HEALTH-CARE EXPENDITURE PROJECTIONS: RESULTS, POLICY CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

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1 Introduction

In the coming decades, the size and age-structure of Europe's population will undergo dramatic changes due to low fertility rates, continuous increases in life expectancy and the retirement of baby-boom generation. There has been a growing recognition at national and European level of the profound economic, budgetary and social consequences of ageing populations. In 2006 this led to the publication of the age-related expenditure projections, which aimed at evaluating the impact of current demographic, economic and social processes on the public expenditure on pensions, health care, long-term care, education, unemployment transfers and, where possible, contributions to pensions and social security systems in all twenty-five Member States of the European Union [1]. In turn, the thorough analysis of the budgetary and economic consequences of ageing allowed for an assessment of the risks to the sustainability of public finances in the Member States [2]. Based on the experiences of that exercise, the next round of projections will be prepared in 2009.

The starting point in the projection exercise was a common population projection for all 25 EU Member States produced by Eurostat. In the next step, the Commission and Ageing Working Group (AWG) attached to the Economic Policy Committee (EPC) agreed on a common set of underlying economic assumptions, most importantly on the evolution of the labour force and productivity. By combining the population projections with the economic assumptions, a projection was made for GDP growth potential for all Member States up to 2050. Following this, the underlying population and GDP growth projections were used to project public spending on five categories of expenditure affected by population ageing: health care, long-term care, pensions, education and unemployment benefits. The final step was to aggregate all the projections to get an overall picture of how ageing will affect public spending.

Figure 1 overleaf presents an overview of the entire age-related expenditure projection exercise prepared jointly by the Economic Policy Committee and the European Commission.

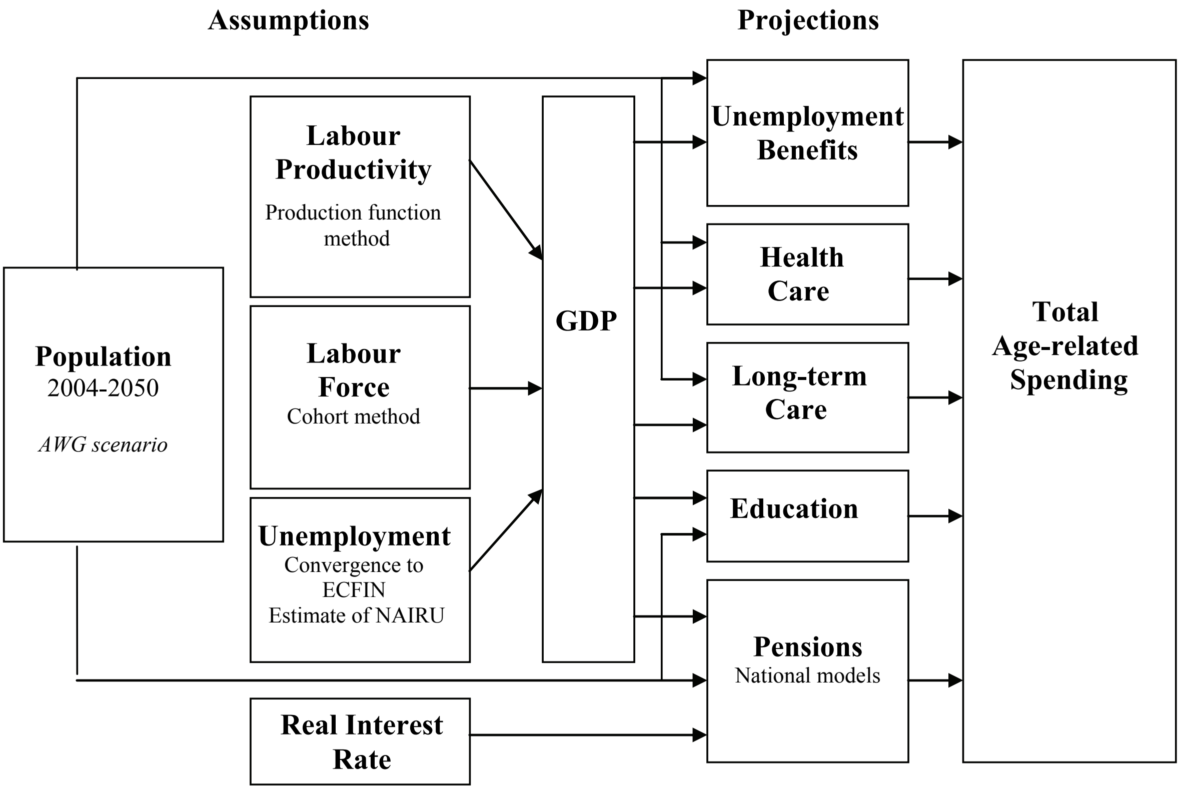
The unique value-added of the exercise results from the fact that it is produced in a multilateral setting involving both national authorities and international organisations. The projections are made on the basis of a common population projection and common underlying economic assumptions that have been endorsed by the EPC and forwarded to the ECOFIN Council. Moreover, they are made on the basis of the "no policy change" principle (*i.e.*, only reflecting enacted legislation, but not possible future policy changes, although account would be taken of provisions in enacted legislation that will enter into force) and on the basis of the assumption on the constant current behaviour of economic agents (*i.e.*, without assuming any changes in behaviour – e.g., participation rate – over time). Every effort has been made to maximise the comparability of the projection exercise across countries. While the underlying assumptions have been made by

* European Commission.

This paper is based on the common age-related public expenditure projections produced by the Economic Policy Committee and the European Commission. The authors would like to thank Giuseppe Carone, Núria Diez Guardia, Gilles Mourre, Aino Salomäki, as well as other colleagues from DG ECFIN and the Members of the Working Group on Ageing Populations chaired by Henri Bogaert for helpful input, suggestions and comments.

Figure 1

Overview of the 2006 Projections of Age-related Expenditures



applying a common methodology uniformly to all Member States, for several countries adjustments have been made to avoid an overly mechanical approach that would lead to economically unsound outcomes and to take account of significant relevant country-specific circumstances.

The paper describes the methodology used by the EPC and the Commission to project spending on health care, presents the main results and draws conclusions that could be used to improve the methodology used in future projection exercises. Section 2 describes trends in total and public expenditure on health care in the EU Member States over the recent decades. Section 3 discusses the demand and supply-side factors that may affect public health-care expenditure over the long term. Section 4 presents the methodology used in the projection exercise and the results of different scenarios illustrating the impact of various demographic and non-demographic factors on health expenditure. Section 5 concludes by providing some policy recommendations and suggestions on the possible improvements in the projection technique.

2 Recent trends in public spending on health care in the European Union

As can be seen in Table 1 opposite, health-care expenditure is a major, and over time growing, source of fiscal pressure. Total health-care spending, both public and private, increased

Table 1

Past Trends in Health-care Spending in EU Member States, 1970-2004

Country	Total expenditure (public and private) on health care *(percent of GDP)*					Public expenditure on health care *(percent of GDP)*					Share of public spending in total spending on health care *(percent)*			Share of health-care spending in total government outlays *(percent)*		
	1970	1980	1990	2000	2004*	1970	1980	1990	2000	2004*	1980	1990	2004**	1980	1990	2004**
BG	-	-	5.2	-	-	-	-	5.2	-	-	-	100	-	-	-	12
BE	3.9	6.3	7.2	8.6	10.1	-	-	-	6.5	7.2	-	-	71	-	-	14
CZ	-	-	4.7	6.7	7.3	-	-	4.6	6.1	6.5	-	98	89	-	-	15
DK	-	8.9	8.3	8.3	8.9	-	7.9	6.9	6.8	7.3	89	83	83	15	12	13
DE	6.2	8.7	8.5	10.4	10.9	4.5	6.8	6.5	8.2	8.5	78	76	78	14	15	18
EE	-	-	-	5.4	5.3	-	-	-	4.1	4	-	-	76	-	-	12
EL	6.1	6.6	7.4	9.9	10	2.6	3.7	4	5.2	5.3	56	54	53	-	8	11
ES	3.5	5.3	6.5	7.2	8.1	2.3	4.2	5.1	5.2	5.7	79	78	70	-	-	15
FR	5.3	7	8.4	9.2	10.5	4	5.6	6.4	7	8.3	80	76	79	12	13	15
IE	5.1	8.3	6.1	6.3	7.1	4.1	6.8	4.4	4.6	5.7	82	72	80	-	10	17
IT	-	-	7.7	7.9	8.4	-	-	6.1	5.8	6.4	-	79	76	-	12	14
CY	2.7	2.8	4.5	5.8	6.3	0.9	1.5	1.8	2.4	3	52	40	47	-	-	6
LV	-	2.1	2.5	4.8	6.3	-	-	2.5	3.5	3.3	-	100	52	-	-	11
LT	-	-	3.3	6	6	-	-	3	4.3	4.2	-	90	71	-	-	16
LU	3.1	5.2	5.4	5.8	8	2.8	4.8	5	5.2	7.3	92	93	91	-	13	17
HU	-	-	-	7.1	8.3	-	-	-	5	6	-	-	72	-	-	12
MT	-	-	-	8	9.2	-	-	-	6.1	7.2	-	-	78	-	-	14
NL	-	7.2	7.7	7.9	9.2	-	5	5.2	5	5.7	69	68	62	9	10	12
AT	5.2	7.5	7	9.4	9.6	3.3	5.1	5.1	6.6	6.8	68	73	71	10	10	14
PL	-	-	4.9	5.7	6.5	-	-	4.5	4	4.5	-	92	69	-	-	10
PT	2.6	5.6	6.2	9.4	10	1.6	3.6	4.1	6.8	7.2	64	66	72	10	10	15
RO	-	-	2.8	4.1	3.7	-	-	2.8	4.1	3.7	-	100	100	-	-	11
SI	4.2	4.4	5.6	8	8.6	4.2	4.4	5.6	6.9	6.8	100	100	79	-	-	14
SK	-	-	-	5.5	5.9	-	-	-	4.9	5.2	-	-	88	-	-	14
FI	5.6	6.3	7.8	6.7	7.5	4.1	5	6.3	5	5.7	79	81	76	12	13	11
SE	6.8	9	8.3	8.4	9.1	5.9	8.3	7.5	7.1	7.7	92	90	85	-	-	14
UK	4.5	5.6	6	7.3	8.3	3.9	5	5	5.9	7.1	89	83	86	11	12	16

