4

Year 2011
Volume 53

Demografie

Review for Population Research

DEAR READERS,

Pavel Čtrnáct

you have in your hands the first English-language issue of *Demografie, Review for Population Research.* This journal has been published in Czech for over fifty years – since 1959 – and alongside the Hungarian journal *Demográfia* it is the oldest journal of demography in the former socialist states. Over fifty-three years of existence it has published hundreds of articles, studies, summaries, reviews, reports on conferences and workshops, jubilees, abstracts, and bibliography. Throughout its long history it has been the country's flagship journal in the field of demography, publishing the work of distinguished Czech demographers and young scholars just starting out. The journal has also however published the work of top international figures in demography. In 2009 a conference was held to mark the fiftieth anniversary of the journal and participants had strong praise for the role the journal has played. *Demografie's* founding figures include František Fajfr (1892–1969) and Vladimír Srb (1917–2009), and many others whose names are not mentioned here but who devoted many years of their lives to working on the journal's editorial board and helped enrich the journal with remarkable content.

The texts published in the Czech issues of *Demografie* are accompanied by English summaries. The journal is cited in a number of journals abroad and distributed among numerous institutions and libraries abroad. The journal's publisher, the Czech Statistical Office, and the Editorial Board decided that starting with this year's volume the journal would publish one issue in English and would also allow the publication of important contributions in English in the other quarterly issues of the journal. There are two basic objectives behind this: to expand *Demography's* readership abroad and bring the work of Czech scholars to the attention of the international reading public. We are confident that we have something to offer and we welcome submissions by scholars from abroad. We hope that these steps help to further elevate the level of scholarship on the pages of *Demografie* and enhance its international and domestic prestige – and the number of its citations.

Contributions to the English issue of *Demografie* should focus on new directions in demographic methodology, international comparisons, and analyses of various aspects of demographic development in different countries and regions. We are also of course open to other themes.

As of 2011 the complete contents of individual issues of *Demografie* will be published on the website of the Czech Statistical Office (www.czso.cz), which can be accessed by clicking on We publish → Journals → Demografie, Review for Population research (http://www.czso.cz/eng/redakce.nsf/i/demografie_review_for_population_research). The Editorial Board hopes that this issue will capture your interest and that you will become regular readers of our journal.

HEALTH STATUS OF THE ROMA POPULATION IN SLOVAKIA[1)]

Branislav Šprocha

ABSTRACT

The health status of the Roma in Slovakia is generally perceived to be very negative. This article deals with this problem based on available data from some field surveys. Author analysed the health status of the Roma population using specific indicators: subjective assessment of health, prevalence of chronic diseases, restriction of daily activities.

Keywords: health status, Roma population, subjective assessment of health, prevalence of chronic diseases, restriction of daily activities

Demografie, 2011, **53: 293–303**

1 INTRODUCTION

The health status of the Roma population living in Slovakia is generally perceived to be very negative. This problem is most serious in segregated Roma settlements and it ranks among the major problems in Slovakia. The main preconditions for solving this problem include enough relevant information. In this respect we must say that there is very little data on the current health status of the Roma population.

Until 1989, this topic was a key issue. Under current legislation, however, surveying the health status of ethnic groups is a violation of human rights. As a result, we have only limited information about the current health status of the Roma population in Slovakia. A lack of reliable data was the initial impetus for the implementation of several field surveys, which focused directly on health status and health or included this topic as one of its components.

The aim of this study is to describe the basic results of selected surveys and use them to try to outline some of the key determinants of the poorer health and higher mortality of the Roma population. It is important to note, in connection with the background of the available data, that in many cases the object of the surveys were segregated Roma settlements. Therefore, the results cannot be used to characterize the health status of the entire Roma population in Slovakia.

2 THE ISSUE OF HEALTH SURVEYS AND AVAILABLE DATA ON HEALTH STATUS OF ROMA

In general, the most important problem of monitoring the health and morbidity of the population lies in determining the boundaries between health and disease. Determining the exact moment when health passes into disease is very difficult (*Mészáros*, 2007b). WHO´s definition of health, perceived as a state of complete physical, mental and social well-being, is a dynamic variable continuously dependent on a whole range of different factors.

The presence of genetic predispositions and external determinants can produce significant changes

1) This study was prepared at Charles University in Prague, Faculty of Science, Department of Demography and Geodemography as output from a 'Special University Research' project.

in health status and the gradual (or sudden) transition into the state of morbidity. On the other hand, it should be noted that this process may also be reversible, which greatly complicates the analytical assessment of health issues and illness. Basically we can say that moment when the transition from health to disease occurs can be estimated on the basis of feelings and the knowledge of persons whose health is investigated. In practical terms, this process is based on three perspectives on health:

1. the presence or absence of any disease,
2. The presence or absence of any health restrictions,
3. other characteristics of health, for example subjectively perceived health and satisfaction with it (*Hrkal – Daňková*, 2005).

Health monitoring, with the exception of the prevalence and incidence of certain diseases or limitations, is a subjective process. For this purpose, a variety of sample surveys are used in which respondents answer questions about their health (see *Daňková*, 2006; *Rychtaříková*, 2000, 2006; *Mészáros*, 2010). In Slovakia, the representative EU-SILC sample survey was used for this purpose (*Ivančíková*, 2005; *Mészáros*, 2007a, 2007b, 2010) and since 2009 also the EHIS database (*Mészáros*, 2010b).

The main objective of the EU-SILC survey is to prepare a database for the study of income inequality, the level and structure of poverty and social cohesion (*Ivančíková*, 2005). It also includes questions on the health status of persons aged 15 years and over who meet the requirements of the methodology for measuring the health status of European populations according to the EHEMU project (*Mészáros*, 2006, 2007). The survey is conducted annually and it is a representative survey for the whole Slovak population. EU-SILC is conducted through face-to-face interviews by trained interviewers. Given the time the research was carried out on the Roma population, we used data from the EU-SILC 2007. Data collection took place in April 2007 and 5 840 households contained 12 763 persons were selected.

In order to obtain similar information for the Roma population we used the special field survey from the project 'Health and the Roma Community, Analysis of the Situation in Europe' (*Health*..., 2009). This was a specialized survey, whose main objective was to provide information about health, illnesses, accidents, drug consumption, counselling, access to and utilisation of health care, hospitalization and the use of first aid services (*Popper et al.,* 2009).

Information about the health status of the Roma population was obtained using a questionnaire survey administered by trained interviewers working directly in selected Roma settlements.

Data were collected from a total of 657 Roma households representing 3 760 people. The questionnaire was divided into three parts: a household questionnaire, a questionnaire aimed at children and a questionnaire for adults. Part of the questionnaire aimed at children (under 16 years) was answered by an adult household member, the parents or the person with custody of the child (*Popper et al.,* 2009). For this reason in our analysis we focused only on persons over the age of 15.

Another survey, whose results were used to analyse the health status of Roma in Slovakia, took place in 2005. However, the main objective was to map the living conditions and economic situation of Roma households in Slovakia. One part of research was the issue of health. Data collection was conducted through interviews by trained interviewers on the basis of a standardised questionnaire. Overall this survey obtained data from 720 Roma households. Health status was determined for all persons over the age of 6. Like in the previous survey, parents answered on behalf of their children. The sample size was 720 Roma households and 3 765 persons (*Filadelfiová – Gerber – Škobla*, 2006).

3 SUBJECTIVE PERCEPTION OF HEALTH

The *UNDP* (2005), *Health*…(2009) and the *EU-SILC* (2007) surveys are based on questions for which respondents report on their own health. From a methodological point of view it is a subjective opinion, a subjective assessment of their own health. This process is obviously influenced by a number of factors and may not fully reflect the real situation. The conclusion of the respondent may be affected for example

by how the question is presented to him/her, by what he or she understands to mean good or poor health or by his or her current living situation. The opinion also depends on a person's approach to life and socio-cultural conditions (*Daňková*, 2006).

The *UNDP* survey (2005) asked:
'What is the health status of (name of person)?' There were four possible answers: 'very good', 'good', 'bad', 'very bad'.

In the survey *Health…* (2009) respondents answered the question:
'How would you rate your health over the past 12 months?' The assessment was on a 5-point scale: 'very good', 'good', 'average', 'bad' and 'very bad'.

The EU-SILC survey used the question:
'In general you could say that your health is?' Possible answers: 'very good', 'rather good', 'average', 'rather bad' or 'very bad'.

The differently constructed questions and possible answers restricted the comparability of the surveys.

Therefore, in the following sections we focus mainly on the survey *Health…* (2009) and *EU-SILC* (2007), in which the texts of the responses were almost identical. Using data from these surveys we will try to outline the main results and we shall also identify some problems with using this method for the Roma population.

In general, data from all three surveys show that Roma men and men in the Slovak population have a better perception of health than women. This finding is not specific to Slovakia, but was also found in analyses of other European countries (see *Rychtaříková*, 2000, 2005; *Daňková*, 2006). Approximately 80% of Roma men aged 16 and older said their health is very good or good, while for women it was 74% of cases. According to *EU-SILC* (2007) around 58% of men and 49% of women in the population of Slovakia rated their health as very good and rather good.

In general, when we compare the main results of the health assessment of people aged 16 and over, it is clear that Roma respondents rated their health more favourably. The problem lies mainly in the fact that the most important determinant of health is age. With increasing age there are generally more real medical complications and the subjective perception of health status is worse (*Rychtaříková*, 2006).

A simple comparison of the results is very difficult because of the very different age structure of the Roma population. In general, the Roma population is younger than the Slovak population. Younger age groups, which are characterised by a frequent inclination to give answers indicating good and very good health, have a far greater weight than in the Slovak population, where the higher share of elderly persons influenced the tendency for there to be more responses indicating a worse state of health. This results in significant differences in each category by evaluation of

Table 1 **Subjective assessment of the health status of Roma (UNDP 2005; Health…2009) and Slovak (EU-SILC 2007) population**

Sex	Very good	Rather good	Average	Rather bad	Very bad
Health…(2009)					
Male	33.1	47.0	15.5	4.1	0.3
Female	25.9	47.8	20.5	5.5	0.3
UNDP (2005)					
Male	50.7	28.9	*	15.0	5.4
Female	44.9	30.3	*	17.4	7.5
EU-SILC (2007) Slovak population					
Male	28.5	29.7	27.2	10.6	4.0
Female	20.8	27.7	31.0	14.8	5.6

Note: * respondents could choose only: very good, good, bad, very bad.
Source: SO SR EU-SILC (2007), UNDP (2005), Health… (2009); own calculation.

health status. Using standardization (direct method, the standard WHO Europe), the weight of positive responses (very good and rather good) in the case of the Roma population decreased by about 10 percentage points among men and by nearly 13% among women. In contrast, there was a slight increase in Slovakia's population to about 60% of men and 54% of women. Even after removing the impact of differences in the age structure, it is clear that the Roma often assess their health as very good and rather good.

A detailed look at the distribution of responses is possible when we use contribution by age and sex. As Figures 1 and 2 show, in both the Roma and Slovak populations, feelings of very good and good health decrease and are gradually replaced by categories of poor health.

In the 20–29 age group, almost 92% of Roma men rated their health as very good (46%) and rather good, in the 50–59 age group more than 59% (17% very good) and in the 65–69 age group only 36% of respondents answered that their health status is good or very good. A similar trend can be seen in the population of Roma women. In the 20–29 age group around 90% positively assessed their health. Compared to men, women are more inclined to answer rather good (53%). Among people in the 50–59 age group, about one-half of women perceived their health positively (9% very good) and in the 60–69 age group it was only a one-quarter of women (4% very good).

It is clear that both Roma men and women under age of 40 compared to the Slovak population were more likely to evaluate their health as very good. On the other side, men and women in Slovakia in this age group viewed slightly more negatively. The Roma in these age groups rated their health as rather good. Around the age of 40 the answers are prevailingly very good among Roma respondents. The gap between the Roma population and the Slovak population has widened. For example, Roma men aged 50–59 rated their health as very bad or bad only in 11% of cases and Roma women in 13%. In the Slovak population it was more than 16% of men and 22% of women. Greater differences can be seen in the 60–69 age group, in which group 23% of Roma men and 19% of Roma women negatively assessed their health, while in the Slovak population the figures were 38% of men and more than 39% of women.

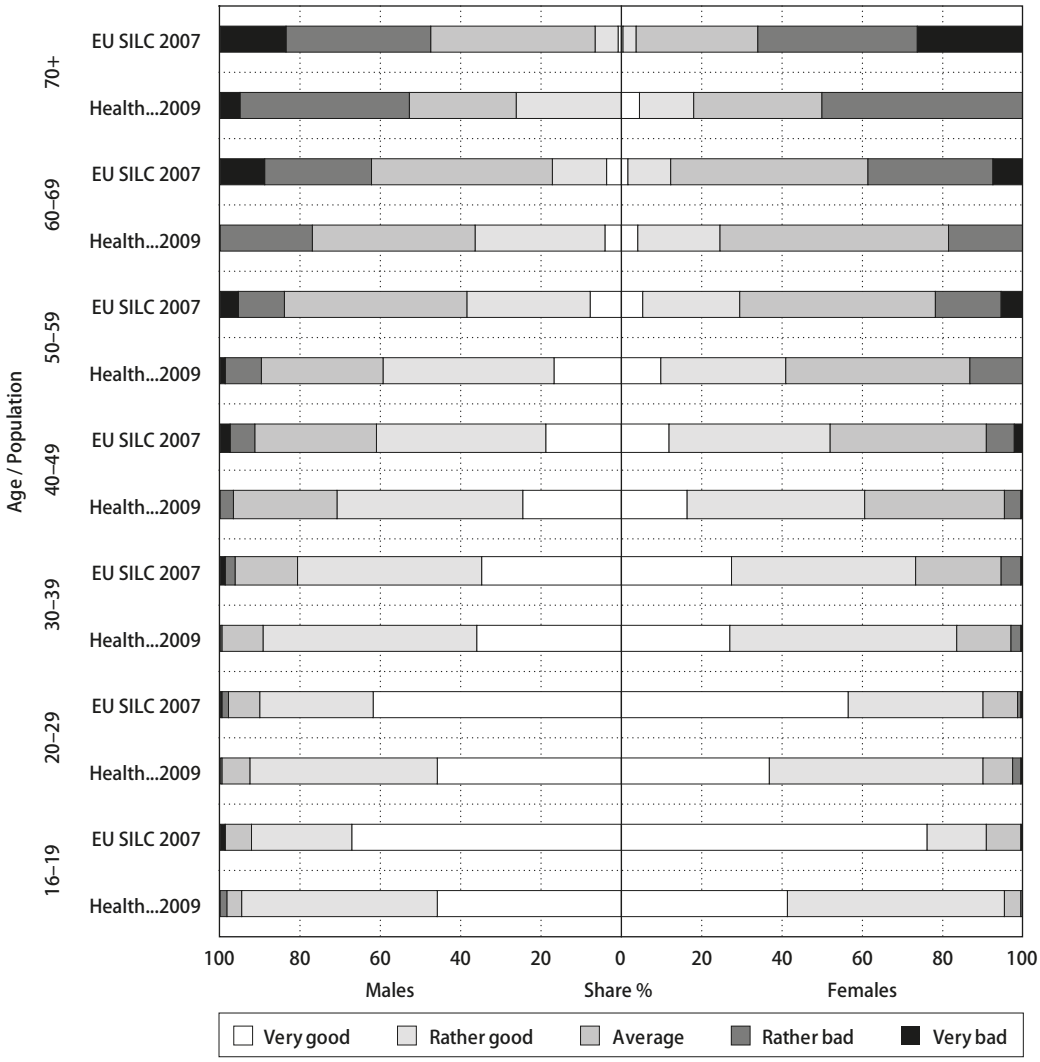
Subjective health assessments showed that Roma respondents of a younger age more often perceive their health as not quite the best, but the share of negative responses decreases with age at a much lower intensity than in the case of Slovak the population. Roma over the age of 50 more often perceived their health positively.

The question is whether the health status of Roma men and women is really so positive or whether there are problems with weaknesses in this method and data. As we show below, if we compare the direct effects of lower health status in terms of health limitations or chronic conditions, the health situation of the Roma population compared to the Slovak population is significantly worse. We get a similar result in the analysis of mortality (see *Šprocha,* 2008a, 2008b, 2009). Based on these facts we are inclined to support the hypothesis that indicates only limited use should be made of this method for determining the real health status of the Roma.

As mentioned at the beginning of this article, in general the results of a subjective assessment of health can be influenced by a variety of different factors. On the one hand, there are demographic and socioeconomic variables such as age, sex, marital status, educational attainment, economic status, social networks and the overall standard of living. On the other hand, an important role is played by access to health services, the quality of health services, the extent of their use and thus the real level of knowledge a person has about his or her own health. As shown in several studies (*Rychtaříková*, 2006; *Mészáros*, 2007), how people assess their health is closely connected with the presence of chronic or long-term illness. It is also necessary to note the significance of different frames of reference, what the different categories of health mean to the respondent and to what group of people respondents compare their health (*Popper et al.,* 2009).

Probably the combination of a different frame of reference, together with limited access to health care, little awareness of its uses and very low knowledge of their own health status significantly influenced the presence of positive responses. We assume that the Roma often evaluate their health positively until they actually have health problems requiring medical treatment; they do not usually get/seek a diagnosis from

Figure 1 **Subjective assessment of the health status of the Roma (Health… 2009) and Slovak (EU-SILC 2007) populations**



Source: SO SR EU-SILC (2007), Health... (2009); own calculation.

a doctor. In addition, it should be noted that there is often a very low level of education among the Roma population, which may affect the understanding of health and health status (*Rimárová et al.,* 2009). In the context of conflicting data on the subjective assessments of health provided by Roma survey respondents in the *UNDP* (2005) and *Health…* (2009), it is possible to question the appropriateness of using this method of obtaining information on health status of people living in Roma settlements.

4 CHRONIC AND LONG-TERM MORBIDITY

One of the main findings from several studies conducted in Roma settlements in Slovakia (Health Pro-

motion Program 2007, Program on… 2007) is that there is a high incidence of chronic illnesses. For example, according to the survey Program on… (2007) almost 44% of Roma respondents indicated they suffered from a long-term illness. The most common was high blood pressure, various cardiovascular illnesses, back problems and diabetes.

The prevalence of chronic illnesses in the Roma population was also examined in the UNDP (2005) survey with the questions: 'Do you suffer from chronic illness or disability that has lasted more than six months?' and *Health*… (2009): 'Do you have a disability (visual, hearing or physical disability), or chronic illness (high pressure, diabetes, cancer or other?'

In the Slovak population this information was examined in the EU-SILC survey and the question was: 'Do you have any chronic (persistent) illness?'

The studied population was split by the answer (yes – no) into two parts – those who suffer from any chronic illnesses (or disabilities) and those who do not.

Overall, according to the results of the *UNDP* (2005) 21% of Roma men and 25% of Roma women reported that they suffered from some chronic illness or disability. A similar incidence of chronic illnesses in the Roma population was found by the *Health...* (2009). According to these results 23% of men and 28% of women suffered from disability or chronic illness. According to the data from the *EU-SILC* (2007) the Slovak population had a very similar incidence of chronic illness. About 23% of men and 32% of women said that have some chronic (persistent) illness.

The overall incidence of chronic illness is significantly influenced by the age structure. Owing to this fact chronic illness rates have been subjected to direct standardization (European standard WHO). Using the standardization method, the Roma male standardized prevalence rates of chronic illness increased to 31% (*UNDP,* 2005) and 35%, respectively, for the two community groups (*Health*… 2009) and among women even more to 34% and 41%, respectively. In the male Slovak population we observed after standardization only minimal changes and in the female population there was even a decrease to 28%. As Figure 3 shows, in the younger age groups the Roma respondents more often reported (even compared to the Slovak population) that they have no chronic disease.

The incidence of chronic illness gradually increases with age among Roma men and women.

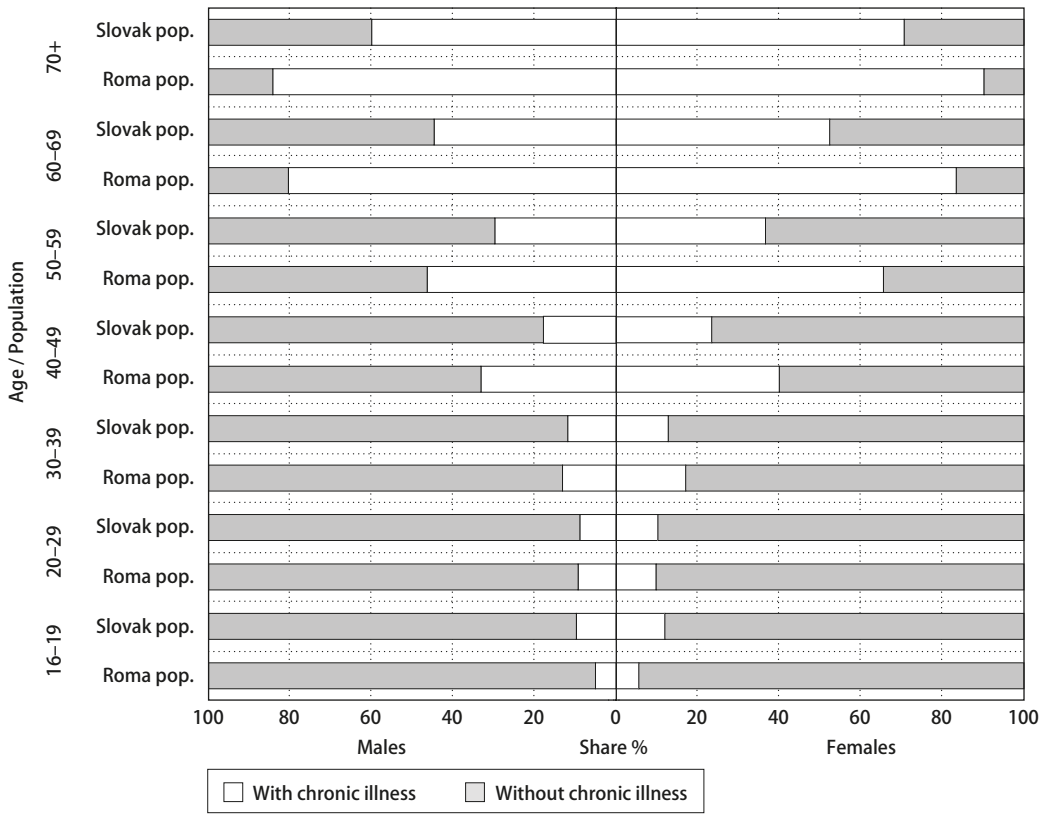
According to the *Health*… survey (2009) more than 46% of men and 65% of women aged 50–59 reported that they suffer from some kind of chronic illness. The largest discrepancy between the Roma population and the Slovak population is situated in the 60–69 age group, where 80% of Roma men had some chronic disease, while in the Slovak population it was only 44% of respondents. In the female population differences were even slightly larger: 84% of Roma women claimed to suffer from some disability or chronic illness, while less than 54% of Slovak women claimed that.

