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Projecting future health care expenditure: drivers, trends, policy recommendations[1]

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/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].

2. Age-related public expenditure projections

2.1. Overview of the projection exercise

The unique value-added of the age-related expenditure projections prepared jointly by the Economic Policy Committee and the European Commission is that they are 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 future 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 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.

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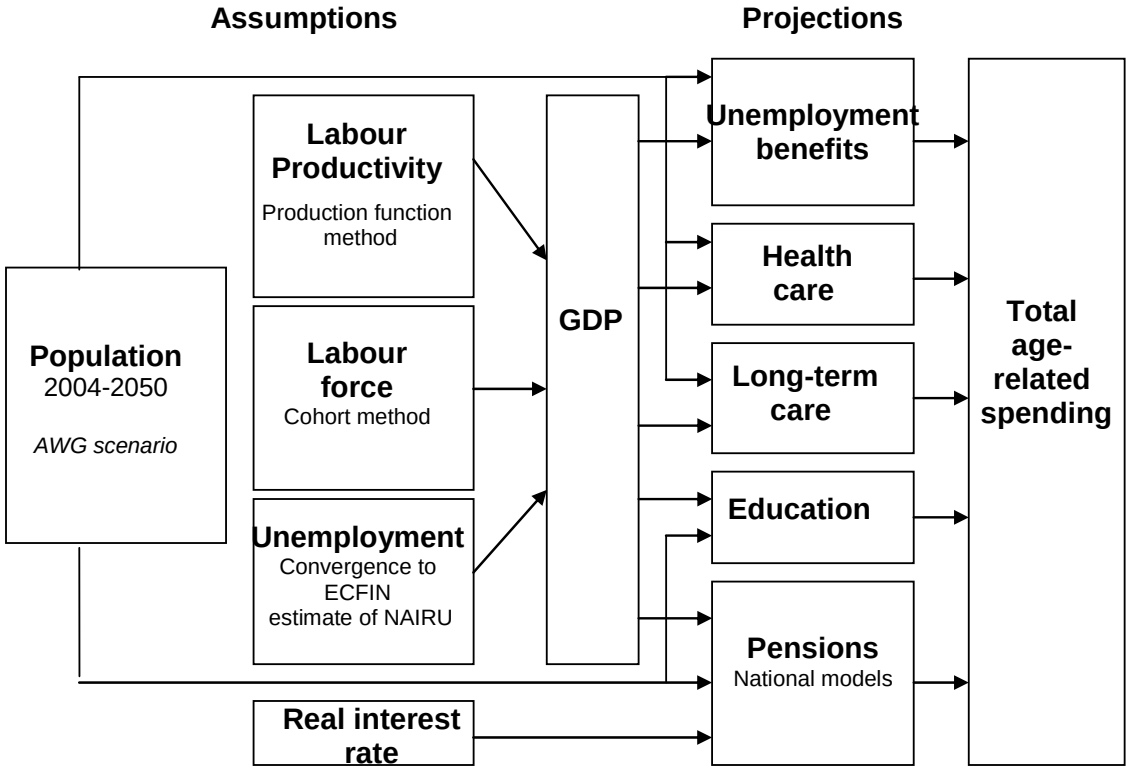
[1] *This paper draws heavily on the forthcoming paper to be published in the "European Economy" series of the European Commission, Directorate-General for Economic and Financial Affairs and is based on the common age-related public expenditure projections produced by the Economic Policy Committee and 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.*

Graph below presents an overview of the entire age-related expenditure projection exercise.

Graph 1. Overview of the 2006 projections of age-related expenditures



The starting point in the projection exercise was a common population projection for all 25 EU Member States supplied by Eurostat. In the next step, the Commission and Ageing Working Group agreed a common set of underlying economic assumptions, most importantly on the evolution of the labour market 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. Projections for spending on pensions were made using the models of the Member States' authorities. Projections for spending were also made for health care, long-term care, education and unemployment transfers, this time using common models developed by the European Commission. The final step was to aggregate all the projections to get an overall picture of how ageing will affect public spending.

The budgetary projection exercise is linked to the assessment of long-term sustainability of public finances and serves as a tool to measure the economic and budgetary consequences of ageing in the general context of the fiscal surveillance and promotion of structural reforms. With the populations getting older and in many cases smaller over time, old-age dependency rates are projected to increase considerably over the coming decades. This tendency, combined with regular growth in public spending on health and long-term care due to extra-demographic factors, puts a growing pressure on the public budgets, financed by contributions from a stagnating size of active population. This trend, observed in the past decades and expected to continue in the future, requires substantial and rapid reforms to be undertaken by policymakers at national level in order to avoid a dramatic worsening of the fiscal stance.

2.2. Demographic changes in Europe: important driver of future health care spending

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 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%) by 2050. In contrast, the elderly population aged 65+ will rise sharply, by 58 million (or 77%) 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% 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 1 below)

Table 1. Overview of the projected changes in the size and age structure of the population, in millions

	Total population			Young population			Working-age population (15-64)			Elderly population (65+)			Very old population (80+)		
	2004	2050	% change	2004	2050	% change	2004	2050	% change	2004	2050	% change	2004	2050	% 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*
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*

Source: Eurostat

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 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[2].

[2] 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).