* data from year 2003 for BE, DE and SK.
** data from year 2002 for DK; and from year 2003 for BE, DE and SK.
Source: *OECD Health Data 2006* (OECD Member States, except SK), *WHO European Health* for all database (all other countries).

rapidly during the 1960s and 1970s and, at a slower rate, in the 1980s. It picked up again in the 1990s in most Member States and currently amounts to around 8 per cent of GDP. Although not measurable in the more remote past, a large gap is noticeable in total spending between the old EU15 countries and the States that have recently joined the European Union (EU12). While total spending in the EU15 ranges from 7.1 per cent of GDP in IE to 10.9 per cent in DE (unweighted average amounts to 9.0 per cent), in the EU12 it ranges from 3.7 per cent in RO to 8.6 per cent in SI and 9.2 per cent in MT (unweighted average of 6.7 per cent).

Similar trends have been generally observed for public health-care spending, with a strong rise during the 1970s (in the countries for which data are available) and a slowdown or even reverse of the trend over the 1980s and 1990s, due to the overall budgetary consolidation efforts. Over the recent years a strong increase is observed again virtually in all the Member States, although significantly different patterns can be distinguished between the New Member States that have enacted a rapid health-care liberalisation and privatisation path (LV, LT, HU, PL, SI, which are the only examples of public fiscal contraction in the health-care sector) and those who have not given up the model of publicly provided and entirely or mostly financed health care (RO, CZ, SK).

A convergence or catch-up process is evident across countries, with the largest increases over time occurring in countries with the lowest initial levels.[1]

Another specific trend observed over the recent decades is that spending on health care has accounted for a growing share of general government expenditure. This occurred not only during the 1980's with the widening of access to public health systems, but especially during the 1990 and in the last decade, suggesting that health-care budgets fared better than other expenditure items during periods of fiscal consolidation. As a share of total public spending, health-care expenditure has grown in almost all countries over the last decade, increase being as strong as 4 percentage points in LU and AT, and 7 percentage points in IE. Currently, health care accounts for between 10 per cent (PL) to 17.6 per cent (DE) of total government expenditure. CY is a strong outlier with less than 6 per cent of its public spending devoted to health care.

Today in the EU15 public spending on health care accounts for almost 7 per cent of GDP in the EU15 and around 5 per cent of GDP in the EU12. The gap between the two groups of countries remains wide but, taking into account different kind of challenges (fast ageing and growing demand for high quality, technology-based care in EU15; current under-provision and growing expectations fuelled by fast real convergence, in EU12), both groups of countries are expected to face a significant increase in their public expenditure over the next decades.

3 Factors behind long-term evolution in health-care expenditure

3.1 Demographic developments

The recent changes in the size and structure of the Europe's population have resulted from a mix of three interrelated phenomena, notably the dramatic fall in fertility rates, gradual increase in life expectancy and net inflow of migrants from the other regions. Similar phenomena are expected to influence demographic developments over the decades to come. According to the Eurostat demographic projections, in 2050 Europe's population will be slightly smaller and significantly older than today. Fertility rates in all countries are projected to remain well below the natural replacement rate. Life expectancy at birth, having risen by some 8 years since 1960, is projected to rise by a further 6 years in the next five decades. Inward migration flows will only partially offset these trends. The total population of the EU25[2] will register a small fall from 457 to 454 million between 2004 and 2050. Of greater economic significance are the dramatic changes in the age structure of the population. Starting already from 2010, the working-age population (15 to 64) is projected to fall by 48 million (or 16 per cent) by 2050. In contrast, the elderly population aged 65+ will rise sharply, by 58 million (or 77 per cent) by 2050. The old-age dependency ratio, that is the number of people aged 65 years and above relative to those between 15 and 64, is projected to double, reaching 51 per cent in 2050. Europe will go from having four people of working age for every elderly citizen currently to a ratio of two to one by 2050 (see Table 2 opposite).

The demographic changes outlined above are expected to have an important impact on the size and structure of the public expenditure on all age-related items, and in particular on health and

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1 For example, public spending on health care in Portugal grew from 1.6 per cent of GDP in 1970 to 7.2 per cent of GDP in 2004, in Spain from 2.3 to 5.7 per cent and Greece from 2.6 to 5.3 per cent.

2 Eurostat's demographic projections underlying 2006 projection exercise did not include Bulgaria and Romania which at that time had not yet been Member States of the European Union. For that reason, the two countries had not taken part in the projection exercise and the aggregates mentioned in the remainder of the paper refer to the EU25 (for the whole EU) and EU10 (for the New Member States) respectively.

Table 2

Overview of the Projected Changes in the Size and Age Structure of the Population
(millions)

Country	Total Population			Young Population			Working-age Population (15-64)			Elderly Population (65+)			Very old Population (80+)		
	2004	2050	*percent of change*	2004	2050	*percent of change*	2004	2050	*percent of change*	2004	2050	*percent of change*	2004	2050	*percent of change*
BE	10.4	10.8	*4*	1.8	1.6	*–11*	6.8	6.3	*–8*	1.8	3.0	*67*	0.4	1.2	*173*
DK	5.4	5.5	*2*	1.0	0.9	*–16*	3.6	3.3	*–8*	0.8	1.4	*70*	0.2	0.5	*140*
DE	82.5	77.7	*–6*	12.2	9.5	*–22*	55.5	45.0	*–19*	14.9	23.3	*57*	3.4	9.9	*187*
GR	11.0	10.7	*–3*	1.6	1.3	*–18*	7.5	5.9	*–21*	2.0	3.6	*80*	0.4	1.2	*227*
ES	42.3	43.0	*1*	6.2	5.0	*–19*	29.1	22.9	*–21*	7.1	15.0	*111*	1.8	5.3	*199*
FR	59.9	65.1	*9*	11.1	10.4	*–7*	39.0	37.4	*–4*	9.8	17.4	*77*	2.6	6.9	*163*
IE	4.0	5.5	*36*	0.8	0.9	*4*	2.7	3.2	*16*	0.4	1.4	*219*	0.1	0.4	*313*
IT	57.9	53.8	*–7*	8.2	6.2	*–25*	38.5	29.3	*–24*	11.1	18.2	*64*	2.8	7.2	*158*
LU	0.5	0.6	*42*	0.1	0.1	*26*	0.3	0.4	*30*	0.1	0.1	*124*	0.0	0.1	*279*
NL	16.3	17.6	*8*	3.0	2.8	*–9*	11.0	10.6	*–4*	2.3	4.3	*91*	0.6	1.6	*191*
AT	8.1	8.2	*1*	1.3	1.0	*–24*	5.5	4.7	*–15*	1.3	2.5	*95*	0.3	1.0	*204*
PT	10.5	10.1	*–4*	1.6	1.3	*–21*	7.1	5.5	*–22*	1.8	3.2	*83*	0.4	1.1	*181*
FI	5.2	5.2	*–0*	0.9	0.8	*–13*	3.5	3.0	*–14*	0.8	1.4	*73*	0.2	0.5	*174*
SE	9.0	10.2	*13*	1.6	1.7	*4*	5.8	6.0	*4*	1.5	2.5	*60*	0.5	0.9	*95*
UK	59.7	64.2	*8*	10.9	9.4	*–13*	39.2	37.8	*–4*	9.5	17.0	*78*	2.6	6.5	*150*
CY	0.7	1.0	*34*	0.1	0.1	*–11*	0.5	0.6	*19*	0.1	0.3	*193*	0.0	0.1	*319*
CZ	10.2	8.9	*–13*	1.6	1.1	*–28*	7.2	5.0	*–31*	1.4	2.8	*93*	0.3	0.8	*164*
EE	1.4	1.1	*–17*	0.2	0.2	*–23*	0.9	0.7	*–27*	0.2	0.3	*33*	0.0	0.1	*124*
HU	10.1	8.9	*–12*	1.6	1.2	*–24*	6.9	5.2	*–25*	1.6	2.5	*60*	0.3	0.8	*131*
LT	3.4	2.9	*–16*	0.6	0.4	*–35*	2.3	1.7	*–26*	0.5	0.8	*49*	0.1	0.3	*171*
LV	2.3	1.9	*–19*	0.4	0.3	*–22*	1.6	1.1	*–30*	0.4	0.5	*30*	0.1	0.2	*131*
MT	0.4	0.5	*27*	0.1	0.1	*1*	0.3	0.3	*12*	0.1	0.1	*141*	0.0	0.0	*254*
PL	38.2	33.7	*–12*	6.6	4.4	*–33*	26.7	19.4	*–27*	5.0	9.9	*100*	0.9	3.0	*226*
SK	5.4	4.7	*–12*	0.9	0.6	*–36*	3.8	2.7	*–28*	0.6	1.4	*124*	0.1	0.4	*210*
SI	2.0	1.9	*–5*	0.3	0.2	*–16*	1.4	1.1	*–24*	0.3	0.6	*97*	0.1	0.2	*252*
EU25	*456.8*	*453.8*	*–1*	74.8	*61.4*	*–18*	306.8	259.1	*–16*	75.3	133.3	*77*	18.2	49.9	*174*
EU15	*382.7*	*388.3*	*1*	62.4	*52.7*	*–15*	255.1	221.3	*–13*	65.2	114.2	*75*	16.3	44.2	*172*
Euro area	*308.6*	*308.4*	*–0*	48.9	*40.8*	*–17*	206.5	174.2	*–16*	53.3	93.4	*75*	13.0	36.3	*180*
EU10	*74.1*	*65.5*	*–12*	12.4	*8.6*	*–30*	51.7	37.8	*–27*	10.1	19.1	*88*	1.9	5.7	*193*

long-term care, two sectors in the financing, managing, and in many cases providing of which the governments of all EU Member States are heavily involved.[3]

