

# THE AGEING OF THE POPULATION – A THREAT TO THE PUBLIC HEALTH-CARE SYSTEM?\*)

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**Abstract:** The Czech population, like other populations in the advanced world, is ageing and the trend will continue in the years to come. This article relates to the possible consequences the ageing of the Czech population holds for funding the public health-care system. A forecast of revenues to health insurance facilities is made along with a forecast of their expenditures on health care in relation to various development scenarios in the area of fertility, mortality, and migration in the next fifty years. The forecast assumes that during this period there are no changes to the system of health insurance, specific measures of employment by sex and age, the structure of average expenditures on health care per insurance subscriber by sex, average-income structure, age, and the rate of increase in health-care costs will grow equally with the rate of increase in wages.

**Keywords:** ageing of the population, population: projection, public health-care: system

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A shared feature of the majority of European countries is decreasing population growth, that is, population decline by natural decrease, falling fertility and natality rates to sub-replacement levels, and increasing life expectancy as mortality conditions improve. The result of all this is the demographic ageing of the population. A specific feature of the Czech Republic on top of this is its irregular population structure, which means that irregular demands are placed on individual branches of the economy. Naturally this also applies to the health-care system and will continue to do so in the future. Moreover, after 1989 demographic behaviour in the Czech Republic underwent dramatic changes. The population is now ageing rapidly. The number of people of post-productive age is rising and will continue to rise substantially, especially among the “oldest old”, that is, the most elderly population group, who tend also to require the most health care. People born in the 1940s and 1950s are part of a large birth cohort and they will soon be entering their post-productive years. Some of the characteristics of the expected ageing of the population of the Czech Republic are presented in Table 1.

As the percentage of economically active persons in the population decreases, and with it the percentage of people paying a portion of their income into the health-insurance system, the question is whether the reduced sum of payments to health insurance that will necessarily occur will be enough to support the costs of health care in the future, which, on the contrary, will continue to rise. Future demographic development will lead to an increase in public health-care costs. Not just expenditures but also the system’s revenue will be affected. And all this lies ahead in the relatively near future. In this article we try to show how health-care expenditures and revenue relate to age and gender.

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**Table 1 Percentages in selected population age groups in the Czech Republic and dependency indices, %**

Age group	2005	2015	2025	2035	2045	2055
0-19	21.0	18.9	19.1	17.5	17.1	17.7
20-64	64.8	63.0	59.6	58.8	54.0	50.6
65+	14.2	18.1	21.4	23.7	28.9	31.7
85+	1.0	1.7	2.0	3.8	4.7	5.8
Dependence index	2005	2015	2025	2035	2045	2055
$((0-19)+(65+))/(20-64)$	0.5	0.6	0.7	0.7	0.9	1.0
$(0-19)/(20-64)$	0.3	0.3	0.3	0.3	0.3	0.3
$(65+)/(20-64)$	0.2	0.3	0.4	0.4	0.5	0.6

Source: Author's projection calculation – middle option (see next text).

The health-care system and health care form an important sector of society. Essentially every citizen comes into contact with the health-care system at some point. Given the sums redistributed in this sector, health care is even a very important sector of the economy.

In the Czech Republic there are three main sources of funding the health-care system: health insurance companies (public health insurance), public funding (the state budget and local budgets), and direct household expenditures. Alongside these three basic pillars of health-care funding, there are also other sources, but they are of negligible significance because they account for an estimated less than 1% of the total expenditures on health care (these include contractual health insurance for foreigners, travel insurance, and supplementary insurance, etc.).

The most important source of health-care funding is the health insurance companies, and their revenue comes from public health insurance payments. Every permanent resident in the Czech Republic (or persons without permanent residence but working with an employer registered to operate in the Czech Republic) must participate in the public health insurance system. The key principle of public health insurance is solidarity, equality and accessibility. Every insurance payer pays a sum determined by the size of their income and each payer is entitled to the same quality of care regardless of how much they pay into the system. Public health insurance funds all health care guaranteed under Act no. 48/1997 Coll. on public health insurance (in its effective amendment).

Public health insurance covers the majority of care services provided by the Czech health-care system, and only in some cases is the patient required to contribute to the costs. State budget resources serve as a supplementary source of funding for procedures or activities not covered by public health insurance, such as nursing care in social service facilities, the costs of research and development work connected with health care, the education of health-services workers, prevention programmes, and so on. Another supplementary source of funding comes in the form of direct household expenditures. Households pay for non-prescription drugs, health-care products, and extra (inessential) health services, for example, from a stomatologist. A less substantial resource is revenue from fees for spas, above-standard hospital rooms, and for various types of health certificates provided mainly by general practitioners.