If we compare the results from the *UNDP* survey (2005) and the *Health*… survey (2009), we get very interesting information. In the second survey, Roma respondents (especially over the age of 40) often declared they had some chronic disease. The main reason for this was the nature of the question. In the case of the *UNDP* (2005) the interviewers posed a more general question, while in the questionnaire from *Health*… (2009) respondents were given some examples of chronic illnesses. According to these results we agree with *Daňková* (2010). If respondents are given examples of chronic illness in the questionnaire, it appears that respondents better understand what is meant by the term chronic illness.

Inconsistencies in the wording of questions may therefore be an important factor affecting what results are obtained. For this reason it is necessary to work carefully with collected data and not overestimate their importance. In addition, it should be noted that the surveys from Roma settlements are not representative of the whole Roma population in Slovakia and therefore cannot be generalized to the entire Roma population.

The lower prevalence of chronic diseases among younger Roma is likely due to the fact that they know little about their condition and do not go to health facilities for treatment, and to the fact that there is a lack of prevention programmes, and this is then reflected in a large number of undiagnosed diseases. The experiences of several field workers indicate that a Roma seeks medical help only in cases where the symptoms

Figure 2 **The prevalence rate of chronic illnesses in the Roma (2009) and Slovak (2007) population**



Source: SO SR EU-SILC (2007), Health... (2009); own calculation.

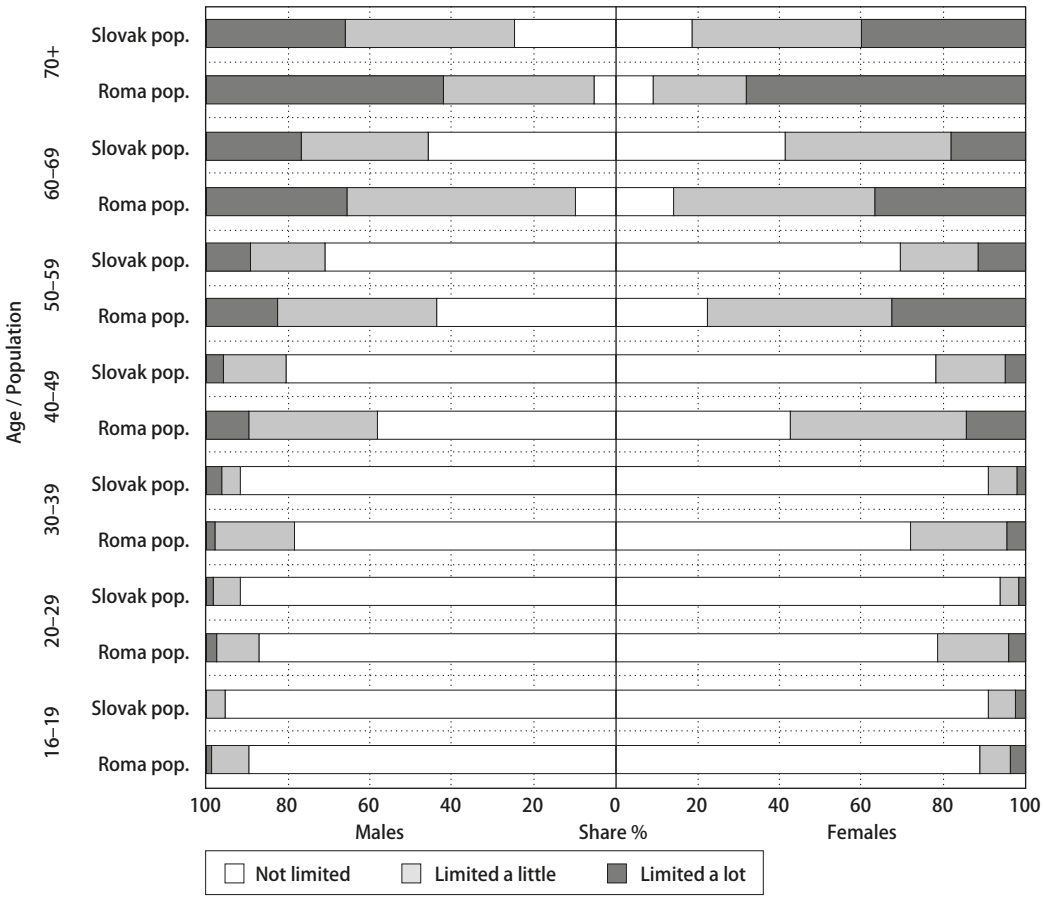
are directly observable (inflammation, fever, trauma, etc.). This fact is related on the one hand to the already mentioned low level of cultural capital, limited overall health awareness, no knowledge of the law governing medical treatment, fear of medical examinations, and the other hand to the socio-economic situation, especially when transport costs and the cost of medicine represent a major barrier to obtaining medical assistance. In addition, an important role may be played by problems with understanding the questionnaire or an unwillingness to acknowledge chronic disease (*Filadelfiová – Gerbery – Škobla*, 2006). It seems that the best method of obtaining data is to use a combination of methods. Replace subjective responses with an analysis of medical records or with research by medical staff in the field.

5 RESTRICTION OF DAILY ACTIVITIES

An important part of the UNDP (2005) and *Health…* (2010) surveys and the EU-SILC 2007 were questions aimed at the existence of any restriction of normal activities due to health problems.

In the *Health…*(2009) survey Roma respondents answered the question:
'Could you tell us whether you have recently had a health problem that makes it difficult for you to perform everyday activities (walking, dressing, personal hygiene, eating etc.)?' Respondents could choose from the response: 1. 'I have no health problem', 2. 'I have a slight health problem', 3. 'I have a quite serious health problem', 4. 'I have a very serious health problem that makes it almost complete impossible for me to perform everyday activities'.

Figure 3 **Structure of the Roma (2009) and Slovak (2007) populations according to the level of restrictions of daily activities**



Source: SO SR EU-SILC (2007), Health… (2009); own calculation.

The *EU-SILC* (2007) survey question was: 'Have you had to restrict your activities due to health reasons within the last six months?' Possible answers were: 'very much had to', 'somewhat had to' or 'did not have to'.

In the survey *Health…* (2009) almost 31% of men and 39% of women over the age of 15 reported having to limit everyday activities such as dressing, personal hygiene, eating, and walking. According to the *EU-SILC* (2007) survey approximately 24% of Slovak men and nearly 32% of Slovak women had difficulty with these activities. More than 8% of Roma men and 12% of Roma women had experienced an extensive or complete restriction of activities in the last six months. Approximately the same amount in the Slovak population had major limitations on daily activities.

The proportion of people who reported in survey that they have to limit their daily activities increases with age. Moreover, we can see that in younger age groups the differences between the Roma and Slovak populations were smaller, but with age the share of people with limitations in the Roma population dynamically increased. For example, according to *EU-SILC* survey 2007 in the 60–69 age group 47% of men and 42% of women had no restriction of daily activities. In the Roma population in the same age

group only less than 10% of men and 14% of women declared they had no restriction of their normal daily activities. In the age group over 70, 58% of Roma men and 68% of Roma women have major problems or are unable to perform normal daily tasks. In the Slovak population the figures are 'only' one-third of men and 42% of women.

6 LIFE EXPECTANCY ACCORDING TO HEALTH STATUS

Life expectancy is a commonly used synthetic indicator of the intensity of mortality. In the current conditions, however, this indicator cannot be measured for the entire Roma population in Slovakia. Therefore, we focused on two groups of municipalities where, according to the Atlas of Roma communities in Slovakia 2004, the Roma make up more than 70% and 95% respectively of the population. For such a specific population (working title Roma localities 70+ and 95+), we calculated abridged life tables for the period 1996–2009 (see *Šprocha*, 2008, 2009).

Probability of death by age shows that in all age groups the population in Roma localities in both sexes has worse mortality conditions.

Life expectancy at birth as a synthetic indicator of mortality depends on the intensity of mortality in all age groups. Among the population in Roma localities in the years 1996–2009 male life expectancy was approximately 63.3 years and female life expectancy almost 68.4 years. Compared to the Slovak population life expectancy was lower about 6.5 years for men and 9.4 years for women.

There is also a qualitative aspect to these figures. In general, human life starts with good health and continues through a variety of diseases and physical and mental changes until death (*Mészáros*, 2007). In various stages of human life the quality of health changes very dynamically.

According to previous information, we can assume that the Slovak population and Roma population differ from each other in life expectancy in good health, without chronic illnesses and restriction of daily activities. To analyse this functions of the mortality tables for the Roma localities (95+ and 70+) were used along with the results from above described health surveys. Life expectancy at age 15–19 was calculated for different health situations using Sullivan's method (for the methodology, see *Hrkal – Daňková*, 2005; *Rychtaříková*, 2000, 2006; *Mészáros*, 2010)

Using this method, real life expectancy at a certain age is divided into stages according to perceived health, the presence (absence) of chronic illness, or restrictions of daily activities.

Table 2 **Life expectancy at age 15 according to different health situations in Roma localities and the Slovak population (1996–2010)**

Answer	Roma localities (95+)		Roma localities (70+)		Slovak population	
	Men	Women	Men	Women	Men	Women
Subjective evaluation of health						
Very good and good	36.5	35.6	37.1	36.0	31.1	30.3
Average	9.9	15.7	10.3	16.3	15.3	18.9
Bad and very bad	3.9	6.3	4.3	6.8	8.6	14.3
Total	50.3	57.6	51.8	59.2	55.0	63.6
Chronic illness						
Yes	16.3	25.5	17.4	26.8	13.1	21.3
No	34.0	32.0	34.4	32.4	41.9	42.2
Total	50.3	57.6	51.8	59.2	55.0	63.6
Daily activity restriction						
Yes	20.4	30.9	22.0	32.2	13.8	21.7
No	29.9	26.7	29.8	27.0	41.2	41.9
Total	50.3	57.6	51.8	59.2	55.0	63.6

Source: Roma localities survey Health… (2009); Slovak population EU-SILC (2007).

For the subjective perception of health we created three basic groups: 1. very well and good; 2. average; 3. bad and very bad. Life expectancy at 15–19 years was around 55 years for Slovak men and 63.6 years for Slovak women. Life expectancy for the population of Roma localities in the same age group was 50.3 to 51.8 years for men and 57.6 to 59.2 years for women.

The impact of differences in the perceived quality of health of the Roma and Slovak populations can be expressed as life expectancy in good health, resp. in poor and very poor health. According to the results of the *Health…* survey (2009), Roma men could survive in very good health to between 36.5 to 37.1 years (about 72% of total life expectancy) and women to between 35.6 to 36.0 years (approximately 61%). In the Slovak population the number of years in very good and good health was significantly lower (men 31 years, women 30 years) and thus would represent a smaller part of total life expectancy (56% for men, 48% for women). This example illustrates how it is difficult to use the concept of the subjective assessment of health status for Roma settlements.

The situation is completely different when we analyse the number of years with or without long-term chronic disease and limitations to daily activities. As Table 2 shows, both sexes in Roma communities have a shorter life expectancy at age 15–19. In addition, significantly fewer people will spend their years without chronic illness.

Apart from differences in life expectancy between populations, there are also differences in their structure depending on the presence of chronic or long-term illness. More than three quarters of men and 66% of women in Slovakia at the age 15 years have a chance of living the rest of his/her life without a chronic disease. In Roma settlements more years in a person's life expectancy are spent living with a chronic illness. More than 30% men and 45% of women will spend their next life with chronic illness.

Restriction of daily activities indicated an unfavourable situation. Men and women in Roma settlements will survive for a shorter period of life without restrictions. In addition, its structure compared with a population of Slovakia is significantly worse. Among the population in Roma settlements almost 40% of men's years and as much as 55% of women's years are years living with restrictions. In the Slovak population the figures are only about 25% for men and 34% for women.

The trend and structure of healthy life expectancy also revealed a few facts. In particular, it is clear that the number of years with chronic or long-term limiting illness is greater in women. Differences in life expectancy between the sexes mean that although women live longer the additional years are often in poor health. This fact is further reflected in the Roma communities.

In general, with increasing age and thus decreasing life expectancy the share of years that a person survives with chronic illnesses and limits on daily activities increases. Among Roma men, from roughly the age of 30–34 the majority experience some limits on their daily activities, and at the age of 40–44 they have already reached two-thirds of their life expectancy. Among Slovak men, a majority with limitations on daily activities first appears in the 50–54 age group, and two-thirds or more have some limitations from the age of 60–69.

In the case of years of life marked by a chronic or long-term illness, among Roma men the majority are affected from the age of 40–44 while among Slovak men the majority are affected from the age of 60–64. Among Roma women the majority have limited daily activities from the age of 15–19 while among Slovak women it is from the age of 40–44.

7 CONCLUSION

An analysis of the results from the field surveys showed a significantly worse health status in Roma settlements compared to the Slovak population. Roma respondents rated their health as good or less frequently rated it as bad and very bad in the older age groups especially. These results should be taken with great caution. This method of analysis does not produce reliable results. Respondents' answers are likely to be largely influenced by what constitutes good or poor health in the local community and also reflects their level of knowledge about their own health.

An analysis of the incidence of chronic disease and limitations on daily activities produced dramatically different results. Disparities between the Roma and Slovak populations grow dynamically with age. Roma from segregated settlements not only have a shorter life expectancy, but survive much of their years in poor health.

References

- Hrkal, J. – Daňková, Š., 2005. *Zdravá délka života u obyvatel EU* (Healthy Life Years in the EU Popualtion). Demografický informační portál. [cit. 25. 11. 2010]. <http://www.demografie.info/?cz_detail_clanku&artclID=107>.
- Daňková, Š., 2006. *Výběrová šetření o zdravotním stavu v ČR a v Evropě* (Sample Surveys of Health in the CR and Europe). Demografický informační portál. [cit. 25. 11. 2010]. <http://www.demografie.info/?cz_detail_clanku&artclID=357>.
- Daňková, Š., 2010. *Srovnání ukazatelů zdravotního stavu v šetření EHIS a SILC* (Comparison of Health Indicators in the EHIS and SILC Surveys). Demografický informační portál. [cit. 25. 11. 2010]. <http://www.demografie.info/?cz_detail_clanku&artclID=703>.
- Ivančíková, Ľ. 2005. Zisťovanie o príjmoch a životných podmienkach domácností 2005 (EU SILC) (Survey on Income and Living Conditions 2005 in Households (EU SILC)). *Slovenská štatistika a demografia*, 3–4, pp. 32–44.
- Mészáros, J., 2007a. Ako dlho žije populácia Slovenskej republiky v zdraví? (How Long Does the Population of the Slovak Republic Live in Health?). *Slovenská štatistika a demografia,* 1–2, pp. 133–140.
- Mészáros, J., 2007b. Úmrtnosť. (Mortality.) In: Vaňo, B. (ed.) *Populačný vývoj v Slovenskej republike 2006* (Population Development in the Slovak Republic 2006). Bratislava: INFOSTAT, pp. 35–46.
- Mészáros, J. 2010a. *Výpočet strednej dĺžky života v zdraví (metodický materiál)* (Calculation of Healthy Life Expectancy (Guidance material)). Bratislava: INFOSTAT, p. 11.
- Mészáros, J. 2010b. *Stredná dĺžka života v zdraví podľa EHIS 2009* (Healthy Life Expectancy by EHIS 2009). Bratislava: INFOSTAT, p. 34.
- Popper, M. – Szeghy, P. – Šarkozy, Š., 2009. *Rómska populácia a zdravie: Analýza situácie na Slovensku* (Roma Population and Health: Analysis of the Situation in Slovakia). Bratislava: Partners for Democratic Change Slovakia.
- Rimárová, K. – Ostró, A. – Kovaľ, J. 2009. Základné diferencie v zdravotných determinantoch medzi rómskou a nerómskou populáciou – výsledky EU MEHO projektu – WP 10 (Basic Differences in the Determinants of Health Among the Roma and Non-Roma Population – Results of the EU MEHO Project – WP 10). In: Jurkovičová, J. – Štefániková, Z. (eds.). *Životné podmienky a zdravie.* (Life Conditions and Health.) Bratislava: Úrad verejného zdravotníctva SR, pp. 252–257. [cit. 15. 3. 2010]. <http://www.fmed.uniba.sk/fileadmin/user_upload/editors/ustavy/hygiena/aZPaZ_2009.pdf>.
- Rychtaříková, J., 2000. Naděje dožití ve zdraví (Healthy Life Expectancy without Serious Health Problems). *Demografie*, 42, pp. 41–48.
- Rychtaříková, J., 2006. Zdravá délka života v současné české populaci (Healthy Life Expectancy in the Current Czech Population). *Demografie*, 48, pp. 166–178.
- Šprocha, B., 2008. Úmrtnosť rómskej populácie na Slovensku (Mortality of the Roma Population in Slovakia). *Demografie*, 50, pp. 276–287.
- Šprocha, B. 2009. Základné charakteristiky úmrtnostných pomerov vo vybraných rómskych lokalitách na Slovensku (Basic Characteristics of the Mortality Circumstances in Selected Roma Localities in Slovakia). *Slovenská štatistika a demografia*, 3, pp. 52–69.

Data sources

- EU-SILC 2007. Statistical Office of the Slovak Republic (SO SR) 2007. Internal data.
- United Nations Development Programme 2005. Internal survey data. <http://vulnerability.undp.sk/>
- Zdravie a rómska komunita, analýza situácie v Európe 2009 (Health and Roma community, analysis of the situation in Europe 2009). Internal survey data.

BRANISLAV ŠPROCHA

graduated in 2006 from the Department of Demography and Geodemography at Charles University in Prague. He is now enrolled in the doctoral programme at the Faculty of Science of Charles University and he also works at the Demographic Research Centre in Bratislava. He specializes in population structures, with a focus on the Roma population. His research interests are the population development of the Slovak population and the analysis of nuptiality and the divorce process in the Slovak population.

PROJECTION OF THE HUMAN CAPITAL OF THE CZECH REPUBLIC AND ITS REGIONS TO 2050

This article originated within the support of 'VŠE IP400040' institutional support for long-term conceptual development of science and research and the Faculty of Informatics and Statistics in Prague in 2011.

Tomáš Fiala – Jitka Langhamrová – Ladislav Průša

ABSTRACT

Classic population projections provide no information about the qualitative side of the population. A possible source of information about the skills and professional qualifications of a person is education level. This article contains a population projection for the Czech Republic as a whole and for its regions according to sex, age and education level to 2050 based on the latest demographic projection. The computations take into account differences in mortality according to education level. According to the projection, the proportion of tertiary educated people will grow very rapidly and the differences in education level between males and females will diminish.

Keywords: population ageing, population projection, human capital, education level, the Czech Republic

Demografie, 2011, **53: 304–320**

INTRODUCTION

One of the themes frequently discussed today is population ageing. This phenomenon affects to a greater or lesser extent all the economically developed countries of the world. Questions often arise concerning whether and how it will be possible to ensure the financing of pensions or the provision of social and health care. Given the continuing rise in life expectancy the number of older people in the population will continue to increase and the number of younger people and people of productive age will decline owing to low fertility. These considerations, however, concern just the development of the number of people and do not take into account the productive abilities of a person, the qualitative side of human capital. When we replace the number of people by the human capital that these people represent, the conclusions concerning future development are not as pessimistic.

The question is how this human capital should be measured. There are certainly many possibilities, but the fundamental shortcoming of the majority of these is the lack of the data necessary for quantification. A simple, albeit very imperfect, measurable characteristic of human capital that is very often used is the level of educational attainment.

This article makes a projection of the development of the human capital of the Czech Republic and its regions based on the latest demographic projection. The purpose is first and foremost to demonstrate what consequences future demographic development in the Czech Republic could have from the viewpoint of the development of human capital. The development of education can usually be influenced much more easily than, for instance, demographic development, where the effect of population policy measures is usually only short term.

This article thus focuses on presenting a projection of the development of the education level of the inhabitants of the Czech Republic up to 2050. Because in the normal course of school attendance it can be

expected that the tertiary education will be attained at the age of 20–24 completed years, the overall results are given only for persons aged 25 or over.

METHODOLOGY AND SCENARIOS PROJECTION FOR THE WHOLE POPULATION (NOT DISTINGUISHING THE EDUCATION LEVEL)

Computation of the Projection

The population projection is computed using the classic component projection method (see, e.g., *Bogue et al.,* 1993) with a simplified model of external migration. Only immigration is assumed; emigration is taken to be zero. The number of immigrants is equal to the expected level of net migration in the given age group. In the case of prevailing emigration the number of immigrants is negative. The computation is carried out for each sex separately.

The inclusion of immigration into the projection formulas (on the assumption that their demographic behaviour is the same as that of the home population) is relatively simple. Each year we add the numbers of immigrants. But we must take into account two facts:

1) The age of the immigrants does not usually refer to the beginning of the year but to the moment of immigration. If an immigrant's birthday (in the year t) was before the moment of immigration, his/her age at the beginning of year t+1 will be the same as at the moment of immigration. Only in the case where the immigrant's birthday is in year t after immigration will his age at the beginning of year t+1 be 1 year higher.

2) The time of surviving immigrants until the end of the year (the period since the moment of immigration until the end of the year) is lower than 1 year.

The computation formulas can be found in Annex 1.

Scenarios of Demographic Development

The input data for the calculations concerning the population of the Czech Republic were acquired from the website of the Czech Statistical Office (CZSO), the source of data on the population of the Netherlands was Eurostat.

The initial demographic structure was the demographic structure of the population of the Czech Republic and its regions according to sex and age as of 1. 1. 2011. The latest available data on fertility, mortality and migration were for 2009 (fertility rates, life tables) or 2010 (total net migration). Two variants of the projection were calculated.

The CZSO Variant

The first variant was a mixture (partly updated according to the latest data) of the low and medium variants of the projection computed by the Czech Statistical Office in 2009, designated the 'CZSO variant' (*Český statistický úřad*, 2009).

