AGEING, HEALTH STATUS AND DETERMINANTS OF HEALTH EXPENDITURE

(AHEAD)

Work package IX

Development of Scenarios for Health Expenditure in the Accession Economies

Comparative report

Bulgaria, Estonia, Hungary, Poland and Slovakia

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Introduction

Objective of the comparative report is to present the model of future health care system revenues and expenditures in the chosen Central and Eastern European countries, which are now the New EU Member States[1], as well as to discuss assumptions of the projection and the projection results.

The analysis and projections of the health expenditures are based on the ILO social budget model, part of which is health budget model. The model covers revenues and expenditures of the health care system, what well responds to the above presented discussion on health care system funding and its sustainability. Next to it, the model allows for analysis of impact of demography (especially ageing) on health care system revenues and expenditures. Examining these factors is an objective of AHEAD project. Up to date, sources of data and information in the New Member States that could be used for the long-term comparative projections were restrained. Only starting from 2005 such analysis, comparable also with the EU-15 (WPVIII), will be possible, based on the survey panel data of EU-SILC.

Structure of the report responds to the template of the WPIX country reports. After presenting characteristics of metodology and the model that is used, sources of data and information are described. Later on, model assumptions are discussed. In the projection an attempt was made to standardize assumptions, however the assumptions for each country are also responsive to country policy processes, latest policy proposals and reforms. Development of specific model variables during the projection period is described in detail. Finally, results of projections together with sensitivity analysis and conclusions upon future development of health care system revenues, expenditures and financial balance are presented. The report concludes with recommendations that are also presented in the country reports and additional recommendations that are a result of comparative analysis.

[1] Estonia represents Baltic countries, Bulgaria – Balkan countries and Slovakia represents countries of Central Europe. Poland is a specific country, with similar demographic and epidemiological characteristics to Slovakia, but much larger, with a high share of rural population. In Hungary demographic processes related to second demographical transition began much earlier and are still dynamic, constituting a reference for other CEE countries.

1. Applied health revenues and expenditures model

Preparation of projection of health cares system expenditure is a complicated and risky task. Earlier AHEAD papers (Christiansen at al 2006) emphasized that theoretical, especially macroeconomic background of determinants of health expenditures is rather modest, if not weak. Research in the area indicated domination of income among health expenditure determinants (Newhouse 1977), while demografic variables were not taken into account or – when included in the analysis – impact of demography was not significant for development of expenditures. A number of analysis emphasized importance of policy processes, political affairs and quality of management in the health sector that impact supply side of expenditures (i.e. Getzen 1992). Only in the late 90. research began to concentrate on impact of demography on aggregated health expenditures.

Analysis of development of health care system revenues and expenditures are complicated as they should take into account a numerous data from differentiated fields: demography and labour market, makroeconomics, health status and quality of management in the health sector, policy and institutional arrangement of the sector. Additional analysis allowing for estimation of interrelations between factors that impact revenues and expenditures levels are needed.

Due to above reason most of prognostic models is not as comprehensive and complex, taking into account impact of selected variables on aggregated revenues / expenditures level only.

Selection of projection method and determinants taken into account depend strongly on time horizon of projection - period that the projection should cover. For example, changes of age structure of the population are so slow that they will not impact results of short or even medium term projections. On the other hand, factors such as health care sector reforms or changes in process of medical procedures can have a strong impact on results of short, medium and long-term projections (Lee 2002). These factors are the most difficult to foreseen and project due to a possiblity of rapid change in the policy process. Therfore they can cause a high level of uncertainty in the projections.

Not only selection of variables depends on the period of projection, but also unit of expenditures measurement (Getzen 2000). According to Getzen, nominal monetary unit is the best measure in the short term projection and the main determinants of health expenditures

level are variables covering insurance, labour market and inflation. Real monetary unit of per capita expenditures is useful for mid-term projections, as these are driven mostly by incomes. In case of the long term projections, the best unit used for presenting expenditures level is GDP percent that they constitute (Getzen op.cit., s.56-57).

1.1. Models used for projection of health care expenditures

The most common methods of projection can be systematize 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 the most commonly used in the health care expenditures projections. They are based on an equation that quantifies the level of expenditures in the year *t:*

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

where:

HE_t – health expenditures in the year t,

g – sex,

a – age cohort (most commonly 5-years age cohors),

$N_{t,a,g}$ – 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 commonly applied actuarial models, two approaches can be identified: "traditional" approach, when the share of population in the last year of life (in each age cohort) is not taken into consideration and generalised projection approach, in which level of per capita expenditures is differentiated depending on time that is 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 expenditures modelling and projection. It considers level of health expenditures in two regions of the world, namely the *more developed country (MDC)* and *less developed countries (LDC)* and covers the period up to 2050.

The analysis of foreseen development of health expenditures growth takes into account two types of factors: demographic changes (changes in the size and structure of the population) and other changes aggregated, inlcuding technological changes, changes in per capita medical services utilization and cost factors. Interdependencies between the level of expenditures in the base year and the level of expenditures in the year t are quantified by the equation:

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

where:

t – analysed year,

H(t) – expenditures in the year t,

r_p - demographic changes coefficient,

r_u – other factors changes coefficient.

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

Similar approach with demographic variables taken into account is represented among other things by Denton et al. (Denton et al.2001), Antolin et al. (Antolin et al. 2001) and with a small extention by Fuchs (Fuchs 1998).

[2] The projection is an extention of the projections based on economic and demographic model of IIASA (*International Institute for Applied Systems Analysis*). The model analysis 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.

Projection of short term expenditures on *Medicare* and *Medicaid* schemes in the USA prepared by Cutler and Sheiner (Cutler, Sheiner 1998) represents generalised method of analysis. Two factors influencing 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 expenctancy and decreasing mortality. At the same time, the number of persons for whom given year is the last year of life is decreasing for younger cohorts.

Two models developed lately by the Ageing Working Group (European Commission 2006) and the OECD experts (OECD 2006) also belong to the group of models using in the projections the factor of increasing health expenditures in the last stage of life.

Actuarial models are also used to build a financial balance models, covering revenues and expenditures side of health care sector. These models are applied to analysis of public and private health insurances. The main aim of using financial balance models is evaluation of health insurance system financial sustainability and estimation 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. Also additional revenues of the insurance institution can be included in the projections, depending on their source and type of activity of the insurer (i.e. interest rates from the capital or capital investments). Methodology for calculations is similar in most of balance models, however some models are restricted to variables covering health care sector (health insurance mostly), while other include system variables and are well set in the macroeconomic context.

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

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

[5] *Management Sciences for Health* – private non-profit organization established in 1971 dealing with work for health managers, policy makers, medical services providers and often patients; assisting in solving problems in the health care sector by providing information and expertise.

Another example of model based on similar methodology is WHO model applied to regional/local insurance systems. The model allows for projecting imact of intruducing regional/local insurance systems on the national health care system (Carrin, Ron 1993). As in case of other models, level of revenues, expenditures and insurance financial balance is estimated in result, as well as the financial structure of the health care system, number of insured and foreseen utilization level of medical services are described.

1.1.2. Macroeconomic models

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

A two-sector model of health care system and social insurance by M. Warshawsky (Warshawsky 1994, 1999). The model is based on a simple equilibrium between two production sectors: health care sector and sector covering the rest of the market with two production factors – namely labour and capital. Development of health care sector 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 labour is a function of demography, social and institutional factors (e.i. high school and university enrollment, women participation, retirement age,...). The projection covers 40 years period. Results included not only estimation of health and pension expenditures in relation to the GDP, but also relations between labour and capital in each of the two sectors, level of per capita consumption, productivity in the health care sector and impact of different insurance systems on the expenditures level. Model also included 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 i Poullier (Getzen, Poulier 1992) is an example of econometric projections. It includes health expenditures projections for 19 OECD countries that were made

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

using different 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, econometric models using additional macroeconomic information.

In addition, combination of above listed methods was also applied to the model. Generally, projections based on econometric models are rarely used to foreseen long-term expenditures level, rather they are applied to short term projections. However, if the projection aims at evaluation of impact of demographic changes on the health expenditure, the projection period should be extended, because changes in the size and age structure of the population are clearly visible only in the long-term.

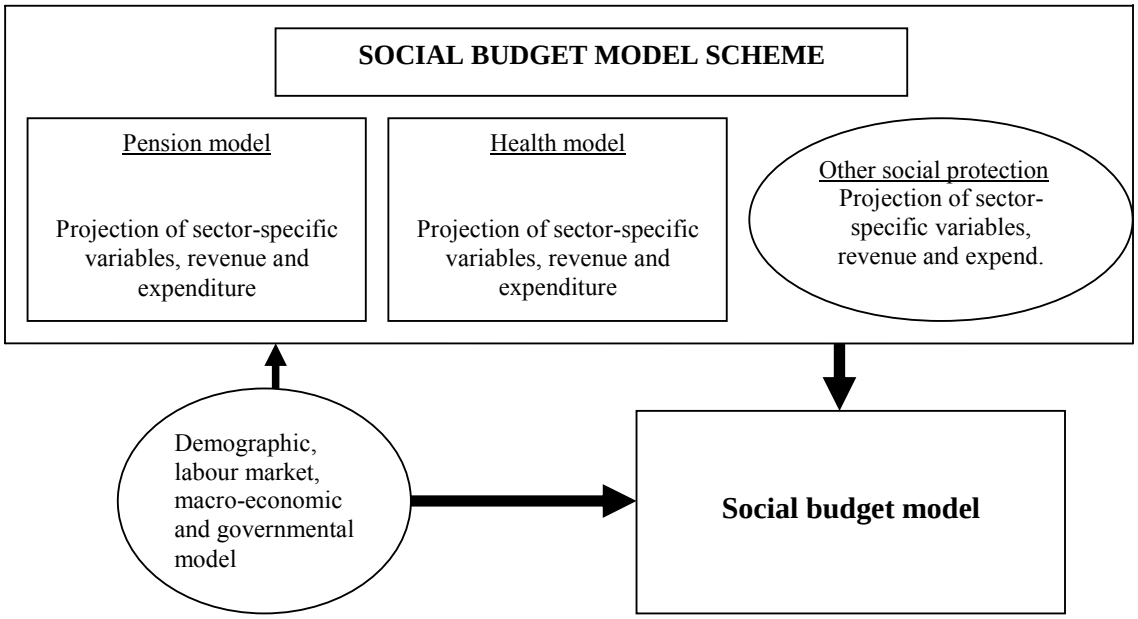
1.2. ILO social budget model

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

The ILO social budget model has been broadly used in countries that cooperate with ILO, including CEE countries. The model was used in the past for assessing financial balance of the whole social protection system in these countries. It allows for middle and long-term projection of revenues and expenditures of main social protection schemes as well as simulation of impact of demographic, economic and legislative changes on social protection financing. The model can be used for short term evaluation of already existing schemes, as well as simulation of future reforms of some parts of the system (i.e. introduction of defined contribution pension system or introduction of 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.

Scheme 1. Construction of ILO social budget model



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

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

There are some advantages of the ILO health budget model, compared to other potential models that could have been applied for health care financing projections in accession economies.

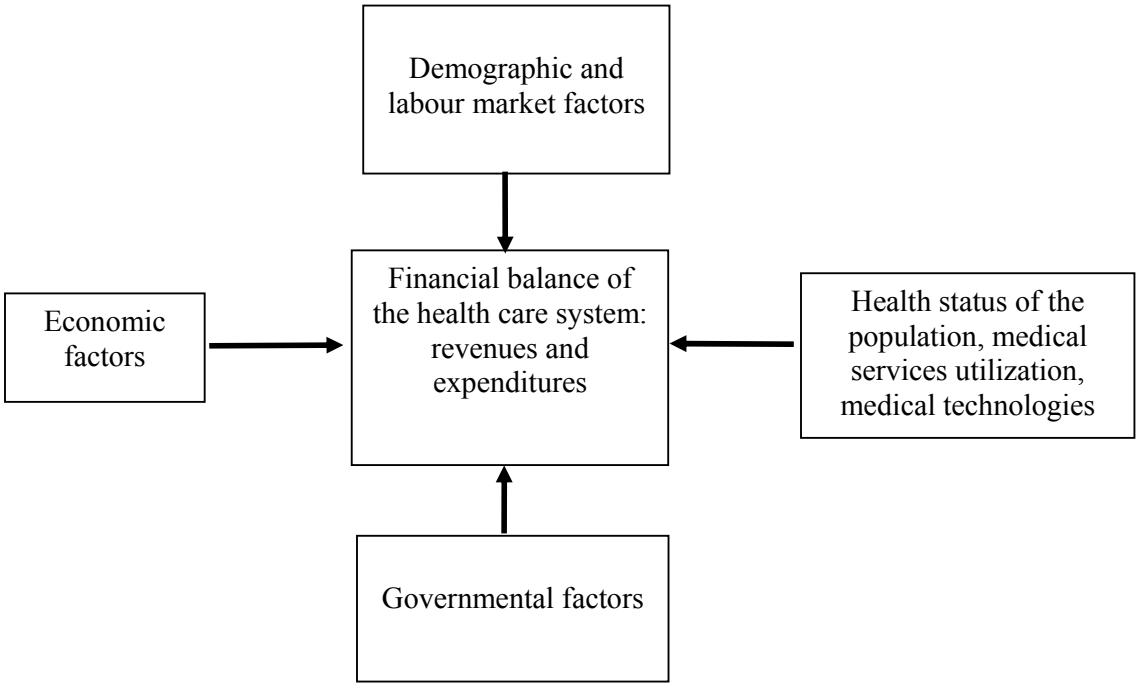
- This model reflects health care sector character, complying many different determinants which influence financial situation of that sector.
- It is some kind of basic platform, allowing a wide adaptation to specific country health system situation. There is much variety in health care systems, especially in financing structures, so there is no one model that can be applied to each country.
- The ILO's model allows to compare of the expenditures side and revenues sides and a deficit or surplus calculation in consequence. This is very essential possibility, especially in the financial projections. Therefore it is useful not only for international comparisons of health care system expenditures – as it was in 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 into account demographic changes (ageing of 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).

