageing: longevity gains are translated into equivalent additional years in good health	Income elasticity is equal to 1	**Residual growth is country-specific and converges to 0 by 2050 (transversality condition)**
Income elasticity = 0.8	Healthy ageing: longevity gains are translated into equivalent additional years in good health	**Income elasticity is equal to 0.8**	Residual growth is equal to 1 per cent in 2005 and converges to 0 by 2050 (transversality condition)
Income elasticity = 1.2	Healthy ageing: longevity gains are translated into equivalent additional years in good health	**Income elasticity is equal to 1.2**	Residual growth is equal to 1 per cent in 2005 and converges to 0 by 2050 (transversality condition)
Residuals at 1.5 per cent	Healthy ageing: longevity gains are translated into equivalent additional years in good health	Income elasticity is equal to 1	**Residual growth is equal to 1.5 per cent in 2005 and converges to 0 by 2050 (transversality condition)**
Compression of morbidity	**Longevity gains are doubled into additional years in good health**	Income elasticity is equal to 1	Residual growth is equal to 1 per cent in 2005 and converges to 0 by 2050 (transversality condition)
Expansion of morbidity	**No healthy ageing adjustment, *i.e.* longevity gains do not translate into additional years in good health**	Income elasticity is equal to 1	Residual growth is equal to 1 per cent in 2005 and converges to 0 by 2050 (transversality condition)

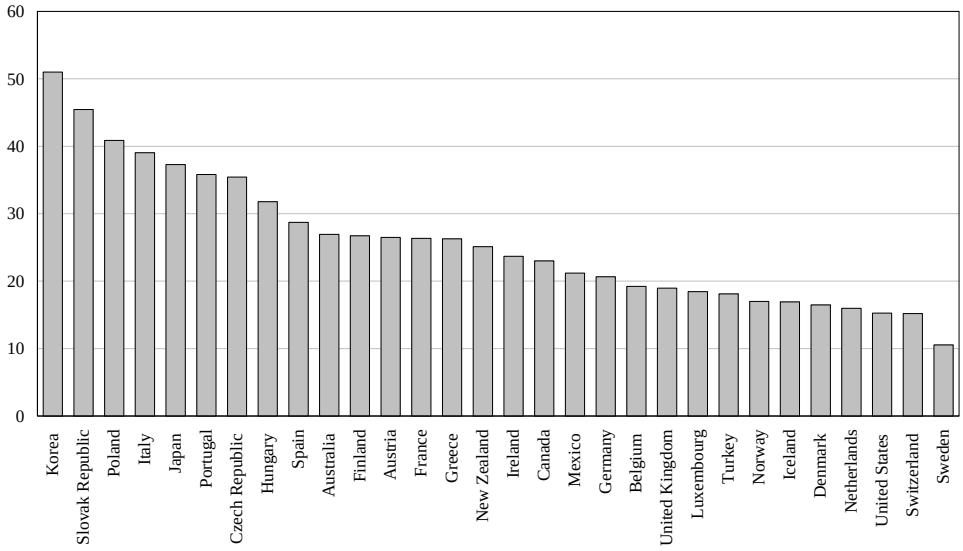
NB: The key assumption changed in each scenario is in bold.

Figure 7

Demographic Effects on Health Care Expenditure, 2005-2050
A. Increase in Public Health Care Expenditure
(percent of GDP)



B. Increase in the Old-age Dependency Ratio between 2005 and 2050*



* Ratio of population aged 65 and over to population aged 15-64.
Source: Secretariat calculations.

Table 5

Projection Scenarios for Public Health Care Expenditure*

(percent of GDP)

Country	2005 **				Sensitivity analysis					
		Demographic effect	Cost-pressure	Cost-containment	Country-specific residuals	Income elasticity=0.8	Income elasticity=1.2	Residuals at 1.5%	Compression of morbidity	Expansion of morbidity
		2050								
Australia	5.6	6.5	9.7	7.9	8.5	7.1	8.9	8.7	7.1	8.7
Austria	3.8	4.4	7.6	5.7	4.4	5.0	6.6	6.6	5.0	6.7
Belgium	5.7	5.8	9.0	7.2	6.7	6.4	8.1	8.0	6.4	8.2
Canada	6.2	7.0	10.2	8.4	7.8	7.6	9.3	9.2	7.9	9.1
Czech Republic	7.0	8.0	11.2	9.4	7.5	8.9	9.9	10.2	8.5	10.3
Denmark	5.3	5.6	8.8	7.0	5.1	6.2	7.9	7.8	6.4	7.6
Finland	3.4	3.8	7.0	5.2	4.1	4.3	6.3	6.0	4.4	6.1
France	7.0	7.3	10.6	8.7	8.7	8.1	9.5	9.6	7.8	9.8
Germany	7.8	8.2	11.4	9.6	9.6	8.9	10.3	10.4	9.0	10.4
Greece	4.9	5.5	8.7	6.9	6.6	6.1	7.9	7.7	6.4	7.5
Hungary	6.7	7.1	10.3	8.5	5.4	7.5	9.6	9.3	7.6	9.6
Iceland	6.8	7.5	10.7	8.9	10.5	7.9	10.1	9.7	8.5	9.3
Ireland	5.9	6.8	10.0	8.2	5.6	6.9	9.8	9.0	7.7	8.8
Italy	6.0	6.5	9.7	7.9	6.4	7.3	8.6	8.7	6.8	9.2
Japan	6.0	7.1	10.3	8.5	8.7	7.9	9.1	9.3	7.9	9.0
Korea	3.0	4.6	7.8	6.0	8.6	5.3	6.9	6.8	4.8	7.3
Luxembourg	6.1	6.6	9.9	8.0	6.6	6.9	9.4	8.9	7.5	8.6
Mexico	3.0	4.3	7.5	5.7	8.3	4.4	7.3	6.5	4.9	6.5
Netherlands	5.1	5.7	8.9	7.0	6.1	6.3	8.0	7.9	6.8	7.4
New Zealand	6.0	6.9	10.1	8.3	8.4	7.6	9.1	9.1	7.7	9.1
Norway	7.3	7.5	10.7	8.9	9.6	8.1	9.8	9.7	8.1	9.7
Poland	4.4	5.3	8.5	6.7	4.6	5.5	8.2	7.5	5.5	8.2
Portugal	6.7	7.7	10.9	9.1	12.6	8.3	10.1	9.9	8.4	9.9
Slovak Republic	5.1	6.5	9.7	7.9	4.9	7.2	8.6	8.7	6.8	9.0
Spain	5.5	6.4	9.6	7.8	7.5	7.1	8.5	8.6	7.2	8.3
Sweden	5.3	5.3	8.5	6.7	4.9	5.9	7.7	7.5	6.3	7.3
Switzerland	6.2	6.4	9.6	7.8	11.4	7.1	8.6	8.6	7.4	8.4
Turkey	5.9	6.7	9.9	8.1	n.a	7.3	9.1	8.9	7.3	9.2
United Kingdom	6.1	6.5	9.7	7.9	7.9	7.1	8.8	8.7	7.1	8.7
United States	6.3	6.5	9.7	7.9	10.8	7.1	8.9	8.7	7.3	8.6
Average	**5.7**	**6.3**	**9.6**	**7.7**	**7.5**	**6.9**	**8.7**	**8.5**	**7.0**	**8.5**

