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Development of Scenarios for Health Expenditure in the New EU Member States: Bulgaria, Estonia, Hungary, Poland and Slovakia

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Abstract

The report is a result of the Ageing, Health Status and Determinants of Health Expenditure (AHEAD) project within the EC 6th Framework programme. The objective of the research was to present the model of future health care system revenues and expenditures in selected Central and Eastern European countries (CEE) which are now the New EU Member States, and to discuss projection assumptions and results. Selected countries include Bulgaria, Estonia, Hungary, Poland and Slovakia. The projections are based on methodology adopted in the International Labour Organization (ILO) Social Budget model. The projection examines impact of demographic changes and changes in health status on future (up to 2050) health expenditures. Next to it, future changes in the labour market participation and their imact on the health care system revenues are examined. Results indicate that due to demographic pressures health expenditures will increase in the next 40 years and health care systems in the NMS will face deficit. Moreover, health revenues, expenditures and deficit/surplus are slightly sensitive to possible labour market changes. Health care system reforms are required in order to balance the disequilibrium of revenues and expenditures caused by external factors (demographic and economic), and decrease the premium needed to cover expenditures. Such reforms should lead, on the one hand, to the rationing of medical services covered by public resources, and on the other, to more effective governance and management of the sector and within the sector.

Introduction

The objective of this report is to present the model of future health care system revenues and expenditures in selected Central and Eastern European countries (CEE) which are now the New EU Member States[1], and to discuss projection assumptions and results.

The report was prepared in result of the Ageing, Health Status and Determinants of the Health Expenditure (AHEAD) project. The project was prepared within the European Commission 6th framework programme. The report discusses results of health budget models for Bulgaria, Estonia, Hungary, Poland and Slovakia that were prepared by experts working within the AHEAD. Detailed results are presented in reports concentrated on country studies (Gabos, Gal 2007, Golinowska, Kocot, Sowa 2007, Kvetan, Palenik, Mlynek, Radvansky 2007, Rangelova, Sariiski 2007, Roovali 2007).

Health expenditure analysis and projections are based on the ILO social budget model, a part of which is the health budget model. The model covers health care system revenues and expenditures. It is suitable for the analysis of impact exerted by demography (especially ageing) on health care system revenues and expenditures. Up to date, data and information sources in New Member States that could be used for the long-term comparative projections have been limited. A structure of the report is as follows. After the presentation of applied methodology and model, data and information sources are described. Next, model assumptions are discussed. In the projection an attempt was made to standardize the assumptions, although the assumptions for each country are also responsive to country policy processes, latest policy proposals and reforms. The development of specific model variables during projection period is described in detail. Finally, the report presents projection results together with sensitivity analysis and conclusions with regard to future development of health care system revenues, expenditures and financial balance. The report concludes with policy recommendations.

[1] Estonia represents Baltic countries, Bulgaria - Balkan countries, and Slovakia represents countries from Central Europe. Poland is a unique country in that it has demographic and epidemiological characteristics similar to Slovakia, but is much larger, with a high share of rural population. In Hungary, demographic processes related to second demographical transition started much earlier and are still dynamic, thus being a reference for other CEE countries.

Chapter 1.

Applied model of health revenues and expenditures

A design of health care system expenditure projection is a complicated and risky task. Christiansen at al. (2006) have argued that theoretical, especially macroeconomic background for health expenditure determinants is rather modest, if not weak. Research in the area pointed at income as the dominant determinant of health expenditures (Newhouse 1977), while demographic variables were not taken into account or – when included in the analysis – impact of demography was not significant from the standpoint of expenditure development. A number of analyses emphasized the importance of policy processes, political affairs and quality of management in the health sector that affect the supply side of expenditures (i.e. Getzen 1992.) Only in late 1990's did the research begin to concentrate on impact of demography on aggregated health expenditures.

Analyses pertaining to health care revenues and expenditures are complicated in that they must take into account numerous data from various fields, such as demography and labor market, macroeconomics, health status and quality of management in the health sector, and finally, policy and institutional implications. Furthermore, it is necessary to perform additional analysis to estimate the inter-relations between factors that have impact on the level of revenues and expenditures.

In view of the reasons referred to above, most projection models are not as comprehensive and complex, and take into account only some of the variables that affect the level of aggregated revenues / expenditures.

The choice of projection method and determinants strongly depends on the time horizon of projection, i.e. the period included in projection. For example, changes of age structure of the population are so slow that they will not affect the outcome of short- or even medium-term projections. On the other hand, factors such as health care sector reforms or changes in medical procedures may have strong impact on results of short-, medium-, and long-term projections (Lee 2002). These factors are the

most difficult to foresee and project due to potential rapid changes in the policy process. In consequence, they may introduce high level of uncertainty in projections.

Length of projection period affects not only the variables, but also the unit of expenditure measurement (Getzen 2000.) According to Getzen, nominal monetary unit is the best measure for short-term projections, and the variables covering insurance, labor market and inflation represent main determinants of health expenditure level. Real monetary unit of *per capita* expenditures is useful for mid-term projections, as these are mostly driven by income. In the case of long-term projections, the best unit to present the level of expenditures is the percentage of GDP reflected in expenditures (Getzen op.cit., p.56-57.)

1.1. Models used for health care expenditure projection

The most common projection methods can be summarized in three groups: (Mahal, Berman 2001):

- Projections based on actuarial models,
- Macroeconomic projections,
- Projections based on econometric models.

1.1.1. Actuarial models

Aggregated actuarial models are most common in health care expenditure projections. They are based on an equation that quantifies the level of expenditures in the year *t :*

$$HE_t = \sum_a \sum_g (N_{t,a,g} \cdot HE_{t,a,g})$$

where:

HE_t – health expenditures in the year t,

g – gender,

a – age cohort (most typically, 5-year age cohorts),

$N_{t,a,g}$ – headcount of age cohort a in the year t by gender g ,

$HE_{t,a.g}$ – average *per capita* expenditures in the age cohort a, by gender g in the year t.

Among the most popular actuarial models, two approaches can be identified: the "traditional" approach, where the share of population in the last year of life (in each age cohort) is not taken into consideration, and the "generalized" projection approach, where the level of *per capita* expenditures is differentiated depending on the time period left till death (Kildemoes et al. 2006).

Projection prepared by L. Mayhew (Mayhew 2000)[2] is a typical example of "traditional" approach to health care expenditure modeling and projection. It looks at the level of health expenditures in two regions of the world, namely: the *more developed countries (MDC)* and *less developed countries (LDC),* and covers the period up to 2050.

The analysis of expected development of health expenditure growth takes two types of factors into account: demographic changes (changes in the size and structure of the population), and other changes aggregated, including technological changes, changes in *per capita* medical service utilization, and cost factors. Inter-relations between the level of expenditures in the base year and the level of expenditures in year t are quantified in the equation:

$$H(t) = H(0) \cdot e^{t(r_p + r_u)}$$

where:

t – year under analysis,

H(t) – expenditures in the year t,

r_p – demographic change coefficient,

r_u – other factors' change coefficient.

The indicator responsible for demographic changes takes into account changes in health needs depending on population size and costs of care for the elderly. An index of relative level of expenditures[3] depending on age cohort and year is used. Index stability was assumed for the MDC (different values of the index are only assumed for different age cohorts based on data for the period of 1980-1990), while in the case of LDC index value is linked to mortality by age. In the MDC, index value is slightly below historical data. Due to lack of current data, the same values were assumed in the LDC.

A similar approach with demographic variables taken into account is represented,

[2] Projection is an extention of projections based on economic and demographic model of IIASA (*International Institute for Applied Systems Analysis*.) The model analyses the impact of ageing on economic development and, with respect to social insurance, concentrates on pension expenditures.

[3] Index has a value 1 for the age kohort 0-4, for other age cohorts its value is quantified in relation to expenditures for the youngest cohort.

among others, by Denton et al. (2001), Antolin et al. (2001) and by Fuchs (1998.)

Projection of short-term expenditures in *Medicare* and *Medicaid* schemes in the USA, prepared by Cutler and Sheiner (1998), is an example of a generalized approach to analysis. Two factors that influence changes in *per capita* expenditures were taken into account: age of death and disability indicator among survivors. The age of death is shifting towards older cohorts due to increasing life expectancy and decreasing mortality. At the same time, the number of persons for whom a given year is the last year of life is decreasing for younger cohorts.

Two models recently developed by the Ageing Working Group (European Commission 2006) and the OECD experts (OECD 2006), also belong to the group of models that apply the factor of increasing health expenditures in the last stage of life in the projection.

Actuarial models are used to build financial balance models as well, covering the revenue and the expenditure side of health care sector. These models are applied to the analysis of public and private health insurance schemes. The main purpose behind the application of financial balance models is to evaluate financial sustainability of health insurance system and estimate the amount of health insurance premium needed to assure system sustainability[4]. Total health insurance revenues are calculated as the sum of health insurance premiums paid by (or on behalf of) the insured. Additional revenues of insurance institutions can also be included in projections, depending on the source of revenue and type of activity of the insurer (i.e. interest rates from the capital or capital investments.) Most balance models use similar methodology in calculations, but some models are restricted to variables pertaining to health care sector only (health insurance, mostly), while others include system variables and are well set in the macroeconomic context.

Projection prepared by the *Management Sciences for Health (MSH)*[5] in the USA is an example of a financial balance model applied to health insurance projections. Projection is used to evaluate health insurance sustainability, with diverse scenarios of future development of actual contribution rate and insurance premium needed to cover the expenditures.

Another example of a model based on similar methodology is the WHO model applied to regional/local insurance systems. The model is suitable for projecting the impact of the introduction of regional/local insurance systems on the national health care system (Carrin, Ron 1993). As with other models, the level of revenues,

[4] Financial sustainability of insurance system is understood as the level of revenues higher or equal to the level of expenditures.

[5] *Management Sciences for Health* – a private, non-profit organization established in 1971, which works for health managers, policy-makers, medical service providers and often patients; and assists in solving problems in the health care sector by providing information and expertise.

expenditures and insurance financial balance are estimated. Likewise, financial structure of health care system, the number of insured and projected level of medical service utilization are described.

1.1.2. Macroeconomic models

The second category of models that can be distinguished are macroeconomic models that present health care system in a broad macroeconomic context. This approach allows for a broader analysis of the reasons underlying the increase in health expenditures and its long term economic implications.

A two-sector model of health care system and social insurance by M. Warshawsky (1994, 1999). The model is based on simple equilibrium between two production sectors: health care sector and the sector covering the rest of the market with two production factors: namely, labor and capital. Health care sector development is driven by the Leontiew production function[6], while the rest of the market is driven by the Cobb-Douglas production function[7]. Aggregated supply of labor is a function of demographic, social and institutional factors (i.e. high school and university enrolment, women's labour market participation, retirement age, etc.) Projection covers 40-year period. The results include not only the estimation of health and pension expenditures in relation to GDP, but also the relations between labor and capital in each of the two sectors, the level of consumption *per capita*, productivity in health care sector, and impact of various insurance systems on the level of expenditures. The model also includes assumptions on technological changes: better utilization of the capital from technical perspective (*capital deepening*), decreasing productivity in the health care sector, and technological development on the market.

1.1.3. Econometric models

The work by Getzen and Poullier (1992) is an example of econometric projections. It includes health expenditure projections for 19 OECD countries. Projections were made using various econometric methods: naive method, assuming the same growth rate of expenditures as in the previous year, moving averages method, exponential smoothing and regressions on historical data, projecting each country's growth rate as the average growth rate for all 19 countries combined, econometric model, and econometric models with additional macroeconomic information.

In addition, combination of methods listed above was also applied in the model. In

[6] $q = \min\{K,L\}$, where q – production size, K,L – factors of production (capital and labor.)
[7] $q = a K^b L^c$, where a,b,c – constant.

general, projections based on econometric models are rarely used to estimate the level of long-term expenditures, rather, they are applied to short-term projections. However, if the projection aims at the evaluation of impact of demographic changes on health expenditure, projection period should be extended, because changes in the size and age structure of the population are clearly visible only in the long term.

1.2. ILO social budget model

Projections of health care system financing and financial balance were made, as was already mentioned, based on the actuarial model prepared by the Social Security Department (SECSOC) of International Labor Organization (ILO).

The ILO social budget model has been broadly applied in the countries which cooperate with ILO, including CEE countries. In the past, the model was used to assess financial balance of the whole social welfare system in these countries. It is suitable for middle- and long-term projection of revenues and expenditures of major social welfare schemes, and for the simulation of impact of demographic, economic and legislative changes on social welfare financing. The model can be used for short-term evaluation of already existing schemes, as well as the simulation of future reforms of some parts of the system (i.e. the introduction of a defined contribution pension system or insurance-based health care system.) The social budget model consists of four sub-models (Scheme 1):

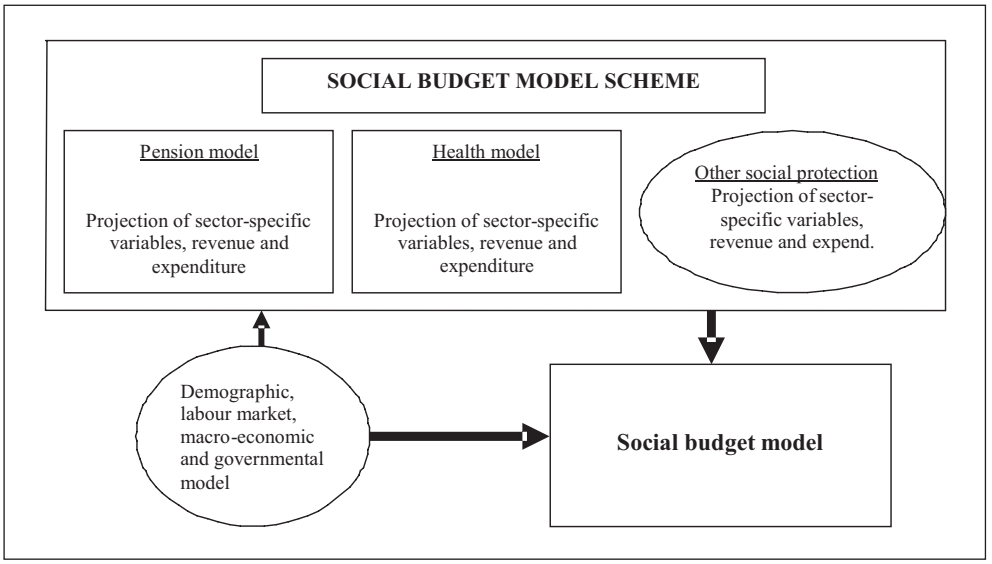
- Pension system sub-model;
- Health care system sub-model;
- Other sub-models, including unemployment benefits, family benefits, social assistance scheme.

The baseline model of social budget is restricted to health care budget, which in the CEE countries is mostly represented by the institution of health insurance budget. The baseline model has been further adjusted to country situation, health care system institutional framework, country legal regulations and policy proposals.

The ILO health budget model has certain advantages compared to other potential models that could have been applied for health care financing projections in accession economies.

- This model reflects the character of health care sector, as it comprises many different determinants that influence financial situation in the sector.
- It constitutes a basic platform of a kind, allowing wide adaptation to specific

Scheme 1. ILO social budget model structure



Source: Scholz W., Cichon M., Hagemejer K. (2000), Social budgeting, International Labor Office, Geneva.

country health system situation. There is great variety in health care systems, especially from the standpoint of their financing structure, so no single model can be applied to each country.

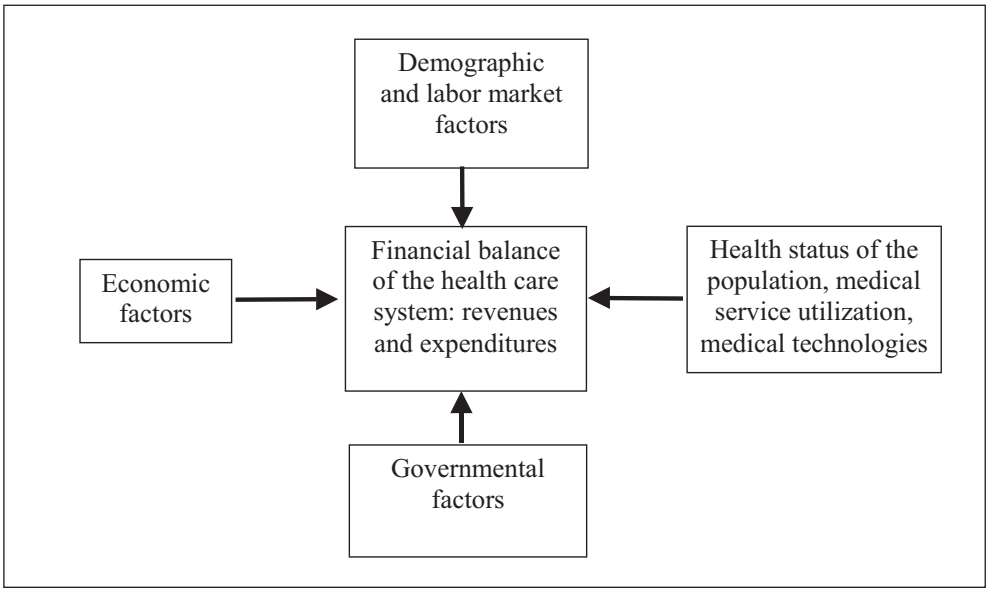
- The ILO model allows for a comparison of the expenditure and the revenue side and, in consequence, for a deficit or surplus calculation. Such feature is absolutely essential, especially in financial projections. Therefore, it is useful not only for international comparisons of health care system expenditures – as was the case with the Ageing Working Group projection – but also for country-based policy makers who are interested in financial sustainability of health care system in the long term.
- This model, unlike some others, takes demographic changes into account (ageing of the population.)

Following the structure of the ILO social budget model, four types of factors are used for the purpose of projecting health care system revenues and expenditures (Scheme 2).

The model applied in the research is slightly different from the original social budget model presented above (Schemes 1 and 2). Main groups of variables used in the analysis are classified under four headings:

- Demographic: TFR, LE, population structure (share of 65+ population) ;

Scheme 2. Key factors that influence financial balance of the health care system



Source: Scholz W., Cichon M., Hagemejer K. (2000), Social budgeting, International Labor Office, Geneva.

- Labor market: participation and employment rate, wages;
- Macroeconomic: GDP, inflation and labor productivity;
- Health status and utilization patterns.

Policy variables were not included in the analysis, with the assumption that the legal framework and financial mechanisms in health care system remain unchanged during projection period.

One of the most significant modifications to the health module of the social budget model (in case of projections for Hungary and Poland) is the introduction of *per capita* expenditures instead of average medical service utilization level (number of *per capita* primary care visits and hospital days.) This modification was made due to greater availability of data on expenditure levels *per capita*, by gender and by age than the data pertaining to average medical service utilization in these two countries. Moreover, the introduction of average *per capita* expenditures allowed for death-related costs scenario.