The total fertility rate is assumed to increase smoothly to 1.565 up to 2020; in the subsequent 30 years to 2050 it will rise gradually to 1.635. The highest specific fertility from 2020 will be that of females aged 29–31, which means that the average age of mothers will rise by 2020 by just one year, after which the structure of fertility will no longer change.

Life expectancy at birth will continue to grow for the entire period of the projection. Up to 2030 the annual increase will be roughly the same as at present; after 2030 we expect the rise in life expectancy to slow down.

It is very difficult to project the future development of migration (see, e.g., *Arltová – Langhamrová*, 2010, or *Kačerová*, 2010). Very often a constant level of net migration is assumed. We assume that the net migration will increase gradually up to 2015 to reach 20 000 persons per annum, and that in subsequent years it will still equal that amount. The assumed demographic structure of migrants taken for 2010 will be at the level of the last known structure, i.e. the level in 2009. In the ensuing years up to 2030 we expect that this structure will gradually move closer to the structure of net migration of the EU, which is chiefly characterized by a balanced ratio of males and females and a larger proportion of immigrants over the age of 30. After the year 2030 the assumption is that the structure will remain the same as EU net migration.

The NL Variant

For the second variant the assumption is that the fertility of Czech females will, with a certain delay, copy

the fertility pattern of females in the Netherlands. The delay should diminish over time. The Netherlands was chosen because this is a population where the transformation of fertility to a higher age has already been completed and the level and structure of fertility is relatively stable there. In addition this is a population not too geographically distant and relatively comparable in size to the Czech Republic. This variant is called the 'NL variant'.

The development of fertility was estimated from the estimated development of the fertility of individual cohorts of females (more precisely 'pseudo-cohorts', i.e. overlapping cohorts of females born in two adjacent years). Instead of (unavailable) age-specific cohort fertility rates $f_x^{(g)}$ for a cohort of females born in the year *g* we used the (available) sequence of age-specific cross-sectional fertility rates $f_{g+x,x}$.

The Czech cohorts of 1965–1979 have already reached the age of 30 or more, i.e. the highest level of their age-specific fertility. Based on the last-known age-specific fertility rates and the fertility trend, a 'similar' cohort from the Netherlands was identified for each of these Czech cohorts. To estimate the unknown age-specific fertility rates for these Czech cohorts at a later age it is assumed that their age-specific fertility rates will correspond to the age-specific fertility rates of the Dutch cohorts, but that the fertility rates of the Czech cohorts will develop more quickly than their Dutch counterparts. With each additional year the Czech cohorts will decrease the time-lag behind the Netherlands by one year. Based on the fertility of the Czech cohorts thus estimated and the expected gradual growth of overall fertility up to 1.850 the cross-sectional fertility was determined in retrospect for the purpose of the demographic projection.

In the Czech Republic from 2001 to 2010 the average annual increase in life expectancy at births (the SLOPE parameter of the linear regression function) was 0.295 of a year for males and 0.253 of a year for females. This variant of the projection assumes that the life expectancy of males and females will grow at the same rate for the entire duration of the projection.

Over the next 15 years we expect a gradual increase in the migration increment of up to 35 000 people a year, which is more than double the amount in 2010. The demographic structure of net migration should be the same as in the CZSO variant.

As opposed to the CZSO variant, in this case we assume a gradual convergence of the demographic behaviour of the populations of individual regions. It is assumed that by the year 2050 differences in fertility and mortality between the individual regions will disappear and the influence of internal migration on changing the population size of individual regions will be minimised. Of international migration it is assumed that the division of the migration increment among the individual regions will increasingly be proportional to the number of inhabitants in the regions.

The trends of population development in both variants of the projection are identical, but the expected rates of development differ. The Netherlands variant assumes a bigger rise in fertility, a more rapid increase in average life expectancy and higher net migration than the CZSO variant. We can therefore consider the CZSO variant to be low and the Netherlands variant to be high. Both variants assume a further rise in fertility, though at a lower rate than in recent years. In both variants a continuing rise in life expectancy at birth is also expected. It is assumed that the Czech Republic will remain an immigration country, but that net migration will be considerably lower than in the years 2007 and 2008 (when the figures were around 70–80 000 people a year). The correctness of this assumption was confirmed in the year 2010, when net migration amounted to only roughly 15 000 persons.

The expected development of fertility, mortality and migration in both variants is shown in the following table.

Scenario of the demographic projection for the regions of the Czech Republic

The demographic projection for the individual regions was also calculated in two variants derived from the above-mentioned scenarios for the Czech Repulic. The structure of fertility and mortality according to age is assumed to be the same in all the regions as in the Czech Republic (but the total fertility rates and life expectancies at birth can be different). Similarly it is assumed that the sex and age structure of net external migration will be the same in all the regions as in the Czech Republic as a whole.

Table 1 **Demographic projection scenarios**

Characteristic	Variant	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total fertility rate	CZSO	1.492	1.529	1.565	1.585	1.605	1.613	1.620	1.628	1.635
	NL	1.492	1.535	1.600	1.650	1.700	1.750	1.800	1.825	1.850
Life expectancy at birth – males	CZSO	74.4	75.7	76.9	78.2	79.4	80.4	81.4	82.4	83.4
	NL	74.4	75.9	77.3	78.8	80.3	81.8	83.3	84.7	86.2
Life expectancy at birth – females	CZSO	80.6	81.7	82.8	84.0	85.1	85.9	86.7	87.6	88.4
	NL	80.6	81.9	83.1	84.4	85.7	86.9	88.2	89.4	90.7
Net migration	CZSO	15 648	20 000	20 000	20 000	20 000	20 000	20 000	20 000	20 000
	NL	15 648	25 000	30 000	35 000	35 000	35 000	35 000	35 000	35 000

Source: Own calculation.

For each region there was a separate assumption of internal migration (i.e. migration between the given region and the other regions of the Czech Republic).

For the sake of simplicity it was always only the net migration that was considered – the difference between the number of immigrants and emigrants – and of course that value can be negative if the number of emigrants is higher than the number of immigrants.

The initial age-specific rates of the internal net migration for the individual regions were estimated on the basis of the weighted averages of the age-specific rates for the years 2005–2009

$$\bar{i}_x = 0.4 \cdot i_x^{(2009)} + 0.3 \cdot i_x^{(2008)} + 0.2 \cdot i_x^{(2007)} + 0.1 \cdot i_x^{(2006)}$$

Both variants assumed a subsequent reduction in internal net migration during the projection period.

The CZSO Variant

The total fertility rate in the individual regions will always be equal to the average of the total fertility rates (in the appropriate year and the appropriate region) for the low and medium variants of the projection of the Czech Statistical Office (*Český statistický úřad*, 2010). The differences between fertility rates in the individual regions will be reduced only in part during the projected period.

The life expectancies in the individual regions will correspond to the values of the medium variant of the projection of the Czech Statistical Office. Differences among the life expectancies in the individual regions will decline only minimally during the projected period.

By 2050 internal net migration in all regions in all age groups will be reduced to half.

As far as international migration is concerned, in the beginning of the projected period it is considered that the proportion of immigrants (from the total net migration of the Czech Republic) into each region is equal to the average share of the net migration of the given region out of the net migration for the Czech Republic as a whole for the past two years 2009–2010. In the course of the projected period the division of net migration into the individual regions will gradually change so that in the year 2050 the share of immigrants to each given region will be equal to the average of the initial proportion and the proportion equal to the number of citizens of the region with regard to the whole of the Czech Republic.

The NL Variant

Unlike the previous variant, in this case we assume a convergence scenario for all regions.

It is assumed that there will be a gradual total reduction of the differences in fertility and mortality between the individual regions of the Czech Republic. The differences in fertility can be characterised by the ratios of the value of the total fertility rate in the region in relation to the total fertility rate for the Czech Republic. The initial value of this ratio has been chosen as equal to the average of the ratios in the period 2005–2009. During the projected period it is assumed there will be a gradual linear reduction of the differences between the regions so that in the year

2050 the fertility in all the regions will be the same as in the Czech Republic as a whole (i.e. the values of the ratios for all regions will be equal to one).

In the case of mortality it is also assumed (by analogy with the case of fertility) that there will be a convergence of demographic development, i.e. a reduction of the differences in mortality between the individual regions. In 2010 it is assumed for the individual regions that the ratio of the value of life expectancy at birth for both males and females with regard to the value for the Czech Republic is at the level of the average of the ratios for the period 2005–2009. In the course of the projected period it is assumed that there will be a gradual linear reduction of the differences between the regions so that in 2050 the mortality of both males and females in all regions will be the same as in the Czech Republic as a whole (i.e. the values of the ratios for all the regions will be equal to one).

Internal migration in the initial year of the projection is considered to be the same as in the CZSO variant. In this variant, however, it is assumed that there will be a gradual total elimination of internal migration by 2050, i.e. for all regions the reduction of net migration within the state to zero in all age groups.

For international migration, in this variant it is assumed that in 2050 the proportion of immigrants to the given region will be directly equal to the share of inhabitants of the region in relation to the Czech Republic as a whole.

In the scenarios described above the projection has been calculated for the population as a whole (without distinguishing the population by education level) for the Czech Republic and for each region.

PROJECTION DISTINGUISHING THE POPULATION BY EDUCATION LEVEL

Computation of the Projection

Only the four following levels of education are distinguished:

A – primary education (including no education or incomplete education) – ISCED 0–2,

B – lower secondary education (without the school-leaving exam) – ISCED 3C, 4C,

C – upper secondary education (with the school-leaving exam) – ISCED 3A, 3B, 4A,

D – tertiary education ('higher education'), meaning education at a conservatory, higher vocational training or university education – ISCED 5–6.

This projection is a multistate type of projection distinguishing four subpopulations, A, B, C and D, respectively. The increase of education level can be regarded as an (internal) 'migration' from one subpopulation to another.

Because primary education also includes no education or incomplete education, newborn children in the population belong to subpopulation A (regardless of the education level of the mother).

A relatively large number of young people after finishing primary school proceed to study at a secondary school terminating in the school-leaving exam. Their education level will then increase directly from A to C. Graduates of a secondary school without the school-leaving exam increase their education from A to B.

A necessary condition for admission to study at a university, technical college or other type of tertiary institution is to pass the secondary school-leaving exam, i.e. to reach upper secondary education level C. It is consequently impossible to increase the education level directly from B to D.

So the only possible changes of education level are: A→B, A→C, B→C, C→D. See Figure 1.

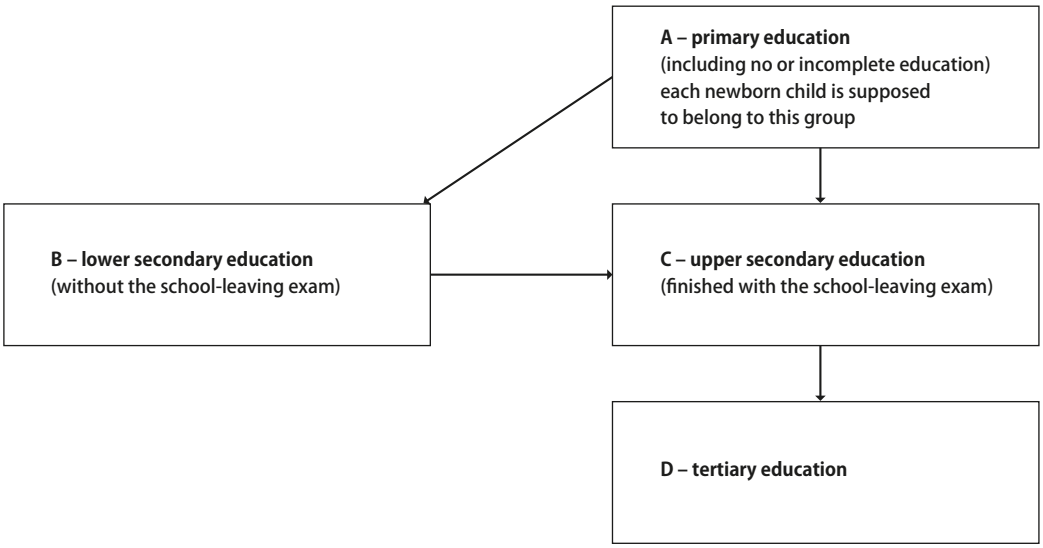
It is well-known that mortality depends not only on age and sex but also on education level. Survival ratios are dependent on education level, too.

The formulas used to compute this projection are presented in Appendix 2.

MAIN RESULTS OF THE PROJECTION OF DEMOGRAPHIC DEVELOPMENT

At first glance the two variants of the projection seem to produce diametrically different results. According to the CZSO variant, during the next 15 years the number of inhabitants of the Czech Republic (Figure 2) will approach 10.8 million, but then, after a brief period of stagnation, it will begin to decline. According to this variant, the number of inhabitants in the Czech Republic in 2050 will be roughly the same as in 2010,

Figure 1 **Education levels and possible paths of increasing education level**



Source: Own calculation.

i.e. just a little over 10.5 million. According to the NL variant, on the other hand, which assumes higher fertility, a more rapid rise in life expectancy at birth and a higher net migration, the number of citizens of the Czech Republic will grow constantly and in 2050 will be almost 1.2 million higher than in 2010.

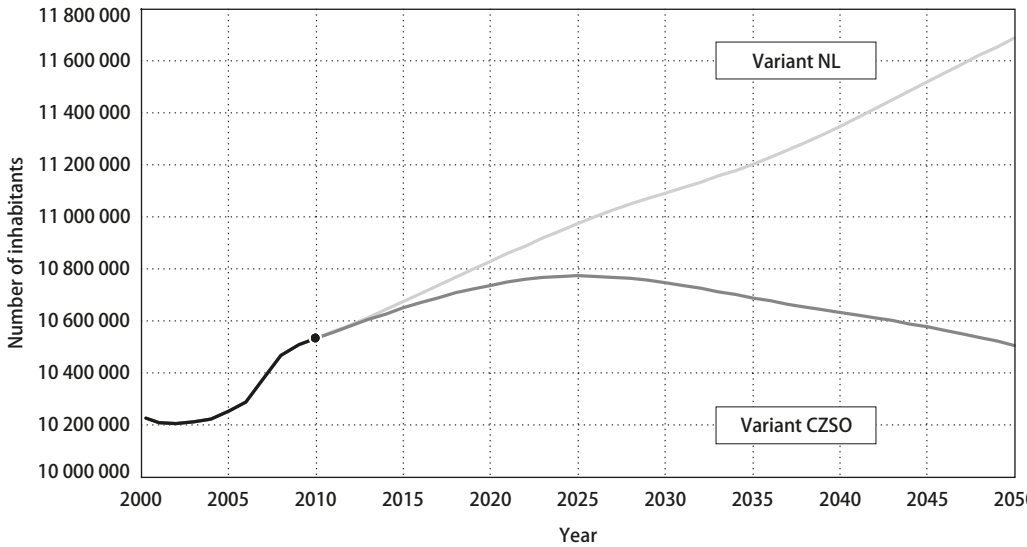
The development of live births and deaths also differs in the two variants (Figure 3). According to the CZSO variant, the moment will come, even before 2020, when the number of live births will once again be lower than the number of deaths (as in the 1994–2005 period). This situation will remain constant, so the natural decrease in the population of the Czech Republic will continue to rise. Around 2050 the annual number of live births might already be around 35 000 lower than the number of deaths. According to the NL variant, the natural decline in the population of the Czech Republic will occur several years later, probably only after 2020. The differences between the number of live births and the number of deaths will not be too marked, and given higher fertility and migration they will begin to decrease after 2030. According to this variant, by the end of the first half of this century it is expected that the annual number of live births will once again be almost at the same level as the number of deaths.

Population growth in the individual regions varies. Whereas in Prague and the Central Bohemian region it can be expected that there will be a relatively strong increase in the number of inhabitants, in a number of the other regions a decline in the population is expected, especially according to the CZSO variant (see Figure 4).

It is difficult to say which of the given variants is more probable. Possibly the most probable will be development according to a medium variant lying somewhere between these two variants. At present there is much discussion around the question of whether the stagnation in fertility that has been observed since 2009 is merely a short-term interruption in further growth or whether it is a long-term (or even permanent) change from the preceding trend. The migration increment has recorded even greater fluctuations. The further migration trend probably depends to a considerable extent on the economic situation in the Czech Republic and in the world. Only the trend in life expectancy at birth is relatively stable – the values for both males and females show a steady increase.

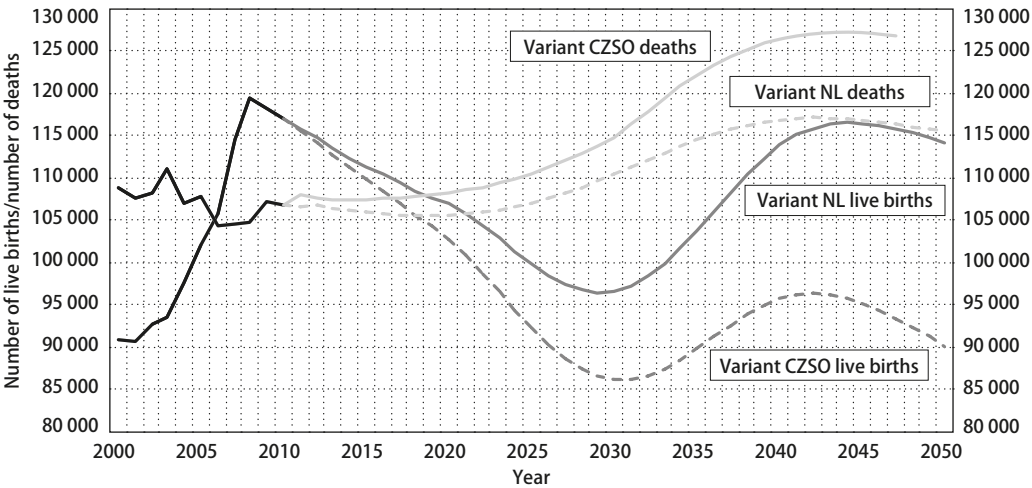
In any case, it is evident that, assuming that there is a continued rise in fertility and in life expectancy at birth and that net migration remains positive, there

Figure 2 **Projected population growth of the Czech Republic**



Source: Own calculation.

Figure 3 **Expected trend in the number of live births and deaths in the Czech Republic**

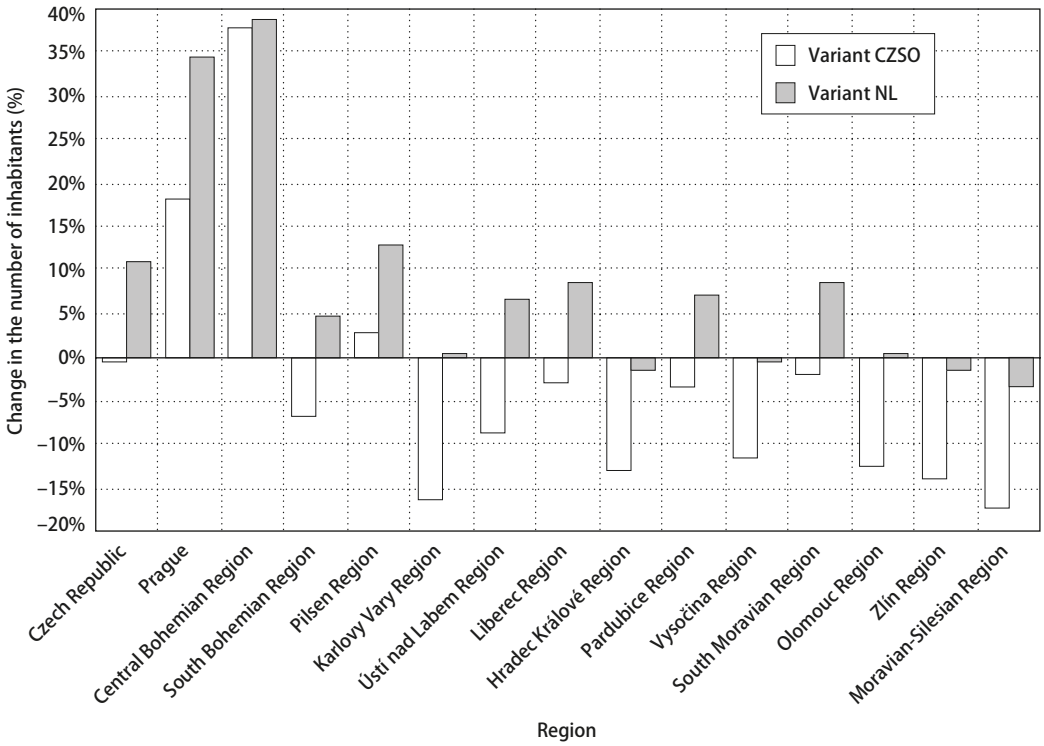


Source: Own calculation.

will be no marked decline in the population size of the Czech Republic in the next few decades.

It is necessary to realise, however, that in spite of the relatively big difference in the projected population size of the two variants (a difference of almost 13% in 2050), the differences in the structure of the population according to the level of education attained are negligible. There are none at all apparent in the figures below. For this reason these figures and the accompanying texts are presented for only one variant (NL).

Figure 4 **Expected changes in the population size in the Czech Republic and in individual regions in the 2011–2050 period**



Source: Own calculation.