Table 2. Past trends in health care spending (public and private) in EU Member States, 1970-2002

	Public health expenditure as % of GDP					Public health expenditure as % of total health expenditure			Public health expenditure as % of total primary government spending (net of interest payments)	
	1970	1980	1990	2000	2002	1970	1990	2002	1990	2003
BE	:	:	:	6,1	6,5	:	:	71	13,0	15,4
CZ	:	:	4,6	6,0	6,6	97	97	91	:	12,6
DK	:	8,0	7,0	6,9	7,3	:	83	83	13,6	13,5
DE	4,5	6,8	6,5	8,4	8,6	73	76	79	13,3**	14,3
EE	:	:	:	4,2	3,9	:	:	76	:	11,4
GR	2,6	3,7	4,0	5,3	5,2	43	54	53	2,6	6,8
ES	2,4	4,3	5,3	5,3	5,4	65	79	71	:	14,5***
FR	4,1	5,7	6,6	7,0	7,4	76	77	76	:	16,5***
IE	4,2	6,9	4,4	4,6	5,5	82	72	75	16,1	20,9***
IT	:	:	6,3	6,0	6,4	:	79	76	14,5	14,8
CY	0,9	1,5	1,8	2,1	2,3	35	40	37	:	7,5
LV	:	:	2,5	3,5	3,4	:	100	68	:	9,3
LT	:	:	3,0	4,3	4,1	:	90	72	:	13,2
LU	3,2	5,5	5,7	4,9	5,2	89	93	85	11,0	11,8
HU	:	:	:	5,0	5,5	:	:	70	:	12,3
MT	:	:	:	4,7	6,6	:	:	69	:	13,7
NL	:	5,2	5,4	5,3	5,8 *	:	67	63*	:	9,8
AT	3,2	5,1	5,1	5,3	5,3	63	74	70	:	13,8
PL	:	:	4,5	4,0	4,3	:	92	72	:	7,3
PT	1,5	3,6	4,1	6,4	6,6	59	66	71	11,8	15,8
SI	4,2	4,4	5,6	6,9	7,1*	100	100	87*	:	14,7
SK	:	:	:	4,9	5,1	:	:	89	:	6,4
FI	4,1	5,1	6,3	5,0	5,5	74	81	76	:	13,3
SE	5,9	8,4	7,6	7,1	7,8	86	90	85	:	12,9
UK	3,9	5,0	5,0	5,9	6,4	87	84	83	13,2	16,3

* 2001; ** 1991; ***2002

Sources: European health for all database (HFA-DB), World Health Organization Regional Office for Europe; OECD Health Data 2005; European Commission

As can be seen in table 2 above, health care expenditure is a major, and over time growing, source of fiscal pressure. Total health care spending, both public and private, increased 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% of GDP ranging from 5% in Latvia to almost 11% of GDP in Germany.

Regarding public spending on health care, it rose as a share of GDP during the 1970s for which data are available. In the 1980s and 1990s, the increasing trend slowed down, and even reversed in a few countries, due to overall budgetary consolidation efforts. A convergence or catch-up process is evident across countries, with the largest increases over time occurring in countries with the lowest initial levels[3]. Health care accounts for between 12 and 15% of total primary government spending in most EU countries, although the dispersion is wide ranging from 6.4% in Slovakia to 21% in Ireland. However, this share has been growing, especially during the 1990s suggesting that health care budgets fared better than other expenditure items during periods of fiscal consolidation.

Today in the EU15 public spending on health care accounts for 6.4% of GDP in the EU15 and 4.9% of GDP in the EU10. 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 EU10), both

[3] For example, public spending on health care in Portugal grew from 1.5% of GDP in 1970 to 6.6% of GDP in 2002, in Spain from 2.4% to 5.4% and Greece from 2.6% to 5.2%.

groups of countries are expected to face a significant increase in their public expenditure over the next decades.

In order to reduce the burden on the public finances stemming from the constantly growing demand for and spending on health care, many Member States of the EU have undertaken steps aiming at reducing or at least containing the rise in public expenditure in the sector. The proposed and enacted reforms have ranged from aggregate macroeconomic measures, including e.g. budgetary caps on spending, regulation of prices and input resources and shifting costs to the private sector, to microeconomic measures aiming at increasing cost efficiency on both demand and supply side of the health care provision activities[4] (for a wider discussion, see [3-4]).

Despite those efforts, the recent demographic developments and prospect of further rapid ageing of population in Europe have added to concerns about the impact of rising health care spending on government finances, which resulted in the bulk of country-specific studies and two consecutive rounds of EU-wide projections attempting at measuring the effects of ageing on public finances (see [1, 5]), followed by the broader analysis of more general economic impact of ageing (see [6-7]).

3. Projecting health care expenditure – main methodological issues

3.1. A number of demographic and non-demographic drivers of spending

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. Graph 2 below shows the unweighted average of per capita spending on acute health care for respective age groups, expressed as the percentage of GDP per capita, in EU15 and EU10[5]. Based on these data (see: [1] for more details), several conclusions can be drawn:

- 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;