To determine whether state health-care spending is adequate a country's total share of expenditures on health is measured as a percentage of GDP. In OECD countries the average share is around 8%. There is a direct connection between the share of expenditures and how economically advanced a country is, expressed as GDP per person. In the Czech Republic health care expenditures were 7.3% of GDP at current prices in 2000 and 7.8% in 2003.

Health-care expenditures per single insurance payer vary mainly in relation to age, but also in relation to gender. Table 2 and Figure 1 show that the highest expenditures occur at the start and towards the end of a person's life.

Table 2 Average expenditures on health care per insurance payer

Age group	2000		2001		2002		2003		2004		Average annual 2004/2000	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
0-4	10 368	9 169	11 254	9 812	12 200	10 570	12 515	10 951	13 086	11 242	1.06	1.05
5-9	5 376	5 050	6 281	5 601	6 574	5 870	7 226	6 494	7 440	6 679	1.08	1.07
10-14	5 565	5 415	5 876	5 737	6 300	5 967	6 835	6 727	6 994	6 988	1.06	1.07
15-19	5 227	6 279	5 463	6 502	5 895	6 911	6 118	7 538	6 297	7 975	1.05	1.06
20-24	4 711	6 953	4 762	7 084	5 247	7 625	5 285	7 727	5 456	8 026	1.04	1.04
25-29	5 096	8 271	4 951	8 519	5 519	9 353	5 732	9 891	5 998	10 458	1.04	1.06
30-34	5 258	7 898	5 575	8 357	5 927	9 307	6 343	10 033	6 855	10 551	1.06	1.08
35-39	5 712	7 985	6 286	8 475	6 885	9 334	7 315	9 893	7 815	10 525	1.08	1.07
40-44	7 008	9 041	7 679	9 529	8 310	10 496	8 763	10 874	9 423	11 566	1.07	1.06
45-49	9 179	11 280	10 036	11 890	10 960	13 029	11 518	13 735	12 026	14 348	1.07	1.06
50-54	12 242	14 001	13 629	14 526	15 089	15 943	15 884	16 779	16 645	17 738	1.08	1.06
55-59	15 911	15 193	18 041	16 154	20 230	18 036	21 295	19 039	22 242	20 069	1.09	1.07
60-64	17 651	17 030	20 952	18 326	23 562	20 349	25 274	21 986	26 769	23 502	1.11	1.08
65-69	20 602	20 161	25 932	22 170	29 074	24 575	31 477	26 280	33 298	27 984	1.13	1.09
70-74	24 648	22 700	30 318	25 788	34 205	28 700	36 926	31 054	39 741	33 157	1.13	1.10
75-79	26 984	25 229	32 543	27 944	37 339	31 648	40 945	33 965	43 718	36 697	1.13	1.10
80-84	28 678	28 253	32 511	30 298	38 396	34 413	40 499	36 283	43 684	38 842	1.11	1.08
85+	24 482	27 630	31 483	30 951	29 261	34 440	29 606	36 387	39 758	40 961	1.13	1.10
Average	9 710	11 816	11 071	12 744	12 339	14 133	13 215	15 127	14 060	16 149	1.10	1.08