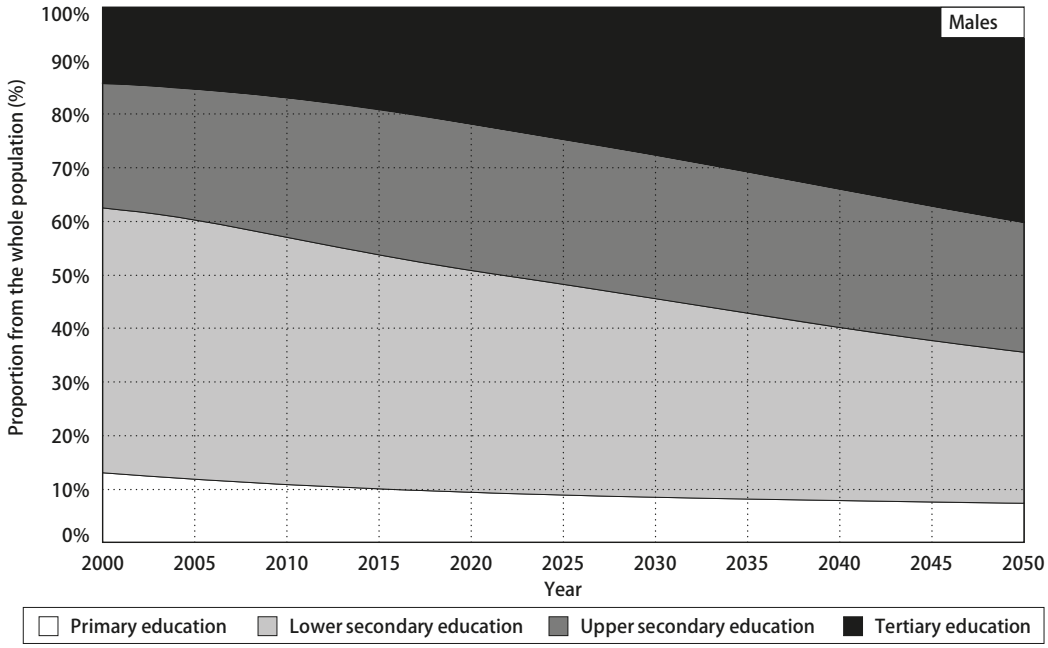
Projection of the structure of education in the Czech Republic

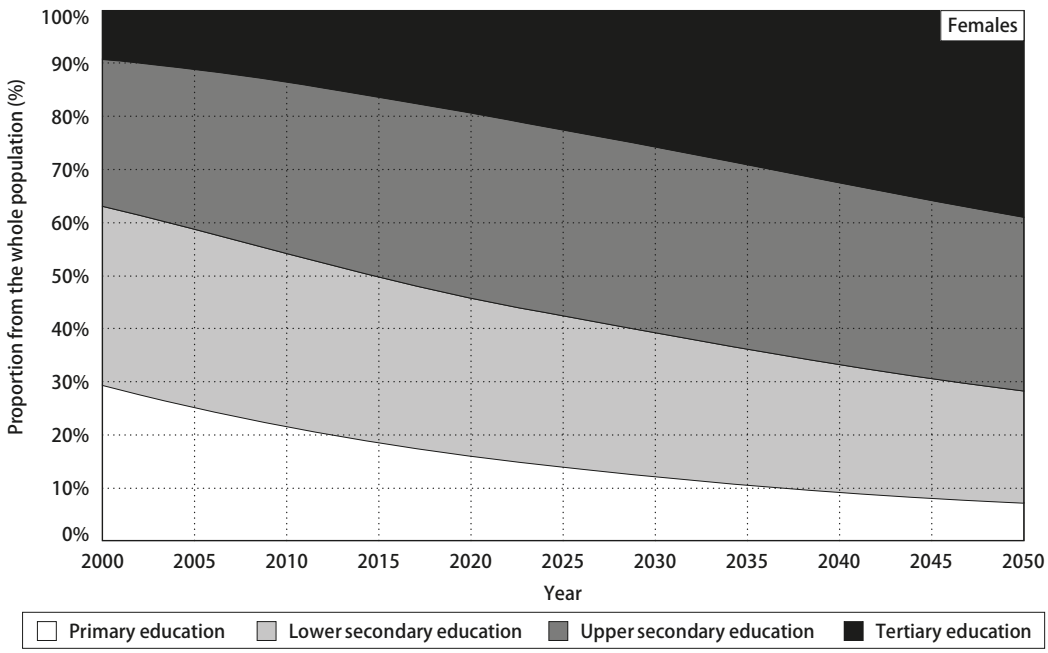
The proportion of persons over the age of 25 with tertiary education in 2010 is over 16% for males and 13% for females. For males the group with lower secondary education makes up the largest share at roughly 45%. For females this group has roughly the same proportion as the group with upper secondary education – in both cases around 33%. The proportion of persons with at most primary education is over 10% for males and over 21% for females. (See Figure 5)

The projection of future development up to 2050 assumes that the most conspicuous growth will be that of the proportion of persons with completed tertiary education. In the case of males the figure should reach 38%, and in the case of females it should even be a little bit higher. Among males this growth will be offset by a decline in the share of people in what is at present the strongest group – that of persons with secondary education without the school-leaving exam, which over time will drop from the present 45% to around 27%. Among females the growth in the share of people with the highest level of education will be offset by a strong decline in the share of people with the lowest level, primary education, dropping from the current 22% to around 7%.

Because of the limited scope of this article we present only selected results at the regional level. Specific results for the regions have been published in *Langhamrová et al.* (2011). Because the biggest growth will occur in the proportion of people with tertiary education, we are concentrating only on this level of education at the regional level. Table 2 shows the trend in the shares of males and females with tertiary education in the Czech Republic as a whole and in the individual regions.

Figure 5 **Expected development of the educational structure of males and females in the Czech Republic**





Source: Own calculation.

The largest shares of males and females with tertiary education are, as expected, in Prague and in the South Moravian Region; the smallest shares of people with this level of education are in the regions of Ústí nad Labem and Karlovy Vary. Whereas in 2010 there were only 81 females with tertiary education for every 100 males with this level of education in the Czech Republic, in 2050 the ratio will be 104 females to 100 males. The smallest number of females to 100 males with tertiary education is in the South Moravian Region, while conversely the highest is in the Central Bohemian, Ústí nad Labem and Moravian-Silesian Regions. See Table 2 and Table 3.

HOW WILL EDUCATION INFLUENCE THE ECONOMIC CONSEQUENCES OF POPULATION AGEING?

It is very often assumed that the productivity of a person with higher education is on average somewhat higher than the productivity of a person with lower education. The length of education expressed in years can be used as a very rough measure of the level and quality of education.

How will the length of education influence the level of productivity? According to *Barro* (2001), increasing education by 1 year would mean an increase in productivity of approximately 4%. At the same time, this increase is higher in developed than in developing countries. We consider the Czech Republic to be an economically developed country, therefore, we assumed that increasing the length of education in the Czech Republic by 1 year would mean an increase in productivity of 5% (see also *Koschin*, 2005: p. 48).

We estimated the overall productivity in the Czech Republic as the sum of the productivity of individual persons. We set the average productivity of an individual with a total period of education of v years as equal to 1.05^{v-v_0}, where v_0 is the length of education considered as standard.

Table 2 **Percentage of people with tertiary education in the regions**

Region	Males							Females						
	Proportion of persons with tertiary education (%)						Growth index 2050/2010	Proportion of persons with tertiary education (%)						Growth index 2050/2010
	2000	2010	2020	2030	2040	2050		2000	2010	2020	2030	2040	2050	
Czech Republic	14.2	16.7	21.2	26.5	32.1	37.4	2.24	9.2	13.5	19.3	25.7	32.5	39.0	2.89
Prague	30.3	30.8	34.9	40.1	45.3	50.6	1.64	19.1	24.1	30.9	38.0	44.9	51.4	2.13
Central Bohemian Region	11.2	14.4	19.9	25.1	29.8	33.9	2.35	7.5	12.5	19.2	26.1	32.7	38.3	3.08
South Bohemian Region	12.4	15.5	20.3	24.9	30.5	35.8	2.30	8.0	12.5	18.3	24.8	31.6	38.2	3.07
Pilsen Region	12.5	14.9	18.8	23.2	28.2	33.1	2.22	7.8	12.1	17.6	22.8	28.9	34.8	2.88
Karlovy Vary Region	9.3	10.1	12.4	15.2	18.3	21.5	2.12	6.1	8.2	11.4	15.1	19.1	23.1	2.83
Ústí nad Labem Region	8.6	9.9	12.7	15.9	19.4	22.6	2.28	6.0	8.7	12.6	16.9	21.4	25.8	2.97
Liberec Region	11.2	12.9	16.5	20.6	25.2	29.6	2.29	7.6	10.8	15.5	20.7	26.3	31.8	2.95
Hradec Králové Region	12.1	15.1	19.7	24.0	28.7	33.8	2.25	7.8	12.1	18.1	23.6	30.0	36.5	3.02
Pardubice Region	11.3	14.3	19.4	25.0	31.2	37.1	2.59	7.2	11.5	17.6	24.3	31.5	38.5	3.34
Vysočina Region	10.5	14.1	19.3	23.8	29.2	34.7	2.46	6.9	11.6	17.6	23.1	29.8	36.3	3.12
South Moravian Region	16.8	19.7	25.4	32.0	39.1	46.0	2.33	10.1	14.6	21.0	28.2	35.9	43.4	2.97
Olomouc Region	12.7	15.9	20.7	25.9	32.0	38.1	2.39	8.3	13.0	18.9	24.3	31.3	38.4	2.96
Zlín Region	12.5	15.7	20.5	26.3	32.7	38.9	2.48	7.6	12.4	18.5	23.9	31.1	38.4	3.10
Moravian-Silesian Region	12.0	15.2	20.0	24.7	30.6	36.4	2.40	8.1	12.8	19.9	24.3	30.8	37.7	2.96

Source: Own calculation.

Table 3 **Regional ratios of proportions of persons with tertiary education in the regions (with respect to the value for the Czech Republic)**

Region	Males						Females					
	2000	2010	2020	2030	2040	2050	2000	2010	2020	2030	2040	2050
Czech Republic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prague	2.14	1.85	1.64	1.52	1.41	1.35	2.07	1.79	1.60	1.48	1.38	1.32
Central Bohemian Region	0.79	0.87	0.94	0.95	0.93	0.91	0.81	0.92	1.00	1.02	1.01	0.98
South Bohemian Region	0.87	0.93	0.96	0.94	0.95	0.96	0.86	0.92	0.95	0.96	0.97	0.98
Pilsen Region	0.88	0.90	0.89	0.88	0.88	0.88	0.85	0.89	0.91	0.89	0.89	0.89
Karlovy Vary Region	0.65	0.61	0.58	0.58	0.57	0.57	0.67	0.61	0.59	0.59	0.59	0.59
Ústí nad Labem Region	0.61	0.59	0.60	0.60	0.61	0.61	0.66	0.64	0.65	0.66	0.66	0.66
Liberec Region	0.79	0.77	0.78	0.78	0.79	0.79	0.82	0.80	0.80	0.81	0.81	0.82
Hradec Králové Region	0.85	0.90	0.93	0.91	0.90	0.90	0.84	0.90	0.94	0.92	0.92	0.94
Pardubice Region	0.80	0.86	0.91	0.95	0.97	0.99	0.78	0.86	0.91	0.94	0.97	0.99
Vysočina Region	0.74	0.84	0.91	0.90	0.91	0.93	0.75	0.86	0.91	0.90	0.92	0.93
South Moravian Region	1.19	1.18	1.20	1.21	1.22	1.23	1.10	1.08	1.09	1.09	1.10	1.11
Olomouc Region	0.90	0.95	0.98	0.98	1.00	1.02	0.90	0.96	0.98	0.95	0.96	0.99
Zlín Region	0.88	0.94	0.97	1.00	1.02	1.04	0.82	0.92	0.96	0.93	0.96	0.99
Moravian-Silesian Region	0.85	0.91	0.94	0.93	0.95	0.97	0.88	0.94	0.98	0.94	0.95	0.97

Source: Own calculation.

The average length of education in the Czech Republic at present is around 12 years (see, e.g., *Mazouch – Fischer*, 2011), so let us take this period as standard. In the Czech Republic this is the length of education of a person with lower secondary education. Thus, the length of education of a person with primary education is 3 years shorter than standard, that of a person with upper secondary education is 1 year longer than standard, and that of a person with university education is 5 years longer than standard. We are taking the average length of university studies to be only 4 years because a 3-year bachelor's degree also counts as university education.

We often characterise the economic burden imposed on society by seniors by means of the so-called old-age-dependency ratio (OADR), defined as the ratio of the number of persons of post-productive age to the number of persons of productive age.

$$OADR = \frac{S_{III}}{S_{II}}$$

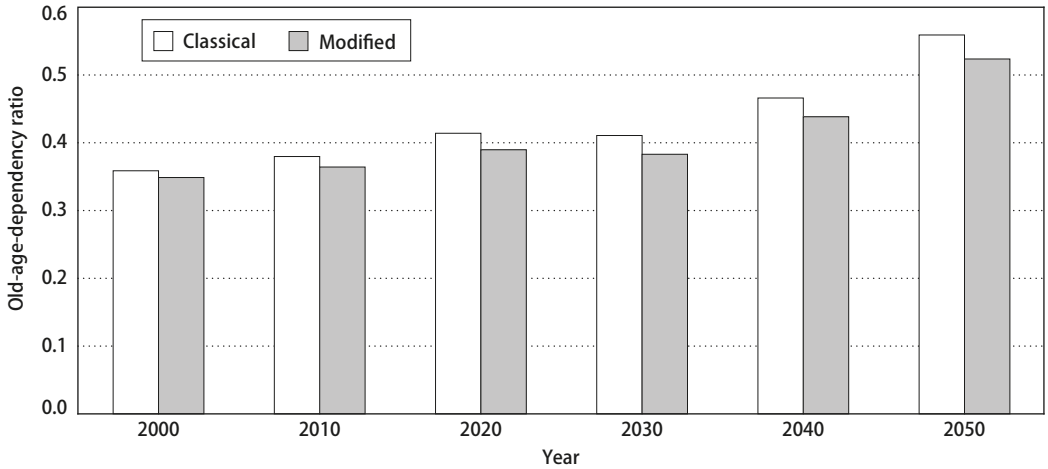
where S_{II} is the number of persons of productive age and is the number of persons of post-productive age. The lower limit of productive age is 20 years, the upper limit is the actual retirement age in the Czech Republic in the given year. The ratio assumes that not only consumption, but also productivity depends only on the number of persons of a given age. Let us compare this ratio with a modified ratio where the denominator includes not just the sum of the number of persons of productive age, but the sum of overall productivity calculated with regard to the above-mentioned assumptions,

$$OADR_{\text{modified}} = \frac{S_{III}}{1.05^{-3} \cdot S_{II,A} + S_{II,B} + 1.05 \cdot S_{II,C} + 1.05^{5} \cdot S_{II,D}}$$

where $S_{II,A}$, $S_{II,B}$, $S_{II,C}$, $S_{II,D}$ are the number of persons of productive age with primary, lower secondary, upper secondary and tertiary education, respectively.

The increase in the dependency of seniors would, when taking into account the rising level of education, be a little bit lower than according to the ratio calculated in the classic manner. The 'classic' ratio would by 2050 be almost 47% higher than in 2010; with the modified ratio the increase is only 44% (see Figure 6). At the same time, we took as the measure of qualifi-

Figure 6 **Comparison of the development of the old-age-dependency ratio calculated using the classic and modified methods**



Source: Own calculation.

cation and level of productivity only the commonly shown 'standard' formal education. Postgraduate study and various other forms of lifelong education were not included in the calculation.

CONCLUSION

The Czech population is ageing; the number of people in the older and oldest age groups is increasing. However, it can be assumed that there will be further growth in the level of education of the population. There will be a further drop in the proportion of people with only primary education, while conversely the proportion of people with tertiary education will increase several-fold. The level of education of females will equal that of males.

There are relatively large differences between the education levels of populations in individual regions. The proportion of people with tertiary education in Prague is twice the average level of the Czech Republic. On the other hand, the proportion of tertiary educated people in the regions of South and West Bohemia is three times lower than in Prague. Despite the differences between males and females, the differences between the education levels in individual regions will not be eliminated during the projected period. But for some regions the differences will considerably diminish. In 2050 the proportion of people with tertiary education in Prague will be only about 30% higher than that of the whole Czech Republic. On the other hand, the proportion of tertiary educated people in Central Bohemian, South Bohemian, Pardubice, Olomouc, Zlín and Moravian-Silesian regions, which is at present around 80–90% of the average share for the Czech Republic will almost draw even with the level of the average share for the Czech Republic by 2050.

It is usually assumed that a person with higher education will more easily find work in the labour market and will also have a higher income. At the same time it can also be assumed that their productivity is on average somewhat higher than the productivity of a person with lower education. This will, among other things, generate more income for the pension system. On the other hand, we must take into account that more educated people have a longer life expectancy and so they will receive a pension for a longer time period.

The projection clearly shows that the population of the Czech Republic will be better educated in 2050 than it is at present; its human capital will increase. The same can be said of the populations of the individual regions. In any case, investment in education will bring society rich dividends. But will the Czech population be wiser and more human?

References

- Arltová, M. – Langhamrová, J. 2010. Migration and ageing of the population of the Czech Republic and the EU countries. *Prague Economic Papers*, 19(1), pp. 54–73. ISSN 1210-0455.
- Barro, R. J. 2001. Human Capital and Growth. In *The American Economic Review,* Vol. 91, No. 2, pp. 12–17.
- Bogue, D. J. – Arriaga, E. E. – Anderton, D. L. (eds.). 1993. *Readings in Population Research Methodology.* Vol. 5. Population Models, Projections and Estimates. United Nations Population Fund, Social Development Center, Chicago, Illinois.
- Fiala, T. – Langhamrová, J. 2010a. Computation of the projection of the inhabitants of the Czech Republic by sex, age and the highest education level. Paris 22. 8. 2010–27. 8. 2010. In *COMPSTAT* 2010. [online]. Paris: CNAM and INRIA, pp. 999–1006. ISBN 978-3-7908-2603-6. <http://www-roc.inria.fr/axis/COMPSTAT2010/images/contents_ebook.pdf>.
- Fiala, T. – Langhamrová, J. 2010b. Population Projection of the Number and Age Structure of ICT Experts in the Czech Republic. Jindřichův Hradec 8. 9. 2010–10. 9. 2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy.* Linz: Trauner, 2010, pp. 115–123. ISBN 978-3-85499-760-3.
- Kačerová, E. 2010. Migration – Source of Human Resources. Jindřichův Hradec 8. 9. 2010–10. 9. 2010. In *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz: Trauner, pp. 213–218. ISBN 978-3-85499-760-3.
- Koschin, F. 2005. *Kapitoly z ekonomické demografie* (Readings in Economic Demography). 1. vyd. Praha: Oeconomica, 52 p. ISBN 80-245-0959-8.
- Langhamrová et al. 2011. *Prognóza lidského kapitálu obyvatelstva České republiky do roku 2050 (verze k roku 2011)* (Forecast of the Human Capital of the Czech Republic until 2050 – version 2011). 1. vyd. Praha: Oeconomica, 258 p. ISBN 978-80-245-1781-0.
- Mazouch, P. – Fischer, J. 2011. *Lidský kapitál – měření, souvislosti, prognózy.* (Human Capital – measuring, context, projections). 1. vyd. Praha: C. H. Beck, 116 p. Beckova edice ekonomie 116. ISBN 978-80-7400-380-6.

Data sources

- Český statistický úřad (Czech Statistical Office). [cit. 24. 9. 2011]. <http://www.czso.cz/>.
- Český statistický úřad (Czech Statistical Office). 2009. Projekce obyvatelstva České republiky do roku 2065 (Population projection of the Czech Republic up to 2065). [cit. 24. 9. 2011], <http://www.czso.cz/csu/2009edicniplan.nsf/p/4020-09>.
- Český statistický úřad (Czech Statistical Office). 2010. Projekce obyvatelstva v krajích a oblastech ČR do roku 2065 (Population projection of the regions of the Czech Republic up to 2065). [cit. 24. 9. 2011]. <http://www.czso.cz/csu/2010edicniplan.nsf/p/4021-10>.
- Statistics database of Eurostat. [cit. 24. 9. 2011]. <http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database>.
- Ústav pro informace ve vzdělávání (Institute for Information on Education), *Statistická ročenka školství* (Statistic Yearbook of Education). [cit. 24. 9. 2011]. <http://www.uiv.cz/rubrika/98>.

TOMÁŠ FIALA

graduated from the Faculty of Mathematics and Physics of Charles University in Prague. He is currently a lecturer in the Department of Demography at the Faculty of Informatics and Statistics of the University of Economics in Prague. In his research he specialises in the study of population ageing and population projections

JITKA LANGHAMROVÁ

graduated from the University of Economics in Prague. She is currently head of the Department of Demography at the Faculty of Informatics and Statistics of the University of Economics in Prague. In her research she specialises in the study of population ageing, social demography, and regional demography.

LADISLAV PRŮŠA
graduated from the University of Economics in Prague. He is currently the director of the Institute for Labour and Social Affairs. In his research he specialises in the field of social demography, social policy and the consequences of population ageing.

Annex 1 | Computation of the population projection including international migration

Let's suppose uniform distribution of the time of immigration and uniform distribution of the date of birth during the year.

Let's have immigrants arrive at moment u after the beginning of year t where $0<u<1$. According to the assumption of uniform distribution, the proportion of immigrants arriving after their birthday is u while the proportion of immigrants arriving before their birthday is of course $1-u$. The time of survival until the end of the year is $1-u$ for both these groups.

The total time of survival until the end of the year for immigrants arriving after their birthday can then be expressed as

$$\int_0^1 u\cdot(1-u)\mathrm{d}u=\int_0^1 u\mathrm{d}u-\int_0^1 u^2\mathrm{d}u=\left[\frac{u^2}{2}\right]_0^1-\left[\frac{u^3}{3}\right]_0^1=\frac{1}{2}-\frac{1}{3}=\frac{1}{6}$$

while the total time of survival until the end of the year for immigrants arriving before their birthday is

$$\int_0^1(1-u)\cdot(1-u)\mathrm{d}u=\int_0^1(1-2u+u^2)\mathrm{d}u=\int_0^1 1\mathrm{d}u-\int_0^1 2u\mathrm{d}u+\int_0^1 u^2\mathrm{d}u=1-\left[u^2\right]_0^1+\left[\frac{u^3}{3}\right]_0^1=1-1+\frac{1}{3}=\frac{1}{3}$$

The proportion of immigrants arriving after their birthday is

$$\int_0^1 u\mathrm{d}u=\left[\frac{u^2}{2}\right]_0^1=\frac{1}{2}$$

while the proportion of immigrants arriving before their birthday is

$$\int_0^1(1-u)\mathrm{d}u=\int_0^1 1\mathrm{d}u-\int_0^1 u\mathrm{d}u=1-\left[\frac{u^2}{2}\right]_0^1=1-\frac{1}{2}=\frac{1}{2}$$

which corresponds to the assumption of uniform distribution mentioned above.

The average time of survival until the end of the year for an immigrant arriving after their birthday is then $\frac{\frac{1}{6}}{\frac{1}{2}}=\frac{1}{3}$ and similarly the average time of survival until the end of the year for an immigrant coming before their birthday is $\frac{\frac{1}{3}}{\frac{1}{2}}=\frac{2}{3}$.