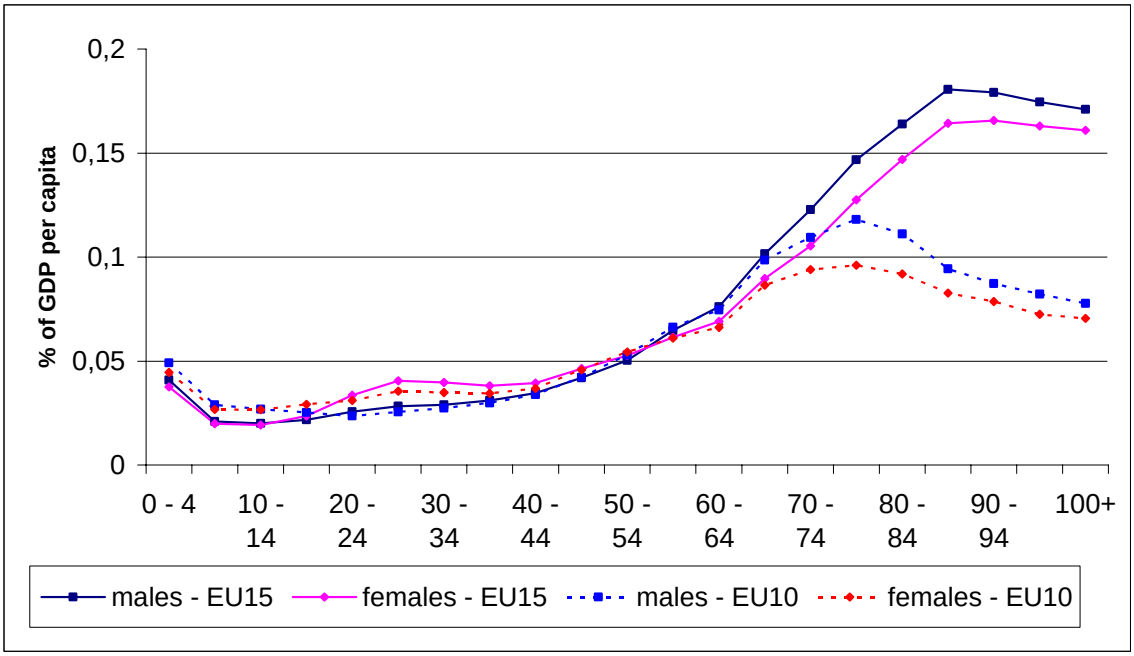
[4] Demand side measures may include increased cost-sharing, assigning major role to general practitioners, limited public insurance coverage etc. Supply side measures may include legal and organisational separation of purchasers and providers, decentralisation and increased management accountability, increased competition amongst providers, improving contracting and payment systems, more efficient use of medical technology, etc.

[5] 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.

- 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% of per capita GDP compared to between 5 and 15% in available EU10 countries. Secondly, peak spending occurs somewhat later in EU15 countries in the cohort aged 85 to 90 compared with the EU10 where it occurs 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[6].

Graph 2. Average age-related expenditure profiles for the EU15 and EU10 (males and females), 2004



Source: National data

As illustrated by the age profile, age is therefore a useful indicator of the health status of elderly population and its demand for health care. However, as argued in many studies [7-10], 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 (for a wider discussion and overview of the existing scientific evidence on the drivers of health care spending, see the full version of the present paper). 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.

[6] 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.

Graph 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. 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.

3.2. Comparison of model-types

There are several theoretical methods which can be used to produce projections of spending on health care and long-term care. They can be divided into three general groups according to the specific needs of the projections exercise and the availability of the data [12]:

- *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.

3.3. Limited options for EU-wide health care expenditure projections

The choice of the methodology used to project future expenditure on health care and long-term care depends on the availability and comparability of data on the one hand and the reliability of the expected results on the other hand.

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[7].

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 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 and follows only to a very limited degree past trends, which makes the time series-based method even less feasible solution.

To sum up, the comparison of existing broad model-types used to project the spending on health care suggests that an optimal choice and a satisfactory compromise between the needs for reliability and feasibility are the macro-simulation models. The practice confirms this thesis, as the bulk of projections made at both national and international level (see for example [14-17]) can be classified as belonging to this model-type. All of those studies follow the similar methodology which consists in decomposing the population into gender, age, or differently characterised cohorts and assigning each of them a given per capita spending. Then, following different assumptions on developments in demographic and macroeconomic variables, various scenarios are produced to illustrate stylised 'optimistic' or 'pessimistic' course of things.

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[7] The main difficulty consists in gathering detailed micro data, especially on epidemiological variables and/or on the individual health history, which requires a sophisticated IT patient registration and classification system, and comparable measurement and calculation standards. On the other hand, it is practically impossible to establish the politically consistent social and health targets for 25 different Member States, which would be a solution similar to the one proposed by Wanless [13] for the UK, who used a benchmark of health status and estimated the resources needed to achieve it by a given time in the future. Another crucial difficulty in running fully comparable projections of health care spending across the Member States is the considerable diversity of the health care systems across the EU countries, since both ownership and management structure of the health care entities and the way they are financed affect financial efficiency and the level of spending on health care.

Since age and gender are the main dimensions according to which the population is decomposed into cohorts, size and structure of the population play the central role in the proposed methodology. However, as discussed above, demand for and use of health care depends ultimately on the health status and functional ability of (elderly) citizens, as well as a series of economic, social and institutional variables, rather than on the age structure of population, which can be just considered as a useful indicator of the health status of a population. Therefore, following the discussion in section 1, one can establish a simplified list of the variables, both demographic and non-demographic, that affect health care spending from both demand and supply side and that should be taken into consideration while projecting future developments in public health care spending (see table 3 for an overview of the drivers of spending and how they have been captured within the budgetary projection exercise).

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 % 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.