3.2 Is age the main driving force?

Contrary to the public spending on pensions which are solely driven by demographic developments and the institutional setting of the pension scheme, expenditure on health care is determined by a complex set of interrelated demand and supply side factors, often exogenous to the discretionary policy decisions. While a widespread belief links the average health-care expenditure to the age of an individual, several studies prove that the demand for and use of health care depends ultimately on the health status and functional ability of (elderly) citizens.

This issue can be illustrated using the age-related per capita expenditure profiles. Figure 2 overleaf shows the unweighted average of per capita spending on acute health care for respective

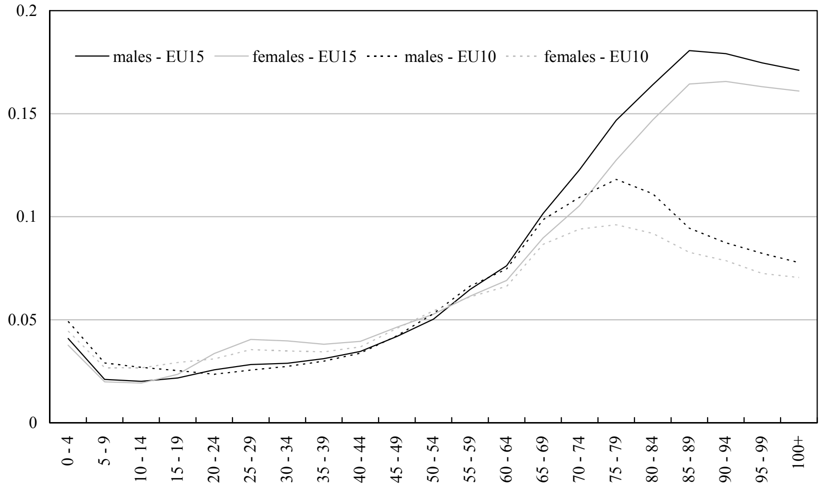
[3] This may reflect shared view on the economic rationale for public sector involvement in health-care markets based on efficiency and equity considerations. Health-care markets suffer from the typical problems of insurance markets such as adverse selection (which may make it difficult for persons with higher health risks to obtain affordable coverage leading to a sub-optimal consumption of health-care services), moral hazard (whereby the insured person may have an incentive to over consume health-care services as they do not bear the full cost) and asymmetric information (whereby health care providers may be in a position to induce the demand for treatment and extract economic rents).

age groups, expressed as the percentage of GDP per capita, in EU15 and EU10.[4] Based on these data (see: [1], Annex 5 for more details), several conclusions can be drawn:

Figure 2

Average Age-related Expenditure Profiles for the EU15 and EU10 (males and females), 2004

(percent of GDP per capita)



Source: National data.

- in both EU15 and EU10, age-related expenditures for older cohorts are considerably higher for males than for females, while for the younger cohorts the opposite applies, although the gap is much less pronounced;
- nominal spending per capita on health is much higher in EU15 than in EU10 countries. Moreover, the gap between the two groups of countries grows noticeably with age;
- expressed as a share of per capita GDP, there is an apparent difference in the age-related spending profiles between EU15 and EU10 countries. First, in most EU15 countries, spending peaks at between 15 and 20 per cent of per capita GDP compared to between 5 and 15 per cent in available EU10 countries. Secondly, peak spending occurs somewhat later in EU15 countries (in the cohort aged 85 to 90) compared with EU10 (in the 75-80 cohort). Thirdly, there appears to be a much sharper tailing-off in spending for the oldest age-cohorts in EU10 countries.[5]

3.3 Wide range of expenditure drivers

As illustrated by the age-related expenditure profile, age can be considered as a useful indicator of the health status of the population and its demand for health care. However, as argued in many studies [3-6], it is not the causal factor for increasing health-care spending. Several other factors have been found to contribute to the growth in health-care expenditure over the recent decades. Those factors can be classified in at least two different ways: following their character/properties and the type of economic agent they involve on the one hand, and distinguishing between factors that affect demand and supply side of the health-care provision on the other hand.

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4 The average spending for EU10 has been calculated without using data on Malta and Cyprus. The Cypriot data has not been available, while Maltese age profile resembles much more that of the average EU15 country and would pervert the shape of the EU10 curve.

5 More detailed analysis of the data shows that the EU15 unweighted average figure is influenced by the results of two "outlying" countries (UK and FI), while considerable variation of the data on spending does not allow for definite conclusions on the EU10 Member States.

Figure 3

Classification of Factors Underlying Developments in Health-care Expenditure

	Demographic factors	**Health factors**	**Economic and social factors**	**Public policy factors**
Demand side factors	• Size and structure of the population	• Health status of the population, in particular of elderly cohorts • Death-related costs	• National/ individual income • Income elasticity of demand for health care • Public expectations and real convergence in living standards	
Supply side factors			• Development of new technologies and medical progress • Unit costs in health-care sector relative to the other sectors of economy • Resource inputs, both human and capital	• Public provision of health-care goods and services • Regulation / liberalisation of the market for health-care services and pharmaceuticals

Given these considerations, reliable projections of future public expenditure on health care need to include not only demographic changes, but also a series of non-demographic factors. Obviously, given limited data availability in many of the quoted areas not all of them can be modelled in the projection exercise, which can also be concluded from Table 3 overleaf discussing the main factors driving health-care expenditures, the impact mechanisms, and the way they are reflected in the projection methodology. While admitting this drawback, it should be acknowledged that to understand the complexity of the network of interrelated factors and to approximate the degree of uncertainty related to each of them is equally if not more important than to try to predict precisely the extent of future growth in health-care expenditure.

4 The methodology used by the EPC and the Commission to project public health-care expenditure

Following the practice of many projection studies made at both national and international level (see, e.g., [10-14]) a macro-simulation model has been chosen to project long-term developments of public health-care expenditure (see the box below for a short characteristics of three main model-types). It has been found to respond to the highest degree to the needs and objectives of the projection exercise and to make best use of the demographic and socio-economic data currently available at the international level.[6] Given a wide range of driving factors and

[6] While several alternative micro-simulation models are used to produce projections of spending on health care and long-term care at the national level, the possibilities to apply them in the specific EU setting are very limited due to the unavailability of the data and lack or limitations in its comparability across the Member States. On the other hand, a time series-based method, even though the easiest to perform and the least demanding in terms of input data, cannot be considered as a viable solution either. Given a large number of interrelated factors affecting health-care spending and very complex network of reciprocal relationships between them
(continues)

Table 3

The Drivers of Health-care Spending: How They Are Incorporated in the Projection Exercise

Demand Side Factors				
	Mechanism/Channel through Which Health-care Spending Is Affected	**Evidence in Literature on Likely Impact on Spending**	**Addressed in Projections**	**Likely Effect on Projection Results**
Size and age structure of the population	Population size and age structure determines the overall number of persons who potentially need some health-care services. Morbidity rates tend to increase sharply at older ages, although age itself is not the causal factor	Population projections show large increase in the number of older persons	*Pure ageing* scenario plus *high life expectancy* scenario	The "pure" effect of an ageing population will lead to strong pressure for increased spending
Health-care status of the population, especially of elderly cohorts	Changes in age-specific mortality rates will alter the demand for health care	No clear cut evidence as to whether the health-care status of elderly is static (expansion of morbidity hypothesis) or improving (dynamic equilibrium or compression of morbidity hypotheses)	*Constant health* scenario and *improved health* scenario	Future improvements of health-care status will lower the projected impact on spending compared with a *pure ageing* scenario
Death-related costs	Large share of total health are spending is concentrated in the final phase of life linked to approaching death	Large body of evidence confirming the existence of death-related costs, and that the ratio of spending between decedents and survivors declines with age. No clear evidence on whether the importance of death-related costs has changed over time	*Death-related cost* scenario	Reduces projected increases in spending compared with *pure ageing* scenario
Income	If health-care services are a luxury good, then the income elasticity of demand would be greater than one, and health-care spending as percent of GDP should increase if real living standards improve	Studies at micro level show income elasticity of demand greater than 1 but neutral at an aggregate level. Real convergence process may lead to an increase in health-care spending as a result of absolute increase in demand and a shift towards high quality medical goods and services demanded in fast growing economies	*Income elasticity* scenario considers an income elasticity of demand greater than 1 for all Member States. *Cost convergence scenario* considers the convergence in age-related expenditure profiles in EU10 to EU15 levels	Projected increases in spending compared with *pure ageing* scenario

and health expenditure, simple extrapolation of past trends cannot provide reliable projection results. Moreover, as recent data shows, public spending on health and long-term care is to a large degree a policy-driven variable, which makes the time series-based method even less feasible solution.