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



Source: Cichon M., Newbrander W., Yamabana H., Weber A., Normand Ch., Dror D., Preker A. (1999), Modelling in health care finance. A compendium of quantitative techniques for health care financing, International Labour Office, Geneva

The model applied in the AHEAD research slightly differs from the above presented original social budget model (Scheme 1 and 2). Main groups of variables that are used in the analysis are classified into four main groups of variables:

- Demographic: TFR, LE, population structure (udział osób 65+)
- Labour market: participation and employment rate, wages
- Macroeconomic: GDP, inflation and labour productivity
- Health status and utilization patterns

Similarly to other AHEAD projections (Work Package VIII), policy varibales were not included in the analysis, assuming that the legal framework and financial mechanisms of the health care system remains during the projection period unchanged.

One of the most important modifications of the health modul of the social budget model is introducion (in case of projections for Hungary and Poland) of *per capita* expenditures instead of average medical services utilization level (number of *per capita* primary care visits and hospital days). This modification was caused by better availablity of data on *per capita*, by sex and by age expenditure levels than data on average medical services utlization in these two countries. Moreover, introduction of average *per capita* expenditures allowed for introducting death-realted costs scenario.

The health care budget model used in the projections is not constraint 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 expendiutres are included.

2. Health care system in analysed countries

A vast majority of transition countries (CEE and CIS) executed the first goal of the health cared reform, namely, they introduced health insurance with an earmarked fund established from pay roll tax, instead of integrated budgetary funding financed from general taxation. Health insurance was introduced gradually: in Hungary in 1990 social insurance fund, including health care, was separated from budgetary funding, 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. Health insurance introducing in analysed countries (2003)

Countries	Date of HI introducing	Contribution	Share of HI in total HC funding
Bulgaria	1999	6,0%	32%
Estonia	1991	13,0%	66%
Hungary	1990 as SI 1996 - separate HI	14,0%	71,6%
Poland	1999	9%	62,7%
Slovakia	1994	14,0%	86%

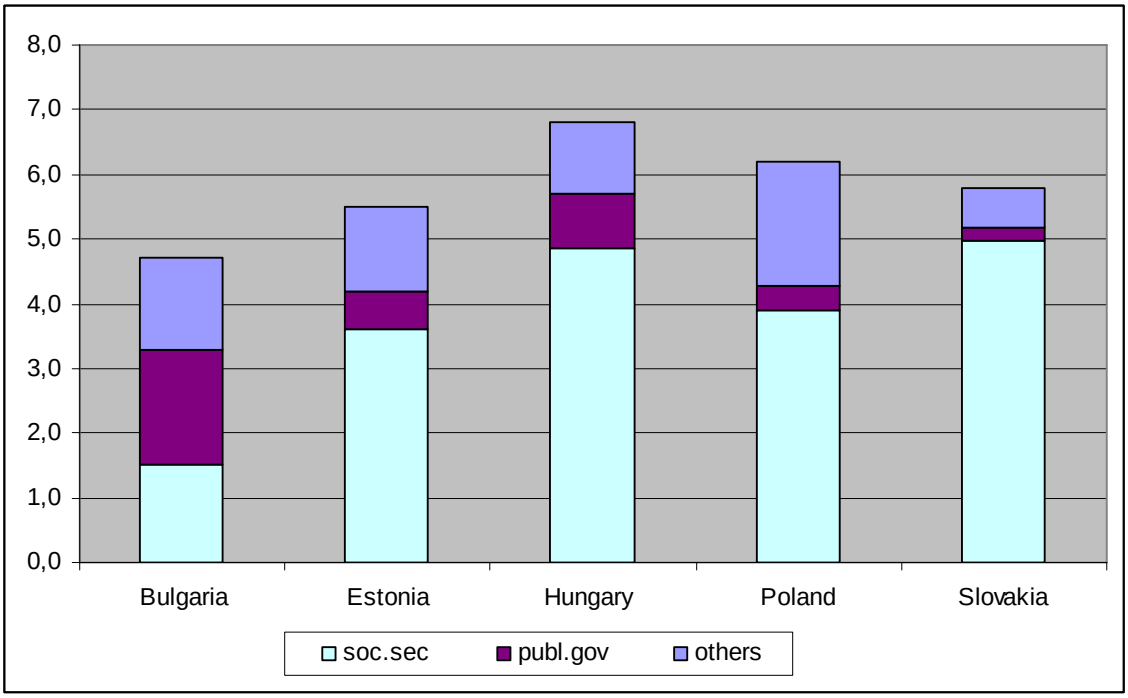
Source: : AHEAD WP II – country reports http://www.enepri.org/Ahead

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 expenditures. Another advantage was related to

[8] In Hungary, health insurance premium was earmarked as late as 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.)

the possibility of defining a package of insurance benefits for the purpose of separating the public component, and thus creating the space for private insurance.

Graph 1. Composition of health expenditures in selected CEEC



Source: AHEAD WP II – Health Status and Health Care Systems in Central and Eastern Europe Countries http://www.enepri.org/Ahead, WPIX – country reports

Introduction of health insurance has braught tension between increasing health needs accompanied by relativelly low health care financing level and requirements of low taxes and low non-wage labour costs needed to stimulate employment and economic growth. In result of this tension, health care sector is systematically falling in financial indebtedness. Either insurance institutions or medical services providers are falling in financial indebtedness, depending on the insitutional arrangements of the health care sector. The high level of indebtedness is stable or even growing (Golinowska, Sowada, Woźniak 2007), what negativelly impact effectiveness of the health care sector management. Future, long-term financial decisions should be based upon recognition of these tendencies as well as external determinants of the health care sector in the future.

3. Data sources

The health budget model is built based upon national data that are supplemented (or corrected) with the data collected and used by the international institutions in their comparative analysis. These include: United Nations, Organization for Economic Co-operation and Development, International Labour Organization, Eurostat and European Commission. Among the nationally based data, dominate data collected by national statistical offices, national health insurance and social insurance institutions, national banks, ministries of finances, ministries of labour and social policy and ministries of health (Table 2).

Due to high fluctuation of economic situation in the countries of political and economic transformation, which CEE countries are, the historical data used in the model are not always the actual data for the base year, but average data form the longer period. Due to the same reason, in some cases, long-term historical data were not available or not fully reliable as a pre-condition for projections.

Table 2. Sources of data for projections

Country	National statistical offices	Social insurance	Health insurance	Governmental agencies	Independent organisations	National Banks
Bulgaria	NSI (Nazionalen statisticheski institut - National Statistical Office): *demographic data* – number of population, 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; labour statistics taken from periodically organized National Survey on Labour Force.	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 health expenditure, health finance system balance.	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): the state budget data AZ (Agenzia po zaetostta pri Ministerstvoto na truda I sozialnata politika - Employment Agency to the Ministry of Labour 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 Ecoonomics at the Bulgarian Academy of Sciences – IE-BAS): GDP, labour productivity projections. CIN (Centur za izsledvane na naselenieto - Centre for the Populations Studies at the Bulgarian Academy of Sciences): ageing population projections.	BNB (Bulgarska nazionalna banka - Bulgarian National Bank): macroeconomic data – interest rates.
Estonia						
Hungary	KSH (Hungarian Central Statistical Office) KSH NKI (Institute of Population Research): 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 on 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

Poland	GUS (Główny Urząd Statystyczny - Central Statistical Office): population data, labour 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, farmers' 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 Labour and Social Policy): macroeconomic projection	CASE (Center for Social and Economi Research): macroeconomic projection consultation	NA
Slovakia	SU SR (Štatistický úrad Slovenskej republiky) Statistical office of Slovak Republic Data used: National accounts, Prices, Labour Market	SOCIÁLNA POISŤOVŇA Social Insurance Data used: Number of insured, shares of populations in insured groups	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, with respect of health care reform	VDC (Výskumné demografické centrum) Demographic Research Centre Data used: Forecast of Demographic Trends (Assumptions for Live 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, Labour market, prices	NBS (Národná banka Slovenska) National Bank of Slovakia Data used: Exchange rates, Prices (CPI)

Source: AHEAD WPIX country reports

4. Assumptions and variables development

The assumptions on future development of revenues and expenditures of the health care sector that are a background for the long-term projections have a positive character. This implies that almost in each case the trend of future development is positive. At first glance, in case of CEE countries which undergone rapid changes during the 90., assuming only positive trend seems to be rather risky. In the 17 years of transformation several improtant fot the model indicators did not have a positive trend: TFR was declining, employment was declining and GDP growth strongly fluctuated. Therefore, it is necessary to keep in mind that the projections assume overcoming crisis and negative trends ogf the 80. and 90..

Assumption of positive economic growth trend is an extrapolation of ambitions of the New Member States in convergence to the EU-15 economic level. Similar assumption are adopted in the national action plans and national convergence programmes. According to these documents economic growth in the NMS should assure employment growth and productivity growth simultaneously. Provious experience shows that such objective is difficult to reach – Poland for example facet (still does?) the situation of "jobless growth" (Kwiatkowski 2002).

4.1. Demographic variables development

Assumptions on future demographic changes in the analysed countries are based upon country sources, which include analitical research and projections prepared by the national statistical office instiutes of demography. These are confronted with the Eurostat projections (EUROPOP 2004), especially with aggregated data on NMS and EU15 country comparisons.

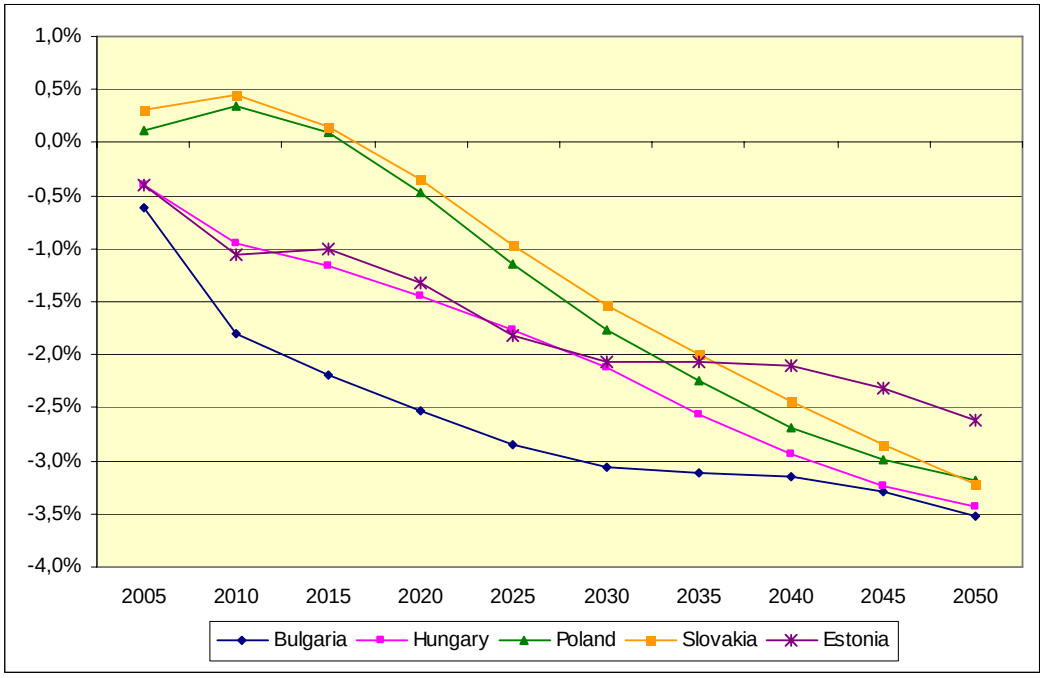
According to demographic projections, the analysed countries will face in the coming decades the same trends as earlier were observable in the EU-15: fertility decline, incease of life expectancy and increase of the share of the elderly (65+) in the population. However, the speed of these changes is higher than in the EU-15 and the changes take place in the relatively poorer countries[9].

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

[9] International analyses i.e. Eberstatd 2005, World Bank 2007 indicate that the CEE countries face untypical phenomenon of coexistance of demographic transformation and lower development level.

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

Graph 2. Size of population changes (5 years period)

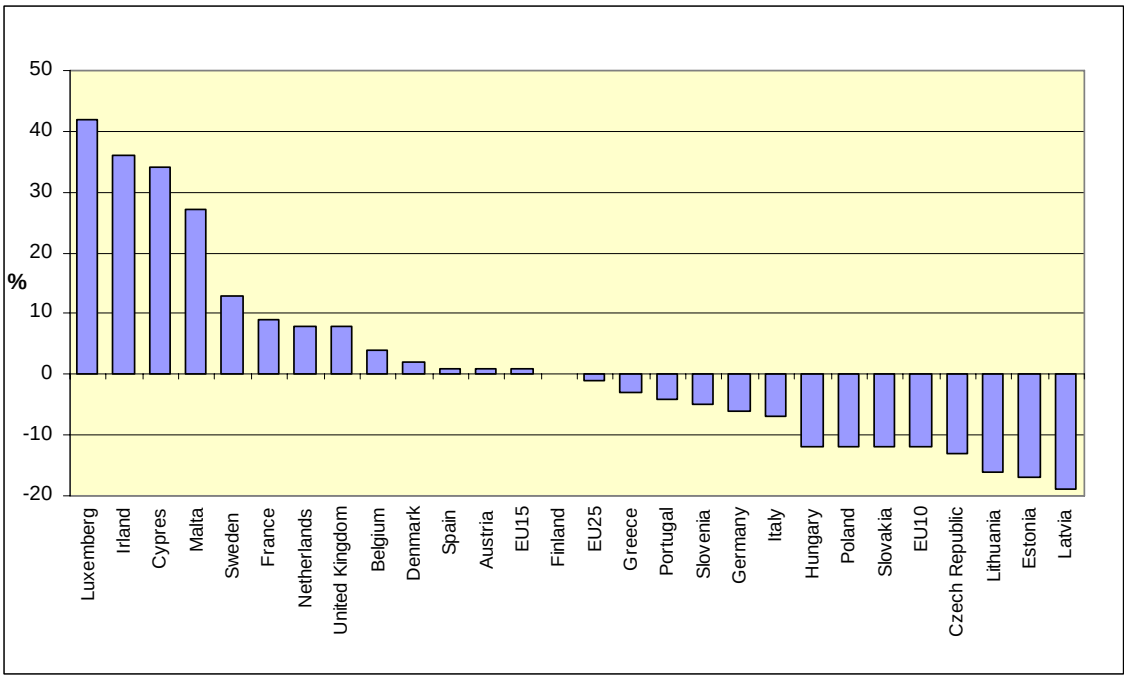


Source: AHEAD WPIX country reports

According to country based projections and the Eurostat, the decrease in the population number is significant. On average, the NMS population will decrease by 12%, while in the EU-15 the population will increase by 1%. These changes are also influenced by migration processes. The Eurostat projection assumes imigrants to the EU-15, also from the NMS, though in the scale of imigration from the NMS will be lower than in the base year of the projections. The NMS face emigration due to the EU accession. Increase of emigration, that leads to negative migration balance, is observable especially in Poland. It is assumed that the dynamics of migrations will slow down after 2010, and positive migration balance (more imigrants than emigrants) is foreseen after 2025

The national demographic projection of Hungary assumes systematic increase of imigrants (about 1 200 persons annually) and the positive migration balance is reached faster.