Let's make
$S_{t,x}$ – the number of persons aged x at the beginning of year t,
$I_{t,x}$ – the number of immigrants aged x during year t. In the case of prevailing emigration these values are negative.
$P_{t,x}$ – the survival ratio – the probability that a person aged x will survive year t.
Assuming the independence of survival probabilities in time the probability of surviving part h of year t is equal to the h-th power of the survival ratio, i.e. to $P_{t,x}^{h}$. The formula for computing the projection including immigration is then

$$S_{t+1,x+1} = S_{t,x} \cdot P_{t,x} + \frac{I_{t,x} \cdot P_{t,x}^{2/3} + I_{t,x+1} \cdot P_{t,x}^{1/3}}{2}$$

The age index in the survival ratio is x in both groups of immigrants because it refers to the age at the beginning of the year, not to the age at the moment of immigration.
For computing the population at age 0 of course only immigrants arriving after their birthday are taken into account so the formula is

$$S_{t+1,0} = N_t \cdot P_{t,*} + \frac{I_{t,0} \cdot P_{t,*}^{1/3}}{2}$$

where
N_t is the number of live births of the given sex in year t computed using the well-known formula

$$N_t^{(bs)} = \sum_{x=15}^{49} \frac{S_{t,x}^{(f)} + S_{t+1,x}^{(f)}}{2} \cdot f_{t,x}, \quad N_t^{(m)} = 0{,}515 \cdot N_t^{(bs)}, \quad N_t^{(f)} = 0{,}485 \cdot N_t^{(bs)}$$

$S_{t,x}^{(f)}$ is the number of females (regardless of their education level) at age x at the beginning of year t,
$f_{t,x}$ are the age-specific fertility rates.

$N_t^{(bs)}$ $N_t^{(m)}$ $N_t^{(f)}$ mean the number of live births in year t of both sexes, males and females, respectively
and $P_{t,*}$ is the survival ratio for newborns – the probability that a child born during year t will survive until the end of year t (see, e.g,. *Koschin*, 2005).

Annex 2 | Computation of the population projection by sex, age and education level

Let us make (for each sex separately):
$S_{E,t,x}$ – the number of persons of the education level E at age x at the beginning of year t.
$I_{E,t,x}$ – the number of immigrants of education level E at age x during year t. In the case of prevailing emigration these values are negative.
${}_{E_1}G_{E_2,t,x}$ – the number of people increasing their education level from E_1 to E_2 at age x during year t.

Unlike international migration, which is supposed to be uniformly distributed throughout the year, the moment of graduation (i.e. the moment of the increase in education level) is usually concentrated at the middle

of the year. For people having increased their education level it is assumed that the time of survival until the end of the year is approximately half a year both for those graduating before and after their birthday.
The projection formulas are as follows (for each sex separately):

$$S_{A,t+1,x+1} = S_{A,t,x} \cdot P_{A,t,x} + \frac{I_{A,t,x} \cdot P_{A,t,x}^{2/3} + I_{A,t,x+1} \cdot P_{A,t,x}^{1/3}}{2} - \frac{{}_{A}G_{B,t,x} + {}_{A}G_{B,t,x+1}}{2} \cdot P_{A,t,x}^{1/2} - \frac{{}_{A}G_{C,t,x} + {}_{A}G_{C,t,x+1}}{2} \cdot P_{A,t,x}^{1/2}$$

$$S_{B,t+1,x+1} = S_{B,t,x} \cdot P_{B,t,x} + \frac{I_{B,t,x} \cdot P_{B,t,x}^{2/3} + I_{B,t,x+1} \cdot P_{B,t,x}^{1/3}}{2} + \frac{{}_{A}G_{B,t,x} + {}_{A}G_{B,t,x+1}}{2} \cdot P_{B,t,x}^{1/2} - \frac{{}_{B}G_{C,t,x} + {}_{B}G_{C,t,x+1}}{2} \cdot P_{B,t,x}^{1/2}$$

$$S_{C,t+1,x+1} = S_{C,t,x} \cdot P_{C,t,x} + \frac{I_{C,t,x} \cdot P_{C,t,x}^{2/3} + I_{C,t,x+1} \cdot P_{C,t,x}^{1/3}}{2} + \frac{{}_{A}G_{C,t,x} + {}_{A}G_{C,t,x+1}}{2} \cdot P_{C,t,x}^{1/2} + \frac{{}_{B}G_{C,t,x} + {}_{B}G_{C,t,x+1}}{2} \cdot P_{C,t,x}^{1/2} - \frac{{}_{C}G_{D,t,x} + {}_{C}G_{D,t,x+1}}{2} \cdot P_{C,t,x}^{1/2}$$

$$S_{D,t+1,x+1} = S_{D,t,x} \cdot P_{D,t,x} + \frac{I_{D,t,x} \cdot P_{D,t,x}^{2/3} + I_{D,t,x+1} \cdot P_{D,t,x}^{1/3}}{2} + \frac{{}_{C}G_{D,t,x} + {}_{C}G_{D,t,x+1}}{2} \cdot P_{D,t,x}^{1/2}$$

where $P_{E,t,x}$ is the survival ratio – the probability that a person of education level E at age x will survive year t. Because all newborns belong to education group A, we have (for each sex separately)

$$S_{A,t+1,0} = S_{t+1,0} = N_t \cdot P_{t,*} + \frac{I_{t,0} \cdot P_{t,*}^{1/3}}{2}$$

and, of course, $S_{B,t+1,0} = S_{C,t+1,0} = S_{D,t+1,0} = 0$, where N_t is the number of newborn boys (or girls respectively) in the whole population and $P_{t,*}$ is the so called survival ratio for newborns – the probability that a child born during year t will survive until the end of year t.

Not only mortality but also fertility depends on the education level. But because only the total number of live births (independent on the education level of the mother) is necessary for the computations, for simplicity the differences in fertility of females by education level have not been distinguished.

The initial demographic structure according to education level is drawn from the Census of People, Houses and Flats (SLDB - Census) in 2001 and has been recalculated to 1 January 2001.The projection has been calculated since 2001.

The differentiation of mortality according to education level was based on the life tables by education level for the period 2000–2002. For each education level E and each region the following indices of probabilities of death according to education level have been computed (for each sex and region separately)

$$I_{E,x} = \frac{q_{E,x}}{q_x}$$

where $q_{E,x}$ is the probability of death for education level E and q_x is the global probability of death (not distinguishing the education level).

The probabilities of deaths used for computation of the survival ratios for education level E were computed simply by multiplying the 'common' probability of deaths (not depending on education level) by the appropriate ratio mentioned above.

$$q_{E,t,x} = I_{E,x} \cdot q_{t,x}$$

For the inclusion of external immigrants in the individual educational groups, it is assumed that the structure of immigrants of a given age according to education level is the same as the structure of the population of the Czech Republic.

The numbers of graduates in 2002–2010 according to particular education levels were available in the statistic yearbooks on education (see *Ústav pro informace ve vzdělávání*). Graduates of secondary schools are not classified by age, only the age structure of all students is available. Most students begin to study at secondary school just after finishing primary school, i.e. at the age of 15. For simplicity we have assumed that each student begins to study at the age of 15 and graduates after the standard period of study, i.e. after 3 years in the case of lower secondary education (without the school-leaving exam) and after 4 years in the case of upper secondary education (with the school-leaving exam). One exception is GED preparatory study where the most frequent age of beginning is about 18 years (i.e. usually after reaching the lower secondary education level) and the standard period of study is 2 years.

Our assumptions concerning people attaining education levels *B* and *C* in year *t* are as follows:

$${}_{A}G_{B,t,18} = G_{B,t} \qquad {}_{A}G_{B,t,x} = 0 \quad \text{for} \quad x \neq 18$$

$${}_{A}G_{C,t,19} = G_{C1,t} \qquad {}_{A}G_{C,t,x} = 0 \quad \text{for} \quad x \neq 19$$

$${}_{B}G_{C,t,20} = G_{C2,t} \qquad {}_{B}G_{C,t,x} = 0 \quad \text{for} \quad x \neq 20$$

where $G_{B,t}$ is the number of graduates attaining lower secondary education (without the school-leaving exam), $G_{C1,t}$ is the number of graduates attaining upper secondary education (with the school-leaving exam) excluding graduates of GED preparatory study, $G_{C2,t}$ is the number of graduates of GED preparatory study.

Graduates of universities, technical colleges and other institutions at the tertiary education level are classified by age and so these data can be used directly as the values of ${}_{C}G_{D,t,x}$. Of course, only graduates of bachelor and long-term master programme are taken into account, not graduates of short-term master or doctoral programmes.

In every case age refers to the age reached by 1 July, i.e. near the usual time of graduation.

The expected numbers of graduates in the few years following 2011 were estimated from the corresponding numbers of admitted students in previous years and from the expected proportion of graduates estimated according to shares in previous years. The estimated numbers of graduates in later years were based on the assumption that the proportion of graduates out of the total population of a given age will remain constant or will be growing very slightly.

After each step in the computations (for year *t*) the projected numbers of people by education level were adjusted to the numbers of people in the whole population (regardless of education) at the given age (real numbers until 2011; projected numbers since 2012 were used for adjustment) according to the formula

$$S_{E,t,x}^{(adj)} = S_{E,t,x} \cdot \frac{S_{t,x}}{S_{A,t,x} + S_{B,t,x} + S_{C,t,x} + S_{D,t,x}}$$

for each education level $E = A, B, C, D$. For the next step in the computations (for year $t+1$) the adjusted values were used.

A more detailed description of the projection can be found, e.g., in *Fiala – Langhamrová*, 2010a.

REALISATION OF CHILDBEARING INTENTIONS IN THE CZECH REPUBLIC[1)]

Anna Šťastná

ABSTRACT

This study investigates childbearing intentions and the realisation thereof in the context of the Czech Republic. Czech Generations and Gender Survey panel data from 2005 and 2008 is used to investigate the realisation/non-realisation of short-term fertility intentions. The author studies to what extent the intention of having a child plays a role in real behaviour and what impact might be assigned to other factors such as personal characteristics and socio-economic conditions.

Keywords: fertility, childbearing, intentions, Czech Republic **Demografie,** 2011, **53: 321–332**

1 INTRODUCTION

The most characteristic trend in reproductive patterns during the socialist era in the Czech Republic was a strong orientation towards the two-child family model, the universality of which was apparent from fertility behaviour (*Frejka – Sardon*, 2004; *Rychtaříková*, 2003), and according to recent sociological surveys the ideal of the two-child family persists (e.g. surveys carried out by the Research Institute for Labour and Social Affairs, *CVVM*, 2003; *Fialová et al.*, 2000; *Hamplová*, 2000). Since 1990, two-thirds of all respondents in a wide range of surveys have repeatedly advocated having two children, while only one out of five considers three children to be the ideal (*Šalamounová – Šamanová*, 2003: p. 29; 2004: p. 8).

In the Generation and Gender Survey (GGS) the expected (ultimate) number of children was measured as the sum of the number of children already born plus the additional number of children desired. According to GGS data, the mean expected family size in 2005 declined slightly amongst younger cohorts, among whom women frequently declared a preference for the two-child family and only a small number intended to have a larger family (three or more children). Intentions below replacement level are characteristic for cohorts born after 1980 (and therefore in the year of the interview had reached the 18–24 age group); in this group female respondents often express the intention of remaining childless or of having only one child.

This article investigates short-term childbearing intentions (within the next three years) and the realisation thereof by men and women born between 1960 and 1987 as observed in a longitudinal study that examined fertility intentions over a three-year period and included subsequent follow-up work which monitored actual childbirth as well as respondents' 'new or revised' childbearing intentions at the end of the period.

This study's prospective view is particularly important; the author uses Czech Generations and Gender

1) This article was prepared as part of the 'Active Ageing, Family and Intergenerational Solidarity' project funded under research grant no. 2D06004.

Survey panel data from 2005 and 2008 and focuses on factors explaining the realisation / non-realisation of fertility intentions. A fertility intention is only one of several factors that can play a role in the whole decision-making process. Other factors that have to be taken into account consist of personal characteristics, a respondent's surrounding environment and social ties. Here the author includes the labour-market factor, since parenthood is often, especially for women, perceived as having a negative effect on a person's occupational and therefore financial conditions.

This paper will analyse and discuss four fundamental and closely interrelated research topics:

1. To what extent do different childbearing intentions 'result in' childbirth over a three-year period?

2. What kind of childbearing intentions are more likely to be realised? This leads to another closely related topic that is particularly important for fertility studies in demography: the question of the predictive power of declared intentions.

3. What personal characteristics play a role in the realisation or non-realisation of time-specific fertility intentions?

4. What is the level of stability of such intentions if they are not realised? The author will study the stability of childbearing intentions among those respondents who did not experience childbirth during the time period studied.

Over the period of observation considered in this study (2005–2008) the total fertility rate (TFR) in the Czech Republic increased from 1.28 in 2005 to 1.50 in 2008. Therefore, the realisation of intentions and their predictive power were studied under what might be seen as the relatively favourable conditions in which the populous birth cohorts of the 1970s realised their postponed childbearing, an atmosphere in which the media frequently explained the numbers of newborn babies in terms of a "baby-boom". Moreover, this period of time saw changes in the amount of the birth and parental allowance and the introduction of new parental leave conditions. From April 2006 the birth allowance increased from 8 750 to 17 500 CZK per child; however in 2008 the allowance was reduced to 13 000 CZK per child. In 2007 the parental allowance was doubled from 3 696 CZK to 7 582 CZK, and this change had been extensively discussed already during the second half of 2006. In January 2008 a more flexible 'multispeed' parental allowance was introduced, which allows parents to choose between receiving the allowance for periods of two, three, or four years, and the monthly amount is based on which of the three options they choose: the high rate (11 400 CZK) can be drawn up until the child's second birthday, the basic rate (7 600 CZK) can be drawn up until the child's third birthday, and in the case of the third option the allowance is paid at a reduced rate (3 800 CZK) for the last 27 months of the four-year leave period.

2 STUDYING CHILDBEARING INTENTIONS IN DEMOGRAPHY

Behind any study of fertility intentions lies the assumption that individuals are able to make rational choices about if and when they would like to have children (*Toulemon – Testa*, 2006; *Philipov et al.*, 2009). Most theoretical explanations also assume that behaviour reflects the informed decisions of an individual or couple.

The prospective GGS study, which is used as the data source for this article, was inspired by a variation on the theory of 'reasoned action', which provides an insight into the intention formation process. The project was inspired by the most recent version of this theory, namely, the 'theory of planned behaviour' (*Ajzen*, 1991), so a consistent set of questions on intentions concerning several choices was designed for the questionnaire in order to allow an analysis of such choices as interdependent and competing processes in the life course (*Vikat et al.*, 2007).

The theory of planned behaviour suggests that 'intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour' (*Ajzen*, 1991). Thus intentions to behave in a specific way are shaped by three conceptually independent determinants: (1) *attitudes towards behaviour* – a person's individual

evaluation of the positive or negative outcomes of behaving in a particular way, (2) *subjective norms*, which are determined by normative beliefs and is linked to perceived social pressure to behave or not to behave in a certain way and (3) *perceived behavioural control* – i.e. a person's perception of the ease or difficulty of behaving in a certain way (*Ajzen*, 1991).

This social-psychological model provides a potential framework in which to explain not only the decision-making process but also any potential correspondence with subsequent outcomes, i.e. with real behaviour. According to this theory, behaviour is a joint function of intentions and perceived behavioural control. The relative importance of intentions and perceived behavioural control in the prediction of behaviour is expected to vary in relation to specific situations and across different behaviours (*Ajzen*, 1991). Possible inconsistencies are explained either by the strength of the attempt at behavioural performance or by the degree of control over behaviour, which includes internal and external constraints. It is supposed that when behaviour affords a person complete control over behavioural performance, intentions alone should be sufficient to predict behaviour.

The attention paid to fertility intentions in demographic research is closely linked with the possibility of predicting fertility, and the realisation or non-realisation of individual childbearing intentions has become an important question for demographers in recent years (*Philipov et al.*, 2009). A major obstacle to research on this issue is the availability of both appropriate and detailed data at the micro-level. At least two waves of longitudinal data are required in order to track the behaviour of individuals and to study the likelihood of the realisation of measured fertility intentions or the stability of those intentions.

Moreover the definition of childbearing intentions differs from survey to survey. In some surveys only the ideal number of children is studied; but the ideal number of children is an abstract notion and refers to social norms rather than to a realistic individual target. Therefore intentions are usually defined with respect to the intended (ultimate) number of children a respondent would like to have by the end of that individual's reproductive life (*Philipov – Dorbritz*, 2003; *Philipov et al.*, 2009). According to Lee's distinction, used by *Philipov et al.* (2009), the intended number of children defined in this way is referred to as a 'fixed target'. There are several problems that complicate theorising about and interpreting the intended number of children in a lifetime perspective, in particular the very long time-scale that younger respondents have for the realisation of their intentions and the different factors in play during the life course of the respondent that might considerably modify not only the realisation of the intention, but the intention itself. Analysing a sequence of 21 General Household Surveys carried out in Great Britain from 1979 to 2001, *Smallwood and Jefferies* (2003) found that average intended family size moves downward over time and thus the intended number of children declines with increasing age. However, they conclude that this should not necessarily be interpreted as what they call an 'unmet need for fertility'. The disparity between intentions collected through surveys and subsequent fertility levels is likely to be a result of both the uncertain nature of many intentions and the modification of those intentions by subsequent life events and circumstances. The case in which individuals can change their fertility intentions according to their life conditions and adjust the intended number of children over the course of time might be termed a 'moving target' (*Lee*, 1980; cf. *Philipov et al.*, 2009: p. 58).

Another important issue in the study of intentions is the question of 'timing', i.e. whether one studies defined short-term or general, lifelong childbearing intentions. According to recent studies, more 'powerful' fertility intention predictions have been achieved when the timing of the behaviour is specified (*Philipov et al.*, 2006). Thus, studies measuring fertility intentions and the realisation thereof commonly examine the intention of having a child within the next few years (within two years – *Philipov – Testa*, 2008; within three years – *Spéder – Kapitány*, 2009; within five years *Toulemon – Testa*, 2006).

3 DATA AND METHODOLOGY

3.1 Sample

In this study, the author intends to focus on short-term intentions within a time-frame of three years following the interview date in order to be consistent with the length of the follow-up period. The author uses data from the Czech Generation and Gender Survey,

which took the form of a longitudinal panel study in 2005 which was repeated in 2008. The second wave thus provides a unique opportunity to compare original opinions and plans with their future realisation. In 2005, both women and men were asked about their future childbearing plans and expectations concerning having a (another) child within the next three years; thus after the second wave in 2008 it was possible to assess whether those expectations had been met and whether and to what extent respondents' original opinions and attitudes with regard to children and their influence on family life were reflected in actual reproductive behaviour.

In this study the author measured intentions with the following basic question: 'Do you intend to have a (another) child during the next three years?' Possible answers included: 'definitely yes', 'probably yes', 'probably not', and 'definitely not'. The question, 'Supposing you do not have a/another child during the next three years, do you intend to have any (more) children at all?', was included to create a variable defining short-term intentions according to declared certainty and longer-term intentions. By combining both questions a new variable was constructed and coded into the following categories: 'definitely yes within three years', 'probably yes within three years', 'yes, but later' and 'no'.

Pregnant women and male respondents with pregnant partners were not asked these questions in the first wave of the survey, so they were omitted from the analysis. In addition, respondents who defined themselves as infertile were excluded from the analytical models; there are however covered in the descriptive findings. The realisation of childbearing intentions within three years was defined as either the birth of a child in the inter-survey period or a pregnancy during the second interview (i.e. potential live births were considered to be 'realized births').

Out of the initial sample of 10 006 respondents consisting of men and women aged 18–79 years in 2005, this focused on men and women aged 18–45 (generations 1960–1987). In 2005 the refined sample consisted of 5 199 respondents and was representative of the Czech population in that year. A total of 1 506 people from the generations selected for the study were re-interviewed in 2008.

Panel attrition in this age group was high, at 71%; this was principally due to refusals, but was also due to respondents moving, or was simply because the interviewers were unable to contact respondents. Since panel attrition was so high it was necessary to analyse it according to interest variables, since such attrition may be connected with both positive and negative fertility intentions and their certainty, thus rendering the results biased. The test consisted of a comparison of respondents from defined generations who participated in the second interview and those who were not re-interviewed. The research found that there was no bias due to attrition in the sub-sample with regard to declared short-term fertility intentions. In addition, it was found that gender, partnership status, infertility and education parameters were also not biased by attrition. Conversely, attrition was found to be slightly higher for younger respondents (18–29 years in 2005) and childless respondents. The attrition rate, ceteris paribus, was lower for women on maternity/parental leave.

3.2 Methodology and variables

Owing to the limitations of the data and the small sample size, the author was to a considerable extent restricted in terms of being able to conduct a more stratified analysis by gender, age or parity. Therefore, binary-logistic regression models were designed to analyse the realization of positive childbearing intentions for both men and women and for all parity, and this characteristic was employed as a covariate in the models. Only those respondents who declared positive short-term or longer-term childbearing intentions and who participated in both waves of the panel survey were included; the response variable was equal to 1 if they had a child during the inter-survey period or declared a pregnancy at the second interview.

Several demographic and socio-economic characteristics collected in 2005 are included in the models as **explanatory variables**. All the following covariates are categorical and were transformed into dummy variables:

- gender;
- age, coded into four groups: 18–24, 25–29 (reference category), 30–34 and 35–45 years;
- number of children that respondents had when declaring their future childbearing intentions

– coded into three groups: no child (reference category), 1 child and 2 and more children. This covariate includes biological children only;[2)]

- education – refers to the highest level of completed study and is coded as: basic, secondary without the school-leaving exam at age 18/19, secondary with the school-leaving exam at age 18/19 (reference category) and tertiary;

- partnership status, coded as: single (reference category), LAT – living apart from the partner irrespective of the respondent's legal marital status, cohabitation, and married (this category implies not only legal marital status but also sharing the same household with the respondent's spouse);

- socio-economic status, coded as: employed (reference category), unemployed, maternity/parental leave, studying, not working (housewife, other).

4 RESULTS – THE REALIZATION OF CHILDBEARING INTENTIONS

4.1 Descriptive findings

Of all the men and women in the panel sample aged 18–45 in 2005 and who (or whose partner) were not pregnant at the time of the first interview, 9.7% gave birth to a child during the period observed or declared a pregnancy at the second interview. Table 1 shows the distribution of men and women according to their childbearing intentions as declared in 2005. One-quarter of both men and women declared that they intended to have a child within the following three years, the difference lies in the level of certainty of the intention, since women declared such an intention more often and with a higher level of certainty than men. The second column of the table presents the figures for the share of those who experienced childbirth during the three-year period or declared a pregnancy at the second interview according to their initial intentions. For example, 27% of men who definitely wanted a child in 2005 actually had a child during the period, compared to only 5% of those who initially intended not to have a child.