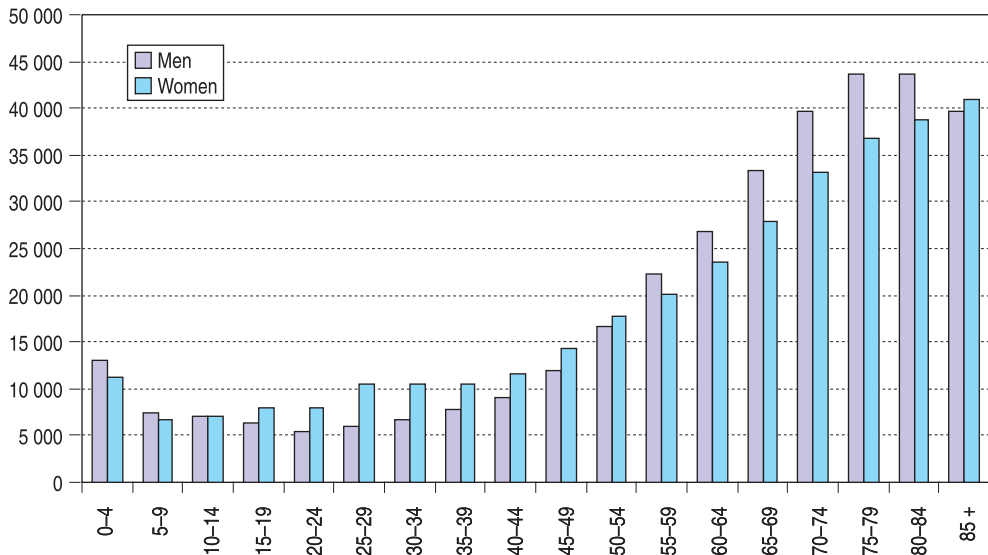
Source: Analýza zdravotnických účtů ČR 2000-2004 (An analysis of health budgets of CR 2000-2004), CZSO.

## Forecasting future development

Here we will present the results of a simple forecast of future trends, which show how big an impact population ageing in the Czech Republic will have in the next fifty years. The forecast was calculated on the assumption that the following characteristics will remain unchanged: the average costs of health care per insurance payer by gender in individual age groups; average wages by gender in individual age groups; the employment rate by gender in individual age groups; and the rules that apply to the payment of health insurance.

The future trends in the costs of health care and the cost of health insurance were forecast using the authors' own projections of population changes in the Czech Republic. The objective was not to provide as exact as possible an estimate of future population changes but instead to describe some alternative scenarios of development estimated using relatively large differences between the minimum and maximum rates of mortality, fertility and migration.

The initial age structure used was based on the most recent available data, i.e. the demographic structure of the population of the Czech Republic as of 1 January 2006, with a projection period until 1 January 2056. It was assumed that

**Figure 1 Average expenditures on health care per insurance payer in 2004**

Source: Analýza zdravotnických účtů ČR 2000–2004 (An analysis of health budgets of CR 2000–2004), CZSO.

throughout the projection period there would be a linear increase in life expectancy (somewhat higher among men than among women). A linear increase in fertility was assumed until 2020, with a simultaneous change in the fertility structure, so that by 2020 the Czech fertility structure would resemble the fertility structure of women in the Netherlands. Between 2020 and 2055 the linear increase was assumed to be slower, without any other structural changes. The annual rate of growth in migration was assumed to be constant throughout the projection period, and the demographic behaviour of migrants was assumed to be the same as the Czech population. Three variants of life expectancy, total fertility, and migration were estimated.

However, as well as the above-mentioned projection variants, other alternatives assuming various combinations of extreme variants of assumed future trends in life expectancy, fertility and migration are also significant for modelling various scenarios of the costs of funding health care. (For example, a scenario in which there is assumed to be a significant increase in life expectancy and simultaneously low fertility and a low rate of migration increase). Therefore, alongside the basic three projection scenarios other alternatives were also estimated. Table 4 presents a summary of the estimated projection scenarios.

The projected population development was used to project expenditures on health care and health insurance payments. The projected health-care expenditures were based on the assumption that the costs per insurance payer by gender and five-year age group (Table 2, Figure 1) would remain at the level they were at in 2004 throughout the projection period. Estimating the rise in insurance premiums was more difficult, as no analogical data exist on collected insurance sums by gender and age. Therefore, the estimate was based on a simplified assumption that any employed person would pay insurance from an amount equal to 80% of the gross average wage by gender and by age in 2004, while for an unemployed person the state would pay the prescribed amount (again in the year 2004)<sup>1)</sup>. Employed persons by defi-

<sup>1)</sup> The total amount of insurance collected from employed persons in 2004 was around 80% of the value calculated on the assumption that each employed person paid insurance out of the average wage for their gender and their age.