The health care budget model applied in projections is not limited to health insurance in a given country, but covers the whole public financing of the health care sector. This implies that not only insurance revenues and expenditures, but also budgetary revenues and expenditures are included.

Chapter 2.

Health care system in analyzed countries

A vast majority of transition countries (CEE and CIS) achieved the first objective of health care reform in that they introduced health insurance with an earmarked fund established from payroll tax, instead of integrated budgetary funding financed from general taxation. Health insurance was introduced gradually: in Hungary social insurance fund, including health care, was separated from budgetary funding in 1990, and then (in 1992) health insurance fund was further isolated from social insurance fund[8]. Over the same period of time, the Baltics designed health insurance approach within the framework of reforms prepared for the new independent states (1991). In Slovakia, health insurance was introduced in 1994, in the Czech Republic in 1997, in Romania in 1998 and, finally, in Bulgaria and Poland in 1999.

Table 1. Introduction of health insurance in analyzed countries (2003)

Country	Year of HI introduction	Contribution (in %)	Share of HI in the total HC funding (in %)
Bulgaria	1999	6.0	32.0
Estonia	1991	13.0	66.0
Hungary	1990 as SI 1996 - separate HI	14.0	71.6
Poland	1999	9.0	62.7
Slovakia	1994	14.0	86.0

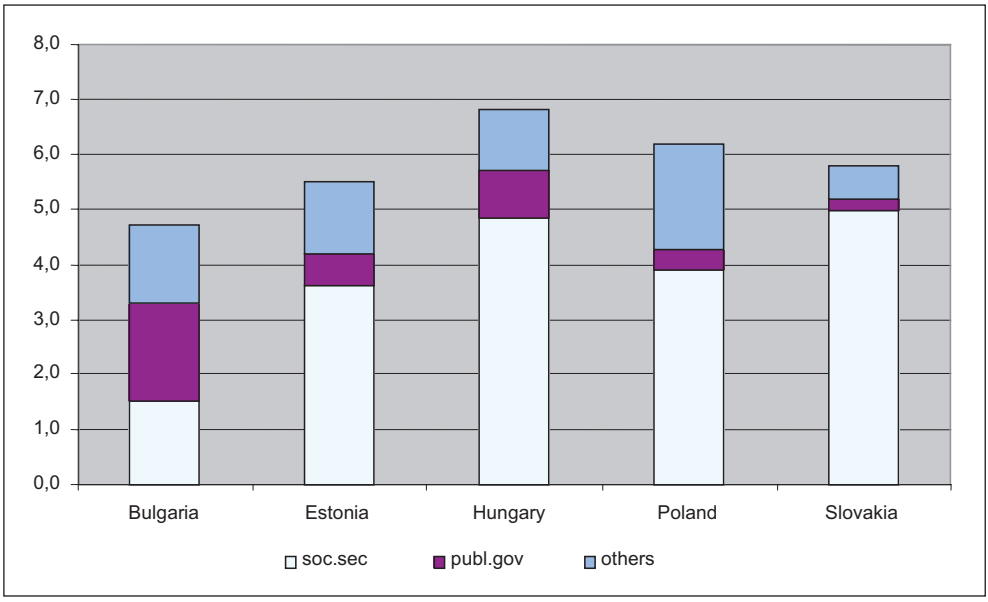
Source: Golinowska, Sowa (2006), Kvetan, Palenik (2006), Rangelova (2006), Remak, Gal, Nemeth (2006), Roovali (2006)

Medical circles strongly supported the introduction of health insurance. It was believed that the inflow of funds to the system would be more secure and stable when the funds are contingent upon economic results (payroll tax) rather than upon political decisions made every year while setting the priorities in budgetary

[8] In Hungary, health insurance premium was earmarked as late as in 1996. Before that, one premium for all insurable social benefits was calculated. The total premium equaled 52.5 % gross compensation, and the health insurance premium isolated therein – 22% (Gaal 2004, p. 37.).

expenditures. Another advantage was related to the possibility of defining a package of insurance benefits for the purpose of separating the public component, and thus creating the space for private health insurance.

Graph 1. Composition of health expenditures in analyzed NMS countries by source (% GDP)



Source: Golinowska, Sowa (2006), Kvetan, Palenik (2006), Rangelova (2006), Remak, Gal, Nemeth (2006), Roovali (2006)

The introduction of health insurance generated tension between increasing health needs on the one hand, and relatively low health care funding and requirements of low taxes and low non-wage labor costs needed to stimulate employment and economic growth, on the other. In consequence of these tensions, health care sector has been systematically falling in debt. Debts are incurred either by insurance institutions or by medical service providers, depending on institutional framework of the health care sector. High level of indebtedness is stable or even growing (Golinowska, Sowada, Woźniak 2007), which has adverse impact on the effectiveness of health care management. Future, long-term financial decisions should be made with the awareness of these tendencies, as well as external determinants of health care sector in the future.

Chapter 3.

Data sources

Health budget model is based upon national data supplemented (or adjusted) with the data collected and used by the international institutions in their comparative analyses. These include: United Nations, Organization for Economic Co-operation and Development, International Labor Organization, Eurostat, and European Commission. Domestic data includes the data collected by national statistical offices, national health insurance and social insurance institutions, national banks, ministries of finances, ministries of labor and social policy, and ministries of health (Table 2.)

Due to rapidly changing economic environment in the countries of political and economic transition, such as CEE countries, historical data used in the model is not always the data valid for the base year, but rather the average data from the longer period. By the same token, in some cases long-term historical data was not available or not fully reliable as the background for projections.

Table 2. Sources of data for projections

Country	National statistical offices	Social insurance	Health insurance	Governmental agencies	Independent organizations	National banks
Bulgaria	NSI (Nazionalen statisticheski institut – National Statistical Office): *demographic data* – population figures, including population by gender, population age structure, total fertility rate, mortality rate, birth rate, rate of natural increase, life expectancy at birth, etc.; *macroeconomic data* – GDP volume and growth, CPI (inflation), GDP deflator, income of population; labor statistics taken from National Survey on Labor Force, organized periodically.	NOI (Nazionalen osiguritelen institut – National Insurance Institute): data on the socio-insurance system, number and structure of insured, insurance payments.	NZOK (Nazionalna zdravno-osiguritelna kasa – National Health Insurance Fund (NHIF): health revenues and expenditures, financial balance of the health sector.	MZ (Ministerstvo na zdraveopazvaneto – Ministry of Health Care) NCZI (Nazionalen centur po zdravna informazia pri Ministerstvoto na zdraveopazvaneto – National Center for Health Information at the Ministry of Health): papers on health care policy and strategy. MF (Ministerstvo na finansite – Ministry of Finance): state budget data AZ (Agenzia po zaetostta pri Ministerstvoto na truda I sozialnata politika – Employment Agency at the Ministry of Labor and Social Policy): economically active population, employed persons both total number and by gender, employment rate, unemployment rate.	II na BAN Ikonomichwski institut na Bulgarska academia na naukite (Institute of Economics at the Bulgarian Academy of Sciences – IE-BAS): GDP, labour productivity projections. CIN (Centur za izsledvane na naselenieto – Centre for Population Studies at the Bulgarian Academy of Sciences): ageing population projections.	BNB (Bulgarska nazionalna banka – Bulgarian National Bank): macroeconomic data – interest rates.
Estonia	Statistikaamet – SA (Statistics Estonia): population, employment, economic data, national population prognosis.	NA	Eesti Haigekassa – EHK (Estonian Health Insurance Fund): number and structure of insured, health insurance expenditures and revenues, utilisation of hospital and outpatient care by age.	Sotsiaalministeerium – SoM (Ministry of Social Affairs of Estonia): total utilisation of health care, expenditures of health care providers, national health accounts, consultation on health expenditure prognosis Rahandusministeerium – RM (Ministry of Finance of Estonia): official financial prognosis, consultation on health expenditure prognosis	UN (United Nations): UN population prognosis data. Poliitikauuringute Keskus PRAXIS (Center for Policy Studies): macroeconomic assumptions used in various projections. Tartu Ülikool (TÜ) University of Tartu: macroeconomic projection	NA
Hungary	KSH (Hungarian Central Statistical Office) KSH NKI (Population Research Institute): target values for TFR and life expectancy, forecast on migration.	NA	OEP (National Health Insurance Fund): aggregate data on health care utilisation, expenditures and revenues; micro data on utilisation and health expenditures by age.	Pénzügyminisztérium (Ministry of Finance): target values for macroeconomic and labour market variables from the Convergence ESKI (National Institute for Strategic Health Research, Ministry of Health): National Health Accounts 2001, 2002.	Kopint-TÁRKI: forecast on real wage growth.	MNB (Hungarian National Bank): interest rates.

Table 2. continued. Sources of data for projections

Country	National statistical offices	Social insurance	Health insurance	Governmental agencies	Independent organizations	National banks
Poland	GUS (Główny Urząd Statystyczny – Central Statistical Office): population data, labor market data, economic data for the base year, health expenditures (National Health Account)	ZUS (Zakład Ubezpieczeń Społecznych – Social Insurance Institution), KRUS (Kasa Rolniczego Ubezpieczenia Społecznego – Agricultural Social Insurance Fund): number of insured, farmer insurance data.	NFZ (Narodowy Fundusz Zdrowia – National Health Fund): health expenditures by age groups, for survivors and deceased (base year), insurance revenues in the base year.	MZ (Ministerstwo Zdrowia – Ministry of Health): budget health expenditures; MF (Ministerstwo Finansów – Ministry of Finance), MPiPS (Ministerstwo Pracy i Polityki Społecznej – Ministry of Labor and Social Policy): macroeconomic projection.	CASE (Center for Social and Economic Research): macroeconomic projection consultation.	NA
Slovakia	SU SR (Štatistický úrad Slovenskej republiky) Statistical Office of Slovak Republic Data used: national accounts, prices, labor market.	SOCIÁLNA POIS OVÒA Social Insurance Data used: number of insured, population shares in the groups of insured.	NCZI (Národné centrum zdravotníckych informácií) National Centre for Health Information Data used: health data, health care utilisation.	MZ SR (Ministerstvo zdravotníctva Slovenskej Republiky) Ministry of Heatlh of the Slovak Republic Data used: contribution rates, data regarding health care reform.	VDC (Výskumné demografické centrum) Demographic Research Centre Data used: demographic trends forecast (assumptions for life expectancy, migration and fertility rates); EU SAV (Ekonomický ústav Slovenskej Akadémie vied) Institute of Economic Research, Slovak Academy of Sciences Data used: forecast of economic trends – GDP, labor market, prices.	NBS (Národná banka Slovenska) National Bank of Slovakia Data used: exchange rates, prices (CPI.)

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Chapter 4.

Assumptions and development of variables

The assumptions on future development of health care sector revenues and expenditures which lie at the background of long-term projections are positive. This implies that in almost every case the trend for future development is positive. At first glance, in the case of CEE countries which went through rapid changes during 1990's, it would seem rather risky to assume only positive trends. Over the 17 years of transition, several indicators which are important for the model did not have a positive trend: TFR was declining, employment was declining, and GDP growth strongly fluctuated. Therefore, it is necessary to keep it in mind that projections assume recovery from the crisis and negative trends of the 80's and 90's.

Assumption of positive economic growth is an extrapolation of ambitions of the New Member States in convergence to the EU-15 economic level. Similar assumptions are adopted in the National Action Plans in the framework of OMC and National Convergence Programs in the framework of the accession process. According to these documents, economic growth in the NMS should guarantee growth in employment and productivity at the same time. Previous experience shows that this objective is difficult to reach – Poland, for example, experienced (still does?) the situation of "jobless growth" (Kwiatkowski 2002).

4.1. Development of demographic variables

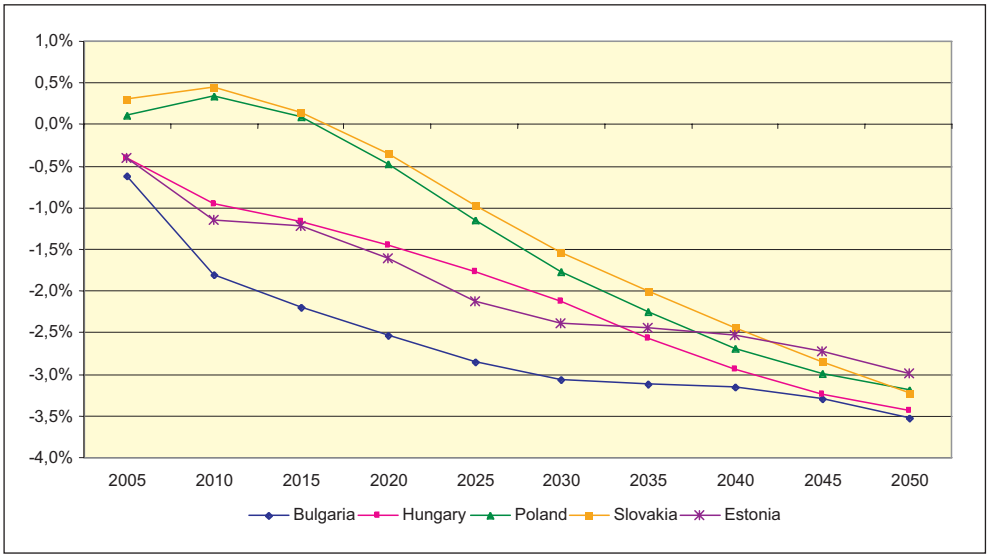
Assumptions on future demographic changes in the countries under analysis are based on country sources, which include analytical research and projections prepared by national statistical offices and institutes of demography. These are confronted with the Eurostat projections (EUROPOP 2004), especially with aggregated data on the NMS and the EU15 country comparisons.

According to demographic projections, in the oncoming decades countries included in the analysis will face the same trends as those observed earlier in the EU-15: fertility decline, life expectancy increase, and increase in the share of the elderly (65+) in the population. The dynamics of those changes, however, will be higher than in the EU-15. Furthermore, one must remember that they will take place in relatively poorer countries[9].

The scale of population decrease varies from 2% in Slovakia to about 20% in Bulgaria, during the next 25 years.

Graph 2 shows that, in the long run, the fastest decrease of population will be observed in Bulgaria. Negative trend will slow down after 2030. In Poland and Slovakia in the period of 2005 – 2010, a slight increase of the population is foreseen, while in the following 5 years (2010 – 2015) the population will start to decrease, but replacement will still be positive. After 2015, the population of these countries is going to shrink.

Graph 2. Size of population changes (5-year period)



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007).

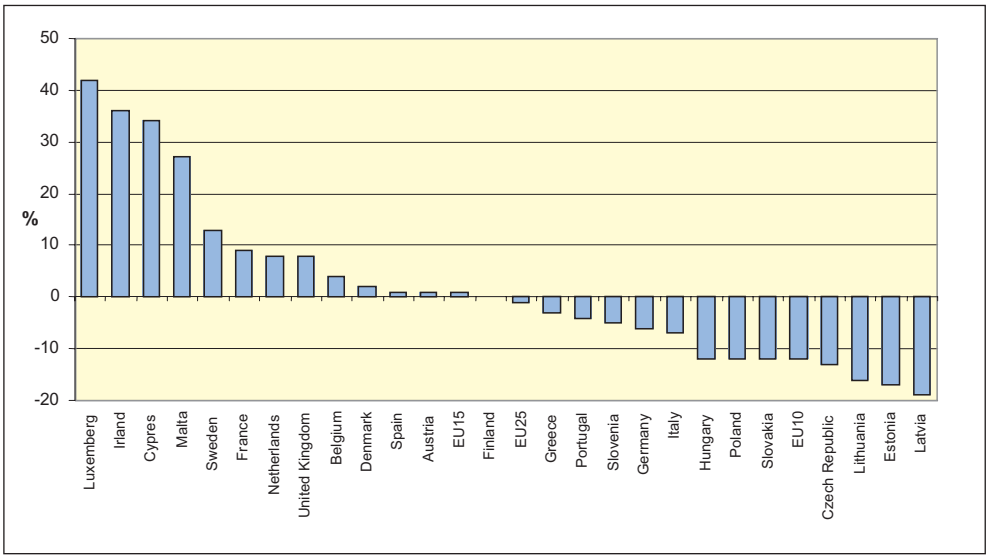
According to country-based projections and the Eurostat, the decrease in population size is significant. On average, NMS population will decrease by 12%, while in EU-15 the population will increase by 1%. These changes are also influenced by migration processes. Eurostat projection assumes immigrants to the EU-15, also from the NMS, though the scale of immigration from the NMS will be lower than in the base

[9] International analyses, i.e. Eberstatd 2005, World Bank 2007, indicate that CEE countries face unusual phenomenon of co-existence of demographic transformation and lower development level.

projection year. The NMS face emigration related to EU accession. Emigration increase leading to negative migration balance can be observed especially in Poland. It is assumed that the dynamics of migrations will slow down after 2010, and positive migration balance (more immigrants than emigrants) is projected after 2025.

National demographic projection for Hungary assumes steady increase of immigrants (about 1 200 individuals, annually), and positive migration balance is achieved faster.

Graph 3. Changes in population size, 2004-2050



Source: EPC and European Commission 2006.

In the EU-15, average (1%) increase of the population is a result of population changes in France, Great Britain, the Netherlands, Sweden and Ireland. Likewise, the smallest EU countries experience significant increase in the population size (see: Graph 3.)

Total fertility rate

During the last 15 years one could observe a decrease in fertility in analyzed countries. It results from modernization in life style (the so-called "westernization"), accompanied by changes in family structure (marriages in older ages, more common cohabitation, birth in older ages, one-child families.) The cost related to raising a child has increased dramatically during transition period. The relations between goods for children and other goods and consumption goals have changed, accessibility of childcare has decreased, and family policy has changed from universal to targeted benefits.

Despite negative tendencies in the last 15-20 years, in all countries under analysis the assumption of fertility increase is adopted (Table 3.) In the next 25 years, the scale of foreseen TFR improvement is smaller than in the EU-15, while in the following period the value of fertility indicator is closer to the projected EU-15 level. This is due to increasing similarities in family formation process, i.e. the age of giving birth to the first child (30.)

Notwithstanding the positive trend in fertility development projection, fertility level is not sufficiently high to offset systematic decrease in the size of the population in analyzed countries[10].