* For the definition of the different scenarios see Table 4.

** Estimates, taking into account the observed expenditure growth between 2000 and 2003 (or 2002 if not available).

Source: Secretariat calculations.

2.4.2 A cost pressure scenario

30. In this scenario it is assumed that, on top of the demographic effects and income effects, the expenditure residual continues to grow at 1 per cent per year over the projection period. This induces a substantial increase in the health expenditures, averaging nearly 4 percentage points of GDP from 2005-2050. In most countries, health care expenditures would then approach or exceed 10 per cent of GDP by the end of the projection period.

31. While these figures may be useful as a benchmark, they do not seem very plausible. It is unlikely that public health care expenditures to GDP could continue to grow at such constant rate, without limit. A long-run convergence (or transversality) condition is therefore considered in the next scenario.

2.4.3 A cost-containment scenario

32. In the "cost-containment" scenario it is assumed that residual expenditure growth converges to zero by 2050,[20] implicitly meaning that policies are effective in controlling expenditure growth driven by some of the non-demographic factors. These policies have been already enacted in the past (see Box 2 above) and could progressively rein in the expenditure residual, for example by ensuring that future technology improvements are mainly used in a cost-saving way. In the absence of additional ageing effects, this would imply that public health care expenditure and income would evolve in parallel over the very long-run.[21]

33. Under this rather optimistic scenario, public health care expenditures in the OECD area would still increase on average by two percentage points between 2005 and 2050, from 5.6 to 7.7 per cent of GDP (Table 5). Large increases (above 2.5 percentage points of GDP) by 2050 are found (in descending order) in Korea, Slovak Republic, Mexico and Japan. Most of these countries are experiencing a rapid demographic change induced by the sharp fall in fertility rates.

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[20] This is roughly equivalent to assuming that the residual grows at a constant rate of ½ per cent per year.

[21] This convergence assumption (or transversality condition) may appear controversial in view of past experience. The assumption is justified by the fact that the expenditure growth has to be financed by the public purse. Under perfect health market conditions, a continuing increase in the share of income going to health care spending could reflect individual preferences. But the health care market is not perfect and governments are footing most of the bill. Thus, rapid growth of the share of health care spending in income would have to be compensated by reductions in other public spending items, which may be difficult to achieve, and/or increased health care charges for individuals. Such cost sharing has already been introduced in most countries. Similar transversality conditions have also been imposed in other projection exercises. For example, Englert (2004) assumes that income elasticity ultimately converges to one. For symmetry, negative residuals are assumed to increase towards zero over the projection period, in the scenario with country-specific residuals.

2.5 Sensitivity analysis

34. In the sensitivity analysis, a number of parameters were changed compared with the "cost-containment scenario": the size of the income elasticity, the magnitude of the residual, as well as factors underlying health status scenarios and demographic projections. Overall, the previous results seem relatively robust, as these alternative simulations do not change qualitatively the picture emerging from the comparison of the "cost-pressure" and "cost-containment" scenarios discussed above.

2.5.1 Residuals, income elasticity and different health scenarios

35. Unsurprisingly, applying country-specific growth rates of the residual component[22] would significantly affect spending patterns of individual OECD countries (Table 5). Korea, Mexico, Portugal, Switzerland, the United States would record significant increases (above two percentage points of GDP) compared with the "cost-containment" scenario.[23] If anything, this scenario illustrates the unsustainability of current health expenditure trends in some OECD countries. In contrast, in countries where recent cost-containment policies were successful, the projected expenditure shares would tend to be more moderate than in the cost-containment scenario (e.g., Denmark, Sweden). Other countries would display large decreases in expenditures because the effect of past residual growth resulting from idiosyncratic conditions, such as the scaling back of former welfare systems during economic transition (Czech Republic, Hungary, Poland and Slovak Republic), would be prolonged in the future.