Table 3 (continued)

The Drivers of Health-care Spending: How They Are Incorporated in the Projection Exercise

Supply Side Factors				
	Mechanism/Channel Through Which Health-Care Spending is Affected	**Evidence in Literature on Likely Impact on Spending**	**Addressed in Projections**	**Likely effect on projection results**
Technology	Technology can lower unit costs of providing more efficient treatment, but can push up total spending by making new treatments available for more persons. Technology can lower the demand for health care if early or less invasive interventions improve health-care status and lower future health-care needs: alternatively, it can increase future health-care needs by increasing the survival probabilities of persons with chronic or multiple health conditions	Not clear cut. Evidence to date suggests that technology has pushed up overall spending as increased demand appears to have outweighed unit cost savings. However, there is considerable uncertainty on future prospects. Prospective technological developments could radically alter treatment possibilities and the health-care sector is starting to catch-up with other sectors on the deployment of IT	Not modelled. All scenarios implicitly assume a neutral impact of technology on spending. From *fast cost growth* scenario one could infer a pessimistic impact of technology (the effects of increased demand outweigh unit cost reductions)	
Relative costs in the health-care sector	Total health-care spending driven by the evolution of unit costs for key components (wages, capital investment and pharmaceuticals) relative to the economy as a whole	Unclear due to data limitations and prevalence of non-market pricing in the health-care sector. Wages often covered by collective agreements and pharmaceutical prices are regulated. Evidence from US points to high price inflation for pharmaceuticals but this may be driven by incentives embedded in their market structure	*Unit cost – GDP per worker* scenario, *fast cost growth* scenario	Can push up (if assumed cost driver grows faster than GDP per capita) or reduce (otherwise) projected spending compared with *pure ageing* scenario
Government policy and institutional settings	Overall spending on health determined by policy choices on access to health-care systems and on quality (waiting times, patient choice etc.) The evolution of spending is also determined by the effectiveness of aggregate budgetary control measures (e.g., spending caps) and micro incentives for patients and health-care professionals favouring rational resource use. Real convergence process also plays a role in designing appropriate health policy setting	Improved access has been major driver of spending in past decades. Governments face strong pressure to provide access to new medical treatments and to improve quality of services, and existing projections from national sources show that policy choices have a major impact on health-care spending. Aggregate budgetary control measures appear to have stemmed increases in health-care spending in the 1990s, but long-term effectiveness will require appropriate micro incentives	Not modelled	

Box
Comparison of model-types

There are several theoretical methods which can be used to produce projections of socio-economic variables in general, and spending on health care and long-term care in particular. They can be divided into three general groups according to the specific needs of the projections exercise and the availability of the data [8]:

- *time series-based methods*: this group of methods is the least demanding in terms of data requirements, as it consists in extrapolating into the future the trends observed in the past. Those methodologies are most appropriate when there is clear and undisturbed trend of a single variable and when structural breaks are not expected. The larger the number of potential explanatory variables, the less reliable are these methods as the impact of possible structural changes in the future cannot be taken into account. Therefore, given the complexity of the network of interrelated factors affecting health-care expenditure, such methods seem unfeasible to project spending in the long-term;
- *macro-simulation models*: these models (also called cell-based models) consist in disaggregating the overall population into a number of groups having a common set of features. Each cell represents another combination of the characteristics. As the number of individuals in the cell changes, so do weights and the aggregate value of the endogenous variable. The focus of the study is on the total population or its subgroups: changes reflected by the model concern those groups rather than the individual components of each one of them;
- *micro-simulation models*: observe individual units (individuals, families, households) and their characteristics, instead of measuring changes in aggregate values. Two subgroups may be distinguished: while static models concentrate on the state at a certain point in time, dynamic models investigate changes over time and in response to context changes. Thanks to this feature, the latter can be used to predict the effect of the alternative events over the lifetime. A specific variant of micro-simulation model which has been successfully used in health-care spending projection exercises at national level are the health-based predictive models.

channels through which they affect spending, this type of model offers an opportunity to run several scenarios in order to tackle the issue from a variety of different angles, rather than to limit itself to a single all-encompassing projection methodology which capture all demographic and non-demographic factors. In this context, it has been implicitly decided that past trends in spending, considered as specific policy-driven,[7] would not play a role in projecting future developments.

The basic methodology used in the *pure ageing scenario* is a very simple one (see Figure 4 opposite, and for the formal expression of methodology, see [1], Annex 4). The age and gender-specific per capita expenditure provided by the Member States is applied to the

[7] The average yearly growth in the ratio of public health care expressed in percent of GDP over the period 1970-2004 varies from –0.01 in IE to 0.14 in PT, while for the period 1995-2004 it ranges from –0.06 in NL to 0.25 in PT (Source: authors' own calculations based on OECD Health Data). Such a wide variety of trends is supposed to be driven, to a large extent, by the country-specific political decisions concerning organisation or provision of care.

Figure 4

Schematic Presentation of the Projection Methodology

Sources of data:	*Eurostat*		*Member States*		*AWG macroeconomic assumptions*		
	↓		↓		↓		
Input data:	**Population projections**	*	**Age-related expenditure profiles**	*	**Unit cost development**	=	**Total spending on health care**
	↑		↑ ↑		↑ ↑		
Alternative scenarios:	Scenarios on **demography**		Scenarios on **health status**		Scenarios on **income** / Scenarios on **unit costs**		

Table 4

Overview of the Scenarios Used in Health-care Expenditure Projections

	Scenarios on **demography**		Scenarios on **health status**		Scenarios on **income**		Scenarios on **unit cost development**	
	Pure ageing	**High life expectancy**	**Constant health / improved health**	**Death-related costs**	**Income elasticity of demand**	**EU10 cost convergence**	**Fast cost growth**	**GDP per worker**
Population projection	AWG scenario – baseline	AWG scenario - high life expectancy	AWG scenario – baseline	AWG scenario – baseline	AWG scenario – baseline	AWG scenario – baseline	AWG scenario – baseline	AWG scenario – baseline
Age-related expenditure profiles	2004 profiles held constant over projection period	2004 profiles held constant over projection period	Constant health scenario whereby 2004 age profile evolves according to changes in age-specific life expectancy	Constant 2004 profiles but split into spending on decedents and survivors	2004 profiles held constant over projection period	For EU10, the 2004 profiles converge to average age-profile for EU15 countries by 2050	2004 profiles held constant over projection period	2004 profiles held constant over projection period
Unit cost development	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per capita	GDP per capita + 1 percent during the period 2004 to 2015	GDP per worker
Income elasticity of demand	1	1	1	1	1.1 in base year converging to 1 by 2050	1	1	1

Source: based on EPC and European Commission.

demographic projections provided by Eurostat to calculate nominal spending on health care. To keep it constant in real terms the assumed deflator is then applied.

In order to reflect a wide variety of factors affecting health-care spending, a number of alternative scenarios have been run. The adjustments reflecting the impact of different factors on health-care spending are applied by correspondingly changing one of three main items of input data: demographic projection scenario, development over time of age-related expenditure profiles, and pattern of unit cost developments (driven in most cases by the macroeconomic variables).

The scenarios have been grouped into four broad categories according to the driving force being modelled and, broadly speaking, the way the basic methodology is adjusted. The four categories are: demography, health status, income, and unit costs. An overview of main characteristics of each scenario is presented in Table 4, which highlights the stylised change in the driving force illustrated by each scenario.

4.1 Comparison of sensitivity tests

Table 5 opposite presents a summary of the projected changes in health-care spending between 2004 and 2050, measured in percent of GDP and expressed as a difference from the *pure ageing scenario*, for all proposed scenarios. The purpose of such presentation setting is straightforward: while the results of the *pure ageing scenario* show the expected impact of the sole demographic changes on health-care expenditure, the difference between them and the results of the other scenarios illustrates the separate impact of each analysed factor on total health-care expenditure (as seen in table 4 above, all variables except the one considered as the driver of costs in a given scenario are kept unchanged with respect to the *pure ageing scenario*).

The following sections present the main features of each scenario and sketch the results of projections of public spending on health care over the next five decades (for detailed results, see [1], Annex 7). The discussion of different scenarios' results refers to the numerical results presented in Table 5.

4.2 Scenarios on demography

The scenarios on demography aim at disentangling the effect of demographic changes on public health-care spending, *i.e.*, eliminating the effect of other, both demand and supply factors. They also show how sensitive public expenditure on health care is to changes in underlying demographic trends.