Table 3. TFR development

Country	2002 (2003)	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	1.23	1.27	1,38	1.49	1.59	1.67	1.75	1.81	1.85	1.88	1.89
Estonia	1.37	1.39	1.44	1.50	1.55	1.60	1.65	1.70	1.76	1.81	1.85
AWG data for Estonia		1.4	1.45	1,5	1.54	1,60	1.60	1.60	1.60	1.60	1.60
Hungary	1.31	1.35	1.41	1.47	1.54	1.60	1.60	1.60	1.60	1.60	1.60
AWG data for Hungary		1,3	1.33	1.4	1.51	1.58	1.59	1.60	1.60	1.60	1.60
Poland	1.22	1.26	1.35	1.43	1.51	1.58	1.64	1.69	1.73	1.75	1.76
AWG data for Poland		1.2	1.19	1.3	1.42	1.5	1.58	1.60	1.60	1.60	1.60
Slovakia	1.29	1.25	1.19	1.22	1.29	1.36	1.43	1.5	1.57	1.64	1.71
AWG data for Slovakia		1.2	1.18	1,2	1.33	1.4	1.52	1.60	1.59	1.60	1.60
NMS (AWG data)		1.23	1.24	1.3	1.44	1.5	1.56	1.6	1.58	1.6	1.58
EU 15 (AWG data)		1.53	1.57	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.61

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007), EPC and European Commission 2006

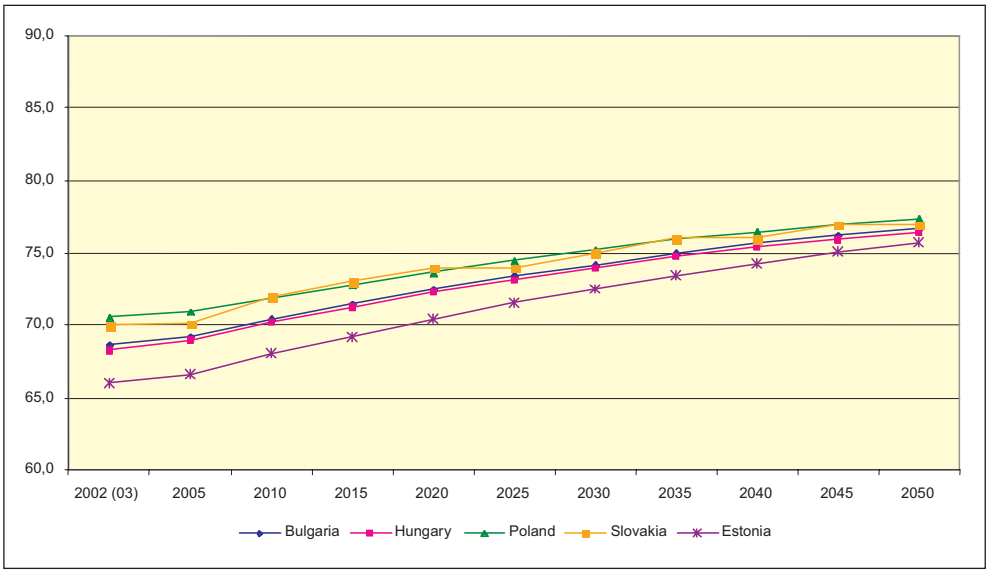
Life expectancy

The assumption of systematic growth in life expectancy is based on historical tendencies observed in EU-15 countries, and positive impact of factors that determine longevity. The latter, on the one hand, include changes in dietary habits (more fruit and vegetables, higher vegetable fat consumption), decrease in smoking, changes in the structure of consumed alcohols, intensification of physical activity, which all lead to decreasing mortality due to cardiovascular diseases, the main reason of high mortality in the CEEC (Zatoński, Willert 2005). On the other hand, access to pharmaceuticals and new technologies has increased, which allows for faster and more effective reaction when the disease occurs (Drygas 2005).

[10] Simple replacement level is assured when TFR equals at least 2.1.

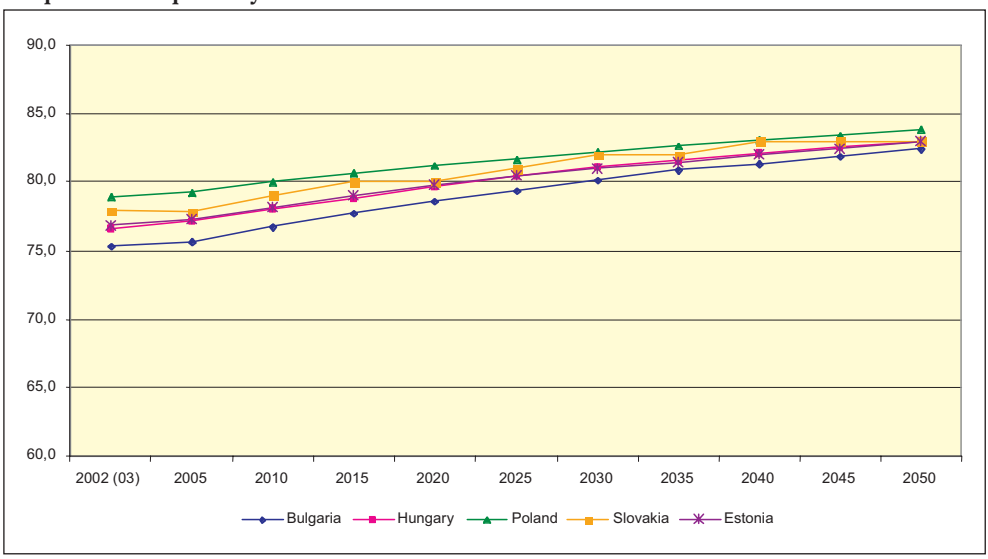
Back in 1980's, CEE countries experienced stagnation or even slight decrease in life expectancy, especially for labor market active male population (Okólski 2004, Golinowska, Sowa, Topór-Mądry 2006). This unfavorable trend is reversed slowly, but

Graph 4. Life expectancy – males



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Graph 5. Life expectancy – females



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

its improvement is observed in Hungary and in Poland, while in Slovakia male life expectancy has not improved yet. In Estonia, the improvement is still unsatisfactory.

Changes in population structure – ageing

Changes in demographic structure according to age are clearly reflected in the shape of age pyramid, which even at the beginning of projection period looks like a Christmas tree, and at the end of projection is shaped as a mushroom with a narrow mushroom leg.

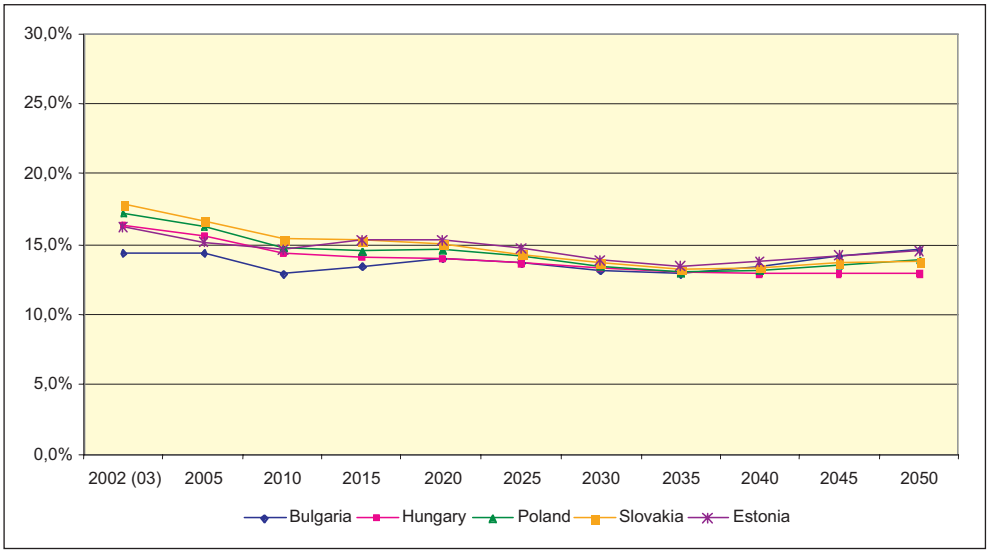
The graphs presented in Annex 1 describe age structure of the population in the base year and at the end of projection period. In the base year in Hungary, Poland and Slovakia two periods of population growth can be distinguished: the first one is the baby boom following World War II, while the other one is its echo after 20-25 years.

The highest share of population is observed for the cohort of 55-75 years of age. In Poland, the peak is at the age of 67-68, in Bulgaria about 60-70, in Estonia 60-65, while in Hungary and Slovakia the peak is at the age of 70-75 and 68-72, respectively.

A decrease in the share of children in the population of analyzed countries can be observed until 2010. Following that period, this decreasing trend remains at the level of about 15%. The share of children slowly decreases again after the year 2020.

The lowest shares of young population are observed in Bulgaria in the first projection period (up to 2025), and in Hungary in the second period (up to 2050.)

Graph 6. Share of population 0-14

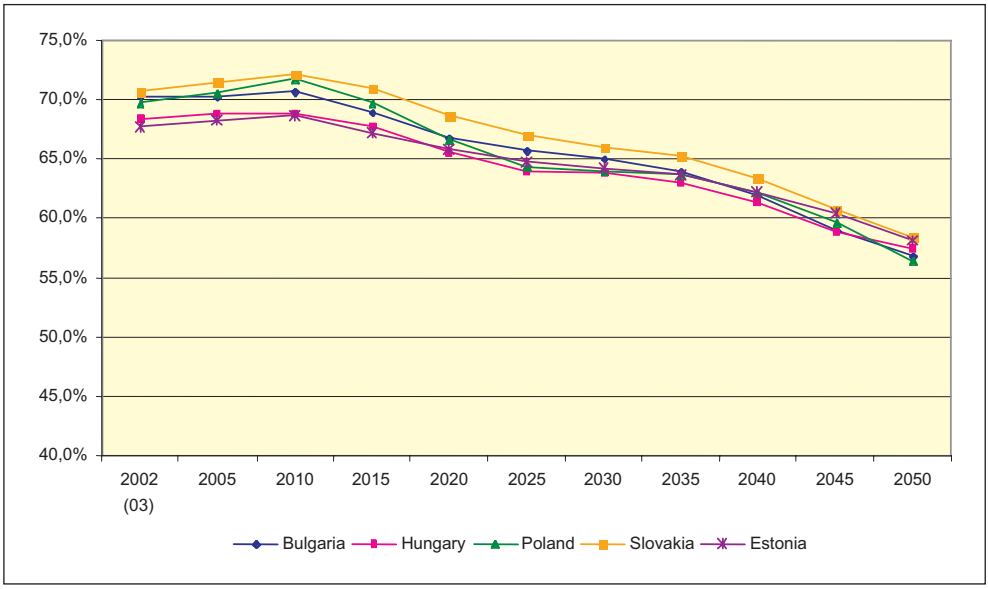


Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

A decrease in the share of labor market active age population can be observed after 2010, when baby boomers begin to retire (at the age of 65.) In the NMS the drop in the share of active age population is rapid (about 27% compared to 13% in the EU-15), and it is projected to continue dynamically up to 2025. In years 2025 – 2030 the decrease will slow down, but in the last decade of projection the share of labor market active population will rapidly shrink again (Graph 7).

Labor market activity development is similar in Eastern and Western Europe, although the dynamics is higher in the NMS. Decrease in labor market activity rate is the main reason for policies of employment promotion and new labor market programs at the EU-level. It also leads to changes in immigration policy in the enlarged EU. In the future, the potential of Eastern Europe as a migration source for Western Europe countries will diminish.

Graph 7. Share of population 15-64



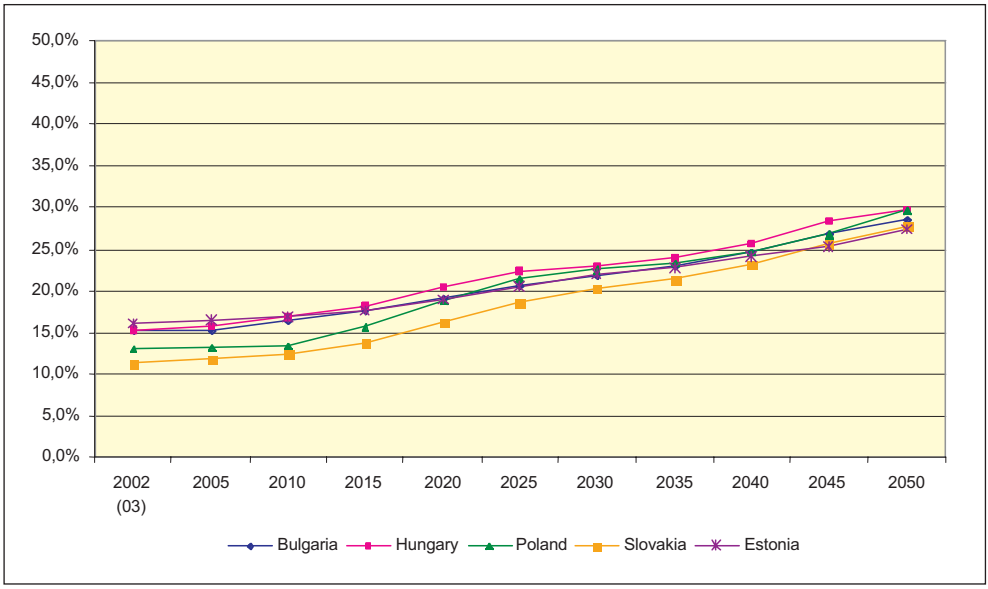
Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

An increase in the share of the elderly has already been described by age pyramids at the beginning and at the end of projection period. Still, it is worth noting that the dynamics of increase in the share of the elderly (from 15% to almost 30% at the end of projection period) will be higher in the period of 2015-2025, when baby boomers get older.

As a result of presented demographic scenario, the old age dependency ratio, which is calculated as a proportion of the number of the elderly (65+) to the number of labor

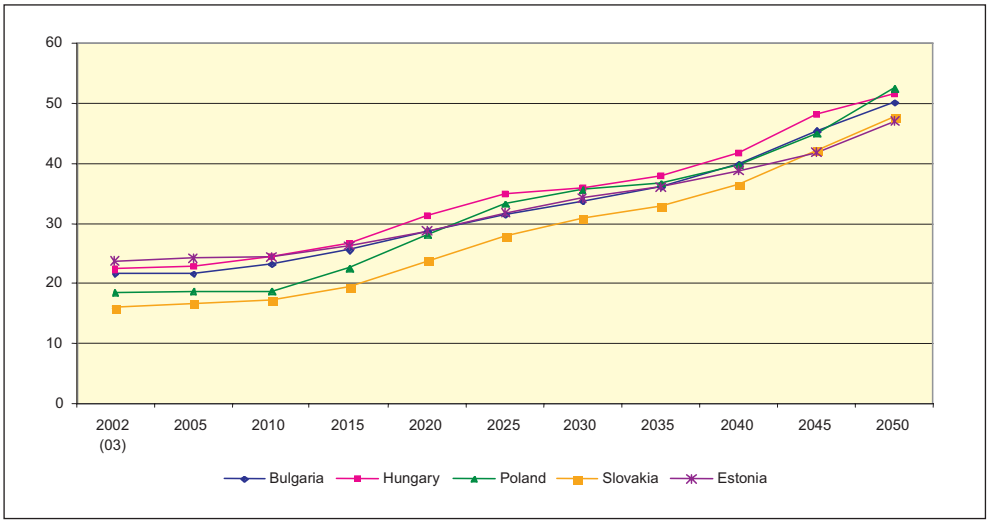
market active age population, doubles – from 20% to around 40%. In Hungary, Poland and Bulgaria the indicator dramatically increases to over 50% (Graph 9.)

Graph 8. Share of population 65+



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Graph 9. Old age dependency ratio



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Employment rate is one of the indicators that deteriorated during transition. In Bulgaria and Poland, only half of the population in labor market active age is currently employed. Estonia has the highest employment rate among all countries under research; moreover, it had the highest rate of economic growth in recent years.

Table 4. Employment rate development

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	51.4	54.8	64.0	64.8	63.8	62.1	60.1	58.9	58.9	59.3
Estonia	63.8	69.4	71.6	73.0	73.4	73.6	73.5	73.7	73.5	73.4
AWG* data for Estonia	64.4	68.4	71.8	72.3	71.9	71.6	71.1	71.2	71.1	70.8
Hungary	56.4	58.7	60.8	64.3	64.0	62.6	61.9	62.0	63.4	63.2
AWG data for Hungary	58.4	60.8	62.4	64.3	65.3	64.6	63.5	62.4	63.1	63.2
Poland	51.2	55.3	59.4	62.9	66.5	70.0	71.0	72.0	73.0	74.0
AWG data for Poland	52.7	57.0	61.0	64.9	68.4	68.6	67.4	66.2	65.6	66.1
Slovakia	57.7	62.0	65.2	68.6	69.4	69.3	68.3	68.0	68.4	68.9
AWG data for Slovakia	59.2	62.1	66.7	70.2	72.7	72.6	71.2	69.5	69.0	68.7
NMS (AWG data)	57.2	60.7	64.2	67.2	69.4	69.2	68.1	67.0	66.8	67.1
EU 15 (AWG data)	65.6	68.1	70.1	70.5	70.5	70.7	71.1	71.5	71.5	71.5

*Eurostat data prepared for the purposes of Ageing Working Group (EPC and European Com mission 2006)
Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007), EPC and European Com mission 2006

Assumptions regarding the development of employment rate in all the countries are quite optimistic, but they are coherent with the national action plans on employment and convergence strategies adopted by selected New Member States (NMS) after EU accession. Projected level of employment rate is necessary in the long run to keep the economy growing (even if productivity growth is high) in view of unfavorable demographic changes.

When comparing these assumptions to the Economic Policy Committee (EPC) and European Commission projection, one can see some discrepancies, especially in phase one of projection period (until 2025.) Presented projections for Poland, Hungary and Slovakia assume higher employment rate than the EPC projection. In general, labor market indicators projected by the EPC and European Commission are less favorable for nearly all NMS in comparison to the EU-15. Most likely, this is a result of demographic situation in the NMS and its impact on labor market activity level. Population ageing dynamics in the NMS is higher than in the EU-15, so the size of labor market active cohort is smaller. Significant improvements in the economic situation in the NMS in recent years seem to indicate that there are grounds for more optimistic employment assumptions than those included in EPC prognosis. Following Lisbon Strategy assumptions, the NMS have released some employment improvement programs which could bring about improvements in labor market situation.

Employment rate assumptions in national and European projections in the second part of projection period (2025-2050) are similar. One should emphasize that the

projections do not assume that the NMS will have reached the goals of the Lisbon Strategy, and national projections are even more skeptical. In Hungary and Bulgaria, estimated employment level is lower than the average for the NMS in 2050. It is assumed that by 2020-2025 employment level will decrease by 20-25%, compared to 2003.