36. To assess sensitivity to income elasticity, projections were run with elasticities below and above unity (0.8 and 1.2, respectively), while keeping the residual as in the cost-containment scenario.[24] Under these alternative scenarios, average OECD public health care expenditure shares would range from around 7 to 8.7 per cent of GDP. The countries with the largest projected GDP per capita growth (e.g. Ireland, Mexico, Poland) are obviously the most affected by changes in income elasticity.

37. As discussed above, the residual was derived from trends observed over the two past decades, a period characterised by efforts to contain costs. Assuming that the residual would grow at 1.5 per cent per year (as observed on average over the past three decades), but that it would still decline to zero over the projection period, would induce an average increase of less than one percentage point of GDP compared with the cost-containment scenario.

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22 Note that the residual is still assumed to converge towards zero over the projection period.

23 Given the very high historical growth rate of the residual for Turkey, this country was excluded from this simulation as it produced rather implausible shares of health care expenditures to GDP by 2050.

24 Note that when the chosen income elasticity is assumed to be changed both in the past and in the future, applying sub-unity elasticity would increase the residual when explaining past data. This means, when projecting, that the drag on expenditure growth from lower income elasticity would be offset by a higher residual, and vice versa. By construction, such scenarios would not produce very different results.

38. Sensitivity to alternative health regimes was also explored. In a "compression of morbidity" scenario the shift in the cost curves is twice the adjustment applied in the "healthy ageing" regime. Alternatively, a regime of "expansion of morbidity" corresponds to a scenario where longevity gains are not translated into "healthy ageing". Under these scenarios, average health expenditures by 2050 range from 7 to 8.5 per cent of GDP. This shows that alternative health regimes matter for projecting future expenditure trends, but their impact is smaller than non-demographic effects.

2.5.2 Alternative population projections

39. As noted in Box 3, national population projections are not based on harmonised assumptions across countries. In particular, projected longevity gains can differ widely and, on average, are also lower than observed in the past decades. Accordingly, an alternative scenario was tested where longevity is assumed to increase uniformly across countries by two years per decade, in line with past trends. These alternative population projections were derived from a stylised demographic *maquette*, mimicking national projections (see Gonand, 2005).

40. The simulations were carried out for five large OECD countries (France, Germany, Italy, Japan and United States). Taking again the "cost-containment" scenario as a benchmark, the implied deviations are relatively modest (on average an increase in expenditures below ½ percentage point of GDP, see Table 6). This could be expected in a world of "healthy ageing". Indeed, a framework were demographic effects are not adjusted to healthy ageing would be much more sensitive to underlying idiosyncrasies in national population projections. Nonetheless, the joint effect of an "expansion of morbidity" assumption and higher longevity gains would generate a sharp increase in expenditures, of around 1½ percentage points, compared with the "cost-containment" scenario. This stresses the important fact that it is not longevity or health status *per se* that could induce expenditure pressures, but rather their interaction.

3. Long-term care

41. Long-term care (hereafter, LTC) differs from health care. While health care services aim at changing a health condition (from unwell to well), long-term care merely aims at making the current condition (unwell) more bearable. Individuals need LTC due to disability, chronic condition, trauma, or illness, which limit their ability to carry out basic self care or personal tasks that must be performed every day. Such activities are defined as activities of daily living, ADLs (eating, dressing, bathing, getting in and out of bed, toileting and continence) or instrumental activities of daily living, IADLs (preparing own meals, cleaning, laundry, taking medication, getting to places beyond walking distance, shopping, managing money affairs and using the telephone/Internet). A person is dependent if he or she has limitations in ADLs and IADLs.

Table 6

Sensitivity Analysis of Health Care Expenditure to Population Projections Assuming Longevity Gains of 2 Years per Decade
(percent of GDP)

Country	2005*	Healthy ageing	Expansion of morbidity
		2050	
France	7.0	8.8	9.8
Germany	7.8	9.6	10.7
Italy	6.0	8.1	9.2
Japan	6.0	8.4	9.5
United States	6.3	7.7	8.6
Average	**6.6**	**8.5**	**9.6**

* Estimates, taking into account the observed expenditure growth between 2000 and 2003 (or 2002 if not available).
Source: Secretariat calculations.

42. At around 1-2 per cent of GDP, the importance of current public long-term care spending is limited compared with health care. Still, as LTC spending is heavily concentrated among the elderly (Wittenberg *et al.*, 2002), the projected demographic change suggests that its share in the economy is likely to increase. As for health care, the expenditure profiles constitute the foundation of the projection framework. In contrast with health care, the cost curves for LTC are basically close to zero up to age 60-65, and then increase sharply and monotonically, with different slopes across countries (Figure 8). These characteristics stem from different features, such as the mix between (expensive) formal and (inexpensive) informal care and the current prevalence of dependency (disability status).[25]

3.1 Projecting demographic drivers of expenditure

43. Whereas health care projections distinguished between survivors and non-survivors, the LTC projections split each age group into *dependants* and