**Table 3 Basic forecast scenarios**

Option	Annual growth of live expectancy		Total fertility rate		Annual migration increase
	Men	Women	2020	2055	
Low	0.1	0.08	1.4	1.5	10 000
Middle	0.2	0.16	1.5	1.7	30 000
High	0.3	0.24	1.6	1.9	50 000

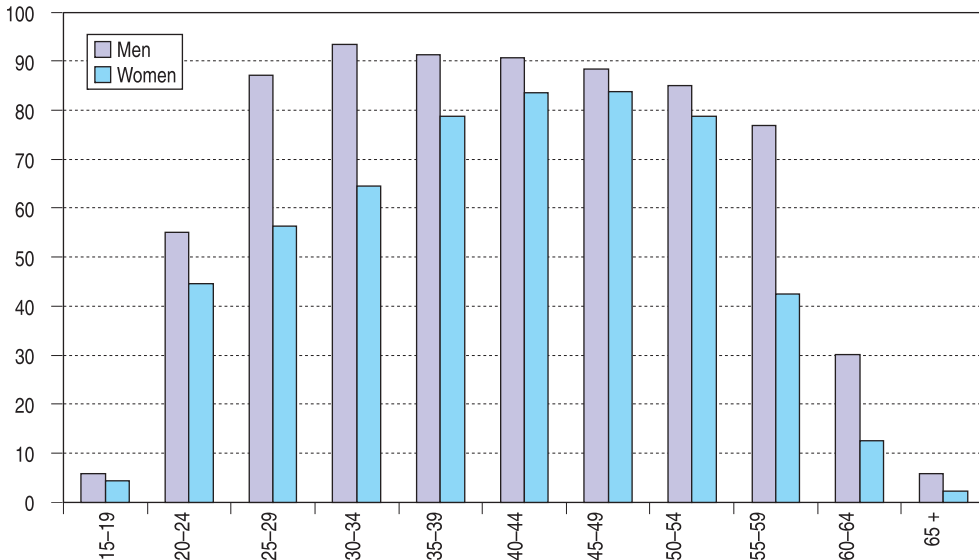
**Table 4 Possible demographic developments**

Alternative of development	Growth of live expectancy	Growth of fertility	Migration increase
LLL	low	low	low
LLH	low	low	high
LHL	low	high	low
LHH	low	high	high
MMM	middle	middle	middle
HLL	high	low	low
HLH	high	low	high
HHL	high	high	low
HHH	high	high	high

dition encompass not just people with an employer but also the self-employed. It can be assumed that persons whose only or main income is from self-employment pay on average (perhaps substantially) less on health insurance than people of the same age with an employer. Data from the Labour Force Survey (Czech Statistical Office) were used for the rate of employment in the Czech Republic (Figure 2).

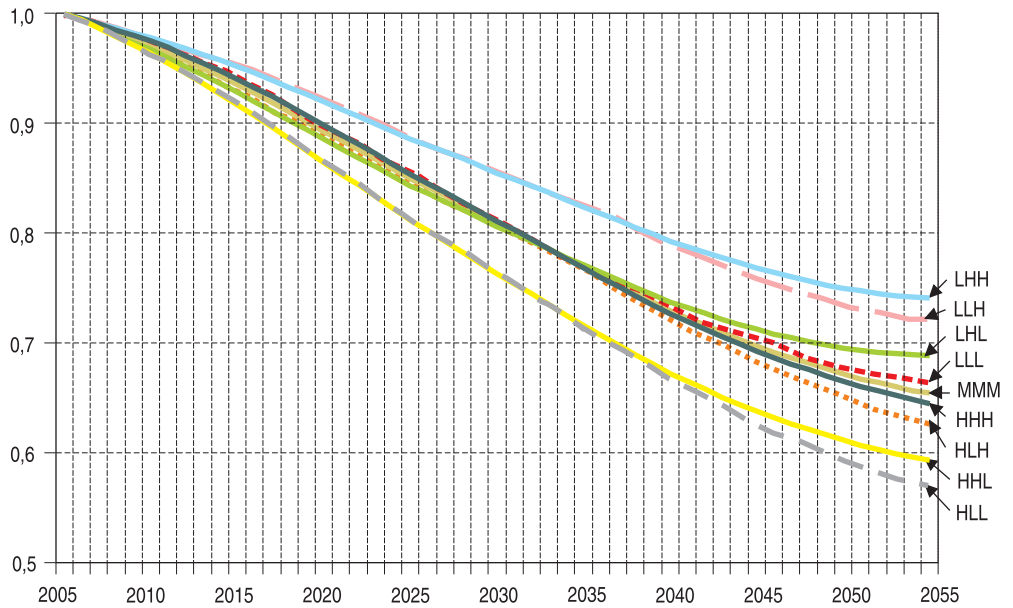
The future burden of costs on the health-insurance system can be described using the rate