Graph 3. Changes of 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, Sveden and Ireland. Also the smallest EU countries have significant increase in the population number (see: Graph 3).

Total fertility rate

The decrease in fertility was observed in the analysed countries during the last 15 years, what is a result of life style modernization (so called "westernization"). Processes of family formation change (marriages in older ages, more common cohabitation, birth in older ages and one-child families). Also the cost of bringing up has a child has dramatically increased during the transformation period. Relations between goods for children and other goods and consumption goals have changed, accesibility of child care have decreased and family policy have changed from universal to targeted benefits.

Despite negative tendencies in the last 15-20 years, in all analysed countries 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 values of

indicator are closer. This is due to increasing similarities in the family formation process i.e. age of giving birth to the first child (30).

Despite the positive trend in projection of fertility indicator development, the fertility level is not high enough to constrain systematic decrease in the number of population in the analysed 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	1.40	1.48	1.56	1.63	1.70	1.75	1.80	1.83	1.85	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: AHEAD WPIX country reports, EPC and European Commission 2006

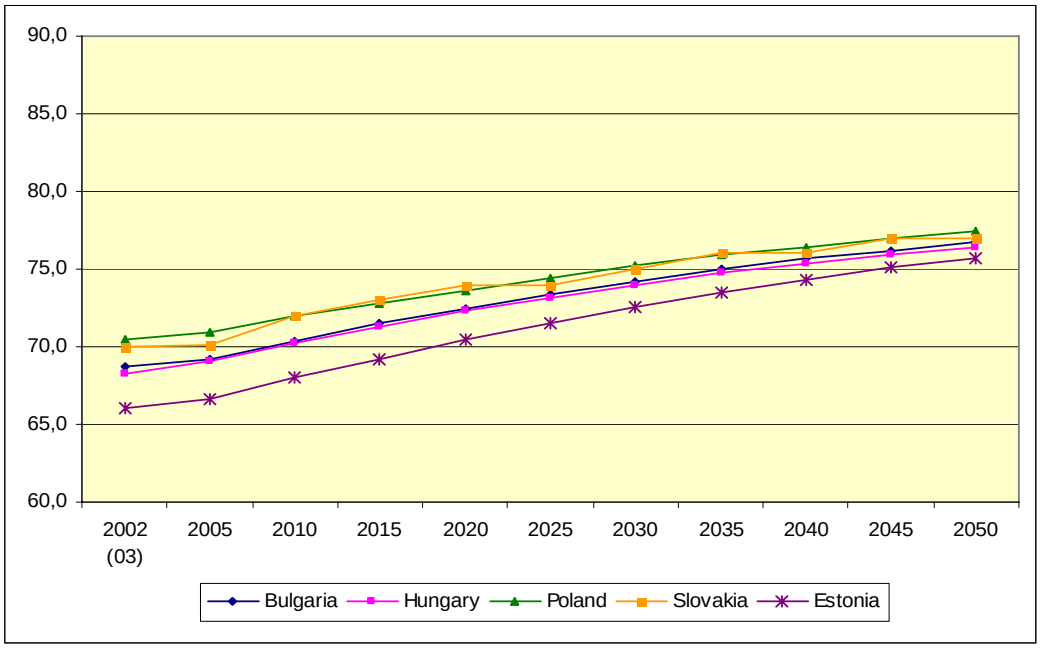
Life expectancy

The assumption of systematic life expectancy growth is based on historical tendencies observed in the EU-15 countries and positive impact of factors that determine longevity. The latter - on the one hand - include changes in diet (more fruits and vegetable, higher vegetable fat consumption), decrease in smoking, changes in the structure of consumed alcohols, increase in physical activity, which lead to decreasing mortality due to cardiovascular diseases; the main reason of high mortality in the CEEC (Zatoński, Willert 2005). On the other hand, accessiblity of pharmaceuticals and new technologies increase, what allows for faster and more effective intervention in case of illness. (Drygas 2005).

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

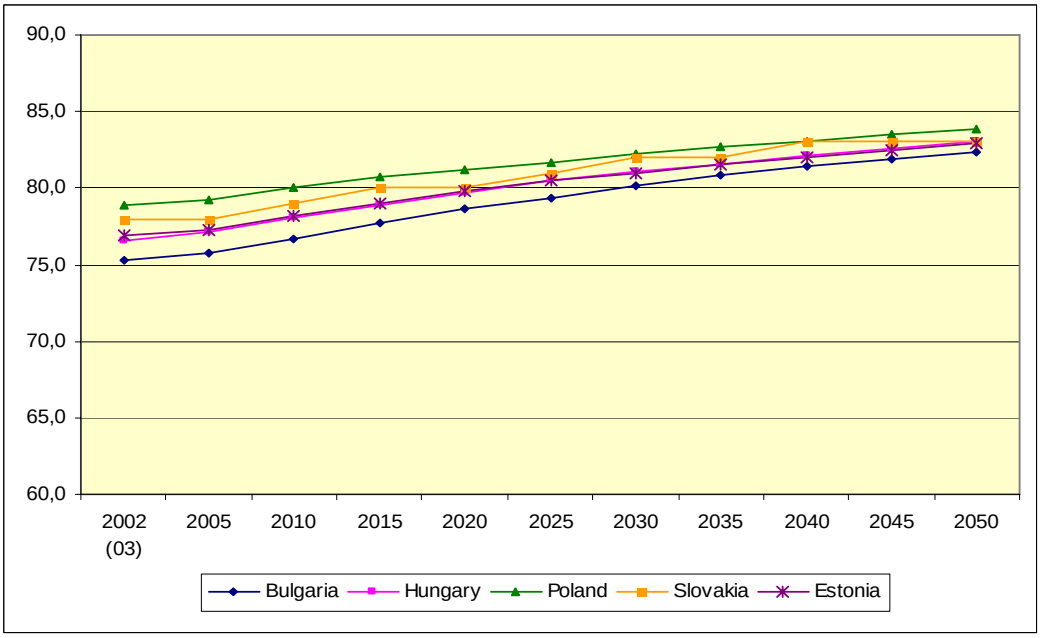
Still in the 80. CEE countries faced stagnation or in even decrease in life expectancy, especially for the population of labour market active male population (Okólski 2004, Golinowska, Sowa, Topór-Mądry 2006). Reverse of the unfavourable trend is slow, but observable in Hungary in Poland, while in Slovakia male life expectancy has not yet improved lately and in Estonia improvement is still not satisfactory.

Graph 4. Life expectancy - males



Source: AHEAD WPIX country reports

Graph 5. Life expectancy - females



Source: AHEAD WPIX country reports

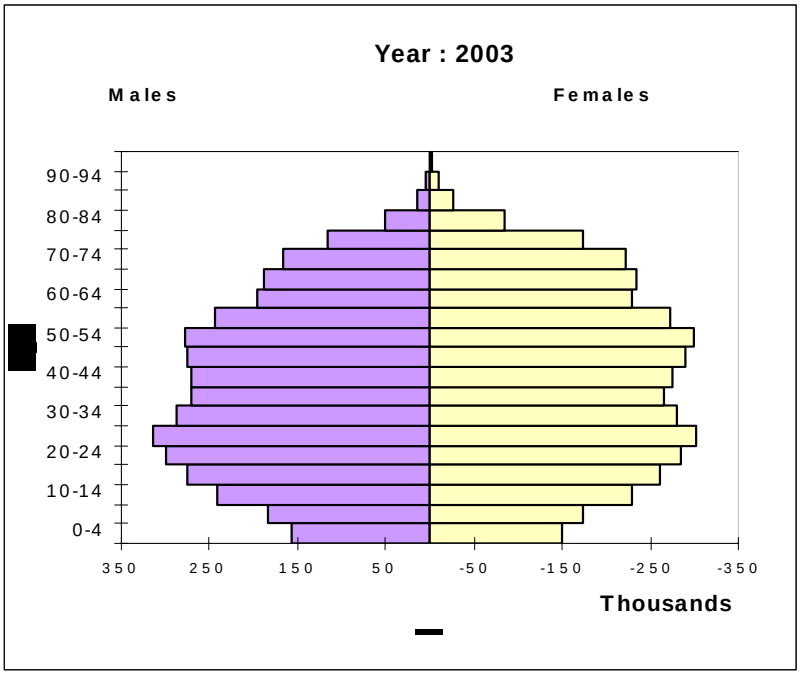
Changes in population structure – ageing

Changes in demographic structure by age are well catched by the shape of age pyramid., which already at the beginning of the projection period looks like a Christmas tree and at the end of projection shapes as a mushroom with a narrowed mushroom leg.

Graphs below present the age structure of the population in the projection base year and at the end of the projection period. In the base year, for three countries, Hungary, Poland and Slovakia, two periods of population growth are observable: the first one is the baby boom following the second world war, while the second one is its echo after the 20-25 years.

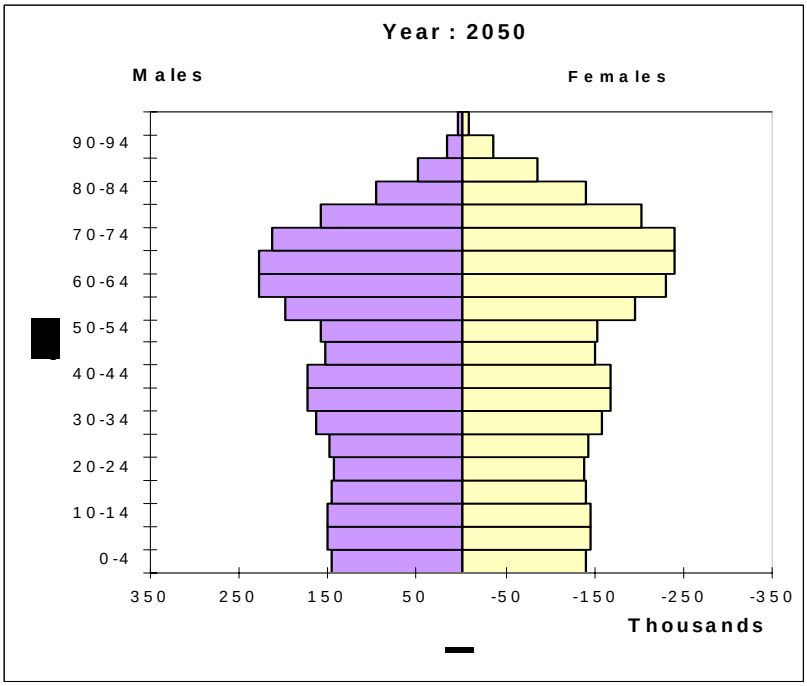
During the projection period the highest share of the population are cohorts of 55 – 75 years old. In Poland the peak is for the age of 67-68 years old, in Bulgaria about 60-70 years old, in Estonia 60-65, while in Hungary and Slovakia it is a little higher (properly 70-75 and 68-72 years old).

Graph 6. Population histogram – Bulgaria 2003



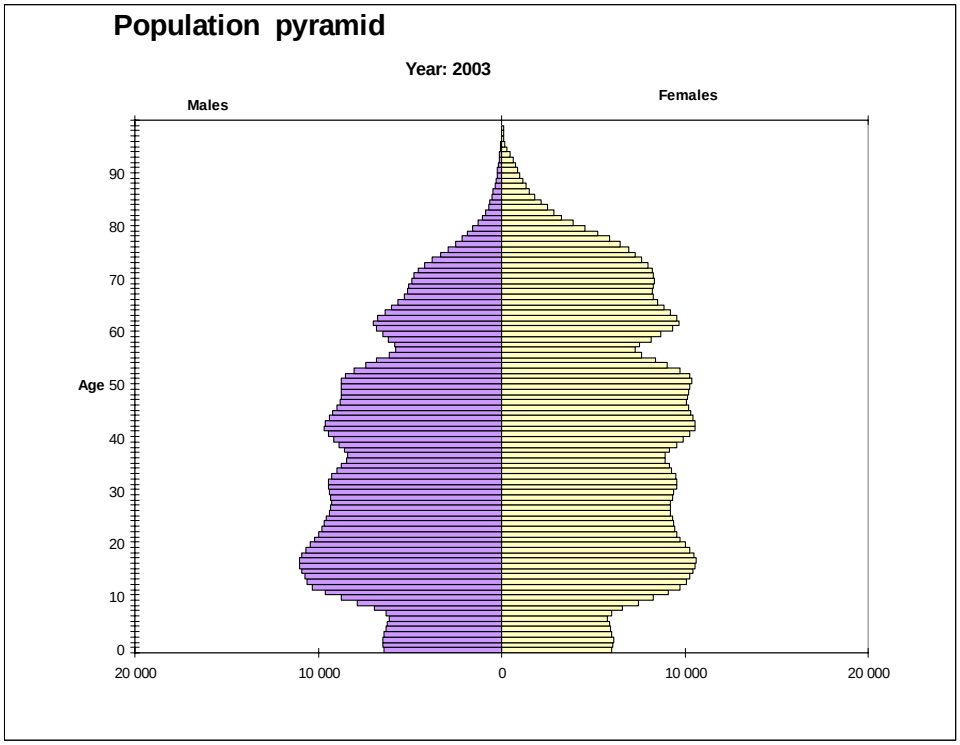
Source: AHEAD WP IX country report of R.Rangelova and G.Sariiski