Pure ageing scenario attempts to isolate the "pure" effects of an ageing population on health-care spending. It assumes that age-related spending per capita on health care in the base year remains constant in real terms over time. Since health-care spending, assumed to proxy the health status of population, or in other words average morbidity rate, remains constant for each age cohort as life expectancy increases, all gains in life expectancy are assumed to be spent in bad health, while the number of years spent in good health remains constant. As such, this scenario follows thus the *expansion of morbidity/disability* hypothesis quoted in the literature.[8] The constant age

[8] The expansion of morbidity hypothesis was proposed in, e.g., [15-17] and empirically supported in [18]. It assumes that older people are more vulnerable to chronic diseases and, as their life expectancy increases, they spend most of those additional years of life in bad health. In other words, a higher proportion of people with health problems survive to an advanced age. Overall, this hypothesis can be considered as a pessimistic one, which is illustrative of what could happen if there were no improvements in the epidemiological trends.

Table 5

Overview of Projected Changes in Health-care Spending between 2004 and 2050 According to Different Sensitivity Tests

(percent of GDP)

Country	Level 2004	Change 2004-2050	Difference Compared to Pure Ageing Scenario							
		Pure Ageing GDP Per Capita	High Life Expectancy	Constant Health	Improved Health	Death-related Costs	Income Elasticity of Demand	EU10 Cost Convergence	Fast Cost Growth	Unit Costs - GDP Per Worker
BE	6.2	1.5	0.3	–0.8	–1.4	–0.4	0.3	:	0.8	0.4
DK	6.9	1.1	0.2	–0.8	–1.5	–0.4	0.3	:	0.8	0.6
DE	6.0	1.3	0.4	–0.7	–1.2	–0.3	0.3	:	0.8	0.5
GR	5.1	1.8	0.3	–0.6	–1.2	–0.4	0.2	:	0.7	1.0
ES	6.1	2.2	0.3	–0.6	–1.2	–0.4	0.3	:	0.9	1.1
FR	7.7	1.8	0.3	–0.7	–1.4	–0.4	0.3	:	1.0	0.6
IE	5.3	2.0	0.2	–0.8	–1.5	–0.5	0.5	:	0.7	0.5
IT	5.8	1.4	0.2	–0.5	–1.0	–0.3	0.3	:	0.7	0.6
LU	5.1	1.1	–0.7	–0.6	–1.0	–0.2	0.5	:	0.6	-1.3
NL	6.1	1.3	0.2	–0.5	–1.0	–0.3	0.2	:	0.8	0.4
AT	5.3	1.7	0.2	–0.7	–1.3	–0.4	0.3	:	0.7	0.7
PT	6.7	0.6	0.2	–0.7	–1.3	–0.4	0.3	:	0.7	1.2
FI	5.6	1.5	0.3	–0.6	–1.1	–0.4	0.3	:	0.7	0.5
SE	6.7	1.0	0.2	–0.8	–1.4	–0.3	0.4	:	0.8	0.3
UK	7.0	2.3	0.4	–1.4	–2.1	–0.5	0.4	:	0.9	0.7
CY	2.9	1.1	0.1	–0.4	–0.7	–0.2	0.3	:	0.4	0.2
CZ	6.4	1.9	0.3	–0.9	–1.6	–0.5	0.5	0.5	0.8	1.5
EE	5.4	0.9	0.2	–0.7	–1.2	–0.4	0.6	0.5	0.6	0.2
HU	5.5	1.0	0.2	–0.7	–1.3	–0.6	0.4	0.6	0.7	0.6
LT	3.7	0.7	0.1	–0.4	–0.7	–0.3	0.4	0.6	0.4	0.0
LV	5.1	0.7	0.2	–0.5	–1.0	–0.3	0.6	0.6	0.6	0.2
MT	4.2	2.0	0.3	–0.7	–1.4	–0.8	0.3	:	0.6	0.2
PL	4.1	1.3	0.2	–0.6	–1.1	–0.4	0.4	0.4	0.5	0.0
SK	4.4	1.8	0.2	–0.7	–1.2	–0.4	0.5	0.1	0.6	0.5
SI	6.4	1.4	0.2	–0.5	–0.9	–0.4	0.5	1.4	0.8	1.5
EU25	*6.4*	*1.7*	0.3	*–0.8*	*–1.4*	*–0.4*	*0.3*	*:*	*0.8*	*0.6*
EU15	*6.4*	*1.7*	0.3	*–0.8*	*–1.4*	*–0.4*	*0.3*	*:*	*0.8*	*0.6*
EU12	*6.3*	*1.6*	0.3	*–0.7*	*–1.2*	*–0.3*	*0.3*	*:*	*0.8*	*0.6*
EU10	*4.9*	*1.2*	0.2	*–0.6*	*–1.2*	*–0.4*	*0.5*	*0.5*	*0.6*	*0.5*

Source: EPC and European Commission.

Table 6

Pure Ageing Scenario – Projection of Public Health-care Spending, 2004-2050
(percent of GDP)

Country	2004	2010	2020	2030	2040	2050	Change 2004-50
BE	6.2	6.4	6.8	7.3	7.6	7.7	*1.5*
DK	6.9	7.0	7.4	7.7	7.9	8.0	*1.1*
DE	6.0	6.3	6.7	7.0	7.2	7.3	*1.3*
GR	5.1	5.3	5.5	5.9	6.5	6.9	*1.8*
ES	6.1	6.3	6.7	7.3	7.9	8.3	*2.2*
FR	7.7	8.0	8.4	9.0	9.4	9.5	*1.8*
IE	5.3	5.5	5.9	6.4	6.9	7.3	*2.0*
IT	5.8	6.0	6.3	6.7	7.0	7.2	*1.4*
LU	5.1	5.2	5.5	5.8	6.1	6.2	*1.1*
NL	6.1	6.3	6.7	7.1	7.4	7.4	*1.3*
AT	5.3	5.5	5.9	6.3	6.7	6.9	*1.7*
PT	6.7	6.8	6.7	6.7	7.0	7.3	*0.6*
FI	5.6	5.8	6.2	6.7	7.0	7.0	*1.5*
SE	6.7	6.8	7.2	7.5	7.7	7.8	*1.0*
UK	7.0	7.2	7.7	8.3	8.9	9.3	*2.3*
CY	2.9	3.1	3.3	3.6	3.8	4.0	*1.1*
CZ	6.4	6.7	7.3	7.7	8.1	8.3	*1.9*
EE	5.4	5.6	5.8	6.0	6.2	6.3	*0.9*
HU	5.5	5.7	5.9	6.2	6.4	6.5	*1.0*
LT	3.7	3.8	4.0	4.1	4.3	4.4	*0.7*
LV	5.1	5.3	5.5	5.6	5.8	5.9	*0.7*
MT	4.2	4.5	5.1	5.6	6.0	6.2	*2.0*
PL	4.1	4.3	4.7	5.0	5.2	5.4	*1.3*
SK	4.4	4.6	5.1	5.5	5.9	6.1	*1.8*
SI	6.4	6.6	7.0	7.4	7.7	7.8	*1.4*
EU25	*6.4*	*6.6*	*7.0*	*7.4*	*7.8*	*8.1*	*1.7*
EU15	*6.4*	*6.7*	*7.1*	*7.5*	*8.0*	*8.2*	*1.7*
EU12	*6.3*	*6.5*	*6.9*	*7.3*	*7.7*	*7.9*	*1.6*
EU10	*4.9*	*5.1*	*5.4*	*5.7*	*5.9*	*6.1*	*1.2*

Source: Based on EPC and European Commission.

profile is applied to the population projections with an assumption that the costs evolve in line with GDP per capita. The evolution of expenditure levels under this assumption can be considered to be neutral in macroeconomic terms – if no change in the age structure of the population occurred, the share of health-care sector in GDP would remain the same over the projection period even if the size of the population changed.

Table 6 shows that demographic developments are expected to raise public spending on health care by between 1 and 2 percentage points of GDP in most Member States between 2004 and 2050, and by 1.7 per cent of GDP on average. As expected, large part of that increase is projected to materialise up to 2030, as it is over the first half of the projection period that fastest population growth and ageing process is expected to occur. Despite their less favourable demographic prospects (convergence to lower fertility and lower mortality rates), public spending on health is projected to grow by less in the EU10 than in the EU15 countries, *i.e.*, on average by 0.5 per cent of GDP. This reflects both lower initial level of spending (4.9 per cent compared to 6.4 per cent of GDP in 2004) and their flatter age-related expenditure profiles.

Comparison of the results of *pure ageing scenario* with those of *higher life expectancy scenario* shows the changes in public spending on health care resulting from a stylised change in demographic trends. It uses *high life expectancy demographic scenario*, which assumes age specific mortality rates to fall to 15 per cent lower than those for the baseline scenario (the decrease applies to all ages) at the end of projection period (in 2050)[9]. Since such assumption of the same relative fall in mortality rates across all age cohorts does not only increase the absolute number of people at each age, but additionally raise the share of the older age cohorts in total population, it should, at least theoretically, have a considerable impact on age-related expenditure items.

The results of the simulations confirm this supposition: health-care spending is indeed sensitive to changes in the assumptions on demographic developments. Reducing target age specific mortality rates by 15 per cent leads to a relatively strong change in projected expenditure: an additional increase in their public health expenditure by between 0.1 and 0.4 per cent of GDP (*i.e.*, on average by an extra 20 per cent over what is projected in the pure ageing scenario) is expected in all but one (LU) Member States of the EU.