**Figure 2 Rate of employment in the Czech Republic in 2004, %**

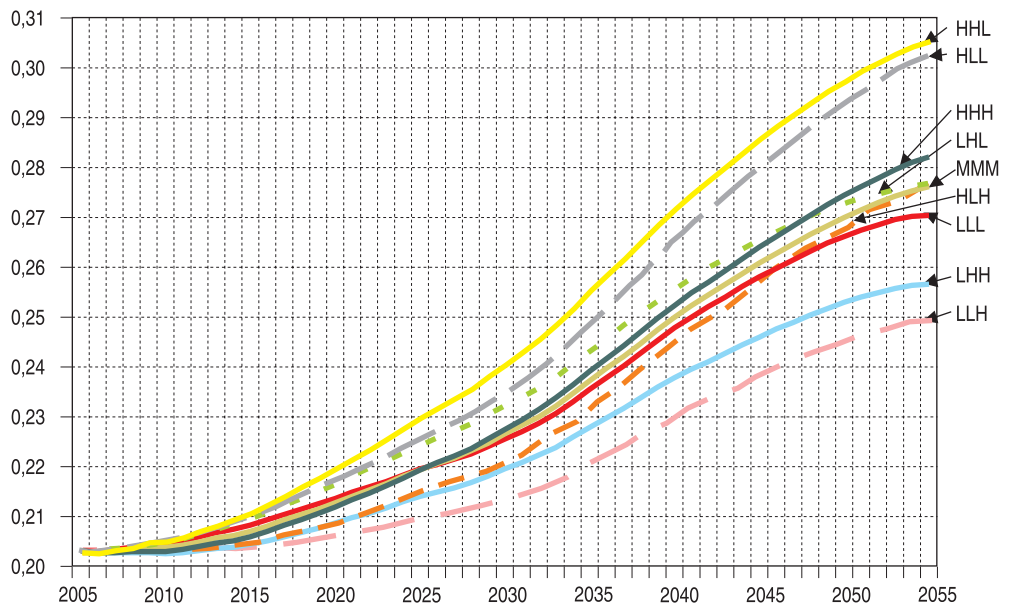


Source: Výběrová šetření pracovních sil 2004 (Sample labour force survey), CZSO.

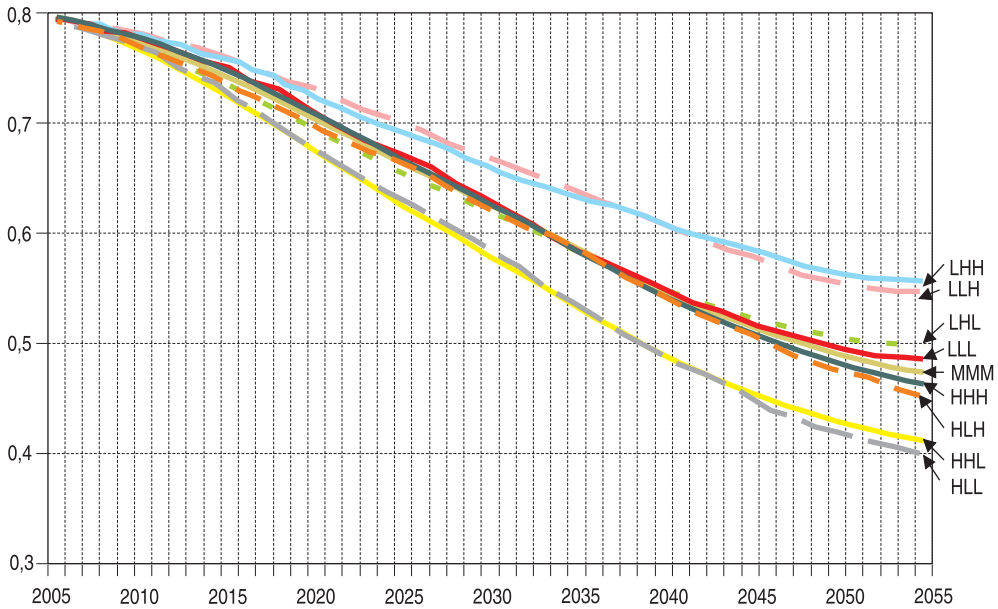
**Figure 3 Rates of insurance to health-care costs covered by insurance companies by individual development scenarios**



**Figure 4 Percentage of insurance paid by the state out of the total health-care insurance by individual development scenarios**



**Figure 5 Rates of insurance collected from employed people to health-care costs covered by insurance companies by individual development scenarios**



of total expected insurance collected to the total expected health-care costs covered by insurance. Figure 3 shows the rates for all of the alternative development scenarios.