Table 5. Unemployment rate development

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	13.2	8.4	6.0	5.6	5.2	4.9	4.7	4.5	4.3	4.1
Estonia	9.4	5.5	5.7	5.0	5.3	5.3	5.3	5.3	5.3	5.3
AWG data for Estonia	9.1	7.8	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Hungary	8.0	7.2	6.4	4.8	6.2	6.6	5.6	4.2	3.9	4.8
AWG data for Hungary	5.3	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Poland	18.2	14.3	11.4	9.9	8.5	7.0	7.0	7.0	7.0	7.0
AWG data for Poland	18.7	15.8	12.9	9.9	7.0	7.0	7.0	7.0	7.0	7.0
Slovakia	17.9	11.7	8.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0
AWG data for Slovakia	16.7	15.2	12.5	9.7	7.0	7.0	7.0	7.0	7.0	7.0
NMS (AWG data)	13.8	12.0	10.0	8.3	6.6	6.6	6.6	6.6	6.6	6.6
EU 15 (AWG data)	7.7	7.0	6.1	6.1	6.1	6.1	6.0	6.0	6.0	6.0

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007), EPC and European Com mission 2005

European Commission projections on the level of unemployment assume that the indicator will decrease up to the NAIRU level of 6-7%. In the case of Poland and Slovakia, where unemployment rate is the highest, it will take even 20 years to approach this estimated level (EPC and European Commission 2006.)

Background for projections on unemployment level prepared by each country is similar to the assumptions made by the European Commission, although the indicators regarding the first period of projection are more optimistic. Only in Hungary is the slope of unemployment rate decrease less steep (overall decrease of unemployment is at the level of 40%), due to the already low unemployment rate in the base year (about 8.0%.) In other countries unemployment rate decreases by 60-70% during projection period, with the lowest unemployment rate estimated in 2050 in Bulgaria.

4.2. Economic assumptions and projections

Projection of economic growth in analyzed countries is built upon convergence assumptions, which implies that these countries will catch up with the average European economic level relatively fast. It is assumed that labor productivity in the NMS will be substantially higher than in the EU-15, particularly with lower employment rate.

In consequence of convergence, GDP growth is expected to be nearly two times higher than in the EU-15 in the first period of projection. National projections are even more optimistic for the next 20 years. Nearly all the countries (except for Hungary in 2025) assume higher GDP growth than that included in European Commission projection.

In phase two of projection period, economic growth dynamics in the EU-15 and in the NMS is assumed to be similar, and by 2050 economic growth in some of EU-15 countries will be higher than in the NMS. National projections assume lower decrease in GDP growth in the second part of projection period, especially in Bulgaria. This is a result of high labour productivity (especially productivity capital deepening) accompanied with adverse tendency in demography and labour utilization.

Table 6. GDP growth rate

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	4.4	4.3	4.2	4.0	3.9	3.7	3.6	3.5	3.4	3.2
Estonia	10.5	7.2	4.3	4.1	4.1	3.9	3.8	3.6	3.4	3.3
AWG data for Estonia	6.3	5.6	3.7	2.7	2.4	2.3	1.5	1.3	0.9	0.6
Hungary	4.1	3.6	3.0	2.5	2.3	2.0	1.8	1.6	1.3	1.1
AWG data for Hungary	3.8	3.3	2.8	2.5	2.4	2.1	1.0	0.8	1.0	1.1
Poland	5.3	5.1	4.8	4.2	3.7	3.2	2.6	2.1	1.5	1.0
AWG data for Poland	3.6	5.0	3.7	3.2	2.9	2.2	1.2	0.7	0.5	0.4
Slovakia	6.0	6.2	5.1	4.1	3.2	3.1	2.9	2.8	2.6	2.5
AWG data for Slovakia	3.9	5.3	4.1	3.3	2.9	2.0	0.8	0.4	0.2	0.3
NMS (AWG data)	4.4	4.6	3.5	2.9	2.7	2.1	1.1	0.7	0.6	0.6
EU 15 (AWG data)	2.0	2.5	2.2	1.7	1.5	1.2	1.2	1.3	1.3	1.3

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007), EPC and European Com mission 2005

4.3. Assumption regarding income elasticity of health expenditures

Presented projections are based upon an assumption that income elasticity of health expenditures is equal to 1.0. This supposition is arbitrary, drawn upon partial analysis of the relation between income and health expenditures (MZ 2004). It should be noted that there are numerous discussions on the value of income elasticity indicator. The outcome of one of the first analyses dedicated to that subject were published in 1977 (Newhouse 1977), and indicated that income elasticity of health expenditures is above 1, which implies that health expenditures are, in fact, luxury expenditures. Over the next 30 years various analyses were published, but their outcome was inconclusive. According to Getzen (2000), different results of those analyses should be attributed to the differences in the definitions of the subject under

analysis. Income elasticity varies depending on the subject under analysis: individual, group (i.e. insurance company clients), or the whole population covered by national health insurance. Income elasticity measured at the individual level is typically lower than 1 (health is understood as a basic, necessary asset), while income elasticity measure at the national level is often higher than 1 (which implies that health is a luxury good) (Getzen 2000.) Table below presents some of the results of income elasticity analysis at the macro (national) level.

Table 7. Selected results of the analysis of impact of income changes on the level of health expenditures

Source	Income elasticity	Comments
Newhouse (1977)	1.30	13 developed countries
Gertler i van der Gaag (1990)	1.30	25 countries
Getzen (1990)	1.60	USA
Getzen i Poullier (1992)	1.40	19 OECD countries
Murthy i Ukpolo (1994)	0.77	USA
Gerdtham et al. (1998)	0.66-0.82	22 OECD countries
Fogel (1999)	1.60	USA
Okunade i Murthy (2002)	1.56-1.64	USA
Ariste i Carr (2003)	0.88	Canada
Clemente et al. (2004)	1.47-3.65	22 OECD countries: results depend on the country
Okunade et al. (2004)	0.87	17 OECD countries
Dreger i Reimers (2005)	0.68-0.84	21 OECD countries: results depend on medical development indicator (LE, infant mortality, share of 65+ population)
OECD (2006)	0.87-1.5	30 OECD countries: results depend on the method applied in the analysis
CPB (2006)*	0.79-0.97	EU14+Iceland+Norway+Switzerland: results depend on the model adopted
	0.81	EU11+Iceland+Norway+USA+Canada
	0.69	OECD countries, excl. Turkey

Source: Mot (2006).

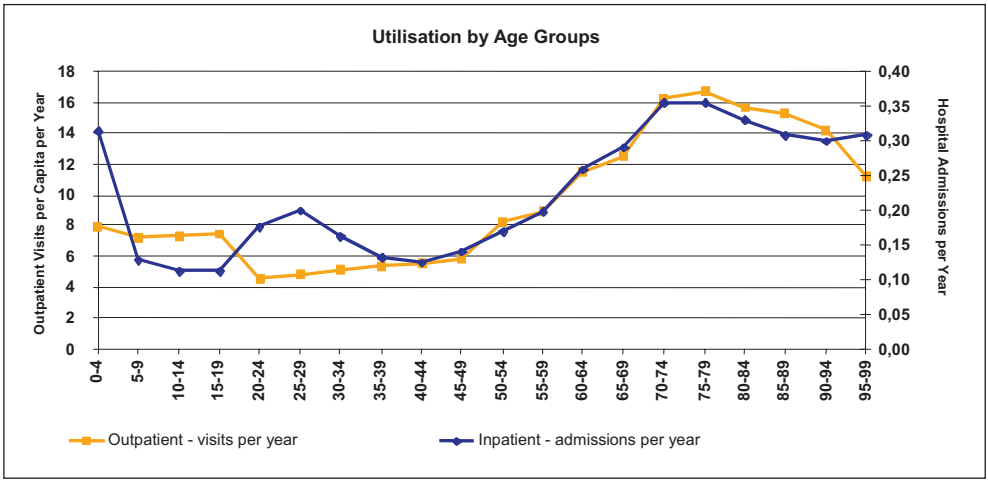
4.4. Assumption on health status and health service utilization

Medical service utilization curve is the basic element of health expenditures projection. It presents diversification of medical services utilization pattern by age, what implies changes in morbidity in the population age cohorts. Utilization curve has a well-known and broadly described J-curve shape; it varies, however, from country to country. Lately (ECP and European Commission 2006) it was shown that the spending peak occurs earlier in life cycle in the NMS that in the EU-15: at the ages of 75-80 and 85-90, respectively. Te main reason of such diversification is the difference

in life expectancy (LE). At the same time, the shape of J-curve is flatter for some of the NMS (especially Baltic states and Poland) than for other European countries. This implies that medical service utilization and health expenditures incurred by the elderly are not as high as in the other countries. As some Polish researches ascertain, lower costs and utilization levels for the elderly are related to social and economic structure of the society, as well as some cultural factors. The milder slope of the J-curve can be explained, most likely, by a high share of rural population that tends to use medical services less commonly.

A significant impact of hospital expenditures on the shape of J-curve is implied by Hungarian data on health expenditures by age (research coordinated by the National Health Insurance Fund – random survey sample of 5% of the population), and by Polish health expenditure data (the National Health Insurance.) The share of hospital expenditures in total health expenditures is relatively high (closer to 50% than to 40%.) Graphs below present this relation in case of Estonia and Hungary.

Graph 10. Medical services utilization by age group in Estonia

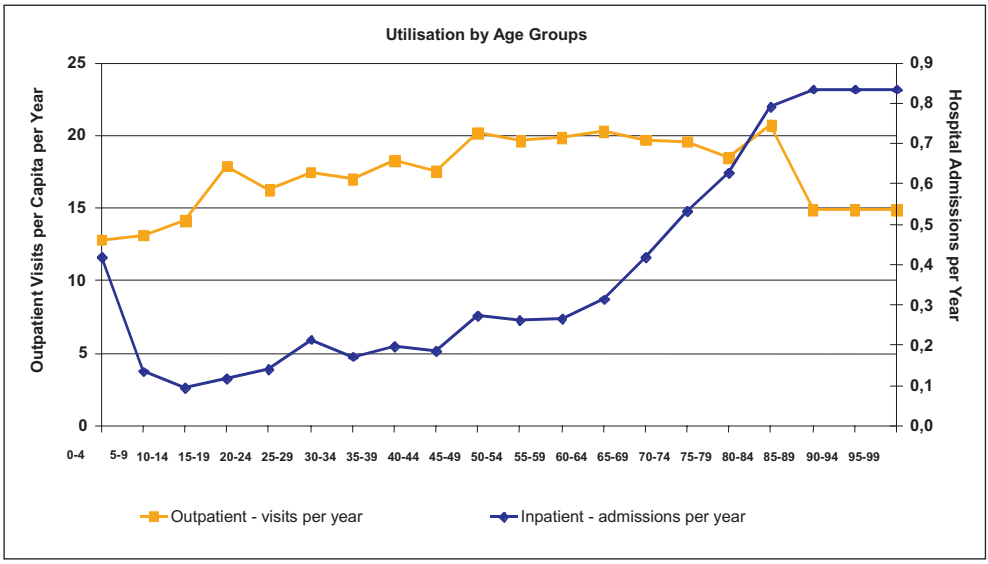


Source: Roovali (2007)

The following graph presents the assumptions on the shape of the J-curve in Poland. Its shape varies significantly from the shape typical of EU-15 countries. Namely, higher expenditures in Poland start for younger cohorts than in the old EU countries; respectively: above 40 and above 50 years of age. However, the peak of expenditures occurs in similar age: about 75-80 for men and 90 for women, but the level of spending in Poland can be even 7 times lower.

Per capita health expenditures in Hungary also have a typical J-curve shape. Analogically to Poland, a rapid increase in per capita health expenditures can be observed for younger cohorts than is the case in the EU-15. The peak of expenditures

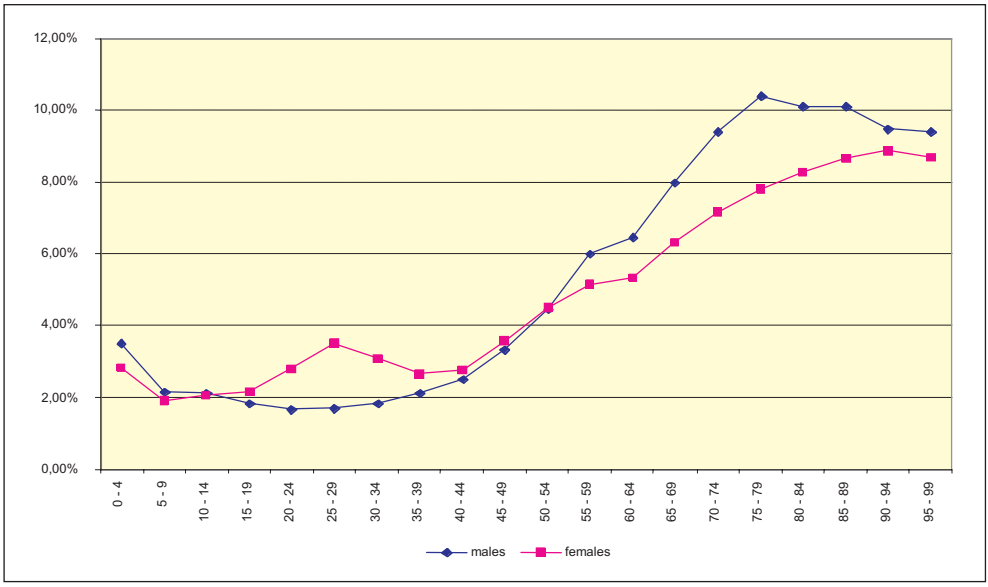
Graph 11. Medical services utilization by age group in Hungary



Source: Gabos, Gal (2007)

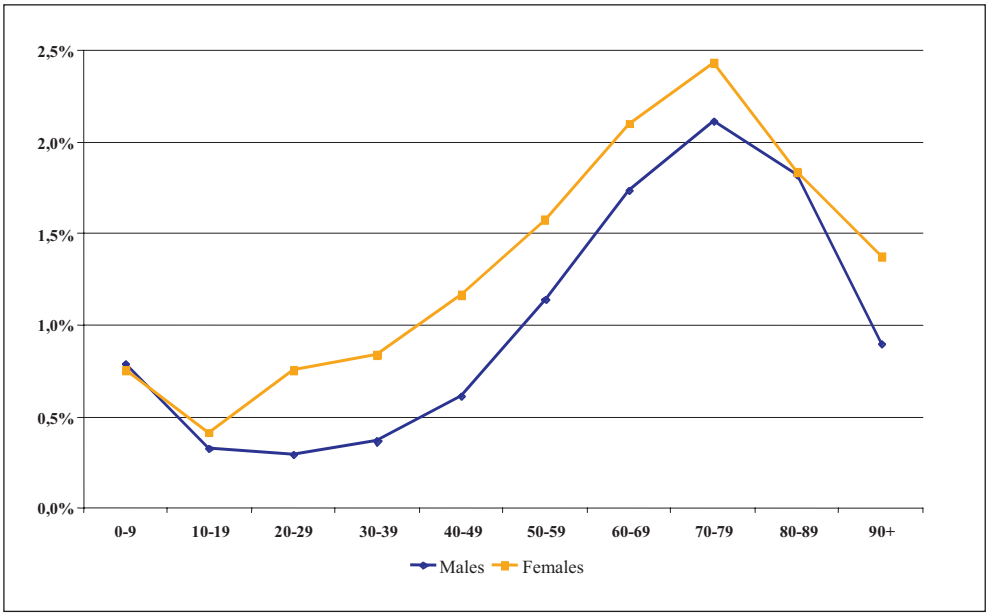
occurs at the age of 70-79, irrespective of gender. The same male age cohort faced the peak of health expenditures in Poland, while for females the peak of health expenditures is observed for a younger cohort.

Graph 12. Average insurance expenditures per capita in Poland as percentage of GDP per capita (base year)



Source: Gabos, Gal (2007)

Graph 13. Average health cost per capita in Hungary as percentage of GDP per capita (base year)



Source: Gabos, Gal (2007)

Chapter 5.

Projection results

Projections pertaining to public funding in health care sector (revenues, expenditures and financial balance) based on the ILO social budget model were prepared according to several scenarios. The first one, identical for all the countries under research, is the (1) baseline scenario. It is based on some assumptions, established for all the countries:

- the base year is 2003,
- life expectancy improvement is medium, based on national demographic projections, taking gender and age-specific mortality rate into account,
- total fertility rate development is the medium variant of national demographic prognosis, with the assumption of no changes / very minor changes in the second part of projection (2025-2050),
- yearly increase in health expenditures per capita has the same rate as GDP per capita (Scenario II in ILO model),
- economic and labor market variables are assumed to be the most probable version of national projections, for Hungary, Poland and Slovakia based on updated country projections used in Governmental Convergence Programs prepared for the European Committee last year (2006), and for Bulgaria based on national Bulgarian considerations from different institutions.

Additional scenarios are not identical across countries. (2) for Poland and Hungary the death-related costs scenario was prepared, where expenditures in the last year of life are taken into account. This scenario was possible thanks to disaggregation of health insurance expenditure data. (3) For Bulgaria, Hungary, Poland and Slovakia different prognoses contingent upon future LE developments were prepared. (4) Additionally, for Bulgaria, Hungary and Slovakia variants with different assumptions concerning wage development were analyzed. (5) Lastly, different development of labor market indicators: activity rate (Hungary), employment rate (Poland and Slovakia), and unemployment rate (Bulgaria), was taken into account. (6) Variants with some combinations of different variable

development assumption were also prepared, for instance, wages and employment rate (Slovakia), and different wage development (Bulgaria, Hungary and Slovakia.) [RTF bookmark start: _Toc169873599]

5.1. Baseline scenario

Revenue side

Public health care sector projected revenues depend on adopted scenarios on the development of demographic and economic variables, including employment, unemployment and economic growth. Institutional framework in the health care sector and insurance premium are assumed to be constant during the whole projection period, according to the *ceteris paribus* principle.

The picture of health care sector revenues in relation to GDP is strongly differentiated. In projection phase one we can observe the trend of increasing revenues, although the trend is very strong only in Bulgaria, in Poland it is weaker, in Hungary the trend is non-linear (decreasing in the first 5 years), and in Slovakia it begins to decrease as early as 2010. In projection phase two, that increasing trend is reversed and we observe a drop in the level of health care revenues in relation to GDP. Only in Poland do the revenues grow almost continuously.