Graph 7. Population histogram – Bulgaria 2050



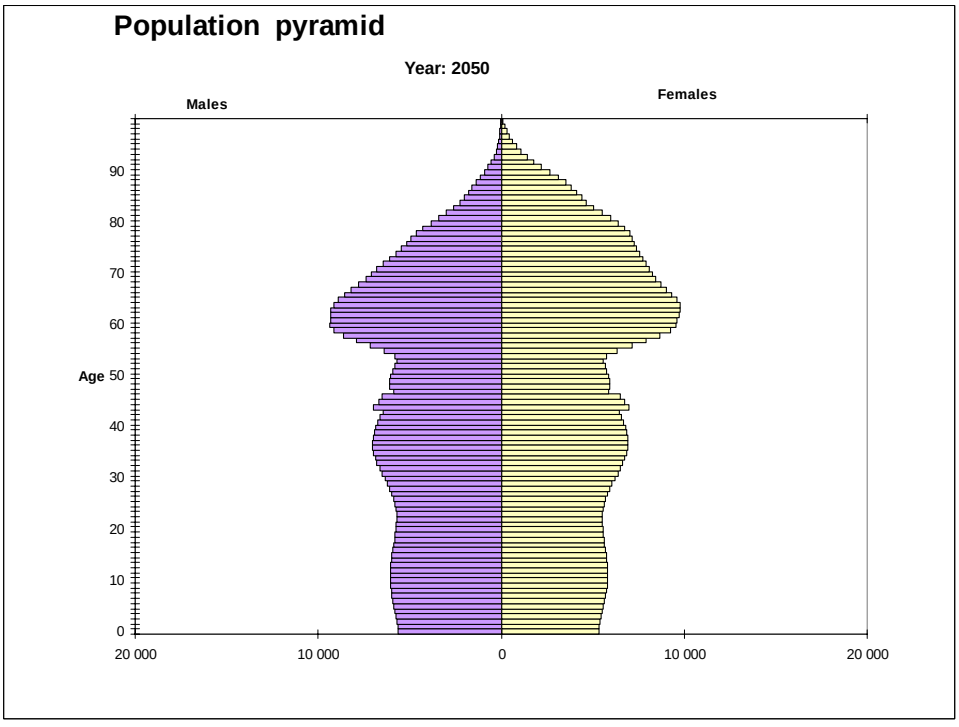
Source: AHEAD WP IX country report of R.Rangelova and G.Sariiski

Graph 8. Population histogram – Estonia 2003



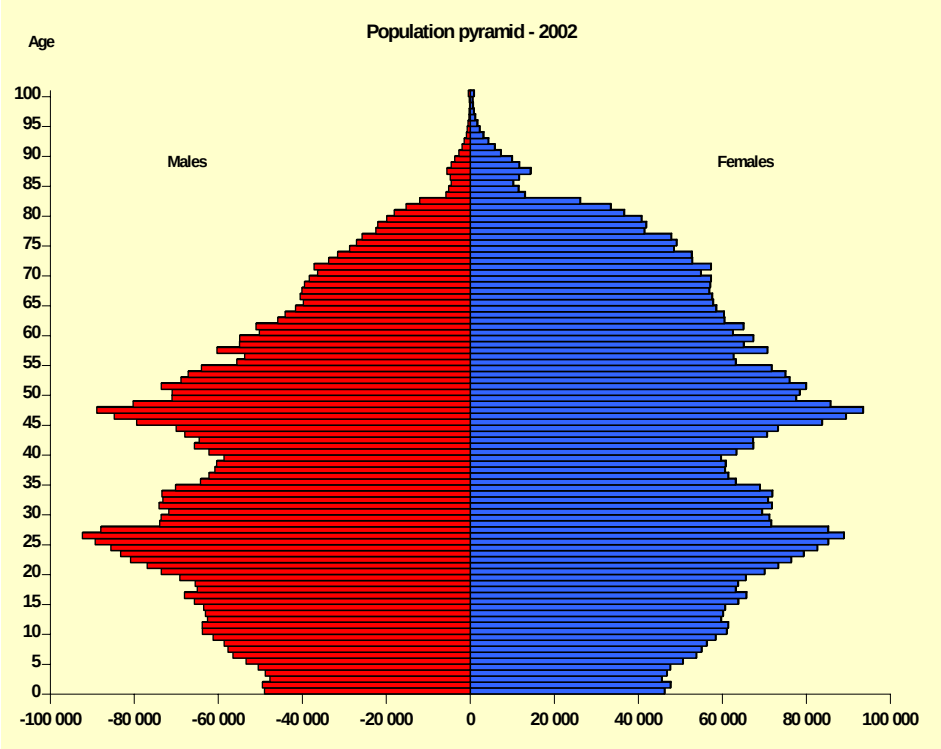
Source: AHEAD WPIX, presentation of L. Roovali, AHEAD Rome Workshop, February 2007

Graph 9. Population histogram – Estonia 2050



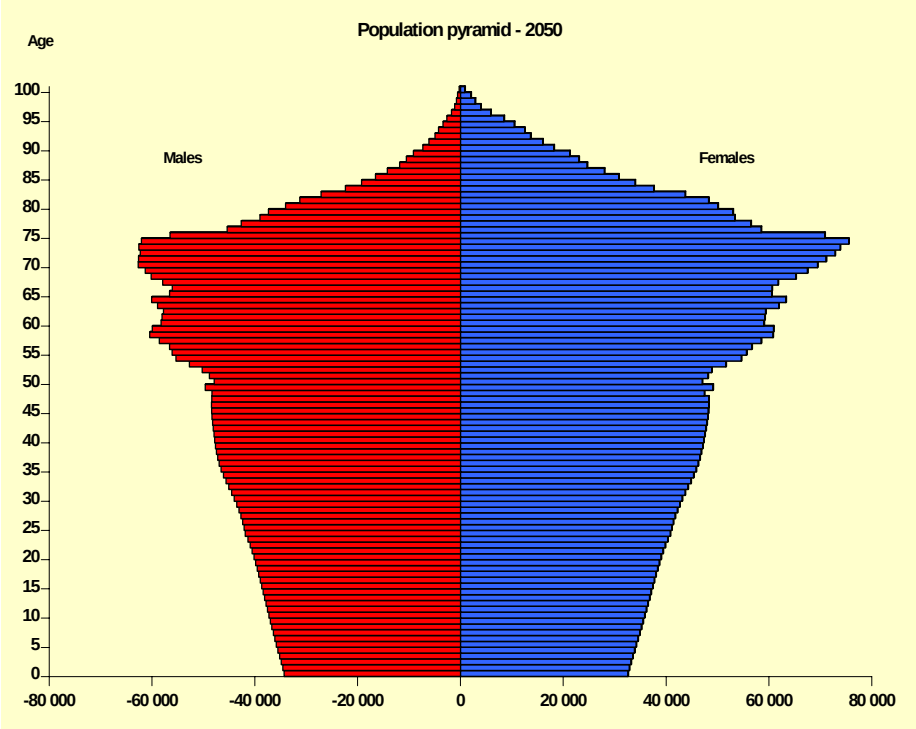
Source: AHEAD WPIX, presentation of L. Roovali, AHEAD Rome Workshop, February 2007

Graph 10. Population histogram – Hungary 2002



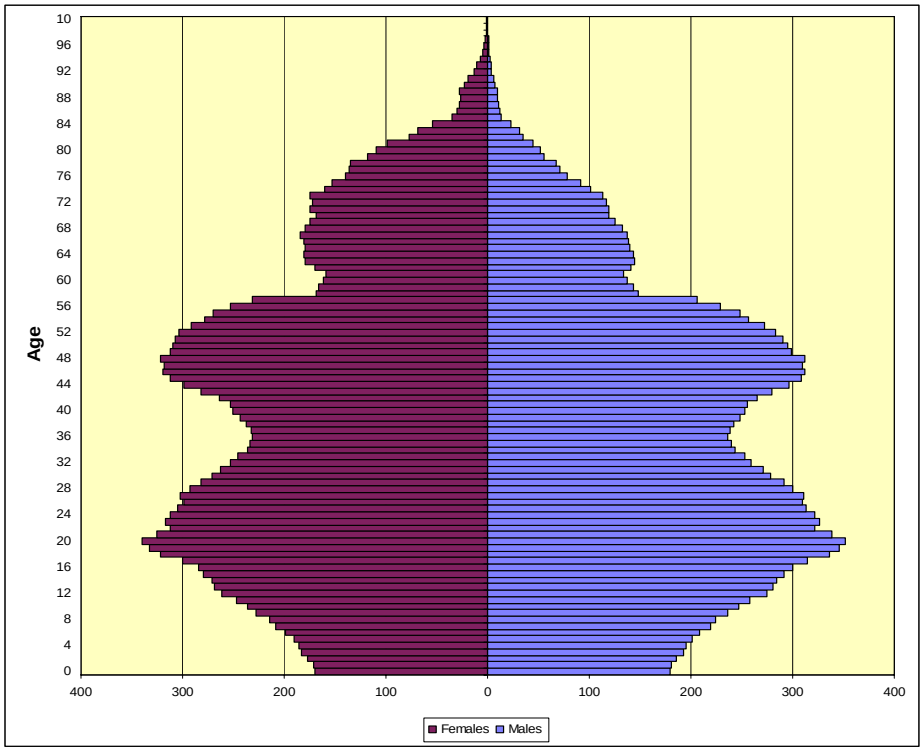
Source: AHEAD WP IX country report of AGabos and I.Gal

Graph 11. Population histogram – Hungary 2050



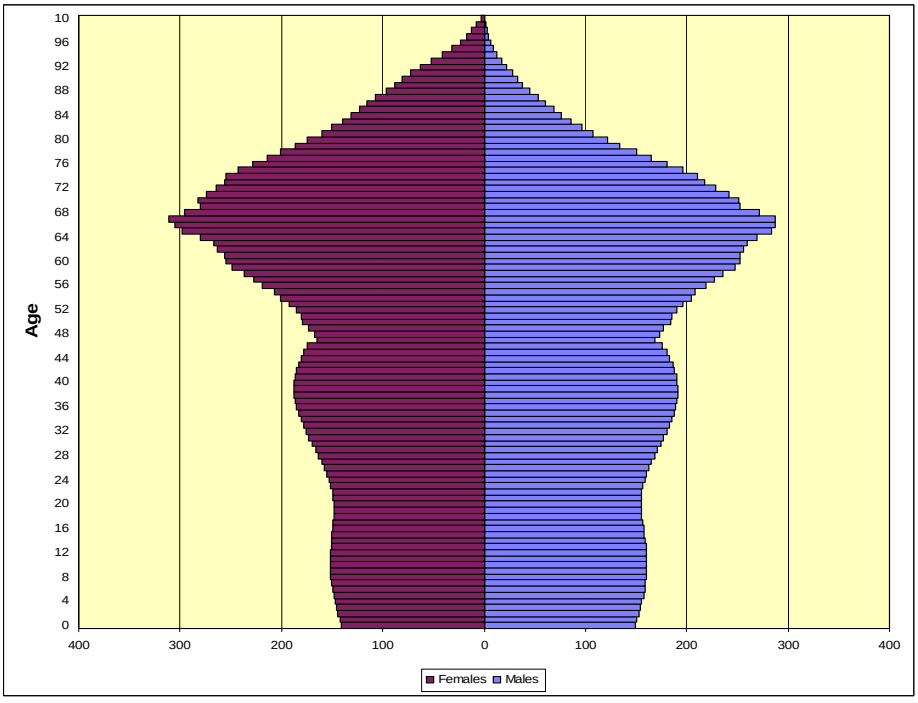
Source: AHEAD WP IX country report of A.Gabos and I.Gal

Graph 12. Population histogram – Poland 2003



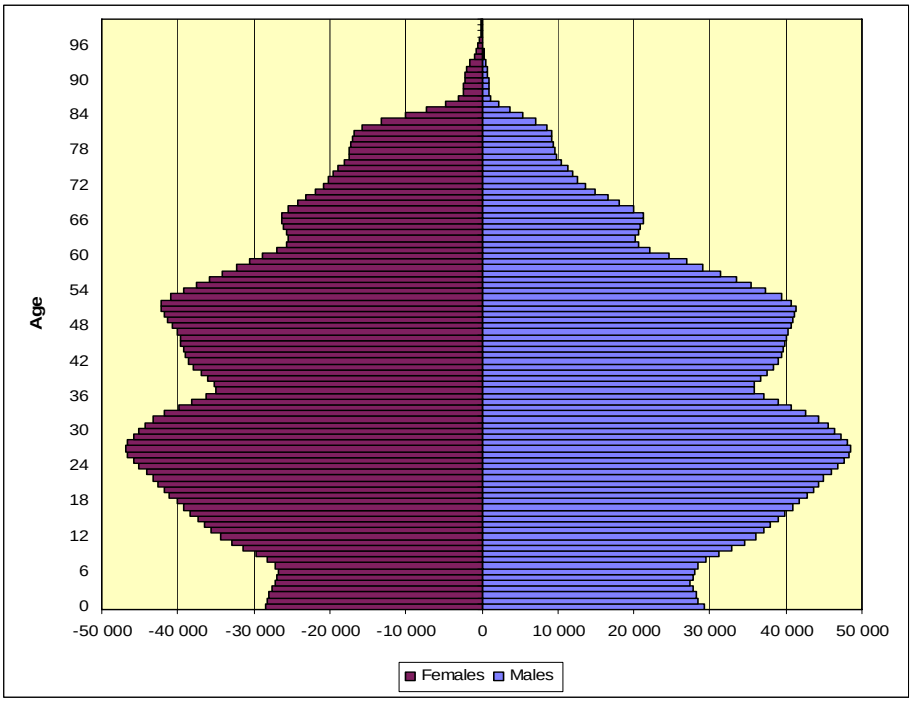
Source: AHED WP IX country report of S.Golinowska, E.Kocot, A.Sowa