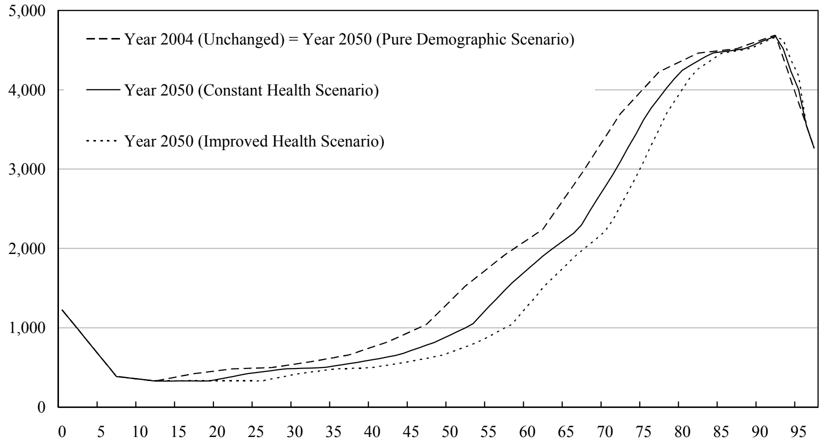
4.3 Scenarios on health status

Pure ageing scenario which takes into account solely changes in the size and structure of the population seemingly abstracts from any changes in health status of the population. Actually, while it assumes the age-related expenditure profile to be constant over time, it may overlook the positive developments in health linked to the fall in mortality rates already embedded in the underlying demographic projections. As such, it may be considered as the practical expression of the *expansion of morbidity/disability* hypothesis quoted in the literature, which may be too pessimistic in that it implicitly assumes that all the gains in life expectancy up to 2050 would be spent in bad health. In order to address this caveat the three health status scenarios have been run which, in a stylised form, are presented in the figure overleaf.

[9] An additional reservation posits that the differences of the cumulative annual increases in life expectancy at birth between the two alternative scenarios until 2050 are kept on average under 1.7 years, see [19].

Figure 5

Illustration of the Different Scenarios on Future Morbidity/Disability and Longevity Using Age Profiles on Health-care Costs
(average expenditure per head, euros)



Source: DG ECFIN.

The constant health scenario is inspired by the *dynamic equilibrium* hypothesis[10] and captures the potential impact of possible improvements in the health-care status of elderly citizens. It assumes that the number of years spent in bad health during a life time in 2050 is identical to that in 2004, *i.e.*, all future gains in life expectancy are spent in good health. As morbidity rate is assumed to fall precisely in line with reduction in mortality rate, it is modelled by progressively shifting the age-related expenditure profile of the base year outwards in direct proportion to the projected gains in age and gender specific life expectancy, embedded in the baseline population projection.

The improved health scenario is inspired by the *compression of morbidity/disability* hypothesis[11] in that it assumes that the number of years spent in bad health during a lifespan falls while total life expectancy increases. In other words, the morbidity rate is assumed to fall faster than mortality rate. The stylised picture of this process is achieved by progressively shifting the age-related expenditure profile of the base year along the age axis by more (by a stylised factor) than the projected gains in age and gender specific life expectancy. Given the lack of a precise

10 The dynamic equilibrium/postponement of morbidity hypothesis was proposed in [20] (1995). It posits that the postponement of death to higher ages due to falling mortality is accompanied by a parallel postponement of morbidity and/or disability. Consequently, healthy life expectancy grows at the same rate as total life expectancy and the number of years spent in bad health remains the same. This can be illustrated by the number of years in good health increasing by the same amount as life expectancy at birth: hence, the total amount of time spent in bad health during a lifetime is unchanged. The term "dynamic equilibrium" is meant to capture the overall changes in life expectancy and severe disability, and as such it is a simplified version of a more sophisticated theory proposed earlier in [21], where it was argued that an increased survival may lead to an increase in the number of years spent in bad health. However, the time spent with severe morbidity and disability remains approximately constant due to the fact that medical treatments and improvement in lifestyles reduce the rate of progression of chronic diseases. Thus, not everybody will enjoy the benefits of all gains in life expectancy being spent in full health. Instead, part of the gains in life expectancy may be spent in moderate health and the prevalence of chronic illnesses may increase; however, severe disability which is connected to the most costly part of health-care services may be postponed to the final phase of life (meaning that age-related disability rates could decline). These effects may cancel out so that the average number of years spent in morbidity would remain unchanged.

11 The compression of morbidity hypothesis proposed by Fries [22-25], posits that as life expectancy increases the onset of disability will be postponed to the higher ages thanks to improved living conditions, healthier life style and the fact that more and more chronic diseases may be curable. According to the hypothesis, humankind has a genetically determined – albeit individually variable – limit to the lifespan and while life expectancy is increasing, it is approaching that limit. Accordingly, morbidity and disability will be gradually compressed at very old ages (into the last years of life) and the number of years spent with diseases or disabilities will decrease over time. It can be illustrated by decreasing the total period of time spent in bad health during a life time. Thus, healthy life expectancy grows by more than life expectancy at birth.

empirical indication of what the scale of possible "compression" is, a factor of 2 is assumed, providing a mirror picture of morbidity expansion hypothesis on the positive side of the constant health scenario deemed neutral in macroeconomic terms.

As the results show, a choice of the assumptions on the future developments in health status of the populations strongly affects the expected evolution of health-care expenditure. As expected, improved health-care status will attenuate future pressure on health-care spending. If it is assumed that healthy life expectancy increases at the same pace as the projected gains in total age-specific life expectancy (constant health scenario), then the projected increase in health-care spending due to ageing (represented by pure ageing scenario) would be halved. Indeed, public spending on health care in the constant health scenario is projected to increase by only 0.9 per cent of GDP in EU15, and 0.6 per cent in the EU10. It is just slightly more than half of 1.7 per cent and 1.2 per cent of GDP increase projected for EU15 and EU10 in the pure ageing scenario.

Furthermore, if healthy life expectancy is assumed to increase twice as fast as total life expectancy (improved health scenario), nearly all the impact of an ageing population will be offset by positive developments in health status. Public health-care spending is projected to increase by mere 0.3 per cent of GDP in EU15 countries and remain broadly constant in the EU10 countries.

An interesting observation is that in both scenarios most of the projected expenditure savings compared with the pure ageing scenario appear to materialise in the first half of the projection period. It can be seen on Figure 6 overleaf which shows a very slow rise (constant health scenario) or even real decrease (improved health scenario) in health-care expenditure up to 2030.

An alternative method to project health-care spending taking into account probable improvement in health status resulting from the evolution of mortality rates is *death-related costs scenario* which links health-care spending to the number of remaining years of life. As discussed extensively in the literature [26-32], there is strong evidence that a large share of total spending on health care during a person's life is concentrated in the final years of life. Therefore, as life expectancy increases and smaller share of each age cohort are in their terminal phase of life, health-care expenditure calculated using constant expenditure profiles may be overestimated. The reasoning behind the death-related costs theory resolves to similar arguments as in the *constant health scenario* presented above: over time there is a growing gap between two basic assumptions. On the one hand, the assumption of constant age profiles which is a central element of *pure ageing scenario* implies constant morbidity rates and constant health-care spending at each age. On the other hand, falling mortality rates embedded in the population projections lead to a fall in the share of those in terminal phase of their lives in each age cohort which, in accordance with the theory, accounts for a disproportionately large share of total health-care spending. To address this inconsistency, an average profile of death-related costs by age has been constructed based on available data supplied by the Member States,[12] where unit costs are differentiated between decedents (those who die within a calendar year) and survivors. Then, using age and gender-specific mortality rates each age group has been split into the group of decedents and survivors and the respective unit cost has been applied to each one.

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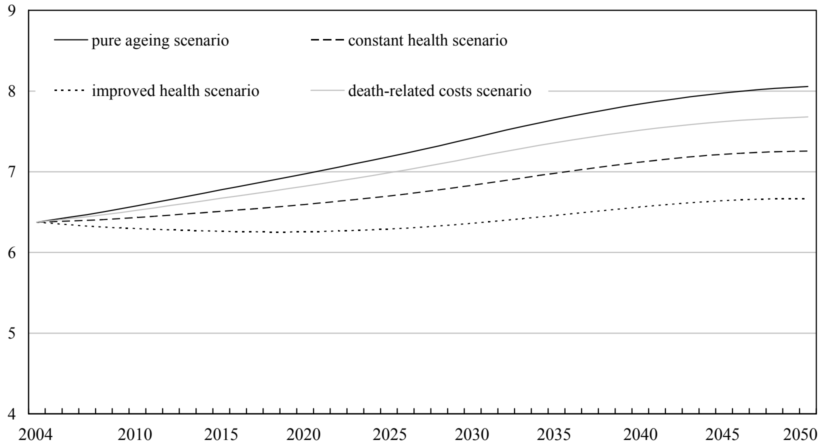
[12] A considerable amount of empirical data on death-related costs at national and regional level is available in scientific literature (see, e.g., [32-40]). Unfortunately, given the lack of common methodology there are considerable differences between the datasets as regards technique of measurement, the degree of precision, sample size, time and space coverage, definition of decedent and survivor status, and other characteristics. Moreover, no study provides an estimate of death-related costs covering total health-care spending (inpatient care + outpatient care + day care + home care). Instead, most studies provide data only on inpatient hospital care expenditure per capita which is then taken as a proxy for total health-care expenditure per capita.