Table 8. Projected health revenues (public) as a share of GDP

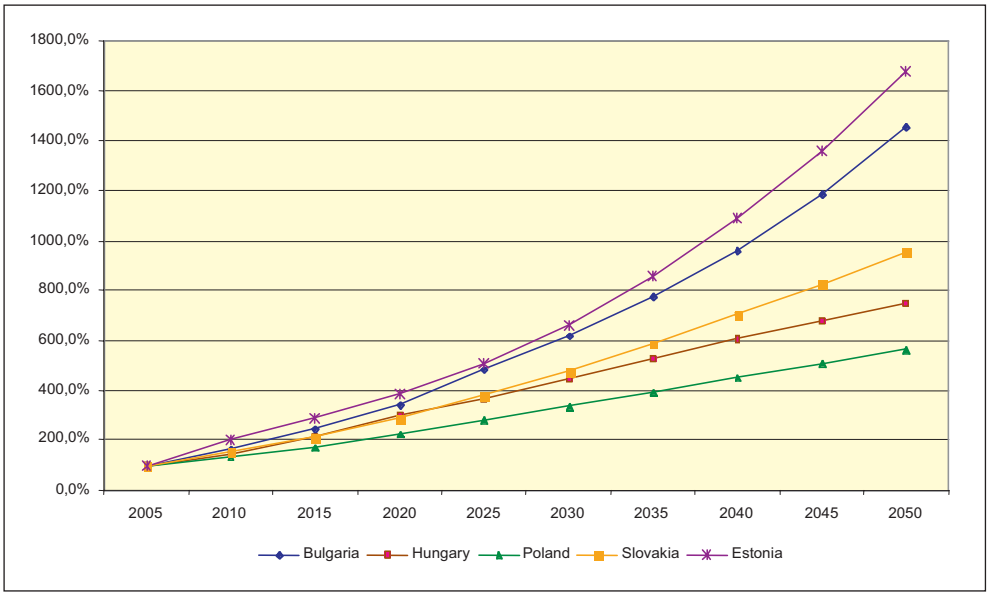
	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	4.6	5.6	6.2	6.5	7.0	7.0	6.9	6.7	6.4	6.1
Estonia	4.2	4.2	4.2	4.1	4.1	4.0	3.8	3.7	3.5	3.3
Hungary	4.0	3.9	4.1	4.3	4.1	3.9	3.8	3.6	3.5	3.4
Poland	4.5	4.7	4.8	5.0	5.2	5.2	5.3	5.4	5.6	5.8
Slovakia	6.3	6.4	6.0	5.8	5.6	5.4	5.2	5.0	4.7	4.5

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Expenditure side

At the beginning of projection period, countries under research are characterized by a low share of public expenditures on health care sector in relation to GDP. Only in Hungary the share of expenditures exceeds 5% of GDP. In the first projection period, relative increase in expenditures is slow in each country except Bulgaria, where the level of 6% of GDP is reached as early as in 2020[11].

Graph 14. Public health care revenue growth in relation to the year 2005 (2005 = 100%)



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Table 9. Projected public expenditures on health as a share of GDP

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	5.0	5.4	5.4	6.1	6.4	6.6	6.8	7.0	7.1	7.1
Estonia	4.0	4.3	4.5	4.7	5.0	5.3	5.6	6.0	6.3	6.7
Hungary	5.5	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.6	6.7
Poland	4.6	4.9	5.2	5.5	5.9	6.2	6.6	6.8	7.0	7.1
Slovakia	4.8	5.0	5.1	5.4	5.6	5.8	6.1	6.4	6.6	6.9

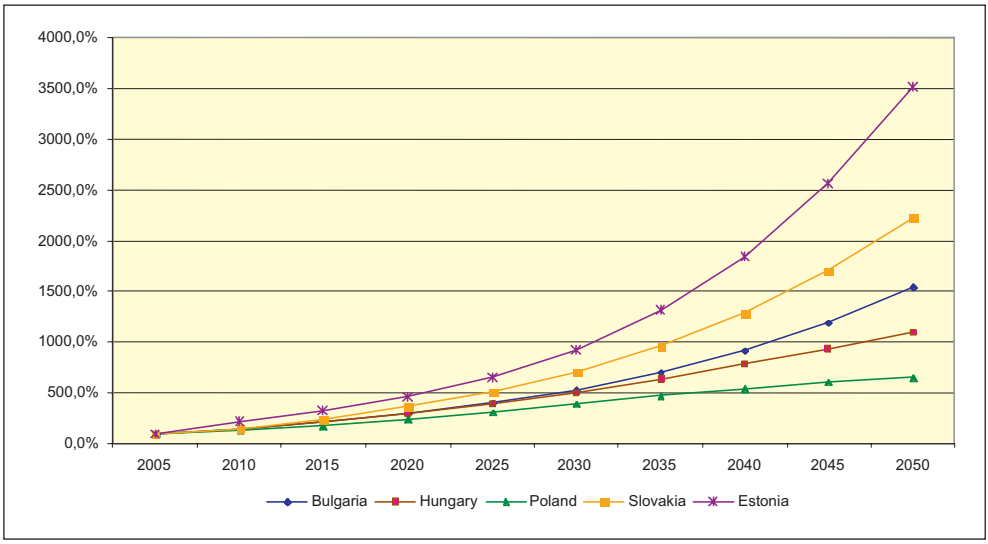
Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

In the second projection period, public expenditures on health systematically increase in relative terms, up to the level of 7% of GDP. The lowest dynamics is projected in Slovakia and Hungary.

The highest share of public expenditures on health in relation to GDP in the year 2050 is projected in Bulgaria and Poland. In Poland, the growth rate of public expenditures on health is the highest during the whole projection period. Level of expenditures, the lowest as compared to other countries in the base year, rapidly increases to the level of 7.1% of GDP in 2050.

[11] In many CEE countries the level of public expenditures on health equal to 6% of GDP is perceived as a standard of appropriate financing in the sector, in relation to other expenditure objectives of the state. In Poland, medical associations are lobbying for priority for health care sector and stipulate for fast increase of expenditures to the level of 6% of GDP.

Graph 15. Public health expenditures growth in relation to the year 2005 (2005 = 100%)



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Balance: surplus/deficit

Public funding surplus / deficit indicators in health care sector in relation to GDP illustrate the scale of financial balance / imbalance and reflect financial tensions in the sector. In the base year, health care sector is in balance only in Slovakia, in consequence of reforms introduced several years ago[12]. The reforms included the introduction of co-payment for services provided in the public sector.

Table 10. Deficit / surplus as a share of GDP

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Bulgaria	-0.5	0.1	0.4	0.4	0.6	0.4	0.0	-0.3	-0.7	-1.0
Estonia	0,2	0,0	-0,3	-0,6	-0,9	-1,3	-1,8	-2,3	-2,8	-3,4
Hungary	-1.5	-1.6	-1.5	-1.5	-1.8	-2.2	-2.5	-2.8	-3.1	-3.4
Poland	-0.2	-0.3	-0.4	-0.6	-0.7	-1.0	-1.3	-1.4	-1.4	-1.3
Slovakia	1.5	1.4	0.8	0.4	0.0	-0.4	-0.9	-1.4	-1.9	-2.3

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

In Bulgaria, despite the presence of financial deficit in the base year, financial balance is projected in the first period and over several subsequent years. Bulgarian health care system experiences financial deficit after 2035, but until 2050 the deficit does not exceed 1% of GDP, staying well above the level of deficit in other countries.

[12] It should be noted that the current government withdraws some of the reforms introduced earlier.

Poland faces the deficit starting from the base year; but further increase of the deficit is milder than in other countries, and in final years of projection the deficit even slightly decreases, reaching the level close to the level of the deficit in Bulgaria (1.3% of GDP.) The least favorable situation is expected in Hungary, where the deficit is the highest during the whole projection period. After the year 2020 the deficit increases with the highest slope, reaching the level of 3.4% GDP in 2050.

5.2. Scenario of increased expenditures in the last year of life

Death-related costs – theoretical background

From the beginning of 1990's, numerous analyses were conducted to examine the relation between *per capita* expenditures on health and the time left until death. Research findings point at two main conclusions:

- Majority of *per capita* expenditures on health is incurred in the last years (months) of individual's life (*death-related costs*), and the increase in *per capita* expenditures on the elderly is caused not only by the impact of age, but by the fact that the elderly face higher probability of death (Raitano 2006, Brockmann 2002, Lubitz et al. 1995.)
- The indicator that describes the relation of costs generated by an individual in the final stage of life to costs generated by an individual in the same age group but not in the final stage of life is very high; though it has a tendency to decrease with age (Raitano 2006, Kildemoes et al. 2006 (expenditures on drugs), Gabriele et al. 2005, Busse 2002, McGrail et al. 2000, Zweifel et al. 1999. Lubitz et al. 1995, Lubitz, Riley 1993.)

Research shows that *per capita* expenditures in the last years of life decrease with age (Gabriele et al. 2005, Polder, Achterberg 2004, Brockmann 2002, Hoover et al. 2002, Serup-Hansen et al. 2002, Madsen 2002, McGrail et al. 2000, Lubitz 1993.) In contrast to individual expenditures in the group of survivors, which increase with age (except for the oldest age groups, where in some cases a decrease of expenditures is observed) (Gabriele et al. 2005, Hoover et al. 2002, Serup-Hansen et al. 2002, McGrail et al. 2000.) McGrail et al. argue that the expenditures on nursery and social care increase with age, interdependently of the status of the patient and proximity to death. Similar relation is confirmed in the research on utilization of health care services, especially day-care in hospitals in Germany (including psychiatric care, excluding long-term care) (Busse et al. 2002.) Among the groups included in the analysis, in the third, second and last year before death the number of days of hospital care decreases with

age.

High share of aggregated health expenditures is targeted towards care over individuals in their last year of life. According to Medicare expenditures in 1978 (Lubitz, Prihoda 1984), health expenditures on individuals who died in that year amounted to 28% of total health expenditures in Medicare. These expenditures were only incurred by the care over 5.9% of the population covered by the analysis. In the following ten years, percentage of the deceased covered by Medicare was between 5.1-5.4%, and the cost of their care was at the level of 26.9-30.6% of total health expenditures annually (Lubitz, Riley 1993). In 1992-1996 the share of costs incurred by individuals in their last year of life amounted to 26% of total Medicare costs (Hoover et al. 2002), so only slight differences in costs can be observed in the course of years. Similar findings were described by Seshamani and Gray (2004), who found that 28% of hospital expenditures in England were generated by the deceased.

When death-related costs are included in the analysis of the impact of ageing on health expenditures, it may lead not only to the constraint of health expenditure growth, but even a decrease in projected health expenditures. This is a result of the fact that expenditures in the last year of life of younger population are significantly higher than those incurred in the case of the elderly (due to more common utilization of intensive and costly treatment for younger population, types of diseases related to age, and the fact that the costs of care for the elderly are shifted outside of health care system – to long-term and home care) (Brockmann 2002, Kramer 1995.)

Assuming increasing life expectancy and decreasing mortality rates, the point of death and higher health expenditures are shifted towards older age. Average expenditures by age change over the years, and in every age cohort the share of persons generating higher costs (costs related to death) decreases (Ahn et al. 2005, Batljan 2004, Seshamani, Gray 2004.)

Lack of necessary data on average health expenditures on the deceased and average health expenditures on survivors represents a common problem in the estimation of increased expenditures related to death. One way to resolve that issue it to use DRG data (Ahn et al. 2005); but in the countries where DRG payment system has not been introduced, the problem remains unresolved.

Owing to lack of necessary data, most analyses are based on the division of population into two groups: the deceased and the survivors in a given year (or shorter period of time) (Batljan, Lagergren 2004 – 1 year for expenditures on ambulatory care, Hoover et al. 2002, Serup-Hansen et al. 2002, McGrail et al. 2000 – 6 months, Lubitz, Riley 1993). Health expenditures are generated especially over the last 2-3 months of life (Hoover et al. 2002 – 51% in the last 3 months of life, Lubitz, Riley 1993 – up to 50% in the last two months.) Only in some research are the expenditures examined depending on the time left until death in a period longer than 1 year (Kildemoes et al.

2006 – 2 years before death for pharmaceutical expenditures, Batljan, Lagergren 2004 – 8 groups of population for hospital expenditures and death in a given calendar year (0 years until death), 6 groups depending on proximity to death (from 1 to 6 years), and the last group – over 6 years till death), Dixon et al. 2004 – 3 groups of population – 1, 2, 3 years before death, analyzed for hospital expenditures, Busse et al. 2002.)

Indicator of proportion of per capita expenditures on a person in the last of life to per capita expenditures on a survivor (k indicator) – comparison of diverse research.

It is difficult to compare projections prepared in different countries mainly due to diversified baskets of benefits included in the analysis, different periods before death

Table 11. Selected results of the analysis of expenditures per deceased in proportion to expenditures per survivor (k indicator.)

Analysis prepared by:	Country	Type of care	Age of population under research	Indicator of proportion of *per capita* expenditures per deceased to *per capita* expenditures per survivor
Kildemoes et al. (2006)	Denmark	Pharmaceuticals	Age groups 0-24, 25-49, 50-74, 75+, by gender	Age: 0-24, 25-49, 50-74, 75+ Males: 12.36, 7.87, 4.00, 1.80 Females: 1.37, 9.91, 3.68, 1.63
Gabriele et al. (2005)	Italy (four regions)	Hospital care	5-year age cohorts	For all age groups: Lombardy: 13.8 Tuscany: 14.0 Apulia: 11.9 Abruzzo: 10.2
Ahn et al. (2005)	Spain	Hospital care	5-year age cohorts	Age: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-65, 66-70, 71-75, 76-80, 81-85, 86+, Total Indicator: 7.6, 71.1, 82.1, 92.7, 96.5, 75.6, 48.9, 40.7, 43.7, 43.5, 35.0, 26.9, 21.7, 15.8, 11.9, 9.4, 7.4, 6.3, 5.0, 24.1
Batljan & Lagergren (2004)	Sweden (region Skane)	Hospital and outpatient care, excluding long-term care	Indicators with no distinction by age	5.96 for outpatient care, 21.5 for hospital care.
National Health Insurance gency for Wage Earners (2003)	France	Medical treatment	Six age groups: 35-44, 45-54, 55-64, 65-74, 75-84, 85+	Age: 35-44, 45-54, 55-64, 65-74, 75-84, 85+ Indicator: 6.5, 8.8, 3.3, 2.6, 2.8, 1.8
Busse et al. (2002)	Germany	Hospital days per year	Up to 24 and above 85 years of life, between 24 i 85, 10-year age groups	Age: <24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+ Indicator: 29.2, 30.8, 31.0, 21.1, 17.6, 12.0, 6.6, 4.3

Table 11. continued Selected results of the analysis of expenditures per deceased in proportion to expenditures per survivor (k indicator.)

Analysis prepared by:	Country	Type of care	Age of population under research	Indicator of proportion of *per capita* expenditures per deceased to *per capita* expenditures per survivor		
Hoover et al. (2002)	USA	Medicare	Three age groups over 65 years of life: 65-74, 75-84, 85+	Age 65-74 75-84 85+		Indicator 8.57 6.28 3.61
McGrail et al. (2000)	Canada	Medical treatment including nursing care (half a year before death)	Four age groups: 65, 75-76, 85-87, 90-93	Age 65 75-76 85-87 90-93	Year 1986 1993 1986 1993 1986 1993 1986 1993	Indicator 16.6 16.7 8.4 8.6 3.4 3.8 2.5 2.5
Lubitz & Riley (1993)	USA	Medicare	Over 65 years of life	6.92		

Source: Own compilation

that are taken into account, and discrepancies in age groups under analysis.

Compilation presented above illustrates the differences in the results of *k-indicator* analyses depending on a country, age and type of services under research. Irrespective of the values of *k-indicator* shown, one can identify decreasing trend in indicator's value by age (except for the youngest age cohort, which relates to intensive treatment of newborns.)

Results of public health expenditure projection, including the analysis of increased expenditures in the last year of life – case of Hungary and Poland

Due to limited availability of adequate data, the scenario of health expenditures adjusted for death-related costs is conducted only for Hungary and Poland. Methodology referred to above is presented in Annex 1. Minor differences between the two estimations include different age groups (5-year cohorts for Poland and 10-year cohorts for Hungary), and the base year for calculations (2004 for Poland and 2002 for Hungary.) In the case of Hungary, estimations are based on total health expenditures, while in the case of Poland they are based on insurance expenditures.

Population split into two groups - the deceased and the survivors - does not affect projected revenues, but only impacts projected expenditures and, as a result, the size of financial deficit.

In both countries, together with the introduction of diversified level of average *per capita* expenditures depending on individual status (deceased or survivor), projected

Table 12. Indicator showing the proportion of expenditures per deceased to expenditures per survivor

Age group	Belgium		Czech Republic		Denmark		Spain		Italy		Netherlands		Austria		Poland		EU average	
	M*	F*	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-4	12.1	20.1	34.5	43.5	4.5	4.0	3.4	3.4	68.0	79.5	31.7	79.1	27.0	39.1	25.7	39.7	25.9	38.5
5-9	33.3	33.0	55.3	48.2	77.4	58.4	6.4	6.9	79.5	163.0	39.6	60.0	104.8	153.0	47.0	50.3	55.4	71.6
10-14	27.7	9.5	74.0	42.5	8.7	14.5	6.9	6.3	73.1	101.4	26.9	43.3	121.6	120.4	40.7	49.3	47.4	48.4
15-19	10.7	21.1	31.0	26.2	1.1	1.3	4.1	7.0	38.7	46.7	21.6	24.7	64.7	69.1	29.5	37.3	25.2	29.2
20-14	8.9	11.7	17.1	26.2	0.3	0.3	3.3	7.1	26.0	32.5	47.4	33.2	41.7	87.3	23.0	26.1	21.0	28.0
25-29	9.4	13.1	19.1	28.7	12.0	12.1	3.9	5.9	29.0	25.5	38.0	10.4	57.7	41.3	27.4	24.5	24.6	20.2
30-34	13.6	11.4	23.1	32.0	11.4	12.7	3.2	6.2	30.4	28.4	25.3	18.9	48.1	33.4	21.2	25.6	22.0	21.1
35-39	14.3	11.7	20.2	25.7	7.1	6.0	2.8	4.6	40.5	37.2	26.7	23.5	42.9	29.6	18.3	23.0	21.6	20.2
40-44	12.4	13.8	19.2	20.4	6.3	5.9	2.6	3.2	35.3	40.7	17.0	18.1	34.6	33.9	13.6	20.5	17.6	19.6
45-49	11.0	14.3	16.8	17.1	8.2	7.2	2.3	2.8	30.9	31.5	15.1	17.2	31.4	28.0	11.1	15.1	15.9	16.6
50-54	10.1	12.1	11.0	13.6	7.5	7.0	2.3	2.6	21.1	26.9	14.2	15.5	21.4	25.7	8.9	12.3	12.1	14.5
55-59	9.5	10.4	8.1	10.7	7.5	6.8	2.2	2.4	17.1	23.7	8.8	12.9	18.9	22.0	7.8	10.9	10.0	12.5
60-64	7.4	9.6	7.2	10.0	6.2	6.0	2.0	2.3	12.1	16.8	8.3	12.4	16.3	20.6	6.6	9.3	8.3	10.9
65-69	5.5	6.8	5.4	6.8	5.0	5.0	1.8	2.1	8.5	11.9	6.4	8.3	13.2	15.0	5.6	7.4	6.4	7.9
70-74	4.5	5.0	4.3	5.1	4.4	4.3	1.7	1.8	6.2	8.2	5.1	6.4	11.6	11.0	4.5	5.6	5.3	5.9
75-79	3.3	3.5	3.5	3.7	2.8	2.9	1.6	1.6	4.5	5.4	4.1	4.6	8.9	8.9	3.9	4.4	4.1	4.4
80-84	2.8	2.5	2.8	2.9	2.0	2.1	1.3	1.3	3.3	3.8	3.4	3.1	8.0	7.1	3.3	3.7	3.4	3.3
85-89	2.1	1.8	2.3	2.2	1.7	1.7	1.3	1.3	2.5	2.6	3.0	2.5	7.3	6.5	3.0	3.3	2.9	2.7
90-94	1.7	1.4	2.3	2.2	1.4	1.4	1.3	1.3	1.7	1.7	2.5	2.0	7.3	6.5	2.9	2.8	2.6	2.4
95-99	1.4	1.1	2.3	2.2	1.6	1.8	1.3	1.3	1.7	1.7	2.0	1.7	7.3	6.5	3.0	2.6	2.6	2.4
100+	0.7	0.9	2.3	2.2	1.6	1.8	1.3	1.3	1.7	1.7	2.0	1.7	7.3	6.5	3.0	2.6	2.5	2.3