The results show that those who planned to have a child later were very consistent in their subsequent behaviour and only 4% of these men and women gave birth to a child during the period studied. This percentage is even smaller than the percentage of those who did not want to have a child at all in 2005 but ultimately did have one (5% of men and 6% of woman). Conversely, a considerable proportion of those who had a positive intention did not realize their stated birth intentions during the given time period. The level of certainty of the intention also determines its fulfilment, at least when in the case of 'positive' intentions; short-term intentions are more likely to be realized if there is a higher level of certainty (the 'definitely yes' response).

The gender difference in the realization of an intention is evident in the case of planning a birth. Women's intentions to have a child are much more likely to be realized than those of men – 45% of female respondents who definitely intended to have a child in the near future fulfilled their plan (compared to 27% of men) and 22% of those who had a probable intention of having a child did so (compared to 10% of men).

The number of children that an individual currently has is an important factor in both measuring intentions and in predicting the future realization of intentions. When short-term fertility intentions and their realization are compared in relation to the number of biological children a respondent already has, the idea of a two-child family being realized over the short period of time is a distinctive feature and is obvious from the research results (Table 2):

Firstly, when comparing the intentions of respondents according to the number of children they had when first interviewed, those with one child declared a positive intention of having another within three years more frequently (more than one-third of

2) The role of step-children, adopted or foster children living in the respondent's household was ignored, however their role could, in certain cases, be more important than for example the role of biological children who do not live in the same household as the respondent.

Table 1 **Childbearing intentions according to certainty and timing: percentage of respondents who had a child within the three-year period, Czech Republic (%)**

Childbirth intentions in 2005 (intentions within 3 years)	Men		Women	
	Distribution in 2005	Had a child within 3 years	Distribution in 2005	Had a child within 3 years
Definitely yes within 3 years	6.5	26.7	12.3	44.9
Probably yes within 3 years	17.5	9.9	12.8	21.5
Yes, but later	34.5	3.8	14.5	3.8
No	40.4	4.7	55.8	5.7
Cannot have (more) children	1.0	28.6	4.7	2.9
Total	100.0	7.0	100.0	12.1

Note: N = 690 men and 726 women aged 18–45 in 2005. Current pregnancies included in the % of births (children within three years).
Source: GGS 2005 and 2008, panel data.

Table 2 **Childbearing intentions and percentage of respondents who had a child within the three-year period, by number of children in 2005, Czech Republic (%)**

Short-term childbearing intention 2005	Distribution 2005	Had a child within 3 years
Intention to have a 1st child		
Definitely yes	11.4	33.3
Probably yes	20.2	11.7
Probably no	27.3	5.2
Definitely no	39.7	4.4
Cannot have (more) children	1.4	0.0
Intention to have a 2nd child		
Definitely yes	17.7	**51.0**
Probably yes	23.8	**22.7**
Probably no	19.9	9.1
Definitely no	35.7	6.1
Cannot have (more) children	2.9	25.0
Intention to have a 3rd child		
Definitely yes	3.2	23.1
Probably yes	4.2	5.9
Probably no	13.7	7.1
Definitely no	**75.1**	2.6
Cannot have (more) children	3.9	6.3

Note: N = 634 childless respondents, N = 277 respondents with 1 child and N = 409 respondents with 2 children in 2005. Men and women aged 18–45 years in 2005. Current pregnancies included in the % of births (realization of positive intention).
Source: GGS 2005 and 2008, panel data.

them) than childless respondents and respondents who already had two children. Families with more than two children make up a minority reproduction group (*Rychtaříková*, 2003) in the Czech Republic; the probability of the birth of a third child continues to fall from one generation to the next (*Pikálková*, 2003). Therefore, not surprisingly, respondents overwhelmingly declared zero short-term birth intentions in terms of having a third child.

Secondly, short-term intentions of having a second child are more likely to be realized than short-term intentions of having a first child, particularly when

the intention is certain (half of the respondents who definitely intended to have a second child did so within the three-year period).

4.2 The realization of childbearing intentions and intervening factors

The author has shown that a considerable proportion of men and women who initially declared the intention to have a child in the near future did not do so within the given time period. Several factors could explain why those intentions remained unrealized, for example, the revision of intentions over the course of the time period, highlighted, for instance, by Smallwood and *Jefferies* (2003) or *Monnier* (1987), or as a result of changes in an individual's private life, personal experiences or societal changes. Moreover, the same set of factors – demographic and social criteria and life-course events – could lead to a change in timing (non-realized births could be postponed) or total rejection.

Therefore, in the next part of the study, the author proposes analysing to what extent demographic and selected socio-economic criteria influence childbirth and the role played by childbearing intentions and to outline what characteristics have the strongest effect on the realization of intentions. Table 3 shows the odds ratios of having a child as estimated using binary-logistic regression models. The first model includes the fertility intentions variable only. Subsequent models control for the effects of relevant background variables: model 2 controls for selected demographic variables only and model 3 controls for both demographic and socio-economic variables. The final model (model 4) contains all the aforementioned variables.

Partnership status is the main background factors predicting who will actually have a birth in the following three-year period. A single person was shown to have the lowest chance of having a child during the following three years, while married couples had the highest chance. The effect of having a partner but not being married to him/her is slightly lower for respondents living apart (LAT) from the partner than for those cohabiting, but the difference is negligible, and the odds of their having a child is still substantially greater than that of a single person.

Interestingly, employment status, level of education and the number of children do not play a significant role. Contrary to the descriptive findings, the number of children a respondent has does not determine the chances of having a (another) child in the given time period. Only having two or more children seems to lower the chances of realizing the positive intention, but the difference is not significant.

Childbearing intentions appear to be a very significant covariate in terms of explaining the birth of a child during the inter-survey period; the highest coefficients can be seen in the intentions-only model (model 1). Even though coefficients characterising short-term intentions are lower in the full model (model 4), the chances of realizing a declared, certain, positive intention remains very high compared to long-term plans and remains very significant when other explanatory variables are controlled for.

The results of model 4 (Table 3) also indicate that childbearing intentions offer a specific type of information on childbearing behaviour and have their own interpretative potential. This conclusion is based particularly on the results, which demonstrate that the effects of demographic and socio-economic variables do not vary substantially between the model that includes and the model that excludes the intentions covariate. The two distinctive variations in the significance of the gender and age covariates are clearly mediated through different intentions in terms of timing – the youngest age group more frequently contains those who plan to have a child, but later than within three years.

As for gender, women often declared a firm short-term intention, unlike men, who tended to express longer-term intentions. After including the interaction between the fertility intention covariate and gender in model 4 (Table 3a), it is evident that women are more likely to realize their short-term childbearing plans than men no matter how certain their positive short-term intentions were.

4.3 Stability of intentions among those who did not have a child between 2005 and 2008

In the inter-survey period changes may well have occurred in the respondent's personal circumstances, in their life course or within the surrounding environment that will have an impact on his/her original in-

Table 3 **Odds ratios concerning having a child between 2005 and 2008 (inter-survey period), Czech Republic**

		Model 1	Model 2	Model 3	Model 4
		Exp(B)	Exp(B)	Exp(B)	Exp(B)
Childbearing intention (ref. wants a child later)	Definitely wants a child within 3 years	16.10 ***			5.46 ***
	Probably wants a child within 3 years	4.46 ***			2.11
	Wants a child later	1			1
Gender (ref. male)	Male		1	1	1
	Female		2.20 **	2.05 **	1.60
Age of respondent in 2005 (ref. 25–29)	Age 18–24		0.28 ***	0.41 *	0.54
	Age 25–29		1	1	1
	Age 30–34		0.51 *	0.51 *	0.50 *
	Age 35+		0.40 *	0.45	0.45
Number of children (ref. childless)	0		1	1	1
	1		1.08	0.92	1.02
	2 and more		0.45	0.41	0.62
Partnership status (ref. no partner)	No partner		1	1	1
	LAT		2.90 *	3.22 **	3.09 *
	Cohabitation		4.93 ***	4.68 ***	3.45 **
	Married		9.11 ***	8.04 ***	4.94 ***
Education (ref. secondary with school-leaving exam at age 18/19)	Basic			1.23	1.27
	Secondary – without leaving exam at age 18/19			0.71	0.72
	Secondary – leaving exam at age 18/19			1	1
	Tertiary			1.43	1.55
Socio-economic status (ref. employed)	Employed			1	1
	Unemployed			1.33	1.23
	Maternity / parental leave			1.42	1.39
	Student			1.12	2.13
	Not working			0.26	0.18
Constant		0.039 ***	0.060 ***	0.069 ***	0.040 ***
N		691	691	691	691

* $p < 0.5$; ** $p < 0.01$; *** $p < 0.001$

Note: N = 691 men and women aged 18–45 in 2005 who declared the positive intention of having a (another) child within the next three years or later. Dependent variable: having a child during the period between the two interviews or pregnancy at the second interview (contrasted with no child born during the inter-survey period).

Source: GGS 2005 and 2008, panel data.

tentions and will lead to a revision of his/her plans. Not only external factors influence the process of changing or redefining childbearing intentions; the individual might well modify his/her previously declared intention after discovering that his/ her evaluation of the factors taken into account in the decision-making process was biased. Therefore, the author provides an overview of the stability of childbearing intentions for those respondents who did not experience childbirth between the two interviews.

Table 3a **Odds ratios concerning having a child between 2005 and 2008 – interaction effect of gender and childbearing intention, Czech Republic**

		Men	Women
		Exp(B)	Exp(B)
Childbearing intention (ref. Men*wants a child later)	Definitely wants a child within 3 years	3.87 *	6.39 ***
	Probably wants a child within 3 years	1.19	2.81*
	Wants a child later	1	0.67

* p < 0.5; *** p < 0.001
Note: Covariates from Model 4 are controlled.
Source: GGS 2005 and 2008, panel data.

Firstly, if we examine positive short-term childbearing plans from 2005 that were not realized, it is evident that (by 2008) a share of respondents had decided to postpone childbearing until later (16.9%) and a very significant number had abandoned their childbearing plan altogether (35.5%); 45% remained consistent and after three years once again declared the intention of having a child within the next three years.

Those who (in 2005) constructed their childbearing plans over a longer time-frame also remained relatively consistent in their attitudes and after three years once again declared their desire to have a child, but to do so later than within the next three years (43%). Almost one-third of respondents had accelerated their plans (by 2008) and intended to have a child in the short term. However, once again, almost a quarter had abandoned their childbearing intentions.

The most consistent group of respondents were those who had no future fertility plans, only around 12% of whom subsequently considered having a (another) child now or later; more than 80%, however, remained negative in terms of future fertility plans.

The results show the obvious dominance of the confirmation of intentions, both positive (32% of the sub-sample of men and women who did not have a child during the inter-survey period) and negative (no child planned – 44%), the latter of the two intentions being dominant. In terms of redefinition, positive childbearing intentions were more frequently abandoned (14%). Only 6% of respondents who initially rejected having a child in the future subsequently expressed the desire to have a child.

The final part of the study focuses on the so-called "abandoners" – those women and men who initially declared positive childbearing intentions (either short- or longer-term in 2005) but who did not have a child in the inter-survey period and, moreover, declared in 2008 that they no longer planned to have a child.

Table 4 **Stability of childbearing intentions among those who did not experience childbirth between 2005 and 2008; Czech Republic (abs. and %)**

Childbearing plan in 2005	Childbearing plan in 2008				Total
	Child within next 3 years (definitely + probably)	Child later	No child (neither within 3 years nor later)	Cannot have children	
Child within next 3 years (definitely + probably)	111	42	88	7	248
	44.8	**16.9**	**35.5**	**2.8**	**100**
Child later	91	123	68	3	285
	31.9	**43.2**	**23.9**	**1.1**	**100**
No child (neither within 3 years nor later)	43	29	504	38	614
	7.0	**4.7**	**82.1**	**6.2**	**100**

Note: N = 1147 men and women who did not experience childbirth between the two interviews and who, in 2005, declared they could have (in physiological terms) a child.
Source: GGS 2005 and 2008, panel data.

Table 5 **Odds ratios concerning abandoning childbearing intentions between 2005 and 2008, Czech Republic**

		Exp(B)
Gender (ref. male)	Male	1
	Female	1.45
Age of respondent in 2005 (ref. 25–29)	Age 18–24	0.83
	Age 25–29	1
	Age 30–34	1.39
	Age 35+	6.98 ***
Number of children (ref. childless)	0	1
	1	2.41 **
	2 and more	6.12 ***
Education (ref. secondary with school-leaving exam at age 18/19)	Basic	2.31 **
	Secondary – without leaving exam at age 18/19	1.81 *
	Secondary – leaving exam at age 18/19	1
	Tertiary	0.47
Constant		0.143 ***
N		523

* $p < 0.5$; ** $p < 0.01$; *** $p < 0.001$
Note: N = 523 men and women who declared positive childbearing intentions and who had no child in the inter-survey period.
Source: GGS 2005 and 2008, panel data.

The binary-logistic regression model was employed to analyse this group. Only those respondents who declared positive childbearing intentions and who had no child in the inter-survey period were included; the response variable was equal to 1 if they declared that they did not plan any (additional) children in 2008. A set of demographic and educational characteristics are included in the models as explanatory variables (for the full specification, see part 3).

People who already had children in 2005 and especially those with more than one child were found to be more likely to abandon their childbearing plans. In addition, people aged 35+ were more likely to abandon their fertility plans than younger age groups who are evidently more easily able to postpone childbearing until a later age. Even though the level of education was found not to play a significant role in models which studied the realization of intentions (Table 3), lower educational attainment does appear to result in a significantly higher chance of initial fertility plans being abandoned. It might be supposed that the economic situation of those with lower levels of education influences such behaviour. Nevertheless, when a subjective evaluation of the material conditions of respondents was included in the model, the chances of fertility intentions being abandoned still remained significantly higher for the lower educated. Therefore it can be assumed that highly educated people construct their life plans in both a more realistic and stable way than the lower educated and that their plans are not easily influenced by either external or internal factors.

5 CONCLUSION

In this paper the author studied to what extent childbearing intentions play a role in real behaviour. The analysis of longitudinal data documents a high level of consistency between zero fertility plans and subsequent behaviour. The highest share of 'consistent' respondents consists of those who did not want and subsequently did not have any children.

The intention to have a child appears to be an important covariate expressing the chances of giving birth during a defined period of time. The highest chances

of realizing positive fertility intentions pertain particularly to those who expressed a declared, certain, positive short-term intention. Even though intentions themselves affect the chances of having a child, mixed results were obtained concerning the predictive power of short-term fertility intentions.

Short-term fertility intentions, as stated by men and women in 2005, tend to overestimate the number of children born in the period of 2005–2008. However, according to the theory of planned behaviour, these intentions have a relevant influence on predicting reproductive behaviour and predicting who will have a child within the three years.

Possible inconsistencies between intentions and real behaviour are explained either by the strength of the attempt at behavioural performance or by the degree of control over behaviour, which includes internal and external constraints. Results shows the importance of the strength of the plan to perform behaviour, since firm fertility intentions show the strongest effect out of all the covariates considered in the regression analysis and indicate the highest odds of having a child in the subsequent three-year period.

This overestimation could be affected both by postponement and by intervening factors that impact a respondent's original plans. Studying the social limits of childbearing, the form of partnership could be seen as one of the constraints. While cohabitation and nonmarital childbearing are widespread in the Czech Republic, those living in legal marriages have a higher chance of realizing their fertility intention compared to other types of partnership (both LAT and cohabitation). Fertility plans and their certainties vary according to parity and people who already have children (especially those with more than one child) are more likely not to realize their childbearing intentions. An important constraint on the realization of a positive childbearing plan is age, since the people over the age of 35 who did not fulfil their reproductive plans tended to abandon them after three years.

Since reproductive behaviour does not afford a person's complete control over its performance, fertility intentions alone are not sufficient to predict behaviour. However, the result shows that certain types of intentions have a relevant influence on predicting future fertility, especially when combined with other personal characteristics that track groups of people who are more able to realize their plans and who exhibit greater efficacy in the planning of their life course.

References

- Ajzen, I. 1991. The Theory of Planned Behavior. *Organizational Behaviour and Human Decision Processes*, 50, pp.179–211.
- CVVM. 2003. Tiskové zprávy z šetření (Press releases from the survey). *Naše společnost.* Praha: CVVM.
- Frejka, T. – Sardon, J-P. 2004. *Childbearing Trends and Prospects in Low-Fertility Countries. A Cohort Analysis.* Dordrecht, Boston, London: Kluwer Academic Publisher.
- Fialová, L. – Hamplová, D. – Kučera, M. – Vymětalová, S. 2000. *Představy mladých lidí o manželství a rodičovství* (Images of young people about marriage and parenthood). Praha: Sociologické nakladatelství.
- Hamplová, D. 2000. Názory na manželství a rodinu mladých svobodných lidí v roce 1997 (Opinions of Young Single People on Marriage and Family in 1997). *Demografie,* 42(2), pp. 92–98.
- Monnier, A. 1987. Project de fécondité et fécondité effective. Une enquête longitudinale: 1974, 1976, 1979. *Population (French Edition,)* 42(6), pp. 819–842.
- Philipov, D. – J. Dorbritz 2003. *Demographic consequences of economic transition in countries of central and eastern Europe.* Council of Europe Publishing.
- Philipov, D. – Spéder, Z. – Billari, F. C. 2006. Soon, later, or ever? The impact of anomie and social capital on fertility intentions in Bulgaria (2002) and Hungary (2001). *Population Studies*, 60(3), pp. 289–308.
- Philipov, D. – Testa, M. R. 2008. *Why fertility remain unrealized? A case study in Bulgaria.* Paper presented at European Population Conference, EAPS, Barcelona.
- Philipov, D. – Thévenon, O. – Klobas, J. – Bernardi, L. – Liefbroer, A.C. 2009. Reproductive Decision-Making in a Macro--Micro Perspective (REPRO). State-of-the-Art Review. *European Demographic Research Paper,* 1 (2009).

- Pikálková, S. 2003. A Third Child in the Family: Plans and Reality among Women with Various Levels of Education. *Sociologický časopis/Czech Sociological Review*, 39(6), pp. 865–884.
- Rychtaříková, J. 2003. Diferenční plodnost v České republice podle rodinného stavu a vzdělání v kohortní perspektivě (Differential fertility in the Czech Republic by Marital. Status and Education and in an Cohort Perspective). In Hamplová, D. – Rychtaříková, J. – Pikálková, S. *České ženy: vzdělání, partnerství a rodina*. Praha: Sociologický ústav AV ČR, pp. 41–83.
- Smallwood, S. – Jefferies J. 2003. Family building intentions in England and Wales: trends, outcomes and interpretations. *Population Trends*, 112, pp. 15–28.
- Spéder, Z. – Kapitány, B. 2009. How are Time-Dependent Childbearing Intentions Realized? Realization, Postponement, Abandonment, Bringing Forward. *European Journal of Population,* 25(4), pp. 503–523.
- Šalamounová, P. – Šamanová, G. 2003. Představy respondentů o partnerských vztazích a rodině (Ideas Expressed by the Respondents about Family and Relations between Couples). *Naše společnost* (3–4), pp. 25–31.
- Šalamounová, P. – Šamanová, G.. 2004. Reprodukční záměry mladých lidí (Reproduction Plans of Young People). *Naše společnost* (1), pp. 8–11.
- Toulemon, L. – Testa, M. R. 2006. Family Formation in France: Individual Preference and Subsequent Outcomes. *Vienna Yearbook of Population Research 2006*, pp. 41–75.
- Vikat A. et al. 2007. Generations and Gender Survey (GGS): Towards a better understanding of relationships and processes in the life course. *Demographic Research,* 17(14), pp. 389–440.

ANNA ŠŤASTNÁ

graduated from sociology at the Faculty of Philosophy & Arts and from demography at the Faculty of Science, Charles University in Prague. Since 2004 she is research scientist at the Research Institute for Labour and Social Affairs in Prague in the working group of family policy. In her research she focuses on family policy, sociology of family, demography and reproductive behaviour.

SUMMARY

Childbearing intentions appear to be a very significant covariate in terms of explaining the reproductive behaviour within the given time interval. The results indicate that childbearing intentions represent specific information explaining childbearing behaviour and have their own interpretative potential. The level of certainty of the intention also determines its fulfilment; short term intentions are more likely to be realised if there is a higher level of certainty. Moreover, women are more likely to realize their short-term childbearing plans than men no matter how certain their positive short-term intentions were.

The important background factors predicting who will actually have a (another) birth in the following three-year period consist of partnership status. A single person was shown to have the lowest chance of having a child during the following three years whereas married couples had the highest chance. The effect of having a partner but not being married to him/her is slightly lower for respondents living apart (LAT) from the partner than for those cohabiting, but the difference is negligible and the odds of their having a child is still substantially greater than that of a single person. Interestingly, employment status, level of education and the number of children do not play a significant role.

The result show that a significant proportion of those respondents who initially plan to have a child in the future had abandoned their childbearing plan altogether. The groups who are more likely to abandon their fertility plans are people with children, lower educated and people aged 35+.

DEPENDENCY RATIOS, AGEING AND THE DEMOGRAPHIC WINDOW IN THE CZECH REPUBLIC

This paper was written with the support of 'VŠE IP400040' institutional support for the long-term conceptual development of science and research and the Faculty of Informatics and Statistics, University of Economics in Prague in 2011.

Sources: The calculations were based on the medium variant projection of the population of the Czech Republic (Projection 2009) for males and females produced by the Czech Statistical Office. Other data sources are listed in the References section of the text.

Martina Miskolczi – Jitka Langhamrová

ABSTRACT

Ageing has become a serious issue in almost all countries. Population ageing raises questions of economic sustainability and the sustainability of the public health, social and pension systems. This article aims to describe several indices that characterise population ageing and analyse the trend of those indices to 2060 based on a projection for the Czech Republic. The article introduces basic dependency ratios for several alternative limits of economic generations. Ait also presents the total dependency ratio based on real retirement ages (in the Czech Republic, retirement ages still differ for males and females and gradually grow each year with different rate), which indicates a positive dependency prognosis. It suggests that pension system should be able to manage expected number of pensioners. Other indicators regarding ageing are also presented in the article. First, the terms of the ageing, aged and super aged society are introduced for selected countries. The Czech Republic will achieve the level of a super-aged society around 2023. Second, the article sets out to present the concept of the demographic window and consider its applicability to the Czech Republic. In this case, under weaker conditions there exists a potential for economic growth from the surplus of people of economically active age compared to those who are economically inactive.