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	

4. Health care projection methodology and results

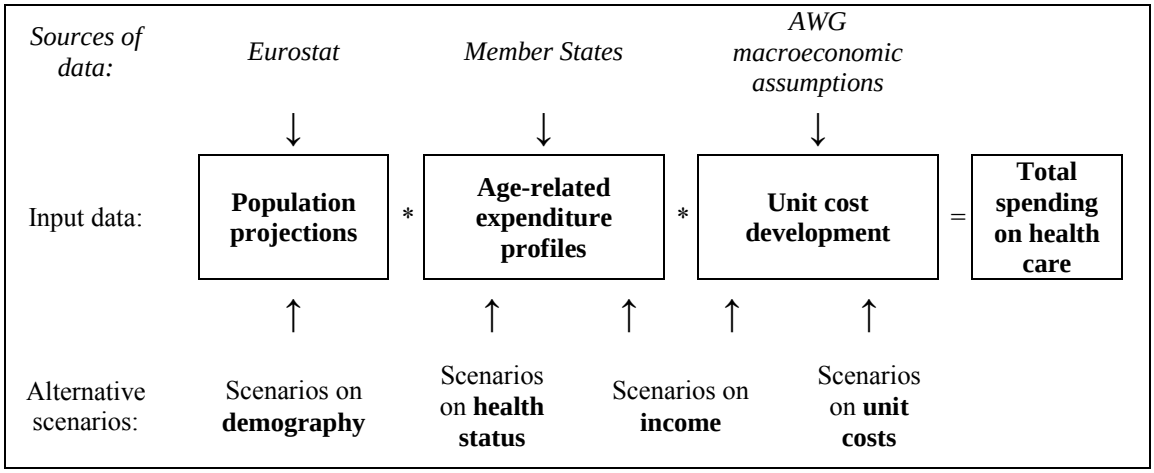
For the reasons discussed in the previous section, a macro-simulation model has been chosen to project future health care expenditure in the framework of the long-term

budgetary projections run by the Ageing Working Group. Given wide range of factors and channels through which they affect spending, several projection scenarios have been run in order to tackle the issue from a variety of different angles, rather than attempting to construct an all-encompassing projection methodology to capture all demographic and non-demographic factors.

The basic methodology used in the *pure ageing scenario* is a very simple one (see graph 4 below, 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 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).

Graph 4. Schematic presentation of the projectiuon methodology



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 all scenarios is presented in table 4 below and the following sections will present the main features of each scenario and sketch the results of projections of public spending on health care over the next five decades according to each one of them (for detailed results, see [1], Annex 7).

Table 4. Overview of different approaches used to make the projections of health care spending

	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 p.p. 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

4.1. 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 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.

[8] The *expansion of morbidity* hypothesis was proposed in e.g. [18-20] and empirically supported in [21]. 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. Pure ageing scenario - projection of public health care spending as % of GDP, 2004-205

	Projected spending as % of GDP						
	2004	**2010**	**2020**	**2030**	**2040**	**2050**	***change 2004-2050***
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*
EU10	*4,9*	*5,1*	*5,4*	*5,7*	*5,9*	*6,1*	*1,2*

Source: based on EPC and European Commission

Table 5 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% 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% of GDP. This reflects both lower initial level of spending (4.9% compared to 6.4% 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% lower than those for the baseline scenario (the decrease applies to all ages) at the end of projection period (in 2050)[9].

[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: [22].

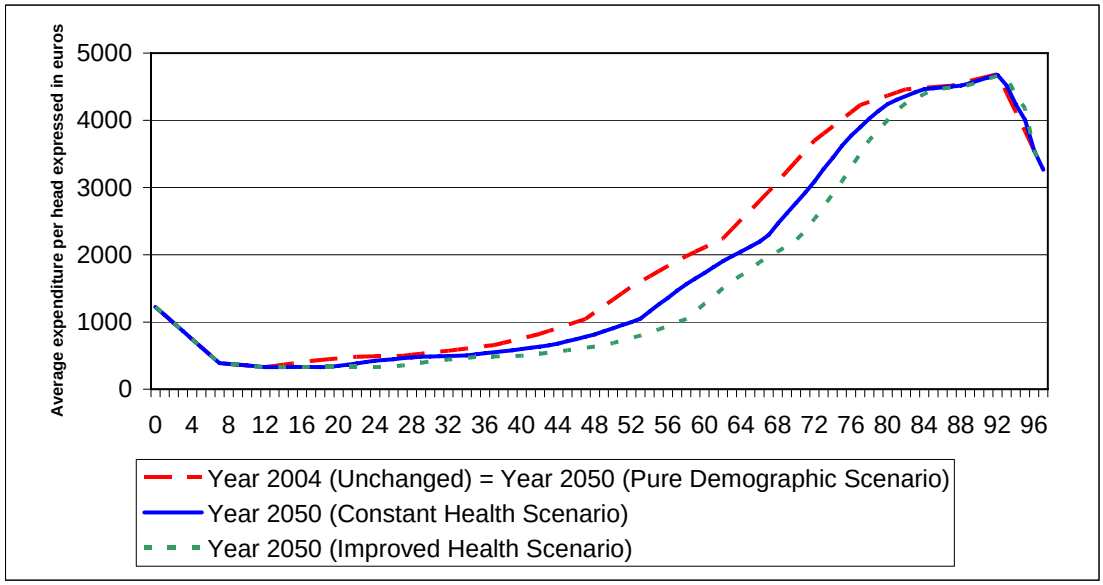
Since such assumption of the same relative fall in mortality rates across all age cohorts does not only increase the absolute number of people at each age, but additionally raise the share of the older age cohorts in total population, it should, at least theoretically, have a considerable impact on age-related 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% leads to a relatively strong change in projected expenditure: an additional increase in their public health expenditure by between 0.1 and 0.4% of GDP (i.e. on average by an extra 20% over what is projected in the pure ageing scenario) is expected in all but one (LU) Member States of the EU.

4.2. 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 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 graph below.