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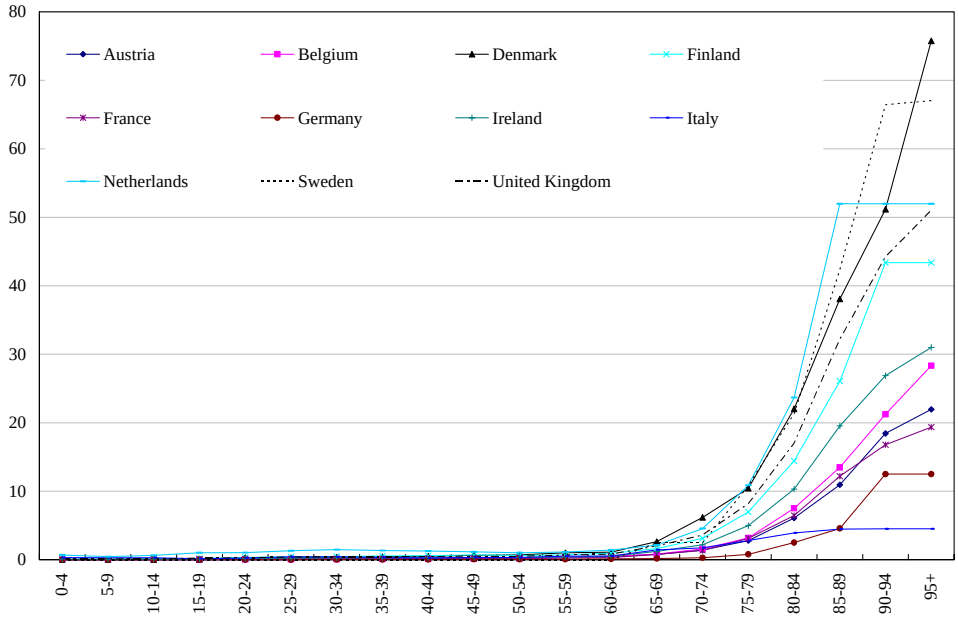
[25] For comprehensive discussions of long-term care, see for example OECD (2005b), Lundsgaard (2005), Karlsson *et al.* (2004), Comas-Herrera *et al.* (2003), Norton (2000) and Wittenberg *et al.* (1998). Interesting UK case studies are Davies *et al.* (1990) and Evandrou *et al.* (1998). As an indication of the potential spending pressures, the average cost per year of institutional long-term care for old persons in France is currently at 35,000 € per dependant, and in the range of 40,000-75,000 US$ per dependant for the United States (Taleyson, 2003).

Figure 8

Public Long-term Care Expenditure by Age Group*

(percent of GDP per capita)



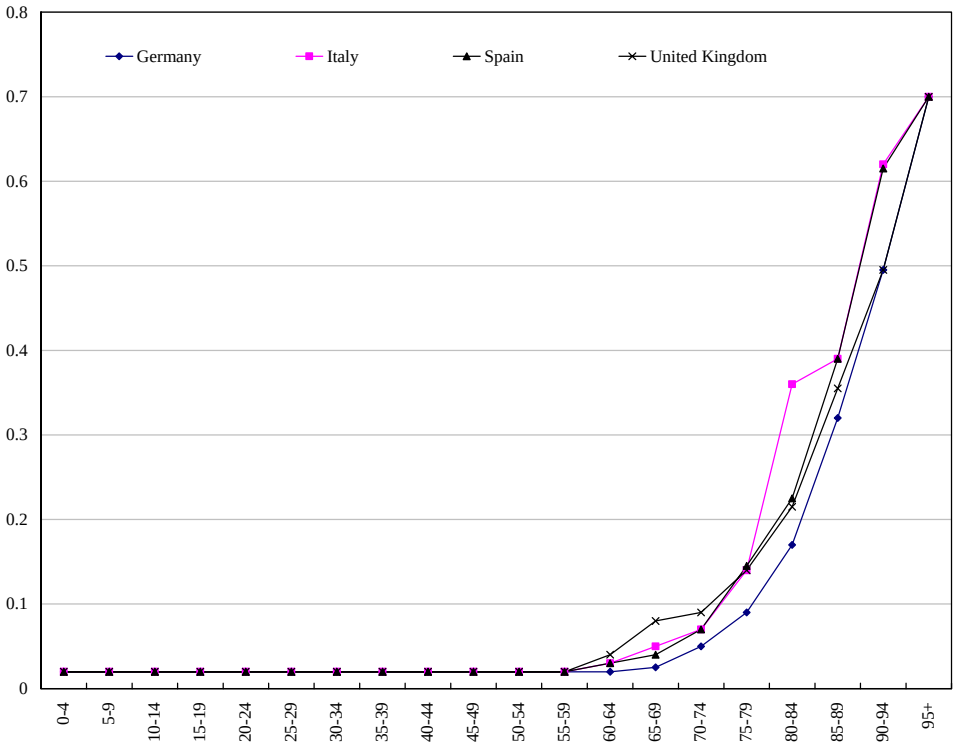
* Expenditure per capita in each age group divided by GDP per capita.
Source: ENPRI-AGIR and Secretariat calculations.

non-dependants.[26] Deriving the cost of LTC *per dependant* requires an estimate of the prevalence of dependency by age group. Unfortunately, one of the most comprehensive study in this area (Comas-Herrera *et al.*, 2003) provides dependency figures only for Germany, Italy, Spain, and the United Kingdom. Nonetheless, it can be observed that the shape of the dependency ratios by age is similar in these four countries (Figure 9). This suggests that, as a first approximation, dependency ratios could be assumed to be broadly uniform across countries. For the purpose of projecting expenditure, this has also the advantage of eliminating current differences in prevalence of dependency across age groups as a possible cause for future different increases in LTC expenditures. Put differently, the projections become less sensitive to initial conditions. Along these lines, the original expenditure profiles were divided by the average cross-country dependency ratio in order to derive the LTC expenditures per dependant person (Figure 10).