Graph 13. Population histogram – Poland 2050



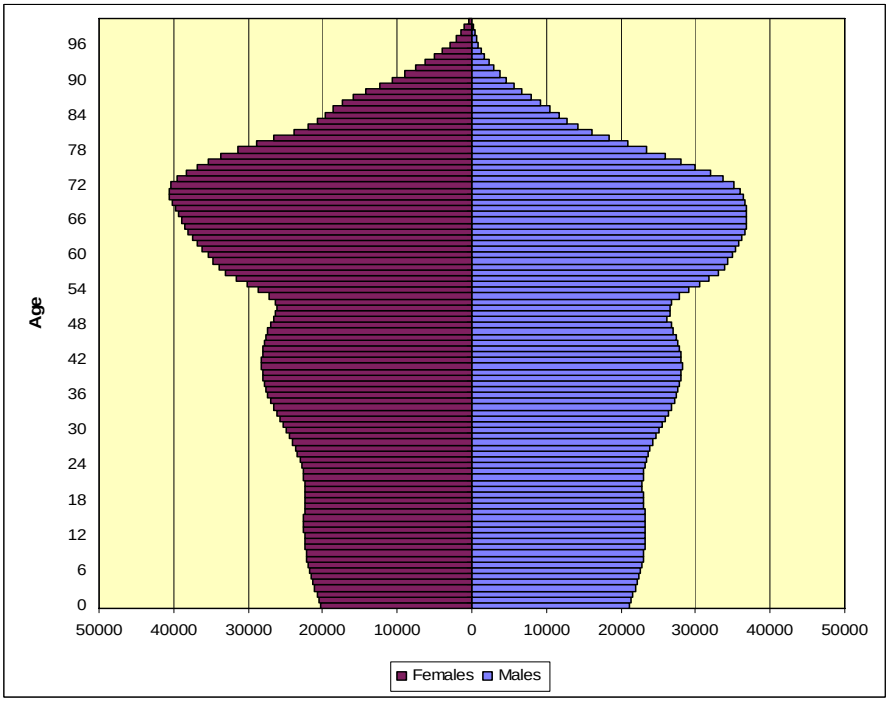
Source: AHED WP IX country report of S.Golinowska, E.Kocot, A.Sowa

Graph 14. Population histogram – Slovakia 2005



Source: AHED WP IX country report of V.Kvetan, V.Páleník, M.Mlýnek, M.Radvanský

Graph 15. Population histogram – Slovakia 2050

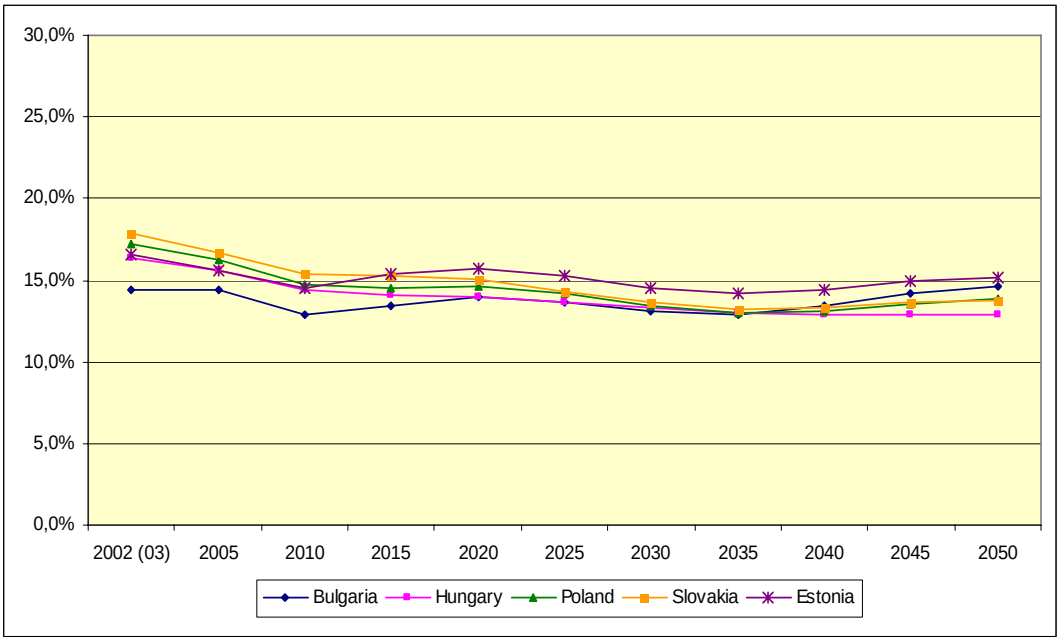


Source: AHED WP IX country report of V.Kvetan, V.Páleník, M.Mlýnek, M.Radvanský

The decrease in the share of children in the population of analysed countries is observable up to the year 2010. Following that period decrasing trend will be restrained at the level of about 15%. The share of children will begin to slowly decreases again after the year 2020.

The lowest shares of young population among countries under analyze in the first period of projection (up to 2025) are observable in Bulgaria and in the second period (up to 2050) in Hungary.

Graph 16. Share of population 0-14



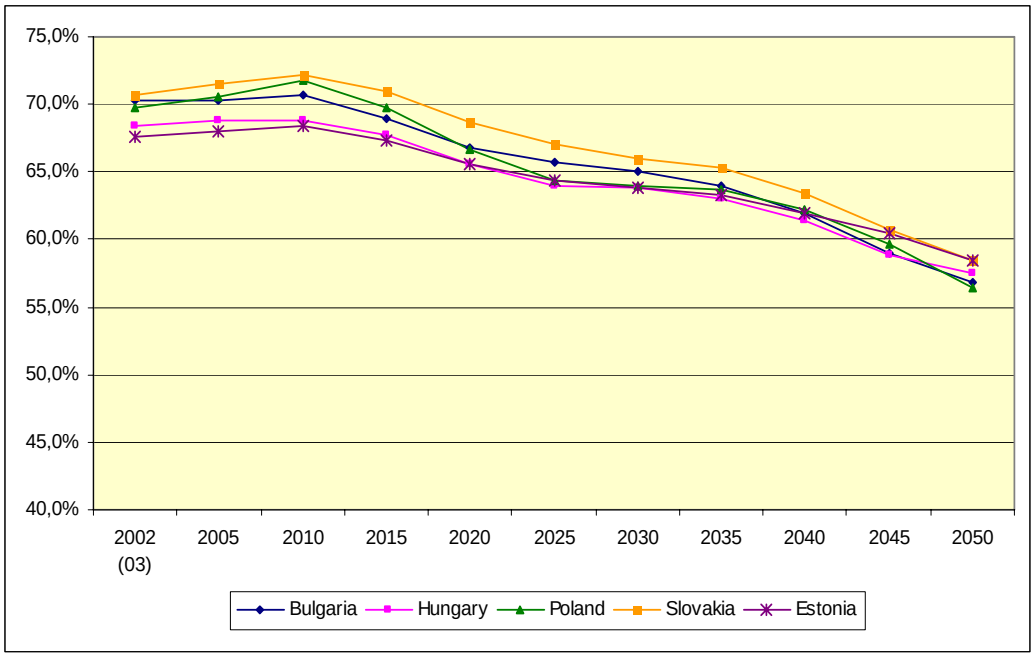
Source: AHEAD WPIX country reports

The decrease in the share of labour market active age population will be observable after the year 2010, when the baby boomers begin to retire (after the age of 65). In the NMS this drop will be rapid (about 27% compared to 13% in the EU-15) and it is foreseen that it will dynamically continue up to 2025.. In the years 2025 – 2030 the decrease will slow down, but in the last decade of projection the share of labour market active population again will rapidly shrink (Graph 17).

The scenario of labour market activity is similar in Eastern and Western Europe, although the dynamics is higher in the NMS. Decrease in labour market activity rates is the main reason for taking up actions of employment promotion and new labour market programmes at the EU-level. It also leads to changes in imigration policy in the enlarged EU. In the future, the

potential of Eastern Europe as a migration source for Western European countries will diminish.

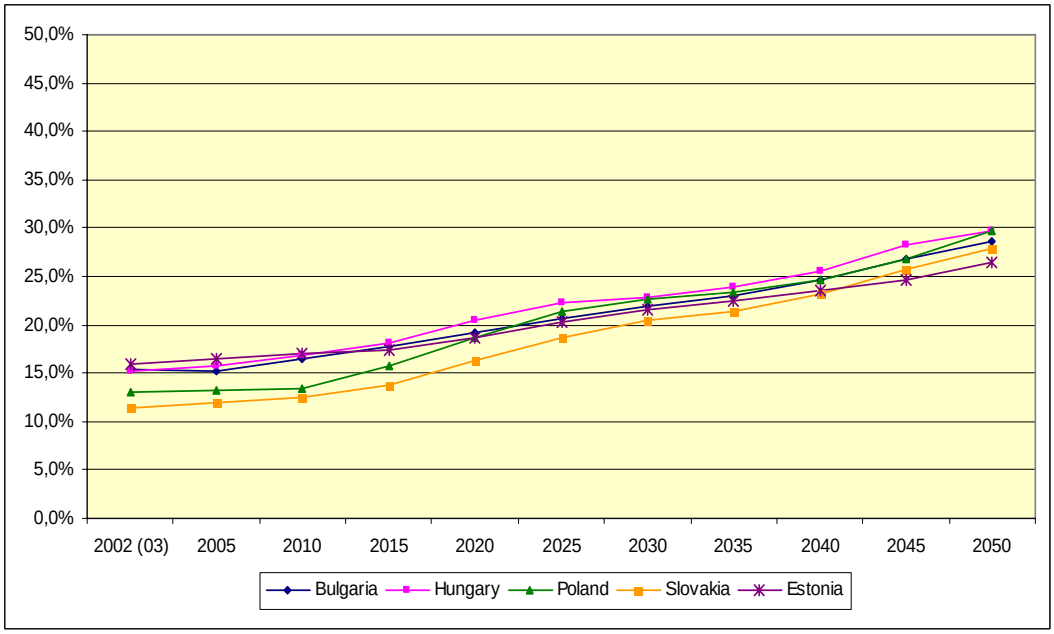
Graph 17. Share of population 15-64



Source: AHEAD WPIX country reports

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

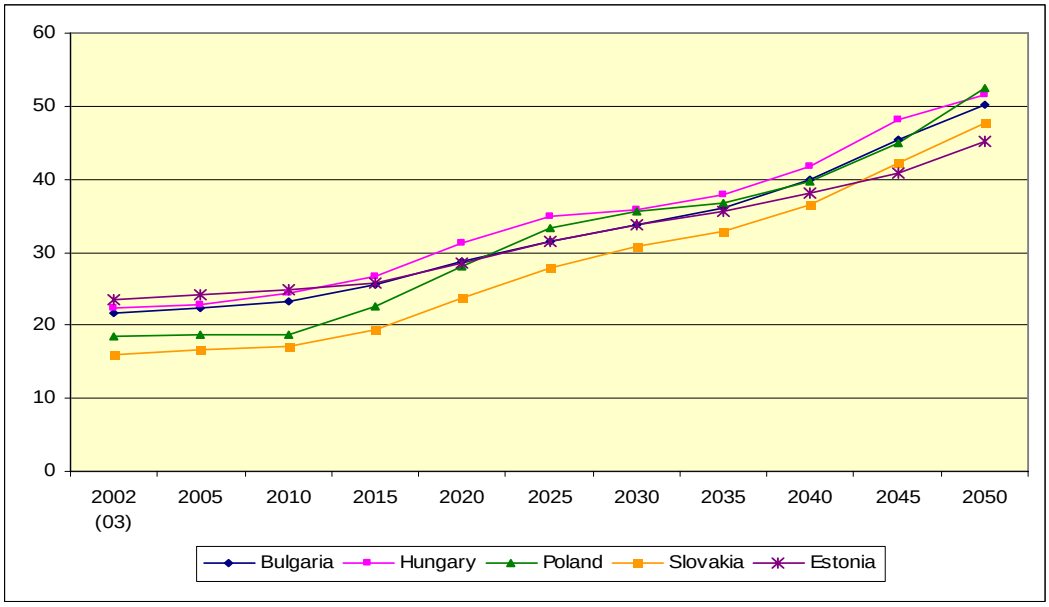
Graph 18. Share of population 65+



Source: AHEAD WPIX country reports

In result of the presented demographic scenario, the old age dependency ratio, which is calculated as a proportion of a number of elderly (65+) to the number of economically active age population doubles – from 20 to around 40% and in Hungary and Poland increases dramatically to over 50% (Graph 19).

Graph 19. Old age dependency ratio



Source: AHEAD WPIX country reports

4.2. Labour market and economic projection

The level of employment rate is one of the indicators that has worsened during the transformation period. In Bulgaria and Poland only half of the population in labour market active age is currently employed. The highest employment rate among analysed countries is in Estonia, which is also the country the highest economic growth in the last 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	66,1	70,7	73,0	75,9	77,8	77,9	77,7	77,9	77,7	78,3
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

Source: AHEAD WPIX country reports, EPC and European Com mission 2006

Assumption on employment rate development in all the countries are quite optimistic; however, they are coherent with the national action plans on employment and convergence starategies adopted by the selected New Member State (NMS) after the EU accession. This level of employment is necessary in the long run to keep economy growing even if productivity growth will be high, due to the unfavourable for the labour market demographic changes.

Compare these assumptions with EPC and European Commission projection some differences are seen, especially in the first phase of the projection period (up to 2025), In the

national projections for Poland, Hungary and Slovakia higher employment rate is assumed. In general the labour market indicators projected by EPC and Commission are worse for nearly all NMS in comparison with EU-15. It is probably the result of demographic situation in the NMS and its dominated influence on labour market activity taken into account in european projection. There are higher dynamic of a population ageing process in the NMS and faster decrease in the size of economically active age group in the result. Whereas a significant improvement of economic situation in the new european union states in the last years could be justified bases to better employment assumptions. Moreover the New Member States have started to put into practice employment improvement programmes, due to the Lisbon Strategy assumptions. These programmes could fructify in the labour market situation improvement.

There are similar assumptions of the employment rate in the national and european projections in the second part of the projection period (2025-2050). It is worth to emphasize that there is no assumption of reaching the Lisbon Strategy goals in the NMS and the national projections are even more sceptical.