Graph 5. Illustration of the different scenarios on future morbidity/disability and longevity using age profiles on health care costs



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

[10] The *dynamic equilibrium/postponement of morbidity* hypothesis was proposed in [23] (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 [24], 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 [25-28], 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

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 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% of GDP in EU15, and 0.6% in the EU10. It is just slightly more than half of 1.7% and 1.2% 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% 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 graph 6 below 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 [29-35], 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

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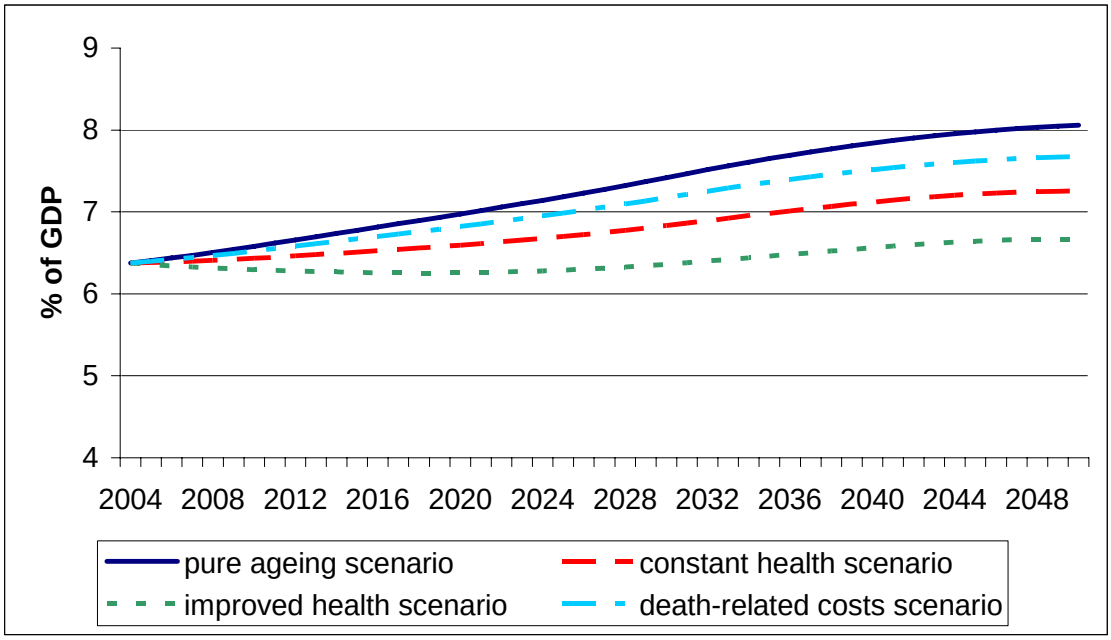
be illustrated by decreasing the total period of time spent in bad health during a life time. Thus, healthy life expectancy grows by more than life expectancy at birth.

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.

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 whole projection period. Public spending on health care is projected to increase by on average 1.3% of GDP, i.e. about 0.4 p.p. of GDP less than in pure ageing scenario. However, the extent of projected changes varies significantly, ranging from 0.2% of GDP in PT to 1.9% 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.

[12] A considerable amount of empirical data on death-related costs at national and regional level is available in scientific literature (see e.g. [35-43]). 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.

Graph 6. Comparison of health care expenditure projections (% of GDP, EU25 average) according to different health status scenarios, 2004-2050



Source: based on EPC and European Commission

4.3. Scenarios on income effects

An important factor driving demand for and expenditure on health care is national income. It has been shown [10, 44-49] 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. [50-52]), *'health care is an individual necessity and a national luxury'* [50] 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 a % 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 % 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% for the age cohort 70-74, respectively 0.85% (men) and 1.03% (women) for age cohort 80-84 and about 1.6% for age cohort 90-94[13].

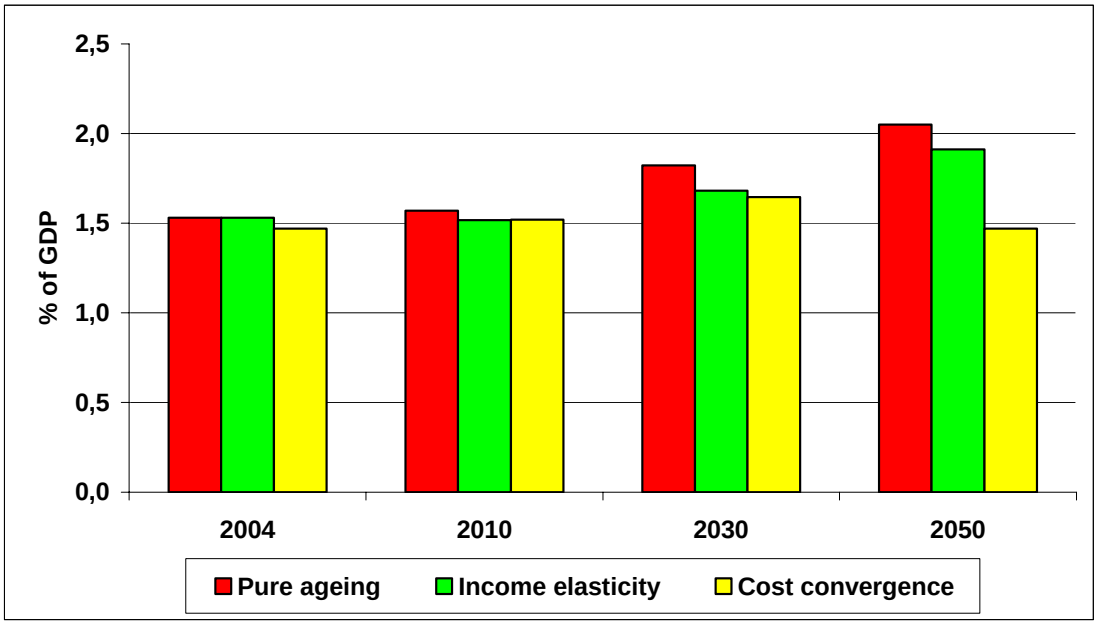
As expected, higher responsiveness of health care spending to the national income results in proportionately higher expenditure linked to each percentage point of GDP per capita growth, even though this effect declines as elasticity converges to 1 at the end of projection period. Given the agreed assumptions, total spending on health care is projected to increase on average by 2.0% of GDP, i.e. 0.3% of GDP more than in the pure ageing scenario. In nominal terms EU15 can expect higher increase than EU10 (2.1% compared to 1.7% 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% of GDP in 2050, which is closer to the EU15 average of 8.2% of GDP compared with the projected level of 6.1% 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