* M - males, F - females

Source: European Commission (2006) – ECFIN calculations based on country sources

Table 13. Projected public expenditures on health and the deficit with/without death-related costs

	2010	2015	2020	2025	2030	2035	2040	2045	2050
POLAND									
Total public health expenditures – A (PLN mln)	56 654	76 414	100 683	129 842	162 756	196 793	228 340	255 028	275 730
Total public health expenditures – B (PLN mln)	56 131	75 211	98 500	126 199	157 216	189 222	218 565	242 699	260 821
Reduction in projected health expenditures (%)	0.92	1.57	2.17	2.81	3.40	3.85	4.28	4.83	5.41
Deficit – A (PLN mln)	3 015	6 470	10 255	15 890	27 159	38 336	46 848	50 777	49 777
Deficit – B (PLN mln)	2 493	5 267	8 072	12 246	21 619	30 764	37 072	38 448	34 869
Reduction in projected deficit (%)	17.34	18.59	21.29	22.93	20.40	19.75	20.87	24.28	29.95
HUNGARY									
Total public health expenditures – A (HUF bln)	1 800	2 585	3 551	4 721	6 100	7 686	9 451	11 313	13 242
Total public health expenditures – B (HUF bln)	1 780	2 538	3 457	4 551	5 851	7 295	8 896	10 545	12 153
Reduction in projected health expenditures (%)	1.14	1.82	2.64	3.60	4.07	5.09	5.88	6.79	8.23
Deficit – A (HUF bln)	518	686	906	1 456	2 159	3 040	4 100	5 297	6 642
Deficit – B (HUF bln)	498	639	812	1 286	1 911	2 649	3 545	4 530	5 553
Reduction in projected deficit (%)	3.96	6.85	10.35	11.67	11.51	12.87	13.54	14.49	16.40

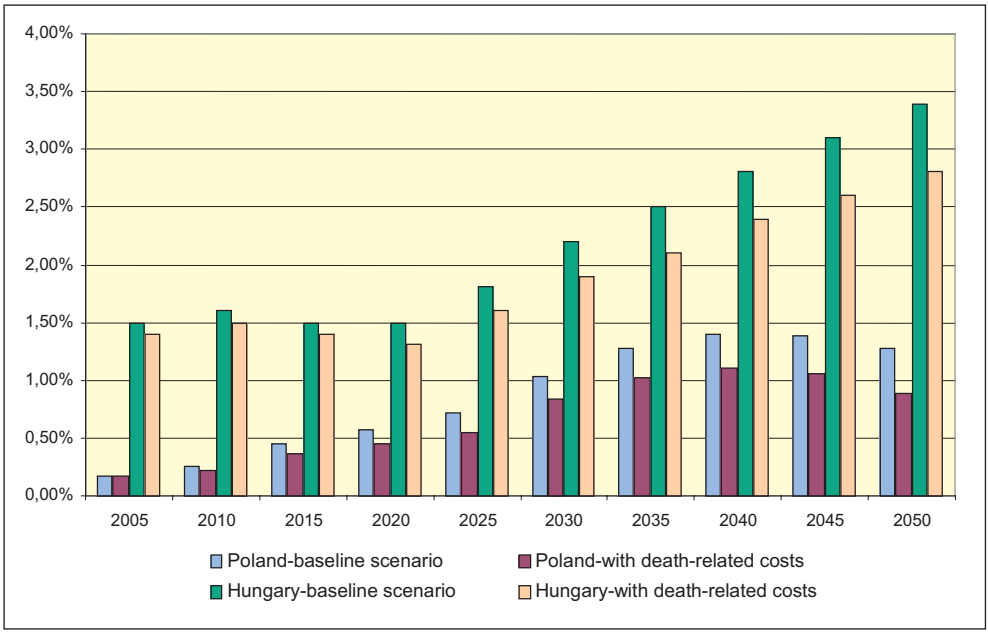
A – baseline scenario
B – death-related costs scenario
Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007)

expenditure increase is slowed down and, as a result, projected financial deficit in the health care system is reduced.

Table 12 presents total projected public expenditures on health in Poland and Hungary. When differences in average *per capita* expenditures for the survivors and the deceased are taken into account, projected health expenditures in Poland decrease by 0.92% (in comparison to the baseline scenario), and in Hungary by 1.14% already in 2010. The gap between baseline scenario and death-related costs scenario broadens in years, amounting to 5.41% for Poland and 8.23% for Hungary at the end of projection period. A decrease in estimated level of expenditures is reflected in the decrease in estimated deficit. In Poland, deficit reduction amounts to 17% in 2010, and almost 30% in 2050. In Hungary, deficit reduction is not that impressive, but quite substantial still – close to 4% in 2010, and over 16% in 2050. Less extensive deficit reduction in Hungary is a result of the size of the deficit – already in the year 2025 it amounts to 30% of total projected health expenditures, and in 2050 it is equivalent to 50.2%. In Poland, projected financial balance looks a bit better since the peak of the deficit falls for 2040 and amounts to 21% of total public expenditures on health care.

The gap in deficit size with and without the assumption regarding death-related costs is quite significant and widens during projection period for both countries, notwithstanding the differences in the size of the deficit between the two countries (measured as percentage of GDP). By the end of projection period, projected deficit reduction (scenario 'including' death-related costs compared to the scenario

Graph 16. Projected deficit in Hungary and in Poland, as GDP percentage



Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007)

'excluding' death-related costs) equals 29.95% for Poland and 16.4% for Hungary.

Overall, these results confirm the findings presented in other publications (some of them quoted above), and indicate that when we take increased health expenditures in the last year of life into account, it has significant impact on projection results and decreases projected level of expenditures.

5.3. Diverse longevity scenarios

Scenarios allowing for different longevity development patterns were prepared for each country. There are three possibilities with regard to the improvement of life expectancy in the model applied: fast, medium and slow. In the baseline scenario, the medium one was adopted, and the two residuals were considered as alternative scenarios.

There are no significant differences between the results from various scenarios. In general, faster life expectancy improvement can lead to deeper deficit, but the extent of that effect is rather insignificant (no differences in the deficit in Bulgaria, 0.1 percentage points in Hungary and 0.07 percentage points in Poland.) Faster increase

Table 14. Projection results for the scenarios of different life expectancy improvement: slow, medium (baseline scenario), and fast (as a share of GDP)

	LE – slow growth			LE – medium growth (baseline scenario)			LE – fast growth		
	2005	2025	2050	2005	2025	2050	2005	2025	2050
BULGARIA									
Health expenditures (% of GDP)	5.0	6.4	7.0	5.0	6.4	7.1	5.0	6.4	7.2
Health revenues (% of GDP)	4.6	7.0	6.0	4.6	7.0	6.1	4.6	7.1	6.1
Surplus/deficit (% of GDP)	-0.5	0.6	-1.0	-0.5	0.6	-1.0	-0.5	0.6	-1.0
ESTONIA									
Health expenditures (% of GDP)	4.0	4.9	6.7	4.0	5.0	6.7	4.0	5.0	6.8
Health revenues (% of GDP)	4.2	4.0	3.3	4.2	4.1	3.3	4.2	4.1	3.4
Surplus/deficit (% of GDP)	0.2	-0.9	-3.3	0.2	-0.9	-3.4	0.2	-0.9	-3.4
HUNGARY									
Health expenditures (% of GDP)	5.5	5.9	6.7	5.5	5.9	6.7	5.5	5.9	6.8
Health revenues (% of GDP)	4.0	4.1	3.4	4.0	4.1	3.4	4.0	4.1	3.4
Surplus/deficit (% of GDP)	-1.5	-1.8	-3.3	-1.5	-1.8	-3.4	-1.5	-1.8	-3.5
POLAND									
Health expenditures (% of GDP)	4.63	5.84	6.92	4.63	5.88	7.08	4.63	5.92	7.25
Health revenues (% of GDP)	4.45	5.13	5.71	4.45	5.16	5.80	4.45	5.19	5.91
Surplus/deficit (% of GDP)	-0.18	-0.71	-1.21	-0.18	-0.72	-1.28	-0.18	-0.73	-1.35
SLOVAKIA									
Health expenditures (% of GDP)	4.83	5.57	6.78	4.83	5.59	6.85	4.83	5.61	6.95
Health revenues (% of GDP)	6.33	5.55	4.46	6.33	5.56	4.50	6.33	5.57	4.51
Surplus/deficit (% of GDP)	1.50	-0.02	-2.32	1.50	-0.03	-2.35	1.50	-0.04	-2.44

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

in LE affects both sides of health care funding, expenditures as well as revenues. On the one hand, there are more elderly individuals to take care of due to the unique pattern of mortality and morbidity among the elderly, but on the other, increased LE has positive influence on employment rate, most likely. Overall, the expenditures grow faster than the revenues, so the deficit is higher. Slower life expectancy improvement has the opposite effect.

5.4. Diversified wage growth scenario

The main source of revenues for social and health insurance system is the pay-roll tax or insurance contributions. Therefore, wage development has significant influence on the revenue side of health care sector financing. In the baseline scenario it was assumed that wage growth is a derivative of assumed labor productivity, which variable

is subjected to convergence strategy[13]. In alternative scenarios it was assumed, additionally, that these variables (productivity and wages) will vary in plus and in minus from the baseline scenario. In the case of higher dynamics of real wages growth (in Bulgaria, 0.6 percentage points higher in 2025 and the same value in 2050, 1.5 percentage points higher in Slovakia, and in Hungary 3% higher over the whole period) during projection period, health care sector deficit will be lower by at least 1 percentage point of GDP share Although higher average wage growth has impact on the health expenditure increase, by expanding labor costs, this effect is smaller than the effect of

Table 15. Scenarios of different wage development patterns (revenues, expenditures and deficit as a share of GDP)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
BULGARIA											
Faster wage growth	Revenues	4.3	5.0	7.1	7.6	8.3	7.7	7.8	5.9	9.0	7.3
	Expenditures	4.7	4.8	6.5	6.9	7.2	6.9	7.3	5.8	9.3	7.9
	Surplus/deficit	-0.4	0.2	0.6	0.7	1.1	0.8	0.5	0.1	-0.3	-0.6
Baseline scenario	Revenues	4.6	5.6	6.2	6.5	7.0	7.0	6.9	6.7	6.4	6.1
	Expenditures	5.0	5.4	5.4	6.1	6.4	6.6	6.8	7.0	7.1	7.1
	Surplus/deficit	-0.5	0.1	0.4	0.4	0.6	0.4	0.0	-0.3	-0.7	-1.0
Slower wage growth	Revenues	4.7	4.7	6.5	5.0	6.6	5.9	5.4	5.8	5.3	5.1
	Expenditures	5.2	4.6	6.3	4.9	6.3	5.9	5.7	6.5	6.3	6.4
	Surplus/deficit	-0.5	0	0.2	0.1	0.3	0	-0.3	-0.7	-1	-1.3
HUNGARY											
Faster wage growth	Revenues	4.0	3.9	4.2	4.4	4.4	4.3	4.2	4.2	4.2	4.1
	Expenditures	5.5	5.5	5.6	5.7	5.9	6.0	6.2	6.4	6.5	6.7
	Surplus/deficit	-1.5	-1.6	-1.4	-1.3	-1.6	-1.8	-2.0	-2.2	-2.4	-2.5
Baseline scenario	Revenues	4.0	3.9	4.1	4.3	4.1	3.9	3.8	3.6	3.5	3.4
	Expenditures	5.5	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.6	6.7
	Surplus/deficit	-1.5	-1.6	-1.5	-1.5	-1.8	-2.2	-2.5	-2.8	-3.1	-3.4
Slower wage growth	Revenues	4.0	3.9	4.1	4.1	3.9	3.6	3.4	3.2	3.1	2.9
	Expenditures	5.5	5.5	5.6	5.8	6.0	6.1	6.3	6.5	6.7	6.8
	Surplus/deficit	-1.5	-1.6	-1.6	-1.7	-2.1	-2.5	-2.9	-3.3	-3.6	-3.9
SLOVAKIA											
Faster wage growth	Revenues	6.33	6.40	5.99	5.86	5.87	5.93	5.95	5.85	5.69	5.54
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.42	0.84	0.51	0.28	0.09	-0.15	-0.51	-0.92	-1.31
Baseline scenario	Revenues	6.33	6.40	5.98	5.75	5.56	5.41	5.25	5.00	4.73	4.50
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.42	0.83	0.40	-0.03	-0.43	-0.86	-1.36	-1.87	-2.35
Slower wage growth	Revenues	6.33	6.40	5.97	5.66	5.32	5.03	4.75	4.42	4.10	3.84
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.42	0.82	0.31	-0.27	-0.82	-1.35	-1.94	-2.50	-3.01

Source: Gabos, Gal (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007)

[13] In the baseline scenarios of convergence strategy prepared in the national plans and AWG report (EPC and European Commission 2006), it was assumed that welfare in NMS will be close to an average EU level in the final part of projection period, which means that labor productivity rate should be three times as high in the following years, and twice as high at the end of the first part of projection period (up to 2025.)

revenue increase. Hence, the impact on health sector financial balance is positive.

Slower wage growth scenario (in Bulgaria, 0.6 percentage points lower in 2025 and 1 percentage point in 2050, in Hungary 0.5% from 2007) yields the opposite result – higher deficit compared to the baseline scenario, and twice as high in comparison to the high wage growth scenario.

5.5. Labor market indicators diversified development scenario

Different values of indicators pertaining to the labor market (employment and unemployment rate) do impact projection results, but the scale of the change is smaller than in the case of wage growth. By the same token, employment rate diversification in projections made for Poland and Slovakia exerts only slight

Table 16. Scenarios of different activity rate development (expenditures, revenues and deficit as GDP share)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
HUNGARY											
Faster activity rate growth	Revenues	4.1	4.1	4.4	4.6	4.5	4.3	4.2	4.1	4.0	4.0
	Expenditures	5.5	5.5	5.6	5.8	6.0	6.1	6.3	6.4	6.6	6.8
	Surplus/deficit	-1.4	-1.4	-1.2	-1.2	-1.5	-1.8	-2.1	-2.3	-2.6	-2.8
Baseline scenario	Revenues	4.0	3.9	4.1	4.3	4.1	3.9	3.8	3.6	3.5	3.4
	Expenditures	5.5	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.6	6.7
	Surplus/deficit	-1.5	-1.6	-1.5	-1.5	-1.8	-2.2	-2.5	-2.8	-3.1	-3.4
Slower activity rate growth	Revenues	4.0	3.8	3.8	3.9	3.7	3.5	3.4	3.3	3.2	3.1
	Expenditures	5.5	5.5	5.6	5.7	5.9	6.0	6.2	6.4	6.5	6.7
	Surplus/deficit	-1.5	-1.7	-1.7	-1.9	-2.2	-2.5	-2.8	-3.1	-3.3	-3.6

Source: Gabos, Gal (2007)

Table 17. Scenarios of different employment rate development (expenditures, revenues and deficit as GDP share)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
POLAND											
Faster employment rate growth	Revenues	4.45	4.73	4.85	5.04	5.24	5.28	5.36	5.48	5.65	5.88
	Expenditures	4.63	4.92	5.22	5.53	5.88	6.24	6.56	6.80	6.96	7.08
	Surplus/deficit	-0.18	-0.20	-0.37	-0.48	-0.64	-0.96	-1.20	-1.32	-1.31	-1.20
Baseline scenario	Revenues	4.45	4.66	4.77	4.96	5.16	5.20	5.28	5.40	5.57	5.80
	Expenditures	4.63	4.92	5.22	5.53	5.88	6.24	6.56	6.80	6.96	7.08
	Surplus/deficit	-0.18	-0.26	-0.44	-0.56	-0.72	-1.04	-1.28	-1.39	-1.39	-1.28
Slower employment rate growth	Revenues	4.45	4.63	4.70	4.88	5.08	5.12	5.21	5.33	5.50	5.73
	Expenditures	4.63	4.92	5.22	5.53	5.88	6.24	6.56	6.80	6.96	7.08
	Surplus/deficit	-0.18	-0.30	-0.52	-0.64	-0.80	-1.12	-1.36	-1.47	-1.46	-1.35

Table 17. continued. Scenarios of different employment rate development (expenditures, revenues and deficit as GDP share)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
SLOVAKIA											
Faster employment rate growth	Revenues	6.33	6.38	5.93	5.74	5.70	5.54	5.37	5.11	4.83	4.59
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.40	0.78	0.38	0.11	-0.30	-0.73	-1.25	-1.78	-2.27
Baseline scenario	Revenues	6.33	6.40	5.98	5.75	5.56	5.41	5.25	5.00	4.73	4.50
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.42	0.83	0.40	-0.03	-0.43	-0.86	-1.36	-1.87	-2.35
Slower employment rate growth	Revenues	6.33	6.43	5.96	5.59	5.38	5.24	5.09	4.85	4.61	4.40
	Expenditures	4.83	4.98	5.15	5.35	5.59	5.84	6.10	6.36	6.61	6.85
	Surplus/deficit	1.50	1.45	0.82	0.23	-0.21	-0.60	-1.02	-1.50	-2.00	-2.46

Source: Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007)

Table 18. Scenarios of different labor force participation and employment rate development (expenditures, revenues and deficit as GDP share)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
ESTONIA											
Faster labor force participation and employment rate growth	Revenues	4.4	4.4	4.4	4.3	4.3	4.2	4.1	3.9	3.8	3.6
	Expenditures	4.0	4.3	4.5	4.7	4.9	5.3	5.6	6.0	6.3	6.7
	Surplus/deficit	0.4	0.1	-0.1	-0.4	-0.7	-1.1	-1.6	-2.0	-2.6	-3.1
Baseline scenario	Revenues	4.2	4.2	4.2	4.1	4.1	4.0	3.8	3.7	3.5	3.3
	Expenditures	4.0	4.3	4.5	4.7	5.0	5.3	5.6	6.0	6.3	6.7
	Surplus/deficit	0.2	0.0	-0.3	-0.6	-0.9	-1.3	-1.8	-2.3	-2.8	-3.4
Slower labor force participation and employment rate growth	Revenues	4.3	4.3	4.2	4.1	4.0	3.9	3.8	3.7	3.5	3.3
	Expenditures	4.0	4.3	4.5	4.7	5.0	5.3	5.6	6.0	6.4	6.7
	Surplus/deficit	0.3	0.0	-0.3	-0.6	-1.0	-1.4	-1.8	-2.3	-2.9	-3.4

Source: Roovali (2007)

Table 19. Scenarios of different unemployment rate (expenditures, revenues and deficit as GDP share)

		2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
BULGARIA											
Different unemployment rate growth*	Revenues	5.0	8.0	6.4	6.2	7.1	7.9	6.2	5.8	6.3	6.0
	Expenditures	5.5	7.9	6.1	5.9	6.5	7.5	6.2	6.1	7.0	7.0
	Surplus/deficit	-0.5	0.1	0.3	0.3	0.6	0.4	0	-0.3	-0.7	-1.0
Baseline scenario	Revenues	4.6	5.6	6.2	6.5	7.0	7.0	6.9	6.7	6.4	6.1
	Expenditures	5.0	5.4	5.4	6.1	6.4	6.6	6.8	7.0	7.1	7.1
	Surplus/deficit	-0.5	0.1	0.4	0.4	0.6	0.4	0.0	-0.3	-0.7	-1.0

* Changes in the minimum unemployment rate: 14% (for the base year, instead of 7% in the baseline scenario); 7% (in 2025, instead of 5% in the baseline scenario); 4% (in 2050 the value is the same as in the baseline scenario)

Source: Rangelova, Sariiski (2007)

influence on financial balance of health sector, and none at all on health care expenditures (Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)).