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										
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: AHEAD WPIX country reports, EPC and European Com mission 2005

Projections of the unemployment level prapared by the European Commission assume that the indicator will decrease up to the NAIRU level of 6-7%. For Poland and Slovakia, which have the highest umeployment level, approaching the foreseen level will take up to 20 years (EPC and European Commission 2006).

Background for projections of the unemployment level prepared by each country is similar to assumptions made by the European Commission, although for the first period of the projections indicators are more optimistic. Only for Hungary the slope of the decrease of the unemployment rate is less steep (the 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 the unemployment rate decreases by 60-70% in the projection period, with the lowest unemployment rate foressen in 2050 in Bulgaria.

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										
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: AHEAD WPIX country reports, EPC and European Com mission 2005

The base of projection of economic growth in the analysed countries is an assumption that these countries will catch up with average european economic level relatively quick. It is

assume that labour productivity in the NMS will be definitely higher than in the EU-15, particularly with lower employment rate.

In consequence of the convergency process it is forseen GDP growth nearly two times higher than in the EU-15 in the first period of projection. The national projections are even more optimistic in the next 20 years. Nearly all states (except Hungary in the year 2025) assume higher GDP growth compared with European Commision.

In the second part of the projection period the speed of the economic growth will be approached to the EU-15. The national projections assume lower decrease of GDP growth in the second part of period as well, in Bulgaria especially. It is because of quite high labour productivity (especially productivity capital deepening) with adverse tendency in demography and labour utilisation simultaneously.

5. Projection results

Projections of the public health care sector finance (revenues, expenditures and balance result) based on social budget model ILO was prepared in some versions. The first one, the same for all analysed countries is (1) variant called baseline. This variant is based on some assumptions established for all countries:

- the base year is 2003,
- life expectancy improvement is middle, based on national demographic projections, taken into account gender and age specific mortality rate,
- total fertility rate development is medium variant of national demographic prognosis, with asssumption on unchanges or very small changes in the second period of projection (2025 – 2050)
- yearly health expenditures per capita increase with the same rate as GDP per capita (Scenario II in ILO model),
- economic and labour market variables, assume to be the most probable version of national projections, for Hungary, Poland and Slovakia based on actualised 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 unified between countries. (2) The Polish and Hungarian team have prepared death related costs scenario, where expenditures in the last year of life are taken into account. This scenario was possible thanks to desaggregation of health insurance expenditures data. (3) Next to it, the four country teams: Bulgarian, Hungarian, Polish and Slovakian prepared different prognosis depending on future LE developments. (4) Additionally three country teams: Bulgarian, Hungarian and Slovakian have prepared variants with different assumptions concerning development of wages. (5) At least different development of labour market indicators: participation rate (Hungary), employment rate (Slovakia) and unemployment rate (Bulgaria) were taken into account. (6) Variants with some combinations of different variable development assumption was also prepared, for instance wages and employment rate (Slovakia) and different wages development (Bulgaria, Hungary and Slovakia).

5.1. Baseline scenario

Revenues side

Projected revenues of the public health care sector depend on assumed scenarios of demographic variables development and economic variables development, including employment, unemployment and economic growth. Institutional arrangements of the health care sector and insurance premium are constant during the whole projection period.

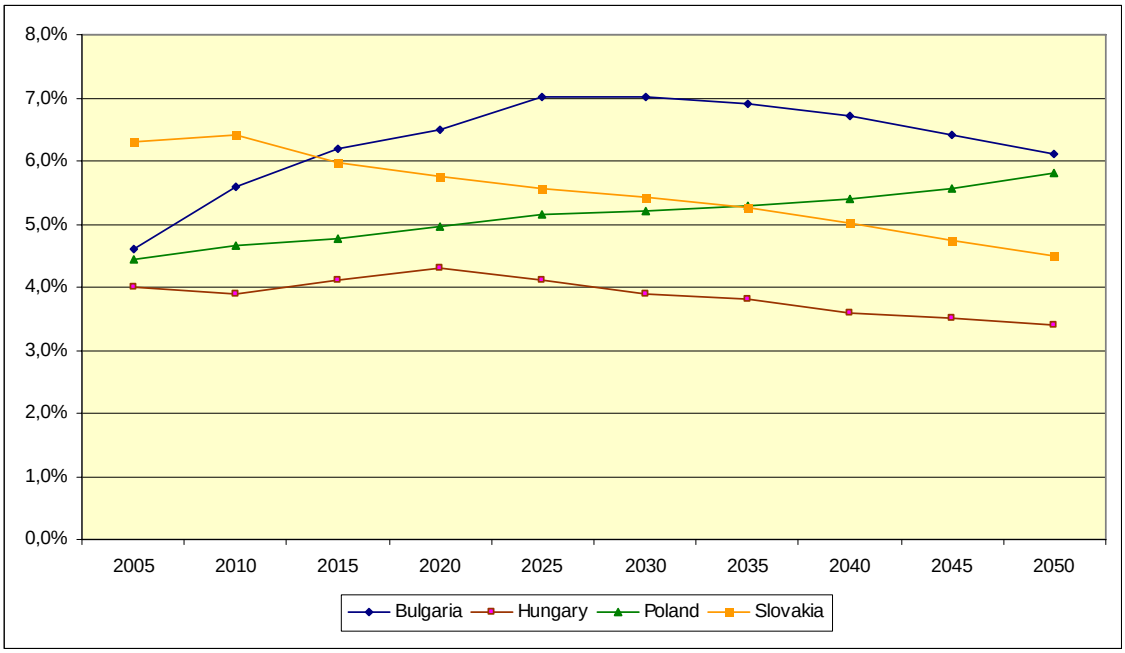
The picture of health care sector revenues in relation to the GDP is differentiated among analysed countries. In the first period of projection we observe trend of increasing revenues, however only in Bulgaria it is very strong, in Poland the trend is weaker, in Hungrary the trend is non-linear (decreasing in the first 5 years) and in Slovakia it begins to decrease already after 2010. In the second period of projections increasing trend reverses and we observe drop in the level of health care revenues in relation to the GDP. Only in Poland the revenues are almost continuously growing.

Table 7. 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										
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

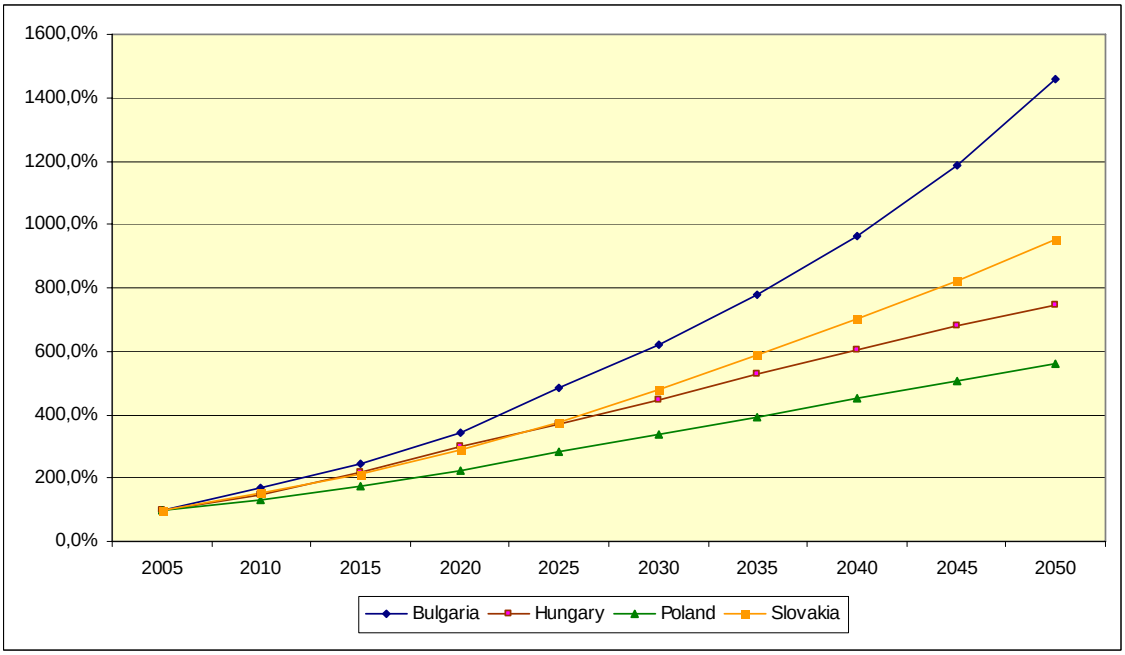
Source: AHEAD WPIX country reports

Graph 20. Total public health revenues as a share of GDP



Source: AHEAD WPIX country reports

Graph 21. Public health revenues growth relate to the year 2005 (2005 = 100%)



Source: AHEAD WPIX country reports

Expenditures side

At the beginning of the projection period analysed countries are characterized by a low share of expenditures on public health care sector in the GDP. Only in Hungary the share of expenditures is above 5% of the GDP. In the first period of projections (up to 2025), relative increase of expenditures is slow, except Bulgaria, where already in 2020 the border level of 6% of the GDP is reached[11].

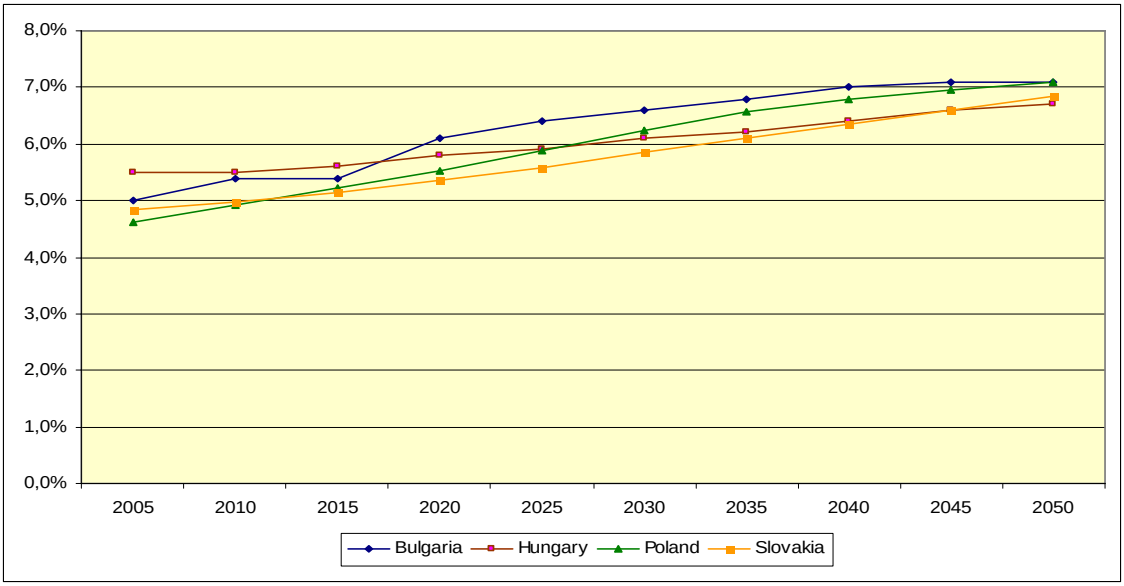
Table 8. Projected public health expenditures as a share of GDP

	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										
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: AHEAD WPIX country reports

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

Graph 22. Public health expenditures as a share of GDP

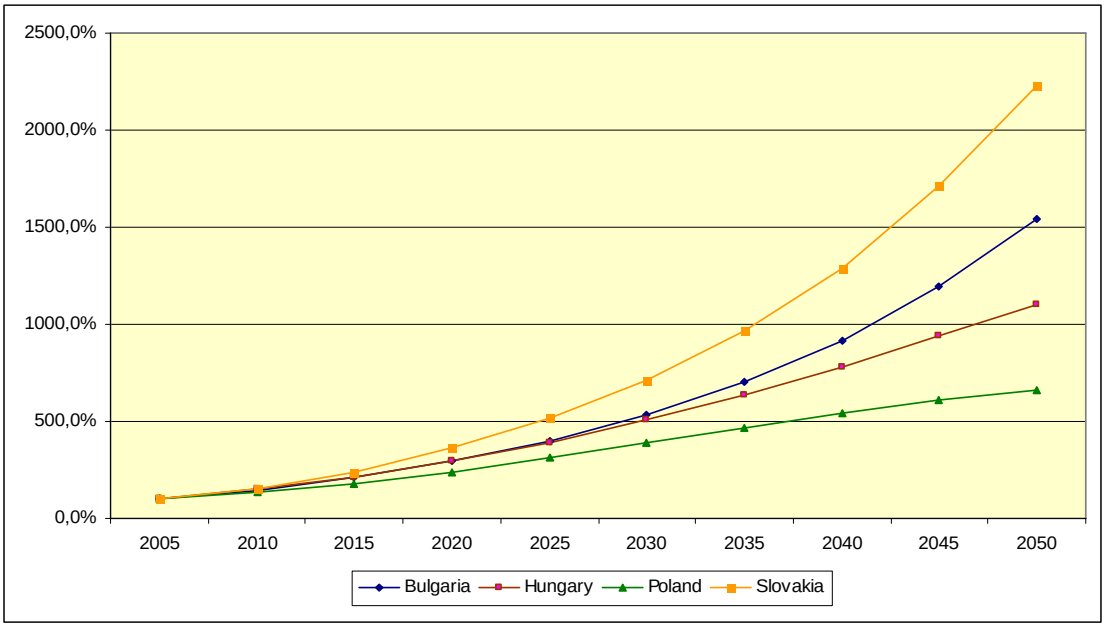


Source: AHEAD WPIX country reports

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

The highest share of public expenditures on health in GDP in the year 2050 is observable in Bulgaria and Poland. In Poland the growth rate of public expenditures on health is the highest during the whole projection period. The level of expenditures, which is the lowest from the analysed countries in the start point, increases rapidly reaching the level of 7.1% of the GDP.

Graph 23. Public health expenditures growth relate to the year 2005 (2005 = 100%)



Source: AHEAD WPIX country reports

Balance: surplus/deficit

Surplus / deficit indicators of the public health care sector financing in relation to the GDP show the scale of financial balance / unbalance and reflects financial tensions in the sector. In the base year, the health care sector is in balance only in Slovakia, what is a result of the reforms introduced several years ago[12]. Reforms included introducing co-payment for services provided in the public sector.