[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% in 1990 to 6.8% 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

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.

Graph 7. Gap between average health care spending in EU15 and EU10 (EU8 for cost convergence scenario) projected according to different income scenarios, 2004-2050



Source: based on EPC and European Commission

4.4. 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. [45, 53-59]). 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 p.p. above GDP per capita, public spending on health care is projected to increase by an additional average of 0.8% of GDP in the EU15 and 0.6% 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% of GDP by 2050 if costs evolve in line with GDP per capita compared with a projected increase of 1.7% of GDP if costs evolve in line with GDP per worker.

4.5. Comparison of sensitivity tests

Table 6 below presents a summary of the projected changes in health care spending between 2004 and 2050, measured in % of GDP and expressed as a difference from the *pure ageing scenario*, for all proposed scenarios. The purpose of such presentation setting is straightforward: the difference from the *pure ageing scenario* illustrates the individual impact of each analysed factor on total health care expenditure, given that all variables except the one considered as the driver of costs in a given scenario are kept unchanged.

[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.

Table 6. Overview of projected changes in health care spending as % of GDP between 2004 and 2050 according to different sensitivity tests

	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*
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

4.6. A reference scenario

Since actual spending on health care is a combined result of the whole set of interrelated demographic and non-demographic factors, the scenarios presented above should not be considered as a reliable prediction of the future, but rather as the sensitivity tests, providing marginal analysis of the separate effect of individual factors. Furthermore, given the complexity of those interconnections and difficulties in defining the most probable course of development in the underlying variables, the probability of predicting the actual development is very limited and subject to high risk. While one possible solution to tackle this problem would be to use stochastic rather than deterministic method of projections, its main value added would be the ability to quantify the level of uncertainty, intrinsically linked to the modelling procedure. Nonetheless, even if highly risky, an attempt to merge a series of quantifiable factors into a single setting and estimate the joint effect of probable combination of underlying factors is a potentially very informative challenge, especially in the context of the public policy of health care provision, which needs to be based on the most reliable forecasts of the expected development in the whole range of health-related variables.

Obviously, the crucial issue in constructing the optimal scenario is the right choice of factors and their expected development path. However, as mentioned above, several arguably significant factors are either not sufficiently defined or quantified (e.g. impact of technology, epidemiological analysis of population's health status) or too complex to be reduced to a single variable or a small set of them (e.g. organisation of health care systems). Facing such dilemma, the Ageing Working Group took a pragmatic approach by choosing a set of a few relatively well known factors and calculating their combined impact on health care expenditure under the name of the *reference scenario*. It has decided to combine the pure demographic impact of ageing population with the neutral assumption on the evolution of health status (which is broadly supported by the empirical evidence on the death-related costs) and the assumption on the moderate impact of national income on the health care spending (chosen on the basis of the past trends). In

practical terms, it has been assumed that morbidity rate evolves at half mortality rate over the whole projection period, or in other words, that half of extra years of life gained through higher life expectancy are spent in good health. Furthermore, income elasticity of demand is assumed to equal 1.1 in the base year and converge to unity by 2050.

A <reference scenario> projects an average growth in public health care spending of 1.6% of GDP in the EU25 Member States, which equals 25% of the initial (2004) level. The relative percentage increase varies considerably across countries, from 7% in PT and 14% in DK to 44% in MT and SK. The relative increase is on average slightly higher in the EU10 (27%) than in the EU15 countries (25%).

As shown in the table 7 below, the rate of growth in spending is projected to fluctuate over time. The fastest increase is expected for the period 2010-2030, when the post-war baby boom generation will reach the age of 60-70 associated with the highest per capita spending on health care. Afterwards, expenditure is expected to keep rising, although at somewhat slower pace in almost all the countries. Only two Member States (PT and GR) will see their expenditure growth accelerate in the last two decades of the projection period, while PT is the sole country which can expect an absolute fall over any period longer than one decade (2010-2030).

The results of the reference scenario do not differ considerably from the pure ageing scenario. It can be explained by the fact that growing pressure stemming from increasing personal incomes and public expectations on the one hand, and the relaxation of health care needs and demand due to improved health status on the other hand, are likely to cancel out. However, since most of supply side effects which tend to aggravate the fiscal risks (costs of medical research, investment in new technologies, scarce resources, over-regulation of the health care and pharmaceutical markets driving up prices) are not properly modelled in the projection exercise, the results are very likely to be underestimated. Given this reservation, the projection results, and in particular the *reference scenario*, should not be considered as a forecast of future developments in health care spending, but just as a quantification of combined impact of a set of measurable variables.