[26] Indeed, even if the unit costs of long-term care per dependant are equal in, say, countries A and B, the cost curves by age group would still differ if the share of dependants in each age group is different in each country.

Figure 9

Prevalence of Dependency by Age Group*

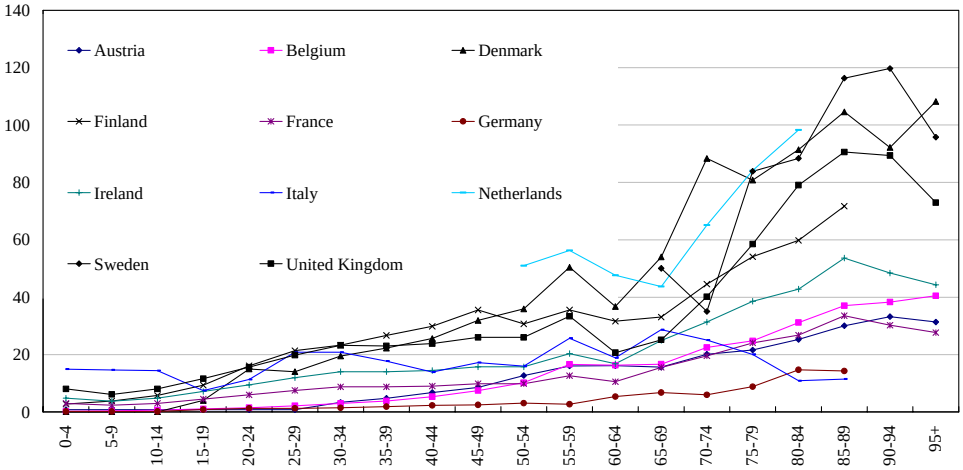


* Dependency is defined as the inability to accomplish one or several Activities of Daily Living (see text).
Source: Comas-Herrera *et al.* (2003) and Secretariat calculations.

44. There is a great deal of uncertainty about the extent to which disability has changed over time or could change for future generations (see Box 4). Internationally-comparable data in this area is also limited (Lagergren and Batljan, 2000; Jacobzone *et al.*, 2000; Wittenberg *et al.*, 2001). Moreover, disability is not necessarily translated into dependency, as the technical progress could help a disable person to work and take part in everyday life. Despite hard evidence on these phenomena, this paper assumes that the prevalence of dependency improves as life expectancy increases. However, while for health care "healthy ageing" implied that every year gained in longevity is one in good health, the assumption for dependency is not as sanguine. One could argue that for the oldest old, where dependency is most prevalent, the potential for experiencing complete healthy longevity gains is decreasing. Accordingly, the "healthy ageing" hypothesis for long-term care was (arbitrarily) assumed to be that only *half* of the longevity gains are translated into a reduction in dependency. Alternative scenarios allow testing the sensitivity of the results to this assumption.

Figure 10

Adjusted Long-term Care Expenditure per Dependant
(percent of GDP per capita)



Source: ENPRI-AGIR and Secretariat calculations.

Box 4
Has disability fallen over time?

Answering this question is not easy because consistent cross-country data on disability rates simply do not exist. Disability is usually measured through the inability of performing one or more Activities of Daily Living (ADL). Evidence for some OECD countries suggests that the share of the severely disabled has fallen over time, while no conclusion could be reached concerning the evolution of moderate disability. Studies on the United States, for which more data are available, show that disability rates may have declined somewhat among the oldest but have increased among younger age groups, a phenomenon that is often linked to obesity trends (cf. Rand Research Bulletin, 2004).

Nonetheless, downward trends in disability may not be accompanied by a lower pressure on expenditures. On the contrary, increased spending on health care is rather the precondition for lower disability (Lichtenberg and Virabhak, 2002; Lichtenberg, 2003; Jacobzone, 2003). Indeed, helping a chronically-ill person to be autonomous may require access to the high-cost technical frontier in bio-tech/drugs.

3.2 Projecting non-demographic drivers of expenditure

45. The main non-demographic driver of LTC expenditure is related to the relative shares of *informal*[27] and *formal* care and their evolution over time.[28] While the bulk of LTC is provided informally throughout the OECD area, it is relatively more important in southern European or lower income countries. As labour force participation is projected to increase in the future, concerns are expressed that informal care will have to be substituted by more expensive formal care, adding to the fiscal burden alongside the projected greying of the population (OECD, 2005b; Comas-Herrera *et al.,* 2005).[29]

46. Wage trends among staff providing LTC would also be a significant driver of costs. Data from a UK study shows that staff costs in public sector homes accounted for 85 per cent of total unit costs (Netten *et al.,* 1998). Similarly, a study in Germany found that staff costs accounted for between 70 and 90 per cent of total unit cost of nursing homes (Reinhold, 2001).

47. LTC is highly labour intensive, but the room for productivity gains is probably limited. Therefore, it could be exposed to a "cost disease" or Baumol (1967, 1993)'s effect. In short, this implies that relative prices of LTC *vis-à-vis* other goods and services in the economy tend to rise, reflecting the negative productivity differential and equalisation of wages across sectors. With a price-inelastic demand, the share of LTC expenditure in GDP would tend to increase over time. A possible way to capture this effect is to assume that unit costs rise in line with average earnings of care staff or a measure of wage inflation in the economy (Comas-Herrera *et al.*, 2003).