Keywords: population ageing, dependency ratio, ageing society, aged society, super-aged society, economic generation, projection, demographic window

Demografie, 2011, **53: 333–343**

INTRODUCTION

The process of an ageing of population is a current issue for most developed countries in the world because it affects people's lives, families, society, economy etc. This issue ranks among the important tasks that need addressing in the European Union (*Arltová – Langhamrová*, 2010; *Langhamrová – Fiala*, 2007; *Langhamrová – Fiala – Langhamrová*, 2009; *Seventh Framework Programme)* and by national governments *(Quality of Life in Old Age. National Programme of Preparation for Ageing for 2008–2012, 2008*). The Czech Republic is currently discussing the impacts of ageing upon the social, health and pension systems.

Populatoin ageing is usually defined as an increasing proportion of old people (aged 65 years and more) (*Binstock – George*, 2011: p. 33) in the population. It can be a consequence of declining fertility (ageing from the bottom of the population

pyramid) or declining mortality (ageing from the top of the population pyramid, ageing in the middle of the population pyramid – with improving mortality in middle age to the age of 60 years, mainly among males). In many countries, including the Czech Republic, both trends happen simultaneously. In the case of increased fertility and/or immigration and stable or decreasing mortality there is a chance that a population could become younger, i.e. the proportion of old people could decrease (*Arltová – Langhamrová*, 2009).

The changing shares of age categories and ageing can be analysed from many perspectives. Most often dependency indices are used, which are based on the population distribution among generations: the pre-productive or Ist economic generation ($I_{eg,}$ 0–14/19 years; limits 0–14 years are used by the United Nations (UN) in its methodology (Dependency Ratio, 2006, p. 1)), the productive or IInd economic generation ($II_{eg,}$ 15/20–64 years), and the post-productive or IIIrd economic generation ($III_{eg,}$ 65 and more years, denoted as 65+). Limits 0–19, 20–64 and 65+ years will be used further here, as this corresponds to the increasing length of time spent in education and preparation for work on one side of the interval and the prolonged age of retirement on the other side. At the same time it is important to monitor the absolute sizes of each group because the proportion of one generation may increase even as it remains stable or even decreases in size. (*Koschin*, 2005)

INDICES OF DEPENDENCY

The increasing proportion of people aged 65+ creates a substantial economic burden. Assuming that individuals aged 65 years and over and children are economically inactive, several ratios between the number of people and the number of economically inactive age and economically active age are calculated. (In fact, not all people aged 20–64 are economically active.)

The proportion of people aged 65 years and over: This indicator is used as a very simple and straightforward characteristic of dependency.

Young-Age Dependency Ratio: I_{eg} / II_{eg},

Old-Age Dependency Ratio: III_{eg} / II_{eg},

Total Dependency Ratio: $TDR = (I_{eg} + II_{eg} + III_{eg}) / II_{eg}$.

It is clear that the TDR = the young-age DR + 1 + the old-age DR. Sometimes it is presented as the young-age and old-age dependency ratio, i.e. the numerator contains just ($I_{eg} + III_{eg}$). (*Dependency Ratio*, 2006; *Koschin*, 2005: p. 30; *Population Statistics*, 2006: p. 175; *Pour*, 2011)

Weighted Total Dependency Ratio: $TDR_w = (\alpha^*I_{eg} + 1^*II_{eg} + \beta^*III_{eg}) / II_{eg}$

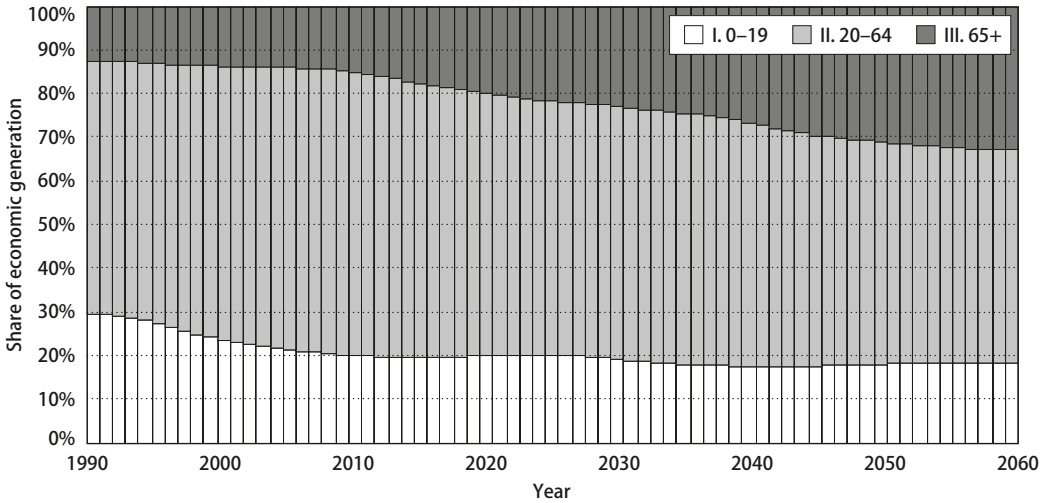
The United Nations suggests weights $\alpha = \beta = 0.7$ (*Koschin*, 2005: p. 30), which reflects the lower consumption of the pre-productive and post-productive parts of the population compared to the productive part of the population. Mathematically, in such a case the weighted version of the TDR does not provide any new information because $TDR_w = \alpha^*TDR + (1–\alpha)$. (*Koschin*, 2005: p. 30) Other weights could be used based on an analysis of alimentation, health care, social care, educational and other needs, separately for young and old people (for example, the United Kingdom uses a higher weight for the older part of the population in the weighted support ratio – '...This takes into account that people over 65, tend to require higher government spending than children under 16. (e.g. old people require more health care spending).' (*Pettinger*, 2006) – and weights it separately for males and females, for instance. However, examining this issue is not the purpose of this article.

Ratio of the productive part to the non-productive parts of the population: $II_{eg} / (I_{eg} + III_{eg})$

This is reciprocal value of the total dependency ratio in narrower definition. Besides this, the potential support ratio is used as '... an alternative way of expressing the numerical relationship between those more likely to be economically productive and those more likely to be dependants. It is the inverse of the old-age dependency ratio, that is, the number of people in the working ages of 15–64 per every person 65 or older.' (*World Population Ageing* 1950–2050, 2002: p. 20)

The proportion of the pre-productive part of the population (see Figure 1) fell from 29.7% in 1990 to 20.1% in 2010 and will probably further decrease to 18.4% by 2060. On the other hand, the share of the post-productive generation increased from 12.5% in 1990 to 15.2% in 2010 and will probably continue to grow to 33.0% in 2060, which means it will double its share within 50 years. In such a situation, the productive part of the population will form 48.6% of the total in 2060, down from its value of 64.7%

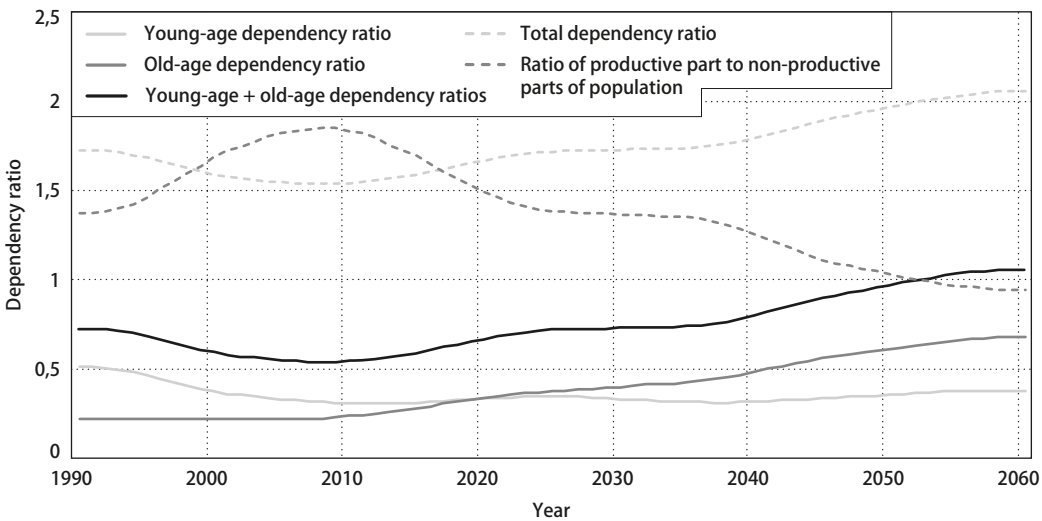
Figure 1 **Relative structure of the population, Czech Republic, economic generations, 1990–2060, as of January 1**



Source: Czech Statistical Office; own calculation.

in 2010. This means that the dependent economic generations (making up 51.4%) will outweigh the IInd economic generation (at 48.6%) in 2060, while a balance between the two could be expected in 2052–2053. At that moment the total dependency ratio will reach 2.0, i.e. a person of economically active age has to be productive for himself/herself and for one other person 'made up of' a pre-productive individual (weight 36.6%) and a post-productive individual (63.4%).

Figure 2 **Dependency ratios, Czech Republic, 1990–2060, as of January 1**



Source: Czech Statistical Office; own calculation.

The trend of dependency indices (Figure 2) shows that the senior part of the population (III_{eg}) will strengthen and will outweigh the pre-productive generation in 2020. The old-age dependency ratio is affected by shifts of large groups of people from the II[nd] economic generation (age 20–64 years) to the III[rd] economic generation (65+ years) in the period of 2005–2010 (people born after the Second World War) and 2035–2045 (people born in 1970s). In absolute values annual increments to III_{eg} will be between 37 and 68 thousand people during the interval of 2010–2015, and II_{eg} will began to shrink in 2012. The annual increment to I_{eg} will fluctuate after 2010 between –30 thousand and +20 thousand people.

DIFFERENT RETIREMENT AGE SCENARIOS

The retirement age has been rising each year in the Czech Republic since 1995, and faster for females. The retirement age was established in *Act No. 155/1995 Coll.*, on pension insurance (namely § 32) and its Appendix and extended by Act No. 220/2011 Coll.

The mechanism of the increase to the retirement age is as follows

Men born in	Retirement age	Interval when they were/will be retired
1936	60 years + 2 months	3/1996–2/1997
1937	60 years + 4 months	5/1997–4/1998
…	…	…
1940	60 years + 10 months	11/2000–10/2001
…	…	…
1950	62 years + 6 months	7/2012–6/2013
…	…	…
1960	64 years + 2 months	3/2024–2/2025
…	…	…
1970	65 years + 10 months	11/2035–10/2036
…	…	…
1975	66 years + 8 months	9/2041–8/2042
etc.		

For males, the retirement age is extended by 2 months each calendar year.

Women with 2 raised children born in	Retirement age	Interval when they were/will be retired
1936	55 years + 0 months	1/1991–12/1991
1937	55 years + 0 months	1/1992–12/1992
…	…	…
1940	55 years + 0 months	1/1995–12/1995
…	…	…
1950	58 years + 4 months	5/2008–4/2009
…	…	…
1960	61 years + 8 months	9/2021–8/2022
…	…	…
1970	65 years + 0 months	1/2035–12/2035
…	…	…
1975	66 years + 8 months	9/2041–8/2042
etc.		

For females with 2 raised children, the retirement age rises by 4 months each calendar year from 1996 till 2041, i.e. for females born in 1941–1975. For females with more than 2 raised children, the increment increases to 6 months from 2018 for a fixed number of years. From 2041, all females will follow the same rules as males, i.e. there will be an increase of 2 months each calendar year.

Currently, the retirement age differs for males and females and varies for females even according to the number of children they raised (there are historically defined categories for the number of raised children: none, 1, 2, 3, 4, 5 and more). The rules for raising the retirement age are aimed at unifying the retirement age for males and females (all groups) by 2041 at the age of 66 years and 8 months, and the retirement age will continue to rise jointly for all groups at the same rate: by 2 months each calendar year. The rule for stopping the increase (setting an upper limit for retirement age) has not yet been defined.

Figure 3 presents the total dependency ratio calculated under various assumptions regarding the age at which economic activity starts and ends:

- Economic activity starts at 20 years of age or at 23 years of age in the case of the extension of education and preparation for work; economic activity ends at 64 years of age or 69 in the case of a prolonged retirement age (the fixed-limit scenarios referred to as *'scenario 20–64', 'scenario 20–69', 'scenario 23–64', 'scenario 23–69'*),

- Economic activity starts at 20 years of age and ends according to the approved (real) retirement ages (the floating-limits scenario referred to as *'scenario REAL'*).

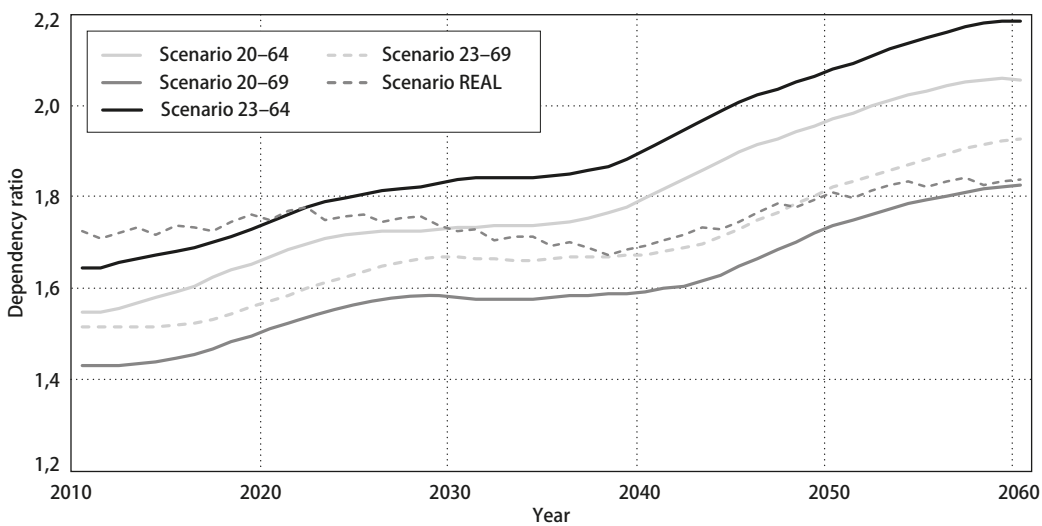
– This means a different rate of increase in the retirement age for males and females to 2041, at which point both males' and females' retirement ages will be unified at 66 years and 8 months for people born in 1975. Females' retirement age will be the same regardless of how many children they have raised.

– The retirement age will continue to increase jointly for men and women by 2 months each calendar year.

– In 2060, some people born in 1990 will retire in the age of 69 years and 2 months (they will reach the retirement age in January and February 2060) and some people born in 1991 at the age of 69 years and 4 months (retirement in May–December 2060).

– This mechanism was approved by the government of the Czech Republic and came into effect on 30 September 2011 (*Act No. 210/2011 Coll.*). It has no stopping rule, i.e. the increase

Figure 3 **Total dependency ratio in five scenarios, Czech Republic, 2010–2060, as of January 1**



Source: Czech Statistical Office; own calculation.

in the retirement age is planned to continue but it can be changed by a new governmental decision.

The fixed-limit scenarios will exceed the threshold of 2.0 in 2053 (scenario 20–64) and in 2045 (scenario 23–64), respectively. The most significant increase is visible after 2015 and after 2035.

Unlike the calculation with fixed limits, where the total dependency ratio gradually grows, the scenario referred to as 'REAL' does not seem as negative as it is often described. In this case, the TDR ranges between 1.67 and 1.84 in the basic version. This calculation should support wide discussions regarding the pension system and its reform. In 2060, a person of economically active age should support himself/herself and another 0.84 individuals of economically inactive age.

The simple conclusion would be that existing rules for raising the retirement age proposed and approved recently by the Czech government are a sufficient tool for the sustainability of the retirement system. However, there are other aspects to be considered:

- Some people of economically active age are in fact economically inactive, for example the disabled, early retirees, inactive at home, homeless etc. Part of this gap is covered by those individuals who work beyond their retirement age.

- Unemployment generates mandatory expenses but unemployed people do not contribute to the economic product. If unemployment remains high or a large portion of unemployed remain jobless for a long time, they in fact become inactive and their chance of finding work decreases.

- The health conditions of each individual limit his/her ability to work. The continuous increase of the retirement age into very high ages (as it now continues without any administrative stopping rule) cannot be expected with a defined rate, as people are able to work only up to a certain age based on individual abilities. This requires an analysis of life expectancy in health and a discussion about the ability to work to ages around 70.

The future trend, regardless of a slight decrease in the total dependency ratio in 2060–2066, indicates further ageing and a growing dependency of the pre-productive and post-productive parts of the population on the productive group of people.

THE SUPER-AGED SOCIETY

The velocity of growth in the proportion of seniors aged 65+ in the population can be measured using the terms 'ageing society', 'aged society' and 'super-aged society', which are widely used in Asia for example.

In the ageing society the proportion of the IIIrd economic generation is over 7%, in the aged so-

Table 1 Ageing of the Population: International Comparison

	Ageing society	Aged society	Super-aged society	Years of Transition	
Proportion of III_{eg} in population	**>7%**	**>14%**	**>21%**	**7% to 14%**	**14% to 21%**
CR	1931	2004	2023	73	19
France	1865	1980	2022	115	42
Germany	1932	1972	2014	40	42
Italy	1927	1988	2011	61	23
Japan	1970	1996	2007	26	11
South Korea	2000	2013	2027	13	14
Sweden	1890	1975	2014	85	39
USA	1942	2013	2032	71	19

Source: Czech Statistical Office, Eurostat, U.S. Census, Statistics Bureau and the Director-General for Policy Planning of Japan, Statistics Korea; own calculation.

ciety over 14% and in the super-aged society over 21% (sometimes the limit is 20%, for example Lee, Mason, Park, 2001: p. 7). 'Because the demographic and epidemiologic transitions for nearly all of the more-developed countries occurred over the course of decades, the resulting population aging has been relatively slow. ... A major exception to this pattern among the richer countries is Japan, whose demographic and epidemiologic transitions occurred somewhat later but at a relatively accelerated pace.' (*Binstock – George*, 2011: p. 35) Using this approach the oldest population is Japan reaching 23% in 2009. Table 1 presents the years of transition for selected countries.

The Czech Republic reached the threshold for an aged society in 2004 and it is predicted to reach the limit for a super-aged society in 2023 (according to a projection of the Czech Statistical Office, 2009). For example, in 1990 the share of IIIrd economic generation in Sweden, Norway, the United Kingdom, Denmark, Austria, Germany, Belgium, Italy and Switzerland reached the 14% limit. By 2009 this limit had already been passed by 26 European countries, including the Czech Republic; Germany and Italy were close to the super-aged category. The biggest jump between 1990 and 2009 was made by Slovenia (+ 5.8 percentage points), Estonia, Germany, Latvia, Italy, Lithuania, and Greece. The IIIrd economic generation in the Czech Republic increased in share by 2.4 percentage points. In the European Union the share of this economic generation grew by 3.5 percentage points from 13.7% in 1990 to 17.2% in 2009 (*Population structure and ageing*, 2011).

According to the projection of the Czech Statistical Office (2009), the Czech Republic will reach the threshold of 28% in 2042. This category could be referred to as the 'ultra-aged society'. Japan expects to achieve this ratio in several years when all the baby-boomers (people born in Japan after the Second World War) reach the age of 65 (*Tsutagawa,* 2004).

The velocity of the increase to higher and higher thresholds in this ageing race is accelerating. It took more than 70 years to reach the limit of the aged society, while the super-aged society will be reached within 18 years in the CR. Usually when a country reaches the stage of the aged society it takes half the time before it progresses to the next category.

THE DEMOGRAPHIC WINDOW

The United Nations defines the demographic window (or dividend, bonus, gift) as a 'high proportion of working age population (15–64 years) and lower dependency ratios, leading to economic and social returns defined as the 'Demographic window of opportunity'. The 'demographic window of opportunity' results when the working age population (15–64 years) grows at a rate that exceeds the rate of growth of the dependent population (under 15 and more than 64 years), which allows increasing personal and public savings. However, taking advantage of this opportunity is contingent upon adopting economic and social policies that will convert savings into developmental investment (including human resources development).' (*United Nations,* 2010: p. 4) It is a period when proportion of the non-productive parts of the population is low owing to an already low fertility rate and a still high mortality rate and when the productive part of the population outweights the non-productive part (*Vítková*, 2009). Specifically, the demographic window occurs when the young-age dependency ratio in the population (I_{eg} / II_{eg}) falls under 0.30 and the old-age dependency ratio (III_{eg} / II_{eg}) does not yet exceed 0.15. In this case, the total dependency ratio remains below the threshold of 1.45 and the reciprocal indicator – the ratio of the productive part to the non-productive parts of the population (II_{eg} / (I_{eg}+III_{eg})) – is above 2.22. In addition, the productive part of the population accounts for at least 69% (= 1 / 1.45) of the population and the proportion of the non-productive parts forms less than 31% of the population. This temporary period may last 30–50 years and terminates when people of productive age get older, the ageing process resulting from the mortality decline causes an increase in the proportion of the post-productive economic generation.

The demographic window offers an opportunity for significant economic growth. Utilising this potential depends on the ability of the population to employ a sufficient or excess supply of labour, the growing participation rate of women, increasing human capital (education, qualifications, health), increasing the volume of savings and potential investments, flexibility of the labour market, and support for education etc. Examples in recent decades are the countries of East Asia and Ireland.