Table 7. Projection results for the reference scenario

	Projected spending as % of GDP				*Absolute change in % of GDP*	*% change*			
	2004	**2010**	**2030**	**2050**	*2004-2050*	*2004-2010*	*2010-2030*	*2030-2050*	*2004-2050*
BE	6,2	6,4	7,1	7,6	***1,4***	*3*	*11*	*7*	***22***
DK	6,9	7,0	7,7	7,8	***1,0***	*2*	*10*	*2*	***14***
DE	6,0	6,3	6,9	7,2	***1,2***	*4*	*10*	*5*	***20***
GR	5,1	5,4	5,9	6,8	***1,7***	*5*	*10*	*16*	***34***
ES	6,1	6,3	7,3	8,3	***2,2***	*3*	*16*	*14*	***36***
FR	7,7	8,0	8,9	9,5	***1,8***	*4*	*12*	*6*	***23***
IE	5,3	5,5	6,4	7,3	***2,0***	*5*	*17*	*13*	***37***
IT	5,8	6,0	6,7	7,1	***1,3***	*3*	*12*	*7*	***23***
LU	5,1	5,3	5,9	6,3	***1,2***	*4*	*11*	*7*	***23***
NL	6,1	6,3	7,1	7,4	***1,3***	*3*	*13*	*4*	***22***
AT	5,3	5,5	6,3	6,8	***1,6***	*4*	*15*	*9*	***30***
PT	6,7	6,8	6,6	7,2	***0,5***	*2*	*-3*	*8*	***7***
FI	5,6	5,8	6,6	7,0	***1,4***	*4*	*15*	*5*	***26***
SE	6,7	6,8	7,5	7,7	***1,0***	*2*	*9*	*3*	***15***
UK	7,0	7,2	8,1	8,9	***1,9***	*2*	*13*	*10*	***27***
CY	2,9	3,1	3,6	4,0	***1,1***	*6*	*19*	*11*	***39***
CZ	6,4	6,8	7,8	8,4	***2,0***	*5*	*15*	*7*	***30***
EE	5,4	5,8	6,2	6,5	***1,1***	*6*	*8*	*5*	***20***
HU	5,5	5,7	6,3	6,5	***1,0***	*4*	*10*	*4*	***19***
LT	3,7	4,0	4,4	4,6	***0,9***	*7*	*10*	*5*	***24***
LV	5,1	5,5	5,9	6,2	***1,1***	*8*	*7*	*5*	***21***
MT	4,2	4,5	5,5	6,1	***1,8***	*7*	*23*	*10*	***44***
PL	4,1	4,4	5,1	5,5	***1,4***	*7*	*16*	*8*	***33***
SK	4,4	4,7	5,7	6,3	***1,9***	*7*	*21*	*11*	***44***
SI	6,4	6,7	7,6	8,0	***1,6***	*4*	*13*	*6*	***25***
EU25	*6,4*	*6,6*	*7,4*	*7,9*	***1,6***	*3*	*12*	*8*	***25***
EU15	*6,4*	*6,7*	*7,5*	*8,1*	***1,6***	*3*	*12*	*8*	***25***
EU10	*4,9*	*5,2*	*5,8*	*6,2*	***1,3***	*5*	*13*	*7*	***27***

Source: EPC and European Commission

5. Possible policy conclusions and recommendations

Broadly speaking, the results of the projection exercise show that public spending on health care depends on the developments of a series of independent drivers and on policy stance chosen individually by the national governments. One can distinguish three areas where governments must take into account the impact of exogenous factors. First, limited growth in total population size together with growing share of elderly will lead to ever higher demand for health care goods and services to be faced with increasing financial and human resources. Second, developments in the medical science, technology and treatment techniques resulting in better health status will require additional investment, but may pay off by reducing the number of chronically ill people and spending devoted to them. Third, persisting high discrepancies in the degree of health care provision across the Member States associated with growing uniformity of needs and expectations will undoubtedly exert additional pressure on public expenditures in the countries offering the narrowest and incomplete coverage to their citizens. Still, although most underlying forces are exogenous to the deliberate government actions, public response to those challenges depends to a high degree on the policy stance approved at the national level and the responsibility which the society wants to assign to the public authorities in the provision of the public good such as health care.

In the context of this complex mix of independent and policy variables facing the financial and health authorities of each country, the following conclusions can be drawn.

First, governments in all EU countries are heavily involved in the financing and/or provision of health care services, and universal access is virtually assured in all

countries. There is, nevertheless, a wide variety of institutional arrangements, making it very difficult to draw general conclusions on detailed factors and policies driving expenditures. What is apparent, however, is that increases in spending on health care as a share of GDP in past decades have not been strongly influenced by demographic developments, but rather by policy decisions to enlarge access, by the demand for better quality health care linked to growing income levels, and (albeit less conclusively) by technology (as falls in unit costs to date appear to have been more than offset by increased demand and quality improvements). Moreover, there are very big differences across Member States in terms of per capita spending on and inputs to health care systems, which do not appear to be correlated with health care outcomes. A priori, this suggests there is considerable scope for efficiency gains. It is difficult to draw conclusions as to whether and how institutional design affects health care outcomes or efficiency.

Second, the demand for health care (and social care) depends ultimately on the health status and functional ability of (elderly) citizens, and not on age per se. Even if age is not the causal factor, ageing populations may lead to pressure for higher public spending on health care. Indeed, the pure demographic effect of an ageing population is projected to push up health care spending by between 1 and 2% of GDP in most Member States, i.e. an increase by approximately 25% of current spending level. This will result from the very large projected increase (70% for persons aged 65+, and 170% for persons aged 85+ in EU25) in older cohorts with a higher prevalence of medical conditions, sometimes chronic, that require (expensive) health care services.