48. It is plausible that income growth could push up LTC expenditure, although empirical evidence on the income elasticity of LTC expenditure is just not available. Considering that LTC can be characterised as a necessity, the income elasticity could be probably small or close to zero, though it could be expected that with the

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[27] Most informal care is provided by partners or children. To be considered informal, the provision of care cannot be paid for as if purchasing a service. However, an informal care giver may receive income transfers conditioned on his/her provision of informal care and possibly, in practice, some informal payment from the person receiving care. On the other hand, formal care is provided by care assistants who are paid for providing care under some form of employment contract. It includes care provided in institutions as well as care provided at home. The difference between formal and informal care is first of all not about the type of care, but who provides it (Lundsgaard, 2005).

[28] Due to lack of sufficiently comparable information across countries, this paper does not incorporate another important distinction, which is the subdivision of formal care into institutional care and care delivered to the patient's home. There are indeed fundamental differences between countries in the way they organise their formal LTC. Institutional LTC is particularly widespread in the Nordic countries. Norway and Sweden stand out with substantially higher LTC spending than any other country due to generous services (single rooms and well-equipped housing infrastructure) provided for residents in nursing homes (OECD, 2005b). Whether this organisation is adopted by other countries or a (cheaper) ambulatory help-at-home strategy is pursued could have important consequences for public expenditures.

[29] There are indications that the proportion of older people living alone increased up to the early 1990s, although trends appear to have changed since (Tomassini *et al.*, 2004 and Borsch-Suppan, 2005).

development of long-term care services a demand for higher quality services could also develop.

49. In order to assess the impact of these different drivers on the observed differences of LTC costs per dependant across countries, a simple econometric model was specified:[30]

$$Log\left(\frac{LTC}{ND}\right) = \alpha + \beta_1 \cdot Age + \beta_2 \cdot Z + \beta_3 \cdot W + u \tag{3}$$

where *LTC* is total long-term care expenditure, *ND*, the number of dependants, *Age* is the central point in each age bracket (2, 7, 12, …, 97), *Z* a proxy capturing the provision of informal care and *W* a proxy for the other effects (relative prices and/or income). The model was estimated using a panel of eleven EU countries by twenty age groups. Following several alternative specification tests (not reported here), the availability of informal care appeared to be best proxied by the participation ratio of the population aged 50-64. The level of GDP per capita was included but it did not appear significant, suggesting that the income elasticity could indeed be small. Given the reduced size of the country cross-section and collinearity problems, it was not possible to test for relative price effects. The equation was first estimated with country-fixed effects (Table 7). In the final specification, the fixed-effects were replaced by the participation ratio of people aged 50-64. The estimates of the age and old-age participation coefficients are robust across different specifications and display the expected sign.

3.3 Combining demographic and non-demographic drivers

50. Combining the different drivers, the logarithmic growth of long-term care expenditures to GDP can be decomposed as follows:

$$\Delta\log\left(\frac{LTC}{Y}\right) = \Delta\log(adjusted\ age\ factor) + (\varphi - 1)\cdot\Delta\log\left(\frac{Y}{N}\right) + \gamma\cdot\Delta\log(Baumol\ effect) + \Delta\log(effect\ \ of\ \ participation) \tag{4}$$

where Y and N are income and population, as defined previously; φ is the income elasticity of LTC expenditures and γ the elasticity characterising the "Baumol effect", *i.e.* the extent to which an increase of average labour productivity in the economy (a proxy for wage growth) is translated into an increase of LTC costs per dependant.

51. Using this framework, the drivers are allowed to operate in several ways (see OECD, 2006, Annex 2A for further details). On demographics, it was assumed that

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[30] Given that the shape of the expenditure curves by age is close to an exponential function, a log-level specification was used.

Table 7

Econometric Estimates of Long-term Care Costs per Dependant

Log of long-term care cost per dependant	**Fixed effects**	**Robust OLS with age-invariant explanatory variables**	
Age	0.0335***	0.0348***	0.0345***
	(0.0014)	(0.0025)	(0.0023)
Participation ratio of people aged 50-64		0.0394***	0.0378***
		(0.0054)	(0.0066)
GDP per capita			0.0748
			(0.0509)
Constant	6.433***	4.217***	2.356*
	(0.079)	(0.380)	(1.317)
Number of countries	11		
Number of age groups	20		
Number of observations	185		
R-squared	0.77 (within)	0.62	0.62

Note: *** significant at 1% and * significant at 10%.
Standard errors in parentheses.

half of the projected longevity gains translated into years with lower dependency. This is accomplished by shifting the dependency curve rightwards accordingly.[31]

52. On non-demographics, the cost curve per dependant is assumed to shift upwards due to the increase of the average labour productivity in the economy, thus embodying an implicit "cost-disease". In most scenarios, the elasticity of this "Baumol effect" (γ) was assumed to be 0.5, probably a mild view on the extent to which the productivity of LTC services could under-perform relatively to the rest of the economy. The income elasticity was assumed in general to be zero, implying that income growth tends to drive down LTC expenditures as a share of GDP. This set of assumptions could be viewed as a relatively optimistic.

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[31] Note that this method differs somewhat from what was presented earlier for health care expenditures, where the cost profile for survivors was shifted directly in line with projected longevity gains. Here the cost profile is shifted indirectly through the shift in dependency rates.

53. The second non-demographic effect is related to the participation rate of people aged 50-64, proxying the supply of informal care. Using the econometric model (3), increasing labour market participation trends induce an additional upward shift in the LTC cost curve. The baseline projections on participation rates were derived from Burniaux *et al.*(2003). These projections rely on a cohort-based approach; however, the last cohort used to project participation is the one entering the labour market in year 2000. The behaviour of subsequent cohorts remains unchanged thereafter. The latter could lead to a somewhat subdued projection of future increases in participation rates, especially in countries where these rates were well below average for cohorts entering the labour market in year 2000.