We can see that in all the development scenarios the rate of insurance to costs would fall well below the unit value. This means that insurance premiums would not be enough to cover health-care costs. The smallest decrease would occur, as expected, in the case of a small increase in life expectancy combined with high immigration, and the biggest decrease would occur with a high increase in life expectancy combined with the currently low rate of immigration. The other development scenarios do not differ much mainly in the first years from the median projection. The pace of the increase in fertility would begin to have a stronger effect after several decades; a higher increase in fertility would signify a lower decrease in the rate of insurance to costs.

It is usually the state that pays health insurance for persons who are not working (children, students, non-working seniors, unemployed actively seeking work, etc.). Figure 4 shows how the percentage of insurance paid by the state would change in connection with changes in the demographic structure of the Czech population.

In all the development scenarios the percentage of insurance paid by the state would increase; the increase would be greatest in the case of a high increase in life expectancy, high fertility and low immigration, and the least increase in the opposite case. High fertility would mean again in the first years an increase in the cost burden, which would later decrease.

The total burden on the state connected with covering health-care costs can be described as the rate of total insurance collected just from employed persons to total health-care costs. Figure 5 shows the development of this characteristic over time.

In all the development scenarios there would be a substantial increase in the difference between the expected revenue and the expected expenditures of health insurance companies.

What are the possible solutions to this unfavourable trend? The first possibility is of course



an increase in health-insurance premiums. If, for example, we want the rate of insurance collected to the costs of health care covered by health-insurance companies to be equal to around one in future years, the rate of insurance to 2055 (assuming other characteristics remain unchanged) would have to increase gradually from the current 13.5% to 18–24% of the assessment base (Table 5).

**Table 5 Insurance rates per insurance payer in 2005**

Option	MMM	LLL	LLH	LHL	LHH	HLL	HLH	HHL	HHH
Insurance rate (%)	20.6	20.3	18.7	19.6	18.2	23.7	21.6	22.8	20.9

Another possible way of increasing total collected insurance and reducing the cost to the state would be to increase the employment rate, in particular by raising the age of retirement. For example, if by 2055 we increased the employment rate of 55–59 year-old men to 80% and 60–64 year-old men to 75%, and the employment rate of women in these age groups was just 5 percentage points below that of men, then in 2055, in the case of the median scenario of demographic development, the rate of collected insurance to health-care costs would be equal to around 70% (while it would be only 65% if the current employment rate remained unchanged). Therefore, increasing employment would only slow the growing differences between revenue and expenditures but would not eliminate them entirely. It would also be important to improve the collection of insurance from persons whose main source of income is self-employment.

A financial tool for reducing the growing difference between the revenue and expenditures of health-insurance companies would be to increase the participation of insurance payers.

For the entire projection period we assumed that the specific health-care costs per insurance payer of a given gender and age would remain unchanged or the rate of increase would be around the same as the rate of increase in wages. In 2000–2004 the costs of health care rose slightly faster than the increase in wages, and the biggest increase in health-care costs was among people of retirement age.

It is very difficult to estimate future developments. However, it is likely that in the future it will be possible to achieve continuing improvements in the state of public health at relatively lower costs than at present. A particularly important advantage would be a public that is better and more informed about matters of health (in comprehensive terms, as defined by WHO). This could lead to changes in behaviour and lifestyle and to an improvement in the health of the population, reducing the demands on the health-care system. In the future older people will be more independent and more active than previously and they will make less use of the health-care system. We may surmise that as education levels in the population rise the amount of increase people take in their own health will also increase.

Another important factor is to increase the resources devoted to preventive health care, which in many cases could lead to a reduction of costs in the area of health treatment.

Some studies outside the Czech Republic claim that the use of some new technologies in health care could lead to the provision of better quality health care at a lower cost. It has also been shown that the total level of health-care costs is determined more by the share of chronically disabled in the population than by the relative proportion of seniors in the population. Some new procedures may, for example, render invasive surgery, intensive care units, or treatment centres for chronic illness (all relatively costly health-care services) less necessary than before. Modern treatment technology can also reduce the length of time patients spend in the hospital, which would also reduce costs. In some cases new technologies will make it possible to diagnose illness earlier and thus also initiate treatment at an earlier stage, which may also cut down on treatment costs and on top of that extend not just life expectancy but



also the quality of life. Genetics and bioinformation can provide information on the effectiveness of medicines and improve the effectiveness of subsequent clinical trials, and that could reduce the price of new medicines. However, the development of these new technologies will probably require increased investment into biomedical research.