Third, ageing is only one of several factors driving health care spending, and other non-demographic determinants are likely to be of equal significance in determining future spending levels. On balance, overall public spending looks set to increase in the context of an ageing society. However, there are upside and downside risks (possibly substantial) to the projected increase in public spending on health care based on a pure ageing scenario. In particular, the different approaches to projecting health care spending underline the critical role played by:

- the *health status of the population*. The projections illustrate that if most of the future gains in life expectancy are spent in broadly good health and free of disability, this could offset up to one half of the projected increases in spending due to an ageing population (the *pure ageing scenario*). Furthermore, a real decrease in the number of years spent in bad health may reduce spending even further. It should, however, be stressed that the current projections are not modelled on the basis of a direct indicator of morbidity, but rather on the basis of stylised assumptions. This is a shortcoming as morbidity patterns change over time (multi- and chronic diseases such as cardiovascular problems now outweigh infectious diseases) and an ageing society may possibly lead to new patterns of morbidity and mortality. 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);

- *macroeconomic variables*. Changes in per capita income could have an important impact on health care spending, especially if it is viewed as a luxury good. Introducing stylised effect of a 1.1 income elasticity converging to 1 over the whole projection period increases total spending by extra 0.3% over 'pure demographic' effect of ageing. This impact will arguably be stronger in the EU10 Member States which will face a particular challenge in balancing the demands of their citizens for

wider access to health care services and for services of similar quality to that in the rest of the EU, with their capacity to pay;

- *relative cost developments in the health care*. The projection results show that spending levels are sensitive to the assumptions on evolution of unit costs in the health care sector. Leaving aside demographic factors, spending on health as a share of GDP could change as a result of several factors, e.g. unit costs (wages, pharmaceutical prices) growing faster than their equivalents in the economy as a whole, public policies to improve access to health or improve quality (reduce waiting lists, increase choice), rising income levels and the impact of technology on total health care spending. The current set of projections is not capable of disentangling the contribution of each factor, which suggests a possible avenue for future work;

- the *effective incorporation of technology* into health care system. 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.

Fourth, ageing will not only raise a policy challenge in terms of putting pressure for increased spending on health care. Of equal, if not more relevance, is the impact of ageing on 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 and secondary, outpatient and hospital care, classical health care, long-term care and social care).

Fifth, while the current set of projection do not model the institutional arrangements for the provision of health care services within Member States, the projection results may nonetheless provide several useful policy insights as follows:

- as outlined above, changing morbidity patterns and healthy life expectancy will be of critical importance. What is striking from the review of existing literature is the lack of comparable data and evidence and analysis within Europe on this matter. A heavy reliance is therefore placed on data and analysis from third countries, notably the US, which may only be of partial relevance for the EU, given possible differences in morbidity patterns and also the very different organisational arrangements of the health care sector. The situation as regards data is improving with the recent release of the SHARE survey. However, more investment is required, especially in longitudinal surveys, in order to get a more accurate and comparable picture on the evolution of health care trends of the European population over time;

- past improvements in life expectancy (and healthy life expectancy) are attributable to a variety of factors including better public health systems, improved education, changes in nutrition and lifestyle. Understanding the precise role which public policies play in shaping health care outcomes is of critical importance. Effective preventive actions to tackle obesity, smoking and drug abuse 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.

Sixth, the prospect of increased spending on health care in an ageing society will be a cause for concern for Finance Ministers as it will make the tasks of achieving and sustaining sound budget positions more challenging. 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, and difficult choices on priorities will have to be made. The management and control of health care spending will be a critical part of overall efforts to ensure sustainable overall public finance positions. In this regard,

- aggregate cost-containment measures to control volume, prices and wages, as well as budgetary caps, have helped constrain expenditure especially in the hospital sector, and are likely to remain key elements in comprehensive health care strategies of Member States. However, their effectiveness may diminish over time as suppliers alter their behaviour and they risk introducing distortions that could lead to costly inefficiencies. Shifting some of the costs to the private sector, for example via cost-sharing requirements, can also help to control public expenditures: however, the expected saving may be modest given the need to pursue public policy objectives related to access and equity;

- efforts to improve the cost efficiency at micro level will play an increasingly important role in controlling expenditures over the long-run. They include a number of highly distinctive measures affecting both demand side (such as increased cost-sharing, use of gatekeeper practitioners or limited public insurance coverage, etc.) and supply side (such as legal and financial separation of purchasers and providers of health care, improving contracting and payment systems, providing legal and economic incentives to increase competition amongst providers, decentralisation and increased management accountability, etc.). However, it is difficult to draw general conclusions on the effectiveness of different types of cost efficiency measures, as much depends on the institutional structure of the health care system concerned. Governments face a considerable challenge in designing reforms that achieve a better alignment of the economic incentives facing health care providers and users that encourage rational resource use, in part linked to lack of data and information.

Seventh, the present health projection exercise constitutes an important step forward in the process of understanding the driving forces behind evolution of public spending on health care. It includes a series of new approaches which aim at quantifying several previously omitted factors such as the health status of the elderly, elasticity relative to the national income and death-related costs. Caution should be exercised, however, as there is no conclusive evidence of the actual occurrence of the assumed trends or of the scale of their likely impact. Overall, more progress has been made in extending the projection methodology for health care on factors that tend to lower health care spending than on, mostly non-demographic, driving forces that could potentially increase spending. In particular, the possible impact of technological development and institutional differences between health care systems needs further analysis.

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