3.4 Alternative scenarios for OECD countries

54. The framework described above was used to project expenditures over the period 2005-50, under a range of scenarios similar to the approach followed for the health care projections. The main assumptions underlying each scenario are listed in Table 8.

3.4.1 Demographic effects

55. The first simulation corresponds to demographic effects (Table 9). On average, LTC expenditures reach 2.3 per cent of GDP by 2050 or an increase of 1.2 percentage points of GDP compared with 2005. Due to the sharp increase in dependency ratios with age, demographic effects contribute to a relatively much larger increase in LTC expenditures than the one observed for health care. Very large impacts of demographics on LTC expenditures (with increases from 2 to above 4 percentage points of GDP) are found in fast-ageing countries, such as Korea, Slovak Republic, Poland, Czech Republic, Poland, Turkey and Japan.

3.4.2 A cost-pressure scenario

56. This scenario assumes a "full Baumol" effect, implying that LTC costs per dependant increase in line with overall labour productivity. Due to the steady increase in relative prices, LTC expenditures would reach 3.3 per cent of GDP by 2050, or an increase of 2.2 percentage points of GDP compared to 2005.

3.4.3 A cost-containment scenario

57. In this case it is assumed that policies are able to "contain" the cost pressures associated with the Baumol effect. It is difficult to give a clear interpretation for this policy lever, but in practical terms it means that governments would deploy a continuous effort to generate productivity gains and/or contain upward pressures on wages of staff providing long-term care. In this scenario, the supply of informal care would also continue to be relatively abundant because mild increases in the

Table 8

Assumptions Underlying the Alternative Projection Scenarios: Long-term Care

Scenarios	Health Status	Participation rates (proxy for availability of informal care)	Income and 'cost disease' effects
Demographic effect	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years (approximately half of the projected longevity gains)	n.a.	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero
Cost-pressure scenario	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years	Participation rates of people aged 50-64 increase in line with baseline labour force projections	**Long-term care costs per dependent increase in line with average labour productivity (full Baumol effect)** Income elasticity equal to zero
Cost-containment scenario	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years	Participation rates of people aged 50-64 increase in line with baseline labour force projections	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero
Unitary income elasticity	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years	Participation rates of people aged 50-64 increase in line with baseline labour force projections	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) I**ncome elasticity equal to one**
Compression of disability	**The prevalence of dependency per age is shifted by 1 year every 10 years**	Participation rates of people aged 50-64 increase in line with baseline labour force projections	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero
Expansion of disability	**No healthy ageing adjustment, *i.e.* the prevalence of dependency remains constant over time**	Participation rates of people aged 50-64 increase in line with baseline labour force projections	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero
Increase in dependency	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years, but **dependency rates are assumed to increase by 0.5% per year**	Participation rates of people aged 50-64 increase in line with baseline labour force projections	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero
Increased participation	Healthy ageing: the prevalence of dependency per age is shifted by ½ year every 10 years	**Participation rates of people aged 50-64 converge to at least 70% by 2050 in all countries**	Long-term care costs per dependent increase by *half* of average labour productivity (partial Baumol effect) Income elasticity equal to zero

NB: The key assumption changed in each scenario is in bold.

Table 9

Projection Scenarios for Public Long-term Care Expenditure*

(percent of GDP)

Country	2005 **				Sensitivity analysis				
		Demographic effect	Cost-pressure	Cost-containment	Unitary income elasticity	Compression of disability	Expansion of disability	Increase in dependency	Increased participation
		2050							
Australia	0.9	2.2	2.9	2.0	2.6	1.5	2.4	3.1	3.2
Austria	1.3	2.5	3.3	2.5	3.0	2.0	2.9	3.6	5.4
Belgium	1.5	2.4	3.4	2.6	3.2	2.2	3.1	3.7	5.9
Canada	1.2	2.3	3.2	2.4	3.0	1.9	2.9	3.6	2.9
Czech Republic	0.4	2.0	2.0	1.3	1.7	0.9	1.8	2.4	3.2
Denmark	2.6	3.3	4.1	3.3	3.9	2.9	3.7	4.2	3.5
Finland	2.9	4.3	5.2	4.2	4.8	3.7	4.6	5.4	4.9
France	1.1	2.3	2.8	2.0	2.5	1.6	2.4	3.0	3.7
Germany	1.0	1.9	2.9	2.2	2.7	1.7	2.7	3.4	3.2
Greece	0.2	1.0	2.8	2.0	2.6	1.4	2.6	3.5	3.0
Hungary	0.3	1.5	2.4	1.0	1.6	0.6	1.3	1.8	5.4
Iceland	2.9	3.5	4.4	3.4	4.1	3.1	3.8	4.3	3.5
Ireland	0.7	1.7	4.6	3.2	3.9	2.5	3.9	4.9	3.7
Italy	0.6	2.0	3.5	2.8	3.3	2.2	3.5	4.5	6.3
Japan	0.9	2.3	3.1	2.4	2.8	1.9	2.9	3.7	2.3
Korea	0.3	4.1	4.1	3.1	3.7	2.3	3.9	5.1	5.1
Luxembourg	0.7	1.6	3.8	2.6	3.3	2.0	3.1	4.0	4.9
Mexico	0.1	2.0	4.2	3.0	3.8	2.2	3.9	5.1	3.7
Netherlands	1.7	2.4	3.7	2.9	3.5	2.4	3.4	4.1	3.9
New Zealand	0.5	2.0	2.4	1.7	2.2	1.2	2.1	2.8	2.1
Norway	2.6	3.3	4.3	3.5	4.1	3.1	3.9	4.5	3.6
Poland	0.5	2.6	3.7	1.8	2.5	1.3	2.2	2.8	6.2
Portugal	0.2	1.3	2.2	1.3	1.9	0.8	1.8	2.4	2.1
Slovak Republic	0.3	2.6	2.6	1.5	2.0	1.1	2.0	2.6	6.6
Spain	0.2	1.0	2.6	1.9	2.3	1.3	2.4	3.3	3.0
Sweden	3.3	3.6	4.3	3.4	4.0	3.2	3.6	4.0	3.6
Switzerland	1.2	1.7	2.6	1.9	2.4	1.5	2.3	2.8	1.9
Turkey	0.1	1.8	1.8	0.8	1.4	0.5	1.2	1.7	6.8
United Kingdom	1.1	2.1	3.0	2.1	2.7	1.7	2.6	3.2	2.6
United States	0.9	1.8	2.7	1.8	2.4	1.4	2.2	2.8	1.9
Average	**1.1**	**2.3**	**3.3**	**2.4**	**2.9**	**1.9**	**2.8**	**3.5**	**3.9**