Another possibility is to create conditions that enable out-patient and home care it is whenever feasible, because such care is usually much less expensive. This also applies to the care provided late in human life. According to some surveys, three-quarters of Czechs would prefer to die at home and with their family. However, current laws do not enable financial support for so-called domestic hospices, which provide qualified home care for people who are dying. Yet this would certainly be less expensive than hospitalising the elderly and in many cases would be much more humane for individuals and their relatives.

Health care and the health-care system are complex issues. **The proposed concept for health care for 2005–2009**, in conformity with the findings of the OECD Health Group (OECD, 2004), is based on creating an integrated health-care system, which favours solutions to emerging problems by means of effectively functioning health systems, the objective of which is sustainable cost management and sustainable financing, accessible health care, and health-care systems sensitive to the needs of patients. Emphasis is placed on improving the state of health of the population by promoting support for health at the level of the regions, municipalities, and towns.

The system of financing and cost defrayal requires sustainable cost management. A disparity between future technological advances and demographic changes on the one hand and the eventual decline in the number of economically active members of the population on the other needs to be addressed through increased efficiency in the area of health services and an improvement in the state of health of the population. Data from an international comparison indicate that there is room for improving the efficiency of health systems.

Another possible solution lies in the direction of advances in molecular medicine and gene therapy, which should therefore be made a priority in the area of research and the development and the application of new technologies. The use of molecular medicine could significantly alter the approach to the mechanisms of financing health care and illness risk management (health insurance).

## Conclusion

Population ageing is an acute issue and not just in the Czech Republic. A useful means of discerning the quantitative consequences of population ageing is to calculate population projections for not just the three basic scenarios described at the start of this article but for other development scenarios that combine, for example, a large increase in average life expectancy with simultaneously low fertility and migration rates.

An elderly population puts greater demands on health care. With population ageing, health-care costs will rise, and we can also expect inauspicious increases in the amount of resources that will be necessary to cover the costs of health care over time. In order to cover increased costs in the future, sufficient resources are required. However, as a population ages the number of economically active persons in the population decreases and thus so does insurance company revenue. Unless changes are made to the public health insurance system there may be a shortage of necessary resources. One possible solution would be to increase the payments for persons insured by the state, generally increase insurance premiums, and increase patient participation in costs. However, it is likely that, given the rising education levels and interest of the population in their own health, there will be some reduction in the demand or need for health care. Also, advances in medical technology and more efficient financial management in health care may make it possible to improve the quality of health care and to provide it at a lower cost.

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## Comments<sup>\*)</sup> on the article “The Ageing of the Population – A Threat to the Public Health-Care System?” by Tomáš Fiala and Jitka Langhamrová

Population ageing, especially in terms of the increase in the proportion of the elderly or very elderly in the population, is not a problem. It is the most positive result of improved living conditions and better health care.

It is specious to one-sidedly indicate, as the authors do, that “future demographic development will lead to an increase in public health-care costs”. One cannot help but ask, how do they know this? Someone else could similarly claim that increased public health-care costs will lead to the further ageing of the population. Which is the dependent and which the independent variable? There is no doubt that in many countries the two phenomena are occurring simultaneously.

The vast majority of people want to live in good health and longer, and they are willing to do something or even to spend money to achieve this. Pharmaceutical companies and producers of health technology are well aware of this. Selling people things that they have been persuaded to believe are good for their health is good business. It manages to create a demand for

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health services. However, it is justified to ask whether and to what extent the demand for health-care services and the services provided actually correspond to people's real needs.

Many advanced countries have already come to the realisation that treating health problems in hospitals is too expensive or even impossible to sustain. For example, the high consumption rates of alcohol and cigarettes in the Czech Republic cannot be offset by importing more medicine or expanding the liver transplant programme.

People who live long are certainly not responsible for the increased costs of public health care. On the contrary, these are usually people who have lived as healthily as possible and have taken care of their health. Such people are not a threat to the public health-care system or society, they are its wealth.