Figure 6

Comparison of Health Care Expenditure Projections According to Different Health Status Scenarios, 2004-50
(percent of GDP, EU25 average)



6.5

Taking death-related costs into account when projecting future health-care spending leads to a considerable reduction in expenditure as compared to the pure ageing scenario over the wholeprojection period. Public spending on health care is projected to increase by on average 1.3 per cent of GDP, *i.e.*, about 0.4 percentage points of GDP less than in pure ageing scenario. However, the extent of projected changes varies significantly, ranging from 0.2 per cent of GDP in PT to 1.9 per cent of GDP in ES). Broadly speaking, the projected change in public spending on health care lies between the results obtained from the pure ageing and the constant health scenarios. According to theory, the discussed scenario reflects the dynamic equilibrium hypothesis, thus its results should be similar to those of constant health scenario. In reality, however, several data and methodological inaccuracies can justify the considerable gap between the two scenarios. As in the other health scenarios, the projected increase in spending is somewhat lower in EU10 than EU15 countries due to lower initial levels of spending but also to their flatter age-related expenditure profiles.

4.4 Scenarios on income effects

An important factor driving demand for and expenditure on health care is national income. It has been shown [6, 41-46] that countries with higher GDP per capita, spend more on health care than the ones with lower income, not only in absolute terms, but also in relative terms (as percentage of their GDP). While the correlation between income and demand at the individual level is biased by universal coverage of health insurance often providing incentives for excessive use of some services, the correlation is much better visible at the aggregate level. Several studies tend to suggest that health-care spending rises broadly in line with economic growth. The responsiveness of health-care spending to the national income, and therefore projected growth in health-care spending due to future evolution of macroeconomic variables depends to a large extent on the income elasticity of demand for health care. As proven by empirical data (see, e.g., [47-49]), *"health care is an individual necessity and a national luxury"* [47] and in aggregate terms it is likely to have high, exceeding unity, income elasticity.

According to the literature, also international variations in the aggregate health-care spending can be broadly explained by the differences in the level of economic development. Investment in new technologies, more sophisticated and effective treatment methods, higher standards of living, public expectations for higher quality of treatment – all those factors contributing to the rise in expenditure are more frequent in the most developed countries, but also spread to the other ones as the gaps in real income between countries shrink due to the real convergence processes.

Both presented mechanisms have been modelled in the two income scenarios. The first one, *income elasticity scenario* shows the effect of elasticity exceeding unity on the evolution of total spending over time. In practical terms, it is identical to the *pure ageing scenario* except that the income elasticity of demand is equal to 1.1 in the base year and converges in a linear manner to 1 by the end of projection horizon in 2050. The elasticity coefficient at the beginning of the period has been chosen arbitrarily, although taking account of empirical evidence on developments in this value over the recent decades in light of which it can be considered as a relatively conservative assumption.

The second discussed mechanism has been modelled in the *EU10 cost convergence scenario* which is meant to capture the possible effect of a convergence in real living standards (which emerges from the macroeconomic assumptions) on health-care spending. It covers only the Central and Eastern European New Member States (EU10 excluding MT and CY) in which current spending on health care (both in nominal terms and as percentage of GDP per capita) is well below the levels observed in EU15 countries. By taking the flatter 2004 age-related expenditure profiles as the basis of the health-care projections, the projected budgetary impact of ageing will be less evident in the EU10 countries compared to EU15. *Cost convergence scenario* assumes therefore that the average age-related expenditure of EU10 countries in the base year 2004 progressively increases to the average age-related expenditure profile of EU15 countries by 2050. Such simplified assumption implies that the underlying growth in per capita spending would have to accelerate considerably in the New Member States. Still, since the current gap in per capita spending as percentage of GDP is significant only for the older age cohorts, the rate of increase would vary considerably across the age groups and the extra spending would concentrate just in the older cohorts. Indeed, if the convergence of EU15 and EU10 age profiles was to be achieved by 2050, per capita spending would grow to a non-negligible extent only for the cohorts aged 70 and more. To complete the convergence process by 2050 would require an average extra yearly increase in spending of 0.25 per cent for the age cohort 70-74, respectively 0.85 per cent (men) and 1.03 per cent (women) for age cohort 80-84 and about 1.6 per cent for age cohort 90-94.[13]

As expected, higher responsiveness of health-care spending to the national income results in proportionately higher expenditure linked to each percentage point of GDP per capita growth, even though this effect declines as elasticity converges to 1 at the end of projection period. Given the agreed assumptions, total spending on health care is projected to increase on average by 2.0 per cent of GDP, *i.e.*, 0.3 per cent of GDP more than in the pure ageing scenario. In nominal terms EU15 can expect higher increase than EU10 (2.1 per cent compared to 1.7 per cent of GDP), but in terms of percentage increase spending in EU10 countries is projected to marginally exceed that in EU15.

On the other hand, the results of the EU10 convergence scenario show, as expected, a strong convergence in spending on health care as a share of GDP towards the levels observed in the EU15 countries. Average health-care spending of eight Central-Eastern European new Member States would reach 6.7 per cent of GDP in 2050, which is closer to the EU15 average of 8.2 per cent of

[13] The theoretical arguments on the increase in health-care spending in the new Member States have not been confirmed by the actual data during the first decade of transition. According to the OECD data, only one (CZ) of four New Member States for which data are available has seen its public health-care spending growing as a percentage of GDP (from 4.6 per cent in 1990 to 6.8 per cent in 2003), while the other ones (HU, PL, SK) have experienced a relative fall. However, it was probably due to the high initial level of spending in fully state-owned and highly inefficient health-care sector and the gradual privatisation process inherent to the initial stages of transition.

GDP compared with the projected level of 6.1 per cent of GDP which emerges on the basis of their flatter national age-related expenditure profiles. On average, spending on health care is projected to increase by 1.7 p.p. of GDP above what is projected using national age-related expenditure profiles, with most of the increase occurring at the end of the projection period. This result suggests that effective managing of expectations regarding health-care services in EU10 could play a significant role in controlling health-care spending in these countries.

4.5 *Unit cost scenarios*

A number of other factors have a direct or indirect effect on public spending on health care. Most of the supply side factors affect the evolution of unit cost of health-care provision. It can be either driven by the market forces (e.g., increase in prices of resources and raw materials, cost of investments in research and technology or in fixed capital, market-driven rise in wages and salaries), or influenced by the institutional structure of the sector or state regulations (e.g., relatively fast growing wages covered by collective agreements or legally regulated prices of pharmaceuticals). However, most of those factors have not been explored thoroughly enough as to allow for a reliable measurement of their effects. For example several studies agree that technological progress contributes to the largest extent in the total increase in health-care spending (see, e.g., [42, 50-56]). Hardly anyone dares however to quote a concrete measure of this impact, and the rare available figures vary significantly. The same difficulty applies to almost all the forces behind the increase in unit costs. In order to encompass the possible effect of several generally uncountable factors, two stylised scenarios have been proposed. All of them use similar methodological tool. The unit cost of health-care spending, provided by the Member States is assumed to follow over time a development path varying from the basic GDP per capita growth rate.

The first scenario, *fast cost growth scenario*, investigate the responsiveness of health-care spending to a given change in the unit cost of health-care provision. It presents a purely stylised situation of the faster evolution of unit costs in the entire health-care sector which can be an effect of any possible supply side factor, such as increased investment in technological development, growth in prices relative to the other sectors of the economy, stricter regulation of health-care sector, etc. The methodology is identical to the *pure ageing scenario*, but instead of following GDP per capita rate of growth, unit costs are increasing by 1 percentage point above that rate in the first ten years of the projection exercise (2005-14) and thereafter, between 2015 and 2050, in line with the simple GDP per capita growth rate.

The second proposed *scenario where costs evolve in line with GDP per worker* is an attempt to reflect the high labour intensity of health-care sector and is similar to the *pure ageing scenario* except that costs are assumed to evolve in line with the evolution of GDP per worker or, in other words, labour productivity of a person employed in the economy (no information on the productivity in individual sectors are available). As wages are projected to grow faster than GDP per capita, this scenario provides an insight into the effects of unit costs in the health-care sector increasing by more than in the economy as a whole. However, to consider the scenario feasible, one needs two strong macroeconomic assumptions. First, wages are assumed to be a key determinant of costs in the health sector, which is therefore supposed to be highly labour intensive. Second, wages in the health sector must grow at the same rate as wages in the whole economy, and wages in the whole economy generally follow the trend of economy-wide productivity. If both conditions are met, expenditures per head are assumed to grow at the same rate as productivity in the whole economy.[14]

Health-care spending does appear to be sensitive as regards the assumptions on unit costs. Assuming that costs grow by 1 percentage point above GDP per capita, public spending on health care is projected to increase by an additional average of 0.8 per cent of GDP in the EU15 and 0.6 per cent in the EU10. If instead unit costs are projected to evolve in line with GDP per worker rate of growth, public spending on health care is projected to increase by between 0.7 and 3.6 percentage points of GDP in all but one Member State (LU) between 2004 and 2050. As expected, dispersion of results appears higher than in *pure ageing scenario* and the projected expenditure increases are in most countries higher when unit costs evolve in line with GDP per worker compared with GDP per capita. For the EU25, average spending on health care is projected to increase by 2.3 per cent of GDP by 2050 if costs evolve in line with GDP per capita compared with a projected increase of 1.7 per cent of GDP if costs evolve in line with GDP per worker.

5 Policy conclusions and suggestions for future rounds of projections

As outlined in the introduction to this paper, the results must be interpreted with caution as they are projections and not forecasts. Moreover, there are clear limitations with the projection methodology which *inter alia* does not capture institutional settings on the provision or financing of public health care in EU Member States, as well as a lack of comparability in some underlying data sources. Nonetheless, the exercise does mark a step forward compared with other cross-country projections on public spending on health care, and a number of useful general insights can be drawn by policy maker.