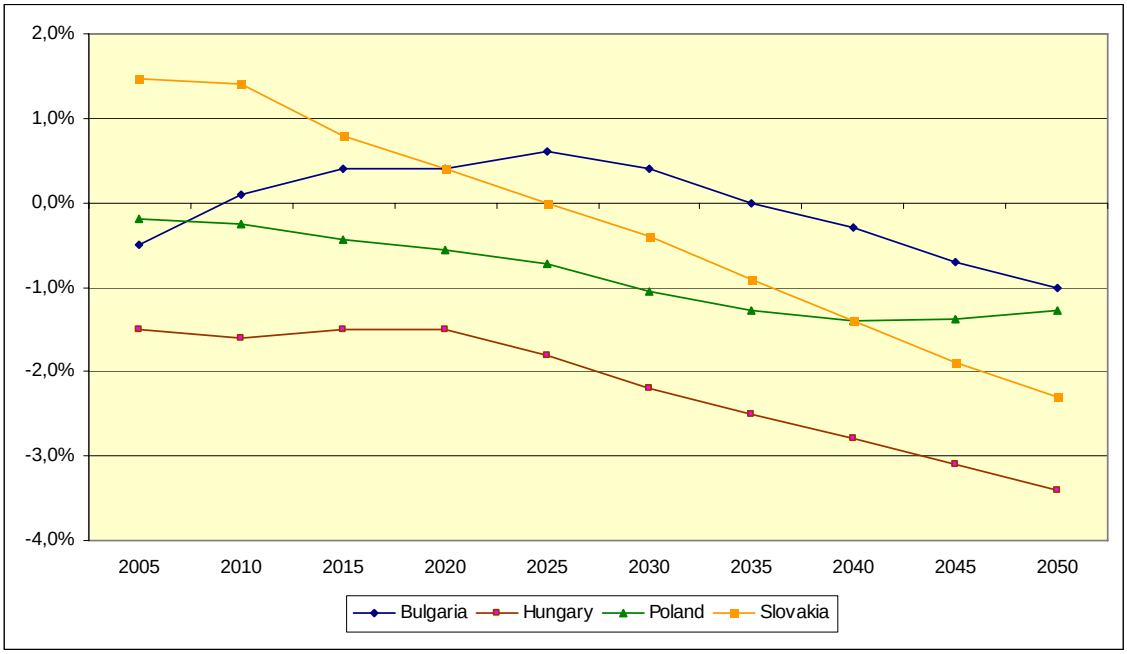
Table 9. Deficit/surplus as a share of GDP

[12] It should be noticed that currently the government withdrawds some of the introduced reforms.

	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										
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: AHEAD WPIX country reports

Graph 24. Public health surplus/deficit as a share of GDP



Source: AHEAD WPIX country reports

In Bulgaria, despite occurance of the financial deficit in the base year, financial balance is foreseen in the first period of projections and during the several following years. Bulgarian health care system faces financial deficit after 2035, but till 2050 it does not exceed 1% of the GDP, well above the level of a deficit in other countries. Poland faces the deficit starting from the base year; however further increase of the deficit is milder than in other countries and in the last years of projections the deficit even slightly decreases reaching the level close to the level of deficit in Bulgaria (1,3% of the GDP). The least advantageous situation is foreseen 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 in 2050 the level of 3,4% of the GDP.

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

Death-related costs – theoretical background

From the beginning of the 90s. numerous analysis of relation between *per capita* expenditures on health and time that is left until ones death were conducted. These researches confirm two main findings:

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

Researches indicate 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). Individual expenditures in the group of survivors on the contrary – increase with age (except the oldest age groups where in some case decrease of expenditures is observable) (Gabriele et al. 2005, Hoover et al. 2002, Serup-Hansen et al. 2002, McGrail et al. 2000). McGrail et al. argues that expenditures on nursery and social care increase with age, indendependently of the status of the patient and proximity to death. Similar relation are confirmed in reasarch 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 that were analysed, in the third, second and last year before death the number of days of hospital care decreases with age.

A high share of aggregated health expenditures is targeted towards care of persons in the last year of life. According to Medicare expenditures in 1978 (Lubitz, Prihoda 1984) the health expenditures on persons who died the same year amounted to 28% of the total health expendiures of Medicare. These expenditures were burned on care of only 5,9% of the population that was covered by the analysis. In the following ten years, percent of deceased that were covered by the Medicare was between 5,1-5,4% and costs of their care was at the level of

26,9-30,6% annually (Lubitz, Riley 1993). In 1992 – 1996 the share of costs on persons in the last year of life amounted to 26% of total costs of Medicare (Hoover et al. 2002), thus only shlight differences in costs are observed in years. Similar findings were described by Seshamani & Gray (2004), who found that 28% of hospital expenditures in England were generated by the deceased.

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

Assuming increasing life expectancy and decreasing mortality rates, the moment of death and higher health expenditures is moved towards older age. The average expenditures by age change over the years so, that 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).

A common problem in estimation of increased expenditures realted to death is lack of necessary data on average health expenditures on deceased and average health expenditures on survivors. One of solutions to this problem is usage of DRG data (Ahn et al. 2005); however, in countries where DRG payment system has not been introduced, the problem remains.

Due to the lack of necessary data most of researches is based on a division of the population on two groups: of deceased and 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). The health expenditures cumulate especially during the last 2-3 months of life (Hoover et al. 2002 – 51% in the alst 3 months of life, Lubitz & Riley 1993 – up to 50% in the last two months). Only in some research expenditures are examined depending on the time left to death in the period longer than 1 year (Kildemoes et al. 2006 – two years before death for the pharmaceutical expenditures, Batljan & Lagergren 2004 – 8 groups of population for hospital expenditures and death in a given calendar year (0 years till death), 6 groups depending on closeness till 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, analysed for hospital expenditures Busse et al. 2002).

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

There are difficulties in comparison of projections prepared in different countries maliny due to diversified baskets of benefis that are included in analysis, different period before death and differences in age groups that are analysed.

Table 10. Selected results of analysis of proporion of expenditures per deceased to expenditures per survivor (k indicator).

Autor of the analysis	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	Pharmaceticals	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-years age cohorts	For all age groups: Lombardia: 13,8 Toskania: 14,0 Apulia: 11,9 Abrucja: 10,2			
Ahn et al. (2005)	Spain	Hospital care	5-years age cohorts	Age 0 1-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 41-45	Indicator 7,6 71,1 82,1 92,7 96,5 75,6 48,9 40,7 43,7 43,5	Age 46-50 51-55 56-60 61-65 66-70 71-75 76-80 81-85 86+ Total	Indicator 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 ambulatory care, long term care excluded	Indicators with no distinction by age	5,96 for ambulatory care, 21,5 for hospital care.			
National Health Insurance Agency 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-years age groups	Age <24 25-34 35-44 45-54 55-64		Indicator 29,2 30,8 31,0 21,1 17,6	

				65-74 75-84 85+		12,0 6,6 4,3
Hoover et al. (2002)	USA	Medicare	Three age groups: oper 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 nursery (half 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

Presented above compilation shows differences of results for the *k-indicator* analysis in depending on a country, age and type of services under research. Irrespectivelly of shown values of the *k-indicator*, decreasing trend of the indicatory by age is identified (except the youngest age cohort, what is related to intensive treatment of newborns).

Table 11. Indicator of proportion of of expenditures per deceased to expenditures per survivor ECFIN data.

Grupa wiekowa	Belgia		Czechy		Dania		Hiszpania		Włochy		Holandia		Austria		Polska		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

Źródło: European Commission (2006) –ECFIN calculations based upon country sources

* M - males, F - females

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

Due to restricted availability of appriopriate data, scenerio of health expenditures corrected by death-related costs is conducted only for Hungary and Poland. Methodology described above and in the Annex 1 was prepared for Poland and further applied to the Hungarian data. Slight differences between the two estimations include different age groups (5-years cohorts for Poland and 10-years cohorts for Hungary) and the base year for calculations (2004 for Poland and 2002 for Hungary). The basis for estimations are in case of Hungary the total health expenditures, while in case of Poland these are insurance expenditures.

Dividing the population on the two groups: deceased and survivors does not impact projected revenues, but only impacts projected expenditures and – in result – the size of a financial deficit.

In case of both countries, including in projection different level of average *per capita* expenditures depending on the status of a person (deceased or survivor) slows down an increase of foreseen expenditures and – in result – decreases projected health care system financial deficit.

Table 12. Projected public health expenditures and deficit with / without death-related costs

	2010	2015	2020	2025	2030	2035	2040	2045	2050
POLAND									
Total public health expenditures – A (mln PLN)	56 654	76 414	100 683	129 842	162 756	196 793	228 340	255 028	275 730
Total public health expenditures – B (mln PLN)	56 131	75 211	98 500	126 199	157 216	189 222	218 565	242 699	260 821
Reduction of projected health expenditures (%)	0,92	1,57	2,17	2,81	3,40	3,85	4,28	4,83	5,41
Deficit – A (mln PLN)	3 015	6 470	10 255	15 890	27 159	38 336	46 848	50 777	49 777
Deficit – B (mln PLN)	2 493	5 267	8 072	12 246	21 619	30 764	37 072	38 448	34 869
Reduction of 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 (bln HUF)	1 800	2 585	3 551	4 721	6 100	7 686	9 451	11 313	13 242
Total public health expenditures – B (bln HUF)	1 780	2 538	3 457	4 551	5 851	7 295	8 896	10 545	12 153
Reduction of projected health expenditures (%)	1,14	1,82	2,64	3,60	4,07	5,09	5,88	6,79	8,23
Deficit – A (bln HUF)	518	686	906	1 456	2 159	3 040	4 100	5 297	6 642
Deficit – B (bln HUF)	498	639	812	1 286	1 911	2 649	3 545	4 530	5 553
Reduction of projected deficit (%)	3,96	6,85	10,35	11,67	11,51	12,87	13,54	14,49	16,40

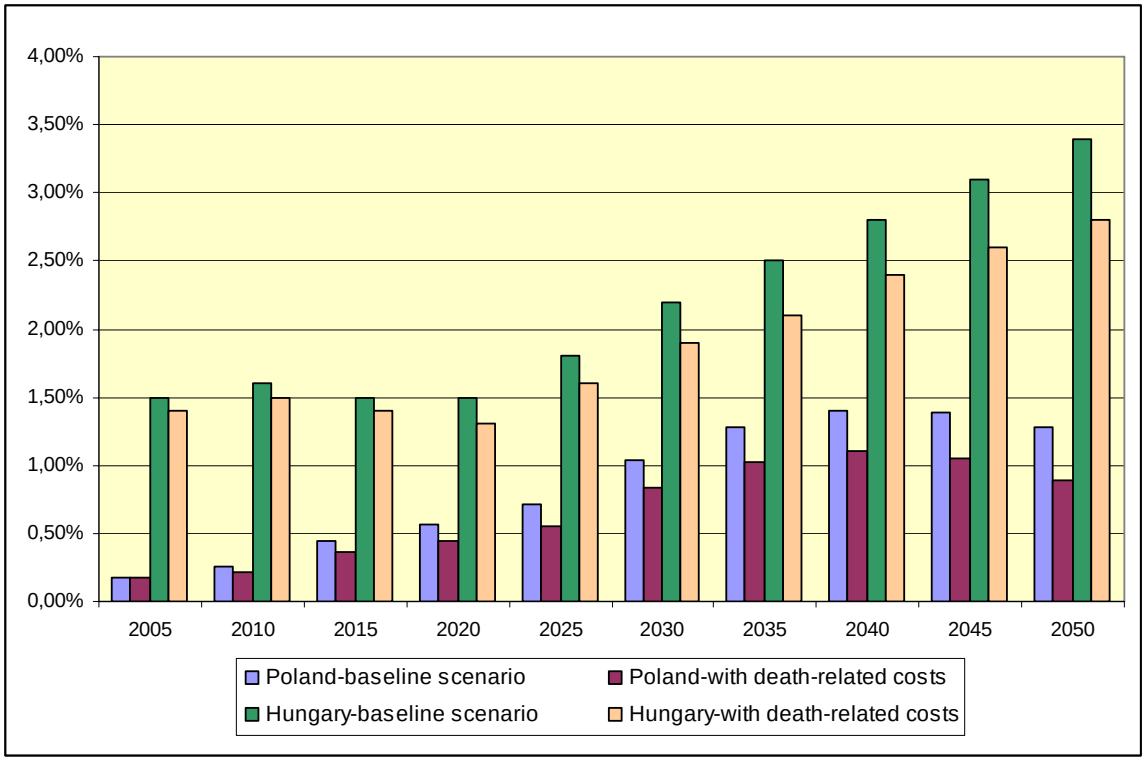
Source: Own projections and calculations

A – baseline scenerio

B – death-related costs scenerio

Table 12 presents projected total public health expenditures in Poland and in Hangary, depending on assumptions made. Including differences in average *per capita* expenditures per survivors and per deceased results in decrease of projected health expenditures in Poland by 0,92% (compared to the baseline scenario) and in Hungary by 1,14% already in 2010. Difference between the baseline scenario and death-related costs scenario widens in years, amounting to 5,41% for Poland and 8,23% for Hungary at the end of projection period. Decrease in foreseen level of expenditures is reflected in decrease in foreseen deficit. In Poland reduction of the deficit amounts to 17% in 2010 and close to 30% in 2050. In Hungary reduction of the deficit is not that impressive, but still very significant – close to 4% in 2010 and over 16% in 2050. The lesser extent of deficit reduction in Hungary is a result of the size of the deficit – already in the year 2025 the deficit amounts to 30% of the foreseen total health expenditures and in 2050 it amounts to 50,2%. In Poland projected financial balance is slightly better as the peak of the deficit is in 2040 and amount to 21% of total health expenditures.

Graph 25. Projected deficit in Hungary and Poland as a percent of the GDP



Source: Own projections and calculation

The difference between the size of the deficit with and without death-related costs assumption is significant and widens during the projection period for both countries, despite

differences in the size of the deficit between countries (measured as a percent of the GDP). By the end of projection period, the reduction of projected deficit ("with" comparatively "without" death-related costs) equals 29,95% in case of Poland and 16,4% in case of Hungary.