* For the definition of the different scenarios see Table 8.

** Estimates, taking into account the observed expenditure growth between 2000 and 2003 (or 2002 if not available).

Source: Secretariat calculations.

participation ratios are combined with an increase of the population in the group of 50-64 years old due to the ageing trends. Despite these optimistic assumptions, average LTC expenditures would still more than double from the current base to reach 2.4 per cent of GDP by 2050. Much larger effects are found in countries, such as Greece, Italy, Ireland and Spain where the participation ratios of those aged 50-64 are projected to increase significantly or in countries facing strong demographic pressures, as noted previously.

3.5 Sensitivity analysis

58. Given the data uncertainties, sensitivity analysis is particularly important concerning LTC projections. A first scenario captures the possibility of higher income effects. Arbitrarily, it was assumed that the income elasticity is unitary. This would add around ½ percentage points of expenditure to GDP by 2050 compared to the cost-containment scenario.

59. As noted above, future developments in the prevalence of dependency are hard to predict. A "compression of disability" scenario was tested, where the dependency curve is shifted to the right twice as fast as longevity gains. This would reduce LTC expenditures by around ½ percentage point of GDP for the OECD group compared with "cost-containment" scenario. In an "expansion of disability" scenario, the dependency rates remain constant as life expectancy increases and the effect would be symmetrically opposite.

60. Another alternative scenario captures a possible autonomous increase in the dependency rate by 0.5 per cent per year. This could be interpreted as a conservative estimate of the impact of the worrying obesity trends on dependency.[32] On average LTC expenditures would reach 3.5 per cent of GDP by 2050, or a significant shift of more than 1 percentage point of GDP compared to the cost-containment case.

61. In an "increased participation" scenario, the availability of informal care is dramatically reduced by assuming that all countries converge towards an old-age participation ratio of at least 70 per cent by 2050 (countries having already a participation ratio above that level were supposed to follow their country-specific pattern). This is well above the baseline labour participation projections and would lead to average LTC costs roughly at 4 per cent of GDP by 2050, or an additional expenditure of 1.5 percentage points of GDP compared to the cost-containment scenario. The most significant increases would occur in countries where old-age participation ratios are currently particularly low (e.g., Austria, France, Italy, Turkey and former transition countries).

62. The comparison between this scenario and the cost-containment one gives a sense of the trade-offs involved with policies aiming at increasing participation

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[32] Sturm *et al.* (2004) argue that if current trends in obesity continue, disability rates will increase by 1 per cent a year more in the 50-59 age group than if there were no further weight gains. See also Olshansky *et al.* (2005) for a discussion on the effect of obesity trends on life expectancy.

rates, on the one hand, and the objective of containing future LTC expenditures, on the other hand. In this context, competing demands on the age group 50-64 could be particularly strong.

63. Finally, the sensitivity to alternative population projections was also tested for five OECD countries (France, Germany, Italy, Japan and the United States). Under the "healthy ageing" assumption (*i.e.* the dependency curves are shifted by half of the increase in life expectancy), higher longevity gains (two years per decade) *per se* do not have a strong impact on expenditures. Average expenditure for the five OECD countries is projected to be around 2.8 per cent of GDP by 2050. In contrast, a scenario where higher longevity gains are coupled with an "expansion of disability" would push average LTC expenditures to above 4 per cent of GDP by 2050.

Table 10

Sensitivity Analysis of Long-term Care Expenditure to Population Projections Assuming Longevity Gains of 2 Years per Decade
(percent of GDP)

Country	2005*	Healthy ageing 2050	Expansion of disability
France	1.1	2.2	3.1
Germany	1.0	3.0	4.4
Italy	0.6	3.5	5.3
Japan	0.9	3.6	5.2
United States	0.9	1.7	2.6
Average	**0.9**	**2.8**	**4.1**

* Estimates, taking into account the observed expenditure growth between 2000 and 2003 (or 2002 if not available).
Source: Secretariat calculations.

64. To sum-up, the sensitivity analysis showed that the long-term care projections presented here seem relatively robust to alternative specifications of the income elasticity, health status and longevity assumptions. In contrast, increased dependency associated with obesity trends or lower provision of informal care could have a much stronger impact on expenditures. A combination of these negative factors would obviously generate a rather gloomy perspective for public budgets.

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