Population ageing and the consequences of this process for public health care have been the subject of an enormous amount of literature (*Thomson – Mossialos, 2000*). Questions that have been raised and carefully studied include: What determines the costs of public health care? Are expenditures effective? What are the costs connected with care for the elderly? What are the costs of health care in relation to the structure of the population by age and gender? Conversely, what are the costs of health care for an individual over the course of his/her lifetime? What other circumstances affect the trend in health-care costs? How should rising health-care costs be addressed? How can the strategy of health care be changed? What else needs to be taken into account? There are countless such questions. What is important is to identify the fundamentals.

In the modern day perhaps only journalists could make a one-sided case for a causal relationship between population ageing and health-care costs. Large-scale studies have been carried out in recent years that devoted more attention to this issue. What did they discover?

First, it has been shown that structural cross-sectional data on the trends in health-care costs are far from ideal for studying the given problem. It is necessary to start with longitudinal data describing the trend in costs over the course of a person's lifetime (*Zweifel et al., 2001*).

The highest health-care costs are incurred during the several months before a person dies. What determines how high the costs are, is how long the person has left to live and not how old they are (*Seshamani – Gray, 2004*). It is mainly hospital care that is involved. The much higher costs of health care for the elderly do not stem from their need for ongoing care. They stem from the fact that the probability of death rises with age. It is obvious that when a young or middle-aged person dies the related health-care costs are quite high. Patients customarily receive intensive care in a hospital and are given very expensive treatments. Conversely, the death of older people is not usually perceived in such dramatic terms, and common experience has shown that the standard treatments applied to younger patients are not as effective on older patients. From a medical perspective, death in old age is "less expensive" than the costs of unsuccessful treatments applied to younger people.

From this perspective, population ageing could lead to a decrease in health-care costs as deaths occur more frequently in old age. However, such an assumption is not realistic, as health-care expenditures are continually rising, and are doing so in every country where the economy is growing relatively favourably. If health-care costs do decrease in a country, it is usually owing to serious internal economic or political problems. For example, in countries that were formerly a part of the Soviet Union, there was a sharp fall in health-care costs in the 1990s owing to a shortage of financial resources, and this was followed also by a sharp decline in the mean life expectancy.

There is no doubt that health-care costs are not determined one-sidedly just by the health problems of individuals, or by the health problems of social units, or even ultimately by population ageing. They are largely determined by the economic and political situation in a country and by the degree influence in decision-making acquired by companies that with effective marketing operate successfully in the pharmaceutical market and in the sale of medical technology bought with public funds. If health and health-care funds fall prey to interest groups prepared for financial conquests then the costs of public health care will grow.

It has to be acknowledged that numerous factors have had a hand in the rising costs of public health care in the Czech Republic in recent years. For example, it is common knowledge that competition between individual health-care facilities in the provision of health care is more expensive than an integrated and coordinated health-care system; it is more expensive when people can freely choose their doctors and have direct access to specialists than when the emphasis is placed on primary care and the general practitioner has a say in the decision to

provide access to specialists. It is more expensive to provide emergency clinic services at a teaching hospital than to provide regular emergency clinic care. And it is also very costly when adequate attention is not devoted to research on health systems, conceptual work on health policy, drawing on foreign experience, and responsible regulation and control over the use of public funds on health care.

If the management of a health-care system underestimates the need for professional ability, information and analytic work, and for the related social regulation, such as legislation, education, and the appropriate use of economic tools, then health care becomes more expensive, and it is impossible to expect the solution to this to lie in increasing user participation or health-insurance premiums.

It would be a mistake, however, to one-sidedly criticise this paper. It is certainly of significance and value. It is essentially a warning prognosis illustrating how things might turn out if not only the parameters mentioned by the authors remain constant but also if there is no progress in our way of thinking, and if we narrow-mindedly and dogmatically cling to some of the preconceptions that have dominated thus far. It would be a catastrophe if by 2055 (the year the authors' prognosis ends) we have not learned anything from the outcome of foreign and domestic research, if we are unable to react to the desirable extension of the population's life expectancy, if we do not value our health, and if we believe that health-care policy, the department of health, and health insurance companies do not need to progress over the next fifty years.

The entire professional community is in this regard faced with an enormous task. Demographic studies and prognoses will certainly constitute an important contribution. The better they can be integrated into summary studies of social, economic, and health issues, the more critically and successfully they can draw on knowledge to date, the more objectively they can present the wide scale of problems that warrant attention, and the more foresight they apply to proposed solutions, the more significant they will be.

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