Results for Bulgaria, presented in Table 19, do not corroborate the impact of unemployment rate variable on health care sector finances. It seems that unemployment rate indicator is not sufficient to illustrate problems connected with the labor market in the context of health care sector budget projection.

5.6. Sensitivity analysis

For the purpose of sensitivity analysis of projection results, a new indicator was established – the relative change of revenues that takes place in consequence of the changes in the parameters under analysis. The analyzed year is 2050, the last year of projection period. The indicator has got a percentage value. The following sensitivity scale was adopted:

- insensitivity: up to 10%;
- moderate sensitivity: 10% - 40%;
- sensitivity: above 40%.

In sensitivity analysis, relative change in parameter value was not taken into account – it was recognized simply as a probable for the analyzed country. Death-

Table 20. Revenue side sensitivity

Country		Bulgaria			Estonia			Hungary			Poland			Slovakia		
Sensitivity degree / Scenario		insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive
Death-related costs scenario		-			-			X			X			-		
LE improvement	Fast	X			X			X			X			X		
	Slow	X			X			X			X			X		
Wage growth	Faster		X		-				X		-				X	
	Slower		X		-				X		-				X	
Employment rate growth*	Faster	-			X				X		X			X	-	
	Slower	-			X			X			X			X		
Unemployment rate decline	Slower	X			-			-			-			-		

'-' indicates that no such scenario was prepared

* activity rate for Hungary, activity and employment rate for Estonia

Source: own calculations based on Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Table 21. Expenditure side sensitivity

Country		Bulgaria			Estonia			Hungary			Poland			Slovakia		
Sensitivity degree / Scenario		insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive
Death-related costs scenario		-			-			X			X			-		
LE improvement	Fast	X			X			X			X			X		
	Slow	X			X			X			X			X		
Wage growth	Faster		X		-			X			-			X		
	Slower	X			-			X			-			X		
Employment rate growth*	Faster	-			X			X			X			X	-	
	Slower	-			X			X			X			X		
Unemployment rate decline	Slower	X			-			-			-			-		

'-' indicates that no such scenario was prepared

* activity rate for Hungary, activity and employment rate for Estonia

Source: own calculations based on Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Table 22. Deficit/surpluse sensitivity

Country		Bulgaria			Estonia			Hungary			Poland			Slovakia		
Sensitivity degree / Scenario		insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive	insensitive	moderate	sensitive
Death-related costs scenario		-			-			X				X		-		
LE improvement	Fast	X			X			X			X			X		
	Slow	X			X			X			X			X		
Wage growth	Faster			X	-				X		-					X
	Slower		X		-				X		-				X	
Employment rate growth*	Faster	-			X				X		X			X	-	
	Slower	-			X			X			X			X		
Unemployment rate decline	Slower	X			-			-			-			-		

'-' indicates that no such scenario was prepared

* activity rate for Hungary, activity and employment rate for Estonia

Source: own calculations based on Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

costs scenario is of different nature than the other scenarios, in that the revenue (expenditures, deficit/surplus) change is the result of a new variable used rather than a change of the variable used previously.

The main conclusion is that health revenues, expenditures and deficit/surplus are slightly sensitive to variable changes in general. There are only two cases of real sensitivity – in the scenario of faster wage growth in Hungary and Slovakia.

The consideration of higher health expenditures in the last year of life has no impact on the revenue side and a slight impact on expenditures, but it strongly affects the deficit in health care sector.

In the case of different life expectancy scenarios, both the revenues, the expenditures, and the deficit are insensitive, even to the point of 0% value.

As was mentioned earlier, a stronger impact can be observed for changes in wage growth rate, especially on the revenue side.

Projection results are not sensitive to the changes in labor market variables, except for the impact of higher activity rate in Hungary on the revenue side and, consequently, on the deficit as well.

Chapter 6.

Conclusions, discussion and policy recommendations

Health care sector balance projection based on the ILO social budget model shows basic trends in the development of future revenues and expenditures shaped by the impact of the so-called external factors, i.e. those that do not belong to the domain of health care system: demography and economy, as well as current medical service utilization pattern depending on age (*J curve*.) The variables pertaining to population ageing are especially important for the results of the analysis. These factors include: increasing share of the elderly in the population, decreasing share of labor market active population, and – as a result - decreasing labor supply and changing trends in labor productivity. The impact of those factors was also reflected in adopted scenarios of future economic growth development. Projected revenues, expenditures and public health care sector balance are presented in relation to economic growth.

The results of health care sector financial projections enable us to analyze simultaneously the two sides of public health care sector: revenues, expenditures and financial balance (surplus/deficit) with interactions between sides, as well as impact on balance effect. That is the advantage of ILO social budget model. As a result, conclusions and recommendations can be well-targeted, depending on the element of the health care sector that each of the variables addresses.

If labor market activity rate strongly affects health care sector revenues, decreasing the deficit in public health care sector, recommendations address labor market policy and economy. This policy includes high economic growth, taxable income and employment.

If, on the other hand, longevity has strong impact on increasing expenditures, the policy is targeted towards expenditure decrease, which is a less effective policy. Rational demographic policy, required to shape health care system expenditures, should create incentives towards changing values and behaviors in the life-cycle related to procreation and health. One must add that there is a correlation between longer economic activity and health of the population. Only healthy and more active

population can stay active on the labor market for the longer period, which will lead to the increase in expenditures on health, especially public health.

Health care sector model also takes into account expenditures on health modified by higher costs incurred in the last year of life. Restricted access to data was an obstacle to the process of preparing similar projections in all the countries under analysis. Projections for Hungary and Poland, however, confirm that death-related cost is a significant factor. Longevity leads to an "extension in time" of higher health care costs incurred in the last year of life. In consequence, aggregated health expenditures in a given projection period are lower. Death-related costs scenario substantially decreases estimated financial deficit in health care system, in comparison to the baseline scenario. Still, the impact of death-related costs on expenditures is restricted since it is contingent upon potential future longevity developments. These are not infinite.

In the table below, key results of analyses and projections are compiled, together with generalized relationships and tendencies. Direction of these changes is similar in the analyzed group of countries. These countries, with higher dynamics of demographic changes and, at the same time, lower level of economic development, may face greater tensions, or even conflicts, between future development objectives.

From social and political perspective, decisions regarding health care financing are particularly sensitive due to higher health needs. Changes are also necessary due to the high costs of the health care system – costs incurred and potential costs related to the ageing. Finally, one of the most crucial cost drivers in the health sector – new medical technology – was not isolated and accounted for in the analysis.

The ILO social budget model not only lends itself to the projection of future financial balance (in this case, a deficit at the end of the projection period), but it also allows for the calculation of insurance premium (tax) needed to balance health care system revenues and expenditures.

Health care system reforms are required in order to balance the disequilibrium of revenues and expenditures caused by external factors (demographic and economic), and decrease the premium needed to cover expenditures. Such reforms should lead, on the one hand, to the rationing of medical services covered by public resources, and on the other, to more effective governance and management of the sector and within the sector.

Finally, it should be added that the ageing process affects other types of expenditures, i.e. those outside of health care sector. In the CEE, one issue is financing income benefits (pensions), which is not discussed here, and another issue is the need to increase the level of long term care (LTC) financing. Up to date, this type of care was most commonly provided within the family rather than within the framework of institutionalized social protection. In Poland, for example, it has also been provided by religious organizations and, albeit only lately, by commercial

Table 23. Summary – factors that affect health care sector budget in projection exercise

Sides of the budget	Variables	Channel trough which budget side is affected	Impact on projection results – evidence
Revenues	Demographic: population size, total fertility rate (TFR) and longevity	Population size and age structure determine the number of persons who can potentially contribute to public health care budget	Positive impact for variants of improved demographic development: especially total fertility rate (TFR) and healthy longevity, negative – for population decline and dynamic aging. Longevity quantitative, not qualitative
	Labor market development: participation rate and employment rate	Higher employment rate increases the number of tax payers (contributors) to health budget	Significant positive effect strengthened by the increase of wages in Slovakia, moderate positive effect in Hungary
	Economic development: wages	Wages are the main source of taxable income	Positive effect, proven for Hungary, Slovakia and Bulgaria
	Utilization pattern	Promotion of investments in health; approval for increased health payments	Assumption – not modeled
Expenditures	Demographic: longevity and age structure	Increased aging and longevity extend the time spent with poorer health status	Positive effect: higher for Bulgaria, moderate for Hungary
	Death related costs	Morbidity picture of the elderly tends to sharply increase the expenditures at an older age, but the costs are substantially higher only in the last year of life, so the ratio between the deceased and the survivors declines with age	Slower increase; 1 percentage point of GDP (Poland) and 0.7 percentage points of GDP (Hungary)
	Labor market development: employment and unemployment	Unemployment leads to poorer health status and more frequent utilization of health services	No evidence
	Economic development: wages, labor productivity and GDP	Income elasticity of demand for health rather neutral at an aggregate level; wage increase entails higher labor cost in the health sector as well	Moderate influence
	Utilization pattern	Changes in line with ageing and wage increase when incom elasticity is greater than 1	Assumption
Financial balance	Demographics: population size, age structure, longevity	Strengthens the effect on both sides: decrease in revenues and increase in expenditures	Higher deficit
	Death related costs	On the expenditure side	Deficit is modified – smaller than in the baseline scenario
	Labor market development: employment	On the revenue side	Smaller deficit – moderate effect
	Economic development: wages and labor productivity	Interactions between sides: increase in revenues higher than a decrease in expenditures	Smaller budget deficit – moderate effect (Hungary), stronger effect (Bulgaria)

Source: Own comparison based country reports

(private) long-term care institutions. Access to this type of services is restricted, and long-term diseases related to old age are becoming one of the most urgent social issues. Overall, the hypothesis that new social problems will arise, the demand for social care will increase, and new financing mechanisms will be needed in the face of ageing, has been confirmed. The other reasons include rapid economic development and modernization processes in the NMS. Thus, rationalization of health care expenditures becomes a necessity, as well as building the space for new taxes and – if socially accepted – increased private financing.

Table 24. Comparison: insurance premium required to balance public health care sector revenues and expenditures

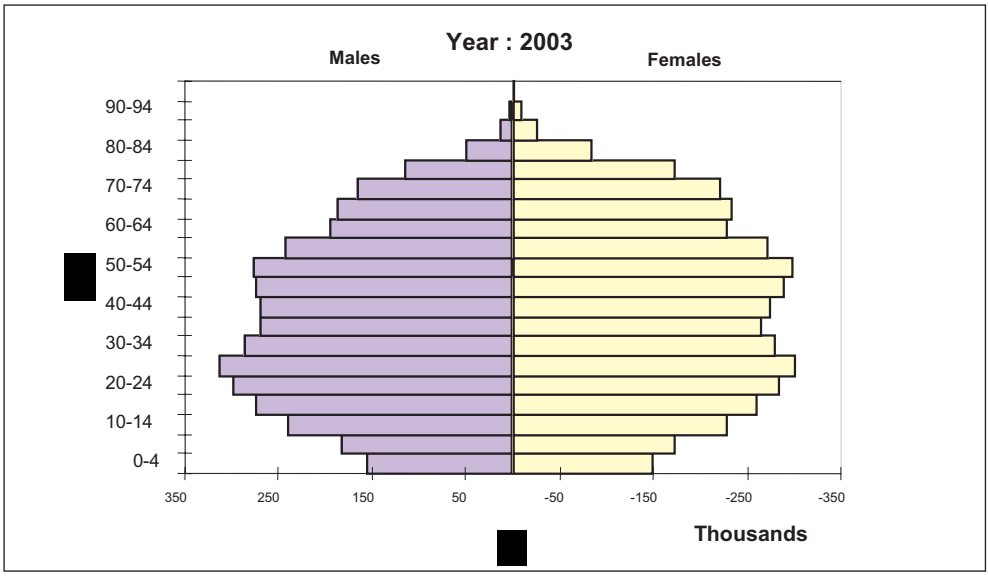
Country	Base year	2025	2050
Bulgaria	*n/a*	*n/a*	*n/a*
Estonia	12.4%	15.8%	25.8%
Hungary	17%	21%	28%
Poland	8.6%	10.7%	11.7%
Slovakia	9.4%	12.7%	21.5%

Source: Gabos, Gal (2007), Golinowska, Kocot, Sowa (2007), Kvetan, Palenik, Mlynek, Radvansky (2007), Rangelova, Sariiski (2007), Roovali (2007)

Annex I

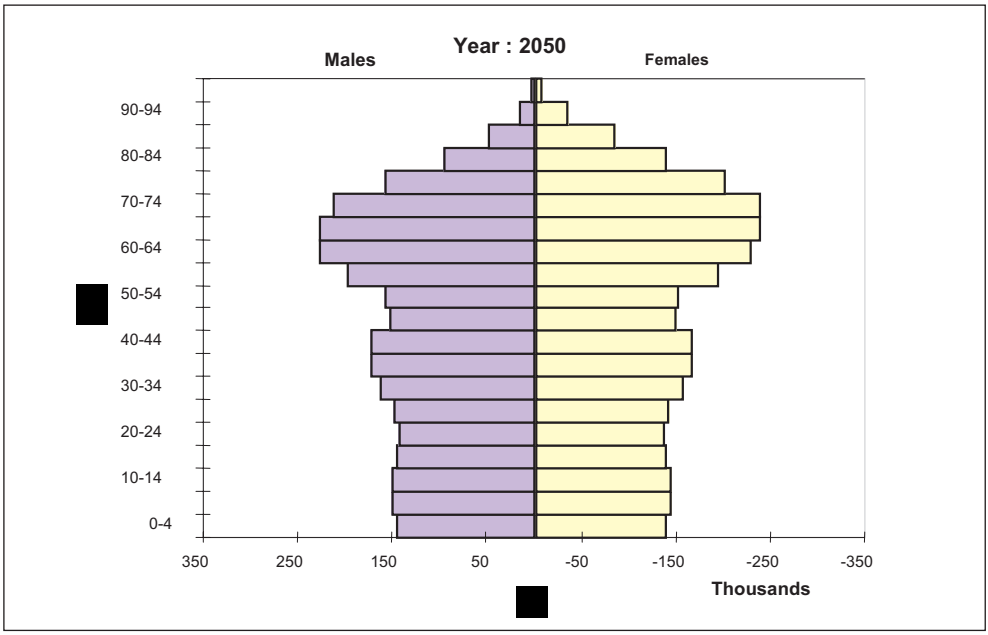
Population changes 2003-2050

Graph 17. Population histogram – Bulgaria 2003



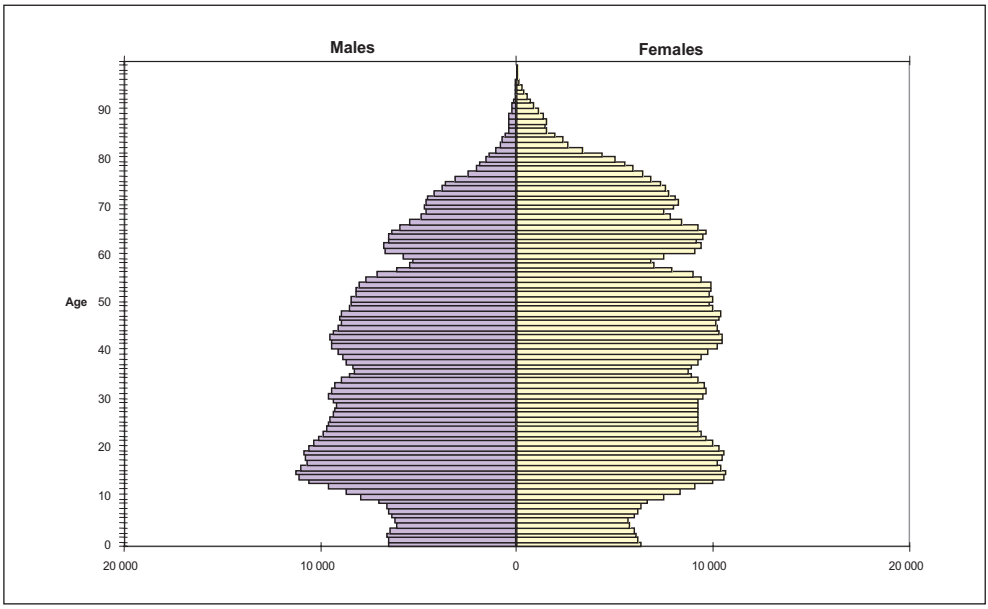
Source: Rangelova, Sariiski (2007)