Overall, the results confirm findings other publications (some of them are quoted above) indicating that taking into account increased health expenditures in the last year of life has a significant impact on the results of projection and decreases foressen expenditures level.

5.3. Scenarios of diversified longevity

Scenarios of different development of longevity were prepare for all analysed countries. There are three possibilities of improvement of life expectancy in the used model: fast, middle and slow. In the baseline scenario the middle one was assumed, two residual was considered as alternative scenarios.

Table 13. Projection results of the scenarios of different life expectancy improvement: slow, middle (baseline scenario) and fast (as a share of GDP)

	LE –slow growth			LE – middle 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
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: AHEAD WPIX country reports

There are no significant differences between scenarios results. In general, faster life expectancy improvement can lead to the deficit deepening, but the scale of that effect is quite small (no differences in the Bulgarian deficit, 0,1 percentage point in Hungary and 0,07 percentage point in Poland). Faster LE changes influence both sides of health care financing – expenditures and revenues – there are more old people to take care of health services because of specific pattern of mortality and morbidity among elderly and on the other side, probably because of positive influence on employment rate. Expenditures growing faster than revenues, so deficit is higher. In case of slower life expectancy improvement the effect is opposite.

5.4. Scenario of diversified wages growth

Pay-roll tax or insurance premium are the main sources of revenues for social and health insurance system. Therefore the wage development has got a significant influence to revenue side of health sector finances model. In the baseline scenario there was assumed that the wage growth will be a derivative of assumed labour productivity, which variable is a drive to convergence strategy[13]. In the alternative scenarios there was assumed additionally that these variables (productivity and wages) will differ 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% during the all period) in the prognosis period, health sector deficit will be at least 1 percentage point of share in GDP lower. Though higher average wage growth influences increase of health expenditures, by enlarging labour costs, but this effect is smaller than the effect of revenues increasing. Hence, positive impact on the heath sector finances balance.

The lower wages growth variant (in Bulgaria 0,6 percentage points lower in 2025 and 1 p.p. in 2050, in Hungary 0,5% from 2007) give the opposite results – higher deficit compared to baseline and two times higher in comparison with high wages growth variant.

[13] I the baseline scenarios of convergence strategy preparing in the national plans and in the AWG report (EPC and European Commission 2006) was assumed that welfare in NMS will be close to an average EU level in the final part of projection period, what means that labour productivity rate should be three times higher in the some following years and two times higher at the end of the first part of the projection period (up to 2025)

Table 14. Scenarios of different wages development. Expenditures, revenues 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: County reports of Bulgaria, Hungary and Slovakia

5.5. Scenario of diversified labour market indicators development

Different values of indicators characterizing labour market situation: employment rate and unemployment rate modify, of course, projection results, but the scale of this is smaller than in the case of wages growth indicators. In the Hungarian report the following conclusion on that base is even drawn: „ Hungarian health care sytem could not expect an improvement of its currently expected financial problems slolely from increasing employment rates" (Gabos, Gal, WPIX Country report - Hungary 2007).

Similar, slight influence on the health sector financial balance and none on health care expenditures follow from the employment rate diversification, in the projections made by Slovakia (Kvetan, Palenik, Mlynek, Radvansky, Country Report - Slovak Republic 2006).

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

		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

Sources: Country report from Hungary

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

		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

Sources: Country report from Slovak

The Bulgarian team have prepared projection variant on the different unemployment rate assumptions. The results presented in the Table 17 do not confirm this variable impact on the health care sector finances condition. It seems that unemployment rate indicator is not good enough to ilustrate problems connected with the labour market in the context of health care sector budget projection.

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

		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 is the same value as in the baseline scenario)

Source: Country report from Bulgaria

5.6. Sensitivity analysis

For the purpose of sensitivity analysis of projection results there was created a new indicator – relative change of revenues (respectively expenditures and balance effect: deficit/surplus) in the consequence of analysed parameters changes. The method of sensitivity analysis is the same after all. The analysed year is 2050, the last year of the projections period. The indicator has got percentage value. The following scale of sensitivity was accepted:

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

In the sensitivity analysis the relative change in the changing parameter value was not taken into account - it was recognized simply as a probable for the analysed country. The death-costs scenario has got a different character than the other scenarios, because the revenues (expenditures, deficit/surplus) change is the result of a new variable used, not a change of the variable used previously.

Table 18. Revenue side sensitivity

Country		Bulgaria			Hungary			Poland			Slovakia		
Sensitivity degree / Scenario		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		
	Slow	X			X			X			X		
Wage growth	Faster		X			X		-				X	
	Slower		X			X		-				X	
Employment rate growth (activity rate for Hungary)	Faster	-				X		-			X		
	Slower	-			X			-			X		
Unemployment rate decline	Slower	X			-			-			-		

- means no that kind of scenario prepared

Source: own calculations based on the country reports

Table 19. Expenditure side sensitivity

Country		Bulgaria			Hungary			Poland			Slovakia		
Scenario \ Sensitivity degree		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		
	Slow	X			X			X			X		
Wage growth	Faster		X		X			-			X		
	Slower	X			X			-			X		
Employment rate growth (activity rate for Hungary)	Faster	-			X			-			X		
	Slower	-			X			-			X		
Unemployment rate decline	Slower	X			-			-			-		

- means no that kind of scenario prepared

Source: own calculations based on the country reports

Table 20. Deficit/surpluse sensitivity

Country		Bulgaria			Hungary			Poland			Slovakia		
Scenario \ Sensitivity degree		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		
	Slow	X			X			X			X		
Wage growth	Faster			X		X		-					X
	Slower		X			X		-				X	
Employment rate growth (activity rate for Hungary)	Faster	-				X		-			X		
	Slower	-			X			-			X		
Unemployment rate decline	Slower	X			-			-			-		

- means no that kind of scenario prepared

Source: own calculations based on the country reports

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

The consideration of higher health expenditures in the last year of life have no impact on revenue side, a little impact on expenditures, but it influences on the deficit stronger (nearly 18% in Hungary and 29% in Poland).

In the case of different life expectancy scenarios revenues, expenditures and deficit as well are insensitive, reaching even 0% value sometimes.

As it was mentioned, the stronger impact can be seen in the case of wage growth rate changes, especially on the revenue side.

The projection results are not sensitive on the labour market variables changes, except the impact of higher activity rate in Hungary on the revenue side and on the deficit as a result.

6. Conclusions, discussion and policy recommendation

Health care sector balance projections, based on the ILO social budget model, show basic trends of the future revenues and expenditures development that result from the impact of so called external factors, being outside of the health care system: demography and economy as well as current medical services utilization pattern depending on age (*J curve*). Variables that characterize the ageing of the population are especially important for the results of the analysis. These factors include increasing share of elderly in the population, decreasing share of labour market active population and – in result - decreasing labour supply and changing trends of labour productivity. Impact of these factors was also reflected in assumed scenarios of future economic growth development. Foreseen revenues, expenditures and public health care sector balance are presented in relation to the economic growth.

Results of the health care sector financial projections allow to analyze simultaneously (at the same time) two sides of the public health care sector: revenues, expenditures and financial balance (surplus/deficit) with interactions between sides and impact on balance effect. This is the advantage of the ILO social budget model. In result, conclusions and recommendations are well targeted, depending on the element of the health care sector that each of the variables addresses.

If the labour market activity rate strongly impacts revenues of the health care sector, decreasing public health care sector deficit, recommendations address labour market policy and economy. This policy includes high economic growth, taxables income and employment.

If – on the other hand – longevity strongly impacts increasing expenditures, policy is targeted towards expenditures decrease, which is less effective policy. Rational demographic policy, which is needed to shape expenditures of the health care system, should create incentives towards changing values and behaviors in the lifecycle related to procreation and health. It is necessary to add that there is a relation between longer economic activity and health of the population. Only healthy and more active population can stay active on the labour market for longer period, what leads to increasing expenditures on health, especially public health.

Health care sector model also takes into account expenditures on health, modified by higher costs borne in the last year of life. Restricted access to data was a constraint in prepare similar projection in all analysed countries. However, projections for Hungary and Poland

confirm that death-related costs is a significant factor. Longevity leads to "extention in time" of higher health care costs that are borne in the last year of life. In result, aggregated health expenditures in a given projection period are lower. Scenario of death-related costs significantly decreases the foreseen health care system financial deficit as compared to the baseline scenario. However, impact of the factor of death related costs on expenditures is restricted, due to the fact that it depends on future possible longevity developments (which is najprawdopodobniej not infinite).

In the table below the fundamental results of prepared analysis and projections are compiled, with generalized relationships and tendencies. They are directional similar in the analysed group of countries. These countries, experiencing by higher dynamics of demographic changes and being on the lower level of economic development simultaneously, are endangered stronger tensions and even conflicts between goals concerning future development.

The decisions concerning health care sector financing will belong to particularly socialy and politicaly sensitive for the sake of higher health needs on the one hand, and on the other hand to economicaly necessary for the sake of relatively high costs scale; incured already and potencialy. Need to say that one of the more crucial cost drive in the health sector – new medical technology costs – was not separated and taken into account in the prepared analysis.

Table 21. Summing up - factors influenced budget of health care sector in the projection exercises

Sides of the budget	Variables	Channel trough which budget side is affected	Effect on projection results - evidence
Revenues	Demographic: population size, TFR and longevity	Population size and age structure determines the number of persons who potentially can contribute to the public health budget	Positive effect for variants of improvement demographic development: especially TFR and healthy longevity, negative - for declining of population and dynamic aging. Quantitative longevity - not qualitative.
	Labour market development: participation rate and employment rate	Higher employment rate increases size of tax payers (contributors) to health budget	Evident positive effect with strengthen by increase of wages in Slovakia, moderate positive effect in Hungary,
	Economic development: wages	Wages are the main source of taxable income	Positive effect, evidenced for Hungary, Slovakia and Bulgaria
	Utilization pattern	Promotion of investing	Assumption - not modeled

		in health; acceptance for increase of paying for health	
Expenditures	Demographic: longevity and age structure	Increase of aging and longevity enlarges time spent in poorer health status	Positive effect: higher for Bulgaria, moderate for Hungary
	Death related costs	Morbidity picture of elderly tends to increase expenditure sharply at older age, but the costs are significant higher only in the last year of life, so the ratio between decedents and survivors declines with age	Slower increase; 1 percentage point of GDP (Poland) and 0,7 (Hungary)
	Labour market development: employment and unemployment	Unemployment leads to poorer health status and more frequent health services using	No evidence
	Economic development: wages, labour productivity and GDP	Income elasticity of demand for health rather neutral at an aggregate level Increase of wages means higher labour cost in the health sector as well	Moderate influence
	Utilization pattern	Changes with the line of ageing and wages increase when income elasticity is more than 1.	Assumption
Financial balance	Demographic: population size, age structure, longevity	Strengthen effect by both sides: decrease of revenues and increase of expenditures	Higher deficit
	Death related costs	Through expenditures side	Deficit modifies – smaller than in the baseline scenario
	Labour market development: employment	Through revenue side	Smaller deficit – moderate effect
	Economic development: wages and labour productivity	Interactions between sides: higher increase of revenue than decline of expenditures	Smaller budget deficit – moderate effect (Hungary), stronger effect (Bulgaria)

Source: own comparison based country reports

The ILO social budget model, next to projecting future financial balance (in this case deficit at the end of the projection period) also allows for calculation of insurance premium (tax) needed to balance revenues and expenditures of the health care system.

Table 22. Comparison. Insurance premium needed to balance public health care sector revenues and expenditures

Country	Base year	2025	2050
Bulgaria	*n/a*	*n/a*	*n/a*
Estonia	*n/a*	*n/a*	*n/a*
Hungary	17%	21%	28%
Poland	8,6%	10,7%	11,7%
Slovakia	9,4%	12,7%	21,5%

Source: AHEAD WPIX

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

Finally, it should be added that ageing process impact other types of expenditures, outside the health care sector. Next to financing income benefits (pensions), which are not the subject of concern here, in the CEE the need to increase the level of the LTC financing arises. Up to date, this type of care was provided most commonly within the family, not within institutionalized social protection, and – i.e. in Poland – by the religious organization and only lately by commercial (private) long term care institutions. Access to this type of services is restricted and long term illnesses related to the old age become one of the most difficult to deal social problems. Overall, the hypothesis of creation of new social problems, increasing demand for social care and need to provide new financing mechanisms related to the ageing process is confirmed. Reasons behind this phenomenon include also rapid economic development and modernization processes in the NMS. Thus, rationalization of health care expenditures becomes a necessity, as well as building space for new taxes and – if socially accepted – increasing private financing.

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ANNEX 1

Methodology for death related costs estimation (in Hungary and Poland)

1. Estimation based on National Health Fund data of average expenditures per capita (per deceased and survivor, divided by sex and 5-years age cohorts) for medical services for which appropriate data are 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 a person: 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 a person 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 persons 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*, divided by sex 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 on 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 by sex and age cohort.

3. Estimation, based on National Health Fund data, of annual insurance expenditures for given medical services. As the National Health Fund data include data with an undefined status of a person (without information and/on sex or age), it was necessary to divide these expenditures using 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 constance of the k-indicator and unchanged proportions of expenditures between sexes and age cohorts. Average expenditures per capita of 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: α – 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:

$$TE^{s}_{n} = \sum_{a=1}^{20} AE^{s}_{a,m,n}\cdot N^{s}_{a,m,n} + \sum_{a=1}^{20} AE^{s}_{a,f,n}\cdot N^{s}_{a,f,n}$$

$$TE^{d}_{n} = \sum_{a=1}^{20} AE^{d}_{a,m,n}\cdot N^{d}_{a,m,n} + \sum_{a=1}^{20} AE^{d}_{a,f,n}\cdot N^{d}_{a,f,n}$$

$$TE_{n} = TE^{s}_{n} + TE^{d}_{n}$$

where: TE^{s}_{n}, TE^{d}_{n} - 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 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. In result, total expenditures are summed up with expenditures on pharmaceuticals, divided by sex, age cohort and status.

7. Due to the capitation system of primary care services financing, National Health Fund expenditures on primary care are divided proportionally between insured and added to the total expenditures.