First, while increases in public spending on health care as a share of GDP in past decades have not been strongly influenced by demographic developments, ageing populations is likely to lead to significant upward pressure in coming decades. For the EU25, public spending is projected to rise by 1.7 percentage points of GDP by 2050 due to "pure demographic" factors: this is equivalent to 25 per cent real an increase in public spending on health, with most of the rise occurring by 2030. It should be underlined that age is not the causal factor, but rather the very large projected increase in the number of persons in older age cohorts (70 per cent for persons aged 65+, and 170 per cent for persons aged 85+ in EU25) which have a higher prevalence of medical conditions, sometimes chronic, that require (expensive) health-care services. There are, however, upside and downside risks to these projections which should be taken into account when considering risks to the sustainability of public finances:

- the 2006 projections of the EPC and European Commission point to a potentially lower impact of ageing populations on public spending compared with their projections of 2001. They show that if the health-care status improves broadly in line with increases in age-specific life expectancy (the *constant health scenario*), this could offset up to one half of the projected increases in spending due to an ageing population (the *pure ageing scenario*). However, the projections are not modelled on the basis of a direct indicator of morbidity, but rather on the basis of stylised assumptions. While most experts agree that age-specific mortality rates will continue falling over the next decades, the future developments in health status of populations is virtually impossible to predict. Whether morbidity indicators actually improve over time is an

[14] This also implies that either: the health and long-term care sectors do not benefit from productivity gains, and that the volume of care services provided does not increase; or alternatively that both productivity in the health and long-term care sectors, and the volume of services provided grow in line with the rate of economy-wide productivity growth.

empirical matter: while some evidence exists to suggest that the health-care status of elderly citizens has improved in recent decades, this does not imply that further improvements will be made in the future as morbidity and mortality patterns in an ageing society may change: for example, the increase in the share of persons surviving to very old ages (80+) may lead to an increase in the prevalence of chronic and degenerative diseases (e.g., neuro-degenerative and musculoskeletal diseases);

- the 2006 projections of the EPC and European Commission point to a somewhat lower headline increase in public spending on health care compared with projections coming from national administrations and other international organisations. This is because less prominence is attached to non-demographic drivers of spending, which partly stems from the focus of the projection exercise which is on demographic developments, but also comes from technical difficulties in modelling supply side factors. To avoid sending complacent policy messages, it is important that the results of the health-care projections are presented with the appropriate caveats, making clear that higher increases in public spending could occur depending upon the effects of technology on health-care spending, the demand for more/better health-care services as real income increase and price inflation in the health sector relative to the economy as a whole.

Second, and notwithstanding the uncertainty surrounding the orders of magnitude, health care will significantly add to other pressures for increased public spending due to population ageing, and therefore should continue to be part of efforts to assess risks to the sustainability of public finances. However, the policy challenge needs to be viewed in terms of general welfare and not budgetary considerations alone, bearing in mind the equally important goals of access and adequacy of health-care systems. *A priori*, there is no economic reasons why countries should not devote a larger share of resources to health care. Increased government intervention can be justified if the income elasticity of demand is such that demand outpaces income growth, and also if investment in technology is more than compensated by improved quality and/or productivity. Notwithstanding these caveats, simply spending more money is not an option. Unlike pension systems where the reform debate is limited to a relatively small number of design parameters, the challenge to control health-care spending will require a wider range of microeconomic measures that improve cost efficiency and aligning the economic incentives facing health-care providers and users so that they encourage rational resource use. The effective incorporation of technology into health-care system will be critical in this regard: technology could either increase or decrease overall public spending on health depending on whether the savings from more effective medical treatments and lower unit costs outweigh the additional spending resulting from the opening up of new and more affordable services.

In the light of ageing populations, technological progress and changing disease patterns, a policy of reducing or capping costs devoted to health care may turn out to be a both economically and politically unfeasible option. Aware of the challenge, the governments tend to shift the public debate towards the issues of efficiency and effectiveness, rather than purely budgetary perspective of health-care spending. In this context, several policy options aiming at more efficient use of available resources have been discussed or introduced in various EU Member States. Those include a wide spectrum of measures, ranging from the reforms that change the organisation of care in order to better allocate the existing resources (e.g., strengthening coordination of care, extending the role of primary care), through measures that aim at providing the care providers right incentives to produce efficiently (e.g., competition between the providers, wider choice offered to patients) and at increasing efficiency through better assessment, evaluation and exchange of good practices, to the measures aiming at efficient use of pharmaceuticals. While not focused specifically at expenditure issues, they play a significant role in contributing to ease the pressure on public finances stemming from the demographic, social and economic factors affecting demand for and supply of health care.

Third, the expanded nature of the projections model points to additional potentially important policy conclusions outside the fiscal sphere:

- substantial potential savings could result from public policies which contribute to an improved health status amongst the elderly citizens. As confirmed by empirical evidence, past improvements in life expectancy (as well as in broadly defined health status) are attributable to a variety of factors including better public health systems, improved education, changes in nutrition and lifestyle (see, e.g., [57]). Understanding the precise role which public policies play in shaping health-care outcomes is of critical importance. Effective preventive actions to tackle obesity, smoking, drug abuse, or to promote healthy lifestyle could have large effects on the health-care status of citizens, and thus on future spending needs. However the evidence of the effectiveness of preventive schemes is mixed and warrants further analysis. Answering these questions would require more investment in micro data from longitudinal surveys (European Health Interview Survey (HIS), Survey on Income and Living Conditions (SILC), Survey of Health, Ageing and Retirement in Europe (SHARE)) which tracks the economic, social and health status of elderly citizens in several European countries;
- in addition to pressure for increased spending, ageing population may also impact the type of health-care services that will be needed. As argued above (and in the literature), morbidity and mortality patterns are changing in the context of an ageing society, and a key challenge for health-care systems is to adapt accordingly. There may be a need to rebalance the various types of care (primary vs. secondary care, outpatient vs. hospital care, acute health care vs. long-term care and social care), which would probably have an impact – although of currently unknown size and direction – on the public expenditure on health care.

Fourth, the 2006 projections of the EPC and European Commission included a series of new approaches to quantify factors which were omitted or underdeveloped in previous projection exercise, e.g., the health status of the elderly, elasticity relative to the national income and death-related costs. To conclude, however, some suggestions for extensions/improvements that could be taken on board in future projection exercise at EU level may be put forward:

- given the fact that the institutional design of the health-care system and its financing mechanism potentially affects the efficiency (mainly in allocative but also, to a certain degree, in technical terms) of the system, it might be useful to get a better understanding of the links and interaction between public and private spending on health, and of the financing mechanisms in general. While total health-care expenditure can be arguably considered as the proxy for health-care inputs, it is important, mainly from the incentives' perspective, to know who takes decision on the provision of health care or pharmaceuticals and who ultimately pays for it. Large diversity in the institutional and legal organisation of health-care systems across the EU Member States limits the explanatory power of public health. Due to practical data limitations and the overarching aim of the exercise which is to feed the discussion on the sustainability of public finances, it may not be feasible to include private spending on health care within the scope of the main projection exercise. However, it may be possible to consider the channels through which they interact and to analyse the past developments in these regards;
- as noted above, less progress was made in advancing the methodologies to capture supply side factors compared with demographic and health drivers. Given that according to many studies (see, e.g., [42, 54-56, 58-59]) the impact of supply side factors on health expenditure is comparable to, if not stronger than, the demand pressures, efforts should be invested to include them in the calculations of health-care expenditure in the following rounds of the exercise.

Although comparable and comprehensive data on the technological developments are still missing in most sectors of health care, it would be useful to develop stylised model to quantify the impact of these drivers over the decades to come, or at least to get a clearer picture of their contribution to changes in public spending on health care in the past. A similar consideration applies to the modelling of institutional arrangements, but the lack of reliable indicators and conclusive empirical findings makes the task even less feasible;

- efforts should be made to improve the comparability of the input data collected from national authorities. This relates both to the financial (total spending, age-related expenditure profiles) and health data (disability rate, assumptions on possible future developments in prevalence of diseases). Having this in mind, the data for the following rounds of projections should be collected, to the possibly largest extent, from the standardised databases which are established on the basis of the single classification and following commonly agreed methodologies. In the area of health expenditure these criteria are met to the highest degree by the common databases compiled according to the System of Health Accounts established jointly by the OECD, Eurostat and the World Health Organisation. These databases should be therefore considered as the basic source of information and only in cases where a given item of data does not exist in the common databases, it should be collected individually from each Member State, with special attention being paid to the comparability of the information;
- the choice of sensitivity tests warrants further reflection. While providing some insights on the role of individual drivers of health-care spending, it is not possible to draw inferences on their relative importance. It would be useful to attach probabilities to the "shocks" introduced in each sensitivity, or at least to obtain an approximate calibration of their scale relative to past observations;
- as outlined in the introductory section of this paper, the health-care projections feed into variety of policy debates at EU level, including discussions as part of the emerging health policy at EU level and the open Method of Co-ordination on Social Protection. While it would not be feasible to introduce features of national health-care systems in the projection model, the policy relevance of the exercise could be enhanced if an attempt is made, at least in qualitative terms, to link the projection results with institutional settings at Member State level.

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