Graph 18. Population histogram – Bulgaria 2050



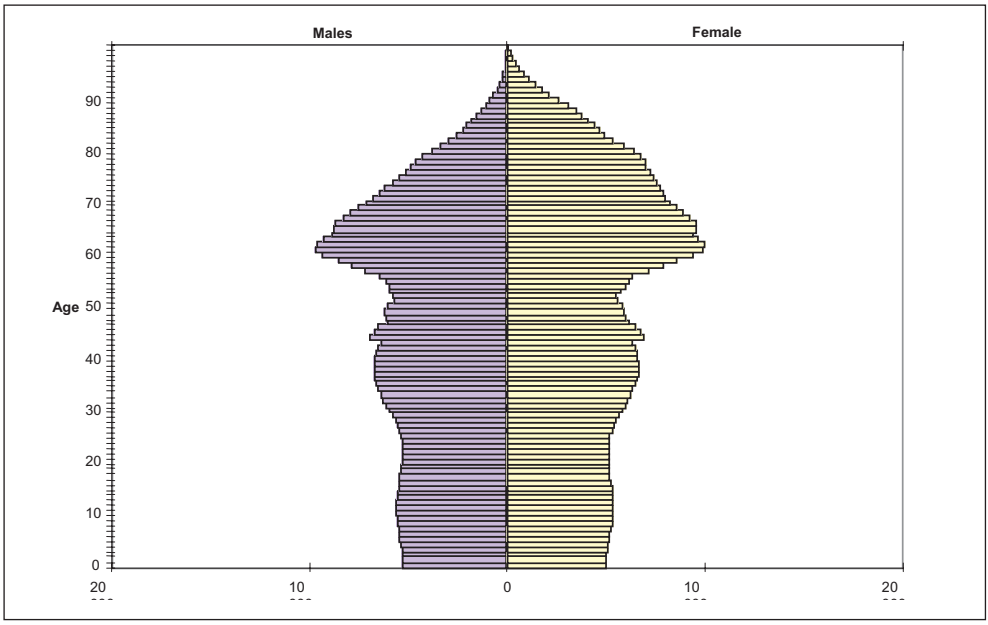
Source: Rangelova, Sariiski (2007)

Graph 19. Population histogram – Estonia 2003



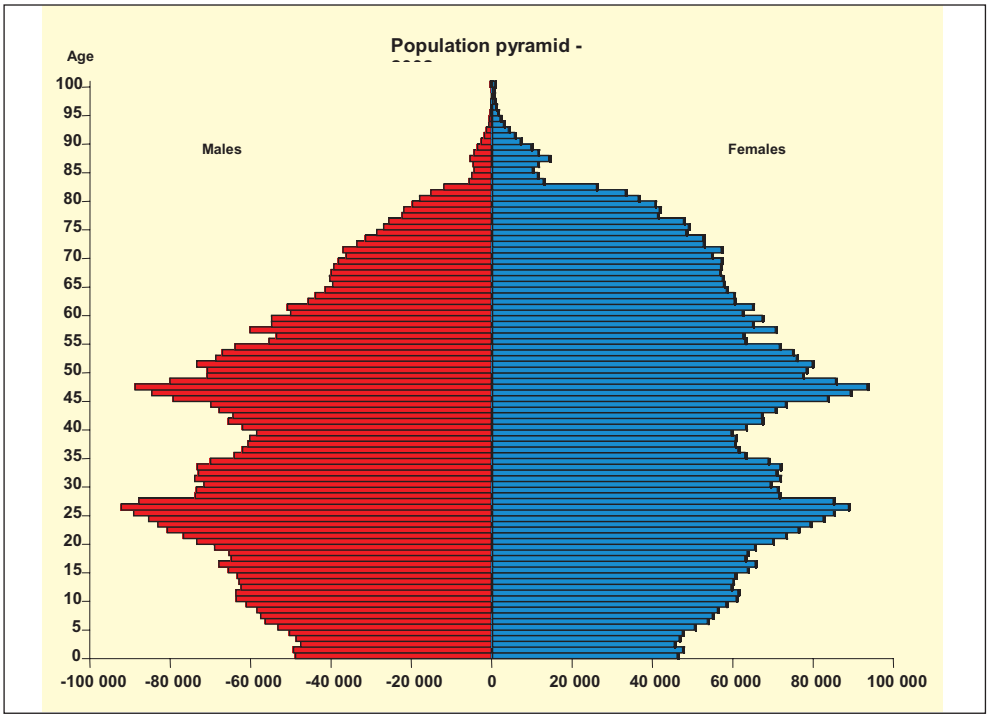
Source: Rangelova, Sariiski (2007)

Graph 20. Population histogram – Estonia 2050



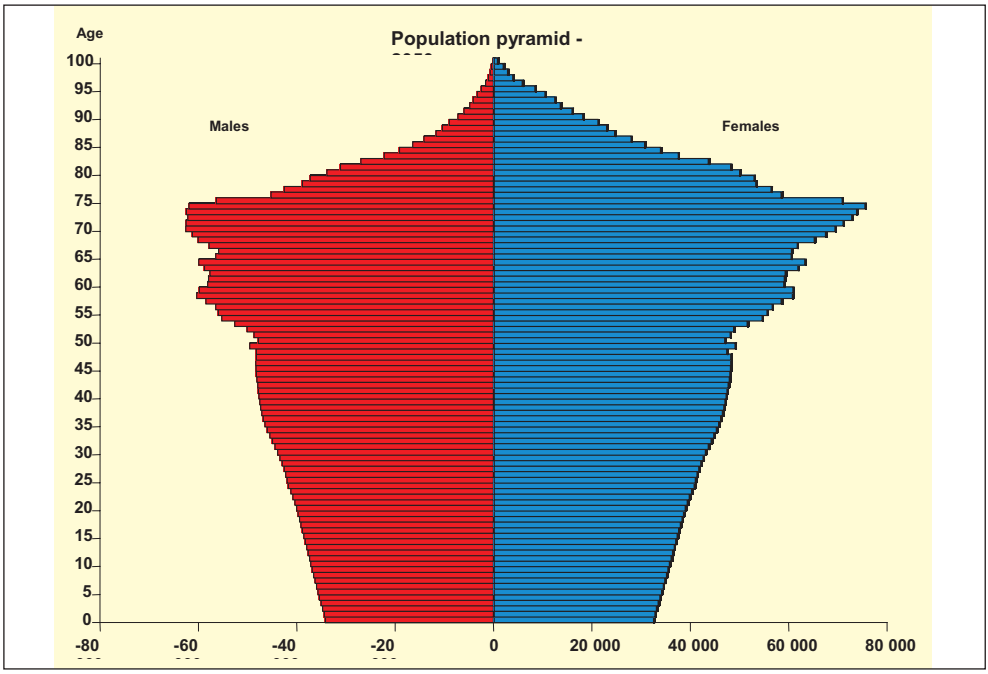
Source: Roovali (2007)

Graph 21. Population histogram – Hungary 2002



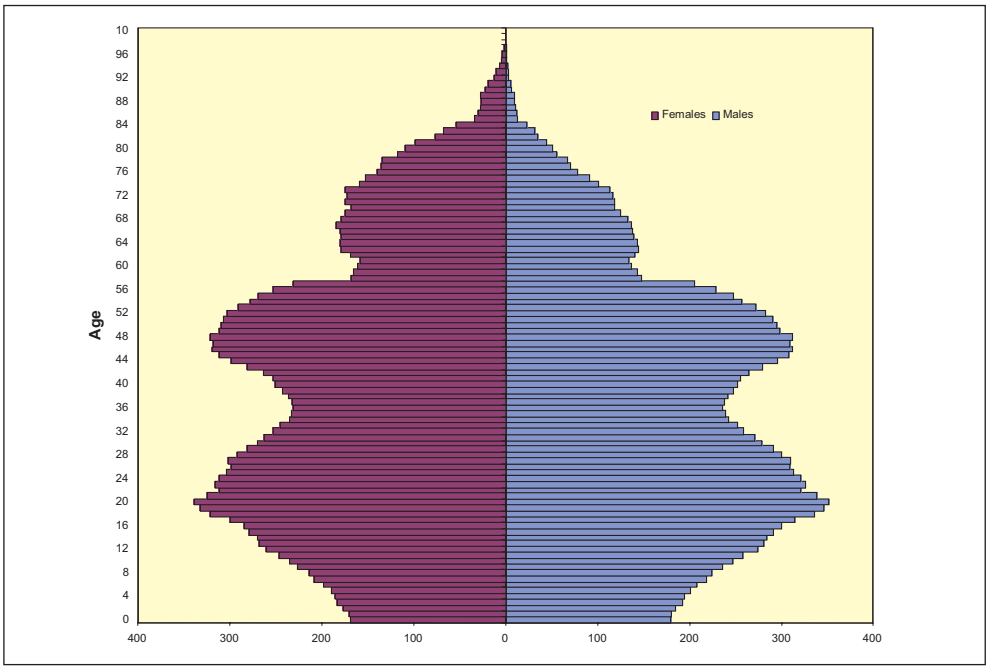
Source: Gabos, Gal (2007)

Graph 22. Population histogram – Hungary 2050



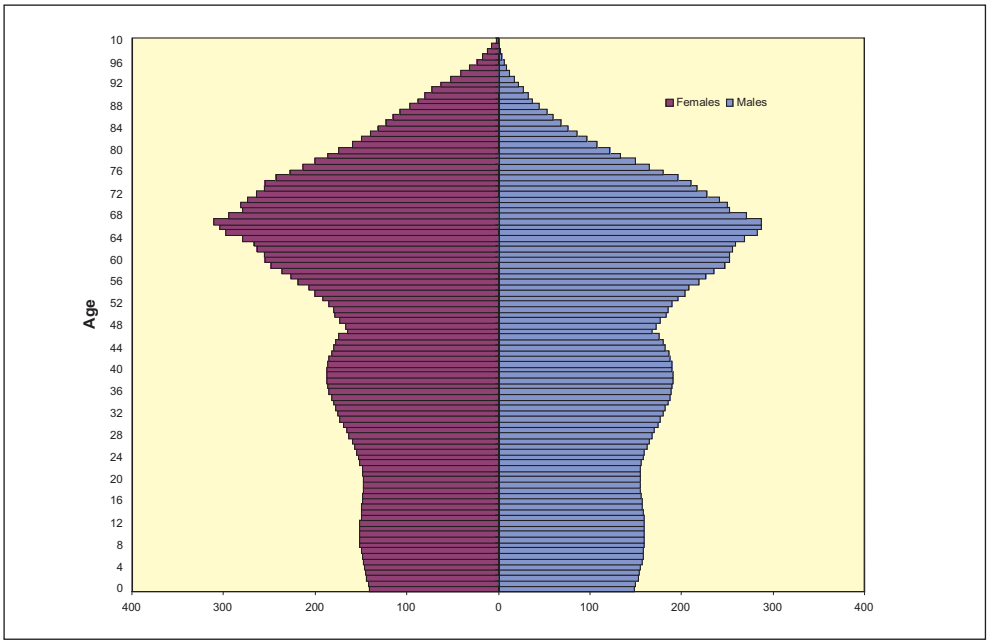
Source: Gabos Gal (2007)

Graph 23. Population histogram – Poland 2003



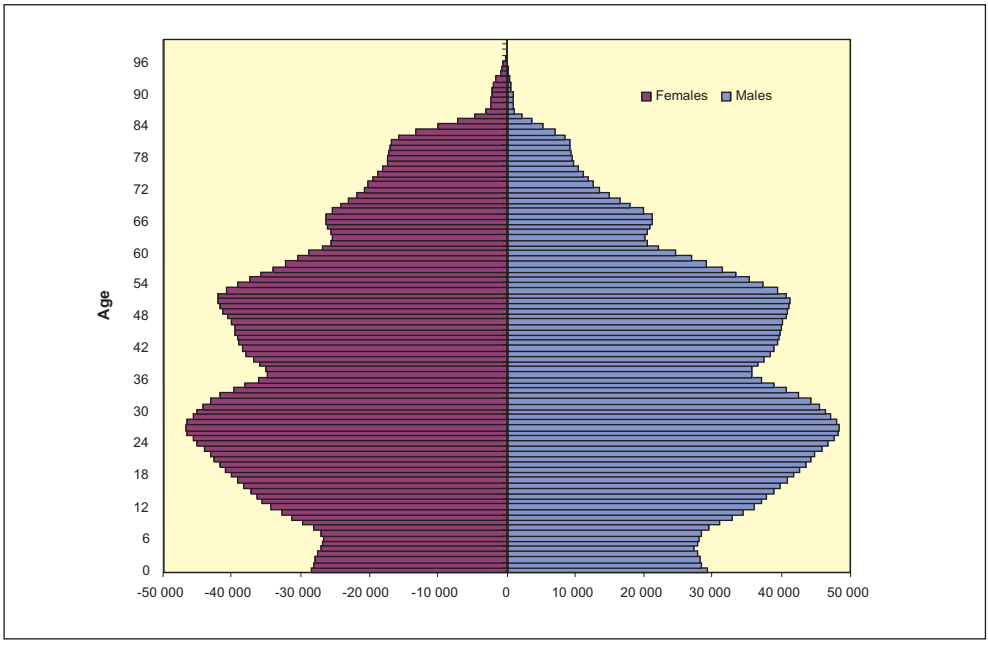
Source: Golinowska, Kocot, Sowa (2007)

Graph 24. Population histogram – Poland 2050



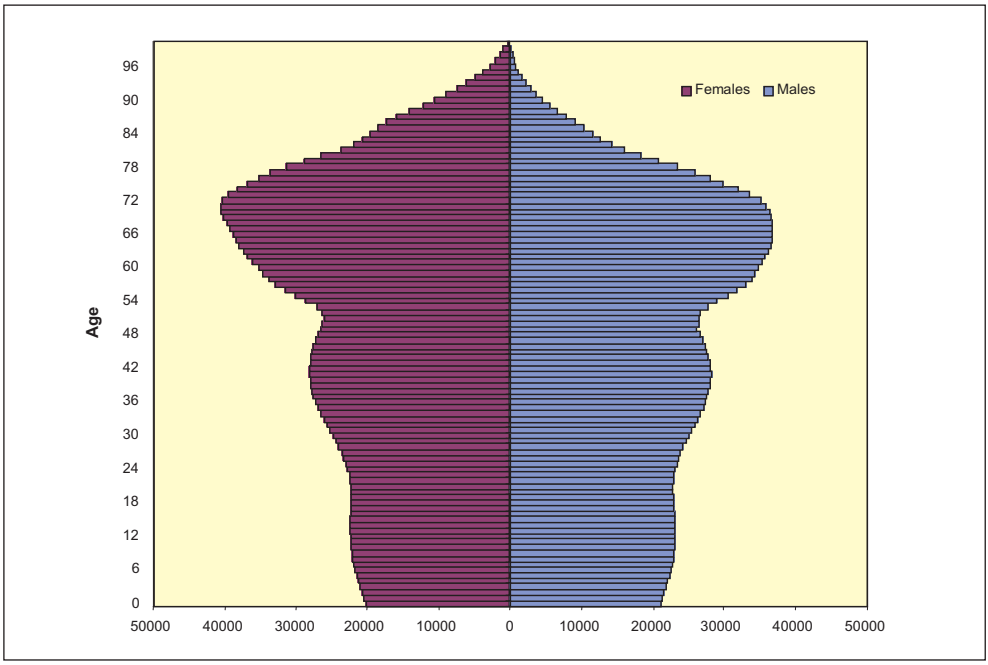
Source: Golinowska, Kocot, Sowa (2007)

Graph 25. Population histogram – Slovakia 2005



Source: Kvetan, Páleník, Mlýnek, M.Radvanský (2007)

Graph 26. Population histogram – Slovakia 2050



Source: Kvetan, Páleník, Mlýnek, M.Radvanský (2007)

Annex 2

Methodology for death related costs estimation for Hungary and Poland

1. Estimation based on National Health Fund data on average expenditures per capita (per deceased and survivor, broken down according to gender and 5-year age cohorts) for medical services for which appropriate data is available:

$$\overline{AE}^{l}_{a,p,2004} = \frac{\overline{TE}^{l}_{a,p,2004}}{N^{l}_{a,p,2004}}$$

where:

$l \in \{s, d\}$, status of an individual: s – survivor, d– deceased

$a \in \{1,..,20\}$, 5-years age cohort

$p \in \{m, f\}$, sex: m – male, f – female

$\overline{AE}^{l}_{a,p,2004}$ – average per capita expenditures for an individual of ***l*** status, age cohort ***a*** and sex ***p*** in the year 2004

$\overline{TE}^{l}_{a,p,2004}$ – total expenditures for ***l*** status, age cohort **a** and sex ***p*** (according to National Health Fund data in the year 2004)

$N^{l}_{a,p,2004}$ – number of individuals with ***l*** status (deceased in the given year or survivors) in age cohort ***a*** and sex ***p*** in the year 2004 (according to the demographic projection used in the ILO model.)

2. Estimation of *k-indicator*, broken down according to gender and age:

$$k_{a,p} = \frac{\overline{AE}^{d}_{a,p,2004}}{\overline{AE}^{s}_{a,p,2004}}$$

K-indicator describes the ratio between average expenditures for given medical services per deceased in the base year and average expenditures per survivor. The

value of the indicator is constant during the projection period and specified according to the sex and age cohort.

3. Estimation based on National Health Fund data, pertaining to annual insurance expenditures for given medical services. As the National Health Fund data includes the data with an undefined status of a person (without information on sex and/or age), it was necessary to divide these expenditures using the k-indicator between groups, in order to receive expenditures coherent with National Health Data. These estimations, covering year 2004, are further applied to the 2003 National Health Data assuming constancy of the k-indicator and unchanged proportions of expenditures between genders and age cohorts. Average expenditures per capita for a person with *s* (survivor) and *d*(deceased) status were calculated as:

$$AE^{s}_{a,p,2003} = \frac{AE_{a,p,2003}}{(1-\alpha)+k\cdot\alpha}$$

$$AE^{d}_{a,p,2003} = k_{a,p}\cdot AE^{s}_{a,p,2003}$$

where:

a - probability of death depending on sex and age cohort in a given year,

$AE_{a,p,2003}$ – average per capita expenditures depending on sex and age, calculated based on National Health Data expenditures, applying sex and age structure from National Health Fund data

4. Calculation of average per capita expenditures depending on sex, age and status for the year n and assuming growth of expenditures in line with GDP per capita.

$$AE^{s}_{a,p,n} = AE^{s}_{a,p,n-1}\cdot(1+r_n)$$

$$AE^{d}_{a,p,n} = AE^{d}_{a,p,n-1}\cdot(1+r_n)$$

where:

n – following year of projection

r_n – GDP per capita growth rate in year n

5. Calculation of total expenditures in year n:

$$TE_n^s = \sum_{a=1}^{20} AE_{a,m,n}^s \cdot N_{a,m,n}^s + \sum_{a=1}^{20} AE_{a,f,n}^s \cdot N_{a,f,n}^s$$

$$TE_n^d = \sum_{a=1}^{20} AE_{a,m,n}^d \cdot N_{a,m,n}^d + \sum_{a=1}^{20} AE_{a,f,n}^d \cdot N_{a,f,n}^d$$

$$TE_n = TE_n^s + TE_n^d$$

where:

TE_n^s, TE_n^d – total expenditures in year n for survivors (s) and deceased (d)

TE_n – total expenditures in year n

6. Due to lack of adequate data on pharmaceutical expenditures, additional indicator defining the ratio between average pharmaceutical expenditures per deceased and average pharmaceutical expenditures per survivor is used. It is assumed that the value of this indicator equals the value of the indicator for other types of medical services. As a result, total expenditures are summed up with expenditures on pharmaceuticals, divided by sex, age cohort and status.
7. In view of the capitation system in primary care services financing, National Health Fund expenditures on primary care are divided proportionally between the insured, and added to total expenditures.

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