In the Czech Republic between 1990 and 2060

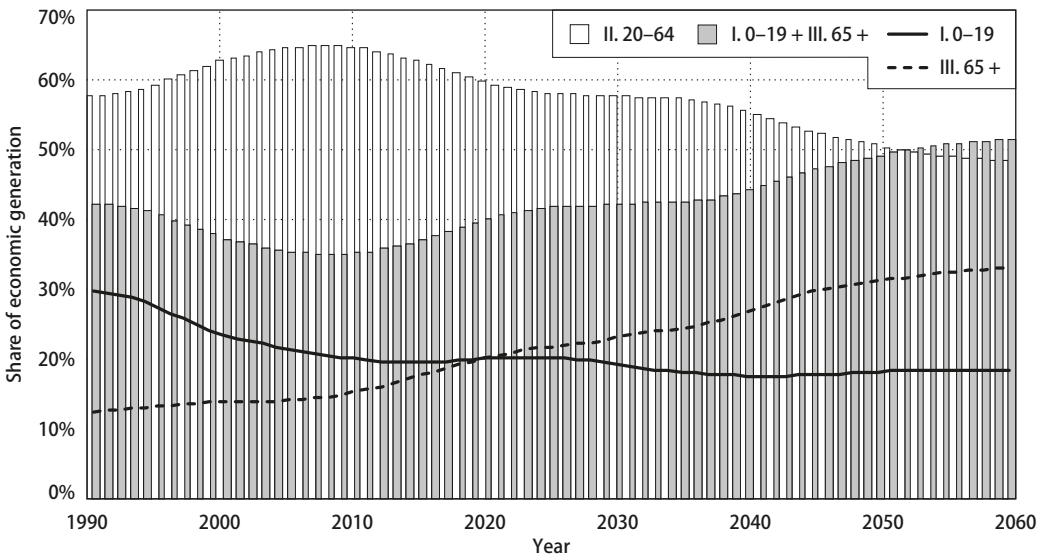
- the young-age dependency ratio will decrease from 0.51 to 0.31 in 2012 and grow to 0.38 in 2060,
- the old-age dependency ratio will permanently grow from 0.22 to 0.68 in 2060,
- the total dependency ratio (basic version), starting at the level of 1.73 and then declining to 1.54, will grows again to 2.06 in 2060.

Technically, (in the Czech Republic) the two conditions regarding the young-age and the old-age dependency ratio are not satisfied and the total dependency ratio oscillates above the given threshold at 1.45. This means that the demographic window will not occur in the Czech Republic because according to the population projection dependency should grow as a result of the ageing process and the increasing proportion of the post-productive part of the population and its ratio to the productive part of the population.

If there are no precise limits for the young-age and old-age dependency ratios, the weaker version of demographic window could be detected even in the case of the Czech Republic. The gap between the proportion of 20–64 year-olds and the non-productive parts of the population aged 0–19 years and those aged 65 and over creates a potential surplus of people of productive age that could be employed for economic growth. The difference between II_{eg} and $(I_{eg} + III_{eg})$ was greatest in 2008: 30.0 p.p. The ratio of the productive part to the non-productive parts of population never reached 2.0; it peaked at 1.86 in 2008 and then decreased.

The period of a weak demographic window started before 1990 and will terminate around 2050. Before 2020 there is an apparent decline in the mentioned surplus generated by the quite large group of people born after the Second World War who reach the age of 65 years and will move into the post-productive generation. (In reality, individuals from this generation are already mostly retired as the retirement age is much lower than 65 years. In fact, the demographic window is currently smaller, but it will converge with the situation displayed in Figure 4 because the retire-

Figure 4 **Proportion of economic generations and their trends, Czech Republic, 1990–2060, as of January 1**



Source: Czech Statistical Office; own calculation.

ment age will rise according to the approved 'small' pension system reform.)

CONCLUSION

Population ageing is a challenge for all developed countries and will later be also for developing countries. It is defined as occurring when a growing proportion of the generation is aged 65 and over. In the case of the Czech Republic, the demographic projection predicts a rising proportion of the IIIrd economic generation to 33.0% in 2060, with a further possible increase, and with a decreasing proportion of Ist economic generation from 30% to 18%. Consequently, dependency indices reflect this situation and show an increase in the economic burden on economically active people.

The fact that people become older and the pension system needs to be able to support more and more pensioners has generated wide discussion. An increase in the retirement age in the Czech Republic has been approved. Examining the retirement ages separately for males and females between 2010 and 2060 the trend of the total dependency ratio reaches a value of 1.84 in 2060 with fluctuating trend. This calculation presents another view in contrast to the usual concept of permanently and rapidly growing dependency and the inability of the pension system to cope with the financial demands (of an ageing population).

Population ageing in the Czech Republic compared to trends in other countries confirms an overall acceleration of the ageing process. It is illustrated using the terms of ageing, the aged and the super-aged society. The Czech Republic should reach the level of a super-aged society in 2023 when the proportion of people aged 65+ will exceed 21%. In Europe, Germany, Italy and Sweden are among the oldest countries.

Finally, there is also the concept of the demographic window. The temporary surplus of productive age group occurs when fertility declines but mortality does not yet decline. In the Czech Republic the strict conditions that must be met for the demographic window to occur were not fulfilled, but if the conditions were less strict the gap between the proportion of 20–64 year-olds and the dependent generations of 0–19 year-olds and people over 65 creates/could create a demographic window. The CR is currently behind its peak (it was in 2008). The trend in the immediate future is unfavourable, and the demographic window is about to quickly become smaller. This phenomenon should be effectively taken advantage of (now) for economic growth.

References

- *Act No. 155/1995 Coll.*, on pension insurance.
- *Act No. 210/2011 Coll.*, that changes act number 155/1995 Coll., on pension insurance, as amended, and some other acts.
- Arltová, M. – Langhamrová, J. 2009. Vliv migrace na stárnutí populace České republiky (The effect of migration on population ageing in the Czech Republic). In *Reprodukce lidského kapitálu – Vzájemné vazby a souvislosti* [CD-ROM]. Prague: Oeconomica, pp. 1–7. ISBN 978-80-245-1577-9. <http://kdem.vse.cz/resources/relik09/Prispevky_PDF/Arltova_Langhamrova.pdf>.
- Arltová, M. – Langhamrová, J. 2010. *Migration and ageing of the population of the Czech Republic and the EU countries.* Prague Economic Papers, Vol. 19, No. 1, pp. 54–73.
- Binstock, R. H. – George, L. K. (ed.). 2011. *Handbook of Aging and the Social Sciences.* 7th ed. Elsevier. ISBN 978-0-12-380880-6.
- European Commission CORDIS. *Seventh Framework Programme (FP7).* European Commission CORDIS. [online]. [cit. 21. 7. 2011]. <http://cordis.europa.eu/fp7/home_en.html>.
- Eurostat. 2006. *Population Statistics.* Detailed Tables. Eurostat, 2006. ISBN 92-79-01642-3. [online]. [cit. 21. 10. 2011]. <http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-EH-06-001/EN/KS-EH-06-001-EN.PDF>.
- Eurostat. 2011. P*opulation structure and ageing.* Eurostat. [online]. [cit. 20. 7. 2011]. <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Population_structure_and_ageing>.
- Koschin, F. 2005. *Kapitoly z ekonomické demografie.* (Chapters from economic demography) 1st ed. Prague: Oeconomica. ISBN 80-245-0959-8.

- Langhamrová , J. – Fiala, T. – Langhamrová, J. 2009. Ageing of the Population of the Czech Republic and its Economic Consequences in the Sphere of Pension Security and Financing of Health Care. Marrakech 27. 09. 2009–02. 10. 2009. In *XXVI International Population Conference* [CD-ROM]. [online] Paris: IUSSP, pp. 1–12. <http://iussp2009.princeton.edu/download.aspx?submissionId=90582>.
- Langhamrová, J. – Fiala, T. 2007. *The Ageing of the Population and its Consequences.* Forum Statisticum Slovacum, Vol. III., No. 6, pp. 79–83.
- Lee, S.-H. – Mason, A. – Park, D. 2011. *Why Does Population Aging Matter So Much for Asia? Population Aging, Economic Security and Economic Growth in Asia.* ERIA Discussion Paper Series. Economic Research Institute for ASEAN and East Asia. Vol. ERIA-DP-2011-04, pp. 1–33.
- Ministry of Labor and Social Affairs, Czech Republic. 2008. *Quality of Life in Old Age. National Programme of Preparation for Ageing for 2008–2012.* Ministry of Labor and Social Affairs, Czech Republic. [online]. [cit. 3. 7. 2011]. <http://www.mpsv.cz/files/clanky/5607/starnuti_en_web.pdf>.
- Pettinger, T. *Dependency Ratio*. ECONOMICS HELP. Helping to Simplify Economics. [online]. [cit. 21. 10. 2011]. <http://www.economicshelp.org/dictionary/d/dependency-ratio.html>.
- Pour, V. V. 2011. *Selected Characteristics of the Labor Market in Connection with Population Ageing.* University of Economics in Prague, prepared bachelor thesis.
- Tsutagawa, K. 2004. *Baby Boomers' Retirement Poses Problems.* The Daily Yomiuri. [online]. [cit. 1. 7. 2011]. <http://www.globalaging.org/pension/world/2004/boomers.htm>.
- United Nations. 2002. *World Population Ageing 1950–2050.* Changing Balance Between Age Groups. Population Division, Department of Economic and Social Affairs, United Nations. [online]. [cit. 20. 10. 2011]. <http://www.un.org/esa/population/publications/worldageing19502050/pdf/81chapteriii.pdf>.
- United Nations. 2006. *Dependency Ratio.* [online]. [cit. 20. 10. 2011]. <http://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/demographics/dependency_ratio.pdf>.
- United Nations. 2010. *Policy Issues in the ESCWA Region. National Youth Policies within the Framework of the World Programme of Action for Youth (WPAY).* [online]. [cit. 20. 10. 2011]. <http://www.escwa.un.org/about/gov/session26/editor/Download.asp?table_name=sess26_documents&field_name=ID&FileID=31>.
- Vítková, L. 2009. *Longterm Trend of Index of Ageing and Dependency Ratio in the Developed Countries.* In Reprodukce lidského kapitálu – Vzájemné vazby a souvislosti [CD-ROM]. Praha: Oeconomica, pp. 1–7. ISBN 978-80-245-1577-9. <http://kdem.vse.cz/resources/relik09/Prispevky_PDF/Vitkova.pdf>.

Data Sources

- Czech Statistical Office. Projection of population of the Czech Republic (Projection 2009). Medium variant. <http://www.czso.cz/csu/2009edicniplan.nsf/p/4020-09>.
- Czech Statistical Office. Population structure. <http://www.czso.cz/csu/2003edicniplan.nsf/p/4109-03>; <http://www.czso.cz/csu/redakce.nsf/i/struktura_obyvatelstva_podle_hlavnich_vekovych_skupin>.
- Eurostat. Population. Demography; Population Projections; Population structure and ageing. <http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data/main_tables>, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00002&plugin=1>, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00028&plugin=1>, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00010&plugin=1>.
- Statistics Bureau and the Director-General for Policy Planning of Japan. <http://www.stat.go.jp/english>.
- Statistics Korea. <http:/kostat.go.kr/eng/>.
- U.S. Census Bureau. People and Households. International Programs. <http://www.census.gov/population/international/data/idb/country.php>.

MARTINA MISKOLCZI

graduated from Charles University, Faculty of Mathematics and Physics (mathematics & economics), and the University of Economics in Prague, Faculty of Informatics and Statistics (applied statistics). She currently works as a senior business consultant and teaches at the University of Economics in Prague. She is also a student in the PhD programme at the University of Economics. Her research interests are the labour market, employment and unemployment, population ageing, mathematical methods in demography (multistate demography), census and life tables.

JITKA LANGHAMROVÁ

graduated from the University of Economics in Prague. She is currently head of the Department of Demography at the Faculty of Informatics and Statistics of the University of Economics in Prague. In her research she focuses on the study of population ageing, social demography and regional demography.

CZECH SOCIOLOGICAL REVIEW

2011, VOLUME 47, NUMBER 3

ARTICLES

Subscriptions and orders:
Postservis, Poděbradská 39, 190 00 Prague 9, tel.: 800 300 302, e-mail: predplatne@prstc-p.cpost.cz
or Sociologický časopis/Czech Sociological review – Jilská 1, 110 00 Prague 1, tel.: +420 210 310 217, +420 210 310 218, e-mail: Monika.Kuzelova@soc.cas.cz

THE HISTORY OF EDUCATION ON THE TERRITORY OF THE CZECH REPUBLIC

Ludmila Fialová

ABSTRACT

This article briefly outlines the development of formal education on the territory of the Czech Republic from 1774, when learning how to read and write was made compulsory by law. It can be observed from the end of the 19th century on the basis of the share of the population of the population that obtained higher than basic education. The article draws on education statistics (the number of students at individual types of schools) and population censuses (the size of the literate population or the highest attained level of education).

Keywords: formal education, history of the education system, educational attainment, population censuses, levels of education

Demografie, 2011, **53: 344–359**

1 INTRODUCTION

The connection between the reproduction rate and the sociocultural level of the population is one of the oldest themes in demographic research. It is essentially impossible to measure the general sociocultural level of a society, but it is possible to identify factors from which it can be inferred. In simple terms, a population's education level, usually reduced to completed level of education, is one such factor, despite the complications arising from the fact that the different types of schools and education systems as a whole in different countries are constantly changing and international comparisons are very difficult because there is no single educational model; each country has evolved its own educational model in relation to its own historical development.[1)]

The relationship between education level and the reproduction rate has usually been demonstrated through the example of on the significant changes in reproduction during the demographic revolution, both in the past (cf., e.g., the synthesising studies of Livi Bacci on world or European population development; *Livi Bacci,* 1992, 2003) or in the present in developing countries (e.g. Caldwel's theory of the influence of education on fertility; *Caldwell,* 1982), but they also explain current changes going on in reproduction in advanced countries. The influence of education is perceived in two ways: a higher level of education usually corresponds to a longer period of time spent obtaining it, so that the age at which a child becomes independent and starts his/her own family rises; and education alters a person's priorities, and in this respect the consequences of education on women are usually cited, as more educated women in particular consciously curtail their reproductive plans in order to pursue plans connected with a professional career (cf., e.g., *Hamplová,* 2004; *Rychtaříková,* 2004).

1) For the purposes of international comparison the ISCED classification standard is often used, which is constructed in a way that makes it possible to compare education systems (see, e.g., *Koschin,* 1999). This article however uses domestic, traditional categories, and even they are difficult to compare over time. The reader can use the glossary at the end of the article for a better orientation in this text.

Passing on knowledge about the outside world from one generation to the next was long left to the initiative of individuals or individual families. If parents felt the need to obtain better quality education for their children a domestic tutor was called in. Given the expense of this type of education it was customary even from the time of antiquity to found special institutions that could pass on knowledge to a larger number of students at once, both basic knowledge such as reading and writing and specialised knowledge. Access to education was reserved for just a narrow group of social strata, and it was possible to characterise individual social strata by their level of education. It was very difficult for children from lower social strata to obtain the kind of education customarily obtained by those from higher social strata, not just because it was usually financially unaffordable, but also because it was (socially) undesirable. It was not until the Renaissance that higher education was recommended and made more accessible.

This article will examine what proportion of children or young people were obtaining basic education in the Czech lands from the end of the 18th century and higher than basic education from the start of the 20th century, and will do so insofar as is allowed by the available data, which start from the period following one of the first school reforms, introduced in 1780.

The development of education during the described period on the territory of what is now the Czech Republic has been the subject of a considerable number of studies, most of them written by education experts and historians. The majority of these publications have focused on pedagogical issues (educational curricula and methods), the development of individual educational institutions, or the personal fates of individual teachers. Very few studies, however, have addressed the subject of the overall development of education over the long term. *V. Srb* examined data on the transformation of the education level of the population on the territory of the Czech lands (2004, 109–127). For the second half of the 20th century, an important source of information are the varyingly detailed analyses of data from population censuses (e.g. *Jurečekˌ* 1972; *Kučera et al.,* 1982; *Fialová,* 1994; *Koschin,* 2003). One study that largely stands out from the mainstream of work is that by *M. N. Kuzmin* describing in great detail the development of education on the territory of Czechoslovakia to 1950 (*Kuzmin,* 1981). His research was later followed up on by *D. Bartoňová*, who examined changes in education levels in the second half of the 20th century (*Bartoňová,* 2007).

The extent of education (i.e. the percentage of people attending a particular type of education, not the level of knowledge provided and obtained) can be evaluated using education statistics, which continuously publish basic data on the number of educational institutions, students, teachers, etc. (cf., e.g., *Bulíř,* 1987), and census data. Educational attainment on the territory of what is now the Czech Republic was first examined in the 1880 population census, which surveyed whether the respondent knew how to read and write, knew just how to read, or could not read or write. Aggregated data were published for the total population up to the level of districts. Starting with the 1890 census, data were obtained in the same way for the entire country and categorised by sex and age (divided into ten-year age categories). A similar categorisation was retained for all the censuses up until 1930. Only in 1950 did the population begin to be categorised according to education level (at the national level for five-year age categories). However, educational attainment published in the tables was slightly different in each census (from 1961, cf., e.g., for more detail *D. Bartoňová,* 2007).

For the earliest period (the end of the 18th century and the start of the 19th century) all that can be ascertained is the percentage of children who obtained at least basic education. Only later on is it possible to distinguish educational attainment and what share of the population in particular time periods obtained each type of education, but not the content or individual aspects of that education. From the late 18th century formal education began to undergo dramatic changes and is no longer comparable to education at the end of the 18th century, the turn of the 20th century, or with the present situation. Nor is it possible to observe the entire subject matter of education at every level, as education on one hand responded to external needs (through curriculum), but also was strongly affected by ideology, especially in the first decades of the period under observation and then through the period of real socialism (1948–1989). Development after 1989 differs from the preceding period very significantly, as the study opportunities available upon

completion of basic education expanded for a larger number of students, university admission quotas were abolished, the structure of study programmes on offer changed, and opportunities to study abroad opened up (something very rare in 1948–1989).

For simplification, in this article the current terms for individual levels (types) of education are used, even though they do not always correspond to the original usage: basic education (corresponding roughly to the period of compulsory school attendance, usually from the age of 6 to 15), secondary education without the school-leaving exam (secondary vocational schools), secondary education with the school-leaving exam (secondary general and secondary technical schools), and tertiary education (not including some former education in enterprises; and doctoral study is not analysed separately). This classification did not include apprenticeship training, graduates of which were officially classified in the census only from 1980, before which time they were probably classified among people with basic education. Population cohorts are similarly simplified when their educational structure is derived from data from the census in 1921 or after, as it was no longer held on 1 January of the given year, as in 1880–1910; this fact should not have a significant distortion effect on the structure of the population according to education level if we use births cohorts (and not the division corresponding to the census date; for more on this, cf. *Bartoňová,* 2007: pp. 24–25).

2 FROM THE END OF THE 18TH CENTURY TO THE END OF THE 19TH CENTURY

The history of educational institutions in what is now the Czech Republic can be traced back to the Middle Ages, but those institutions were far from generally accessible to the entire population. Not only were there large social inequalities in access to education, but even if children were provided with education there was a great unevenness in its quality. In the second half of the 18th century children of the nobility obtained by far the highest quality education, usually with the assistance of tutors or private instructors, and it was provided to both boys and girls. The lower classes were in an altogether different situation. If an educational institution did exist then it was usually in a town, but provided only basic knowledge and admitted only boys; such institutions were funded by town councils usually in cooperation with important guilds.

In the Middle Ages a network of 'secondary schools' began to emerge and were usually run by monasteries (the Piarists, and from the 16th century Jesuits especially), which provided general education and prepared students for higher (university type) education. Following the Thirty Years' War a network of seminaries was established to train Catholic parish clergy.[2] From the 18th century there was an apparent trend to strengthen secondary education; for example, in 1763 the Piarists established a school in Nový Bor with an extended curriculum focusing on glass-working skills,[3] and before that a mining school was founded in Jáchymov (in 1716).[4] In Prague, alongside the university (founded in 1348, but from 1654 run entirely by the Jesuit order), from 1707 there was also a school of engineering (which eventually became the Czech Technical University).[5] In Moravia, a university was founded in 1573 in Olomouc.[6]

From 1526 the Czech lands were part of a larger state unit (the Habsburg Monarchy), which had its centre outside Czech territory; the lands had an ethnically heterogeneous population, and while two-thirds

2) From 1627 in Bohemia and 1628 in Moravia Catholicism was the only religion allowed (until 1781), and the education of children was overseen by the Catholic parish clergy as members of particular religious orders that assumed responsibility for education in general (Piarists, Jesuits).

3) <http://www.glassschool.cz/cs/61-O-skole/99-historie.html> [cit. 2. 8. 2011].

4) <http://www.vsb.cz/cs/okruhy/prezentace-univerzity/historie/historie-vsb-tu-ostrava/> [cit. 2. 8. 2011].

5) <http://www.fsv.cvut.cz/hlavni/historie.php> [cit. 2. 8. 2011].

6) The university in Olomouc had a somewhat complicated history; there were periods when its significance was no more than local and it was essentially just a secondary school. The situation changed in 1946. For more on this see, e.g., <http://www.upol.cz/o-univerzite/historie-a-soucasnost/>.

of the population spoke Czech, in conformity with the monarchy's centralisation, a tendency that intensified during the 18th century, the language of administration was German. Since Latin was the language of education at secondary schools as well as university, gradually superseded by German, these educational institutions were less accessible to the Czech-speaking population.

Education was overseen not just by the church (in connection with the prior re-Catholicisation of the population), but with increasing importance also by the state. State control grew stronger under the rule of Maria Theresa (1740–1780). Her efforts to modernise the state also affected education. At first, secondary schools were put under state control (from 1752), and after the abolition of the Jesuit order (1773) educational institutions originally administrated by the Jesuits were too. The universities were also controlled by the state. Around that time the opinion gained ground that every citizen had a duty to acquire a basic amount of basic skills and knowledge about the world, and above all that people need to know how to read and write. Consequently, on 6 December 1774 a decree was issued that made school education mandatory in the Czech lands (as in the other lands of the Habsburg Monarchy) (*Bulíř,* 1987: p. 3). According to this decree, children whose parents could not or did not want to hire a private teacher were supposed to attend school until they acquired the learning skills that would allow them to proceed further in education (an assumed period of 6–7 years). From 1781 the length of school attendance was firmly set at 6 years and applied to children aged 6–12. However, rural children aged 9–12 did not have to attend school during the summer harvesting period. The same decree also dictated where which schools were to be located and who would finance them (the administration of the schools and the payment of the teachers were to be the responsibility of the local feudal landowner, the church, and the municipality; for details see *Bulíř* 1987, *Kuzmin,* 1981).

Alongside compulsory school attendance, the 1774 decree introduced an entirely new education system, which divided schools into trivial, main, and normal schools. Trivial schools, which were essentially the first level of education, were intended to provide basic education for children aged 6–12 and they were established in every larger village (parish seats). Main schools, the second level, had an extended curriculum that included vocational subjects to prepare students for a trade and these schools were supposed to be established in every region. Normal schools were supposed to be established in the towns in which the educational committees were based, and they had the extended curriculum of the main schools and in specialised courses prepared candidate teachers, among other things. Initially there was a shortage of qualified teachers, so the standard of education was very likely poorer in rural areas (veteran soldiers, for instance, served as teachers). Attendance was compulsory for boys and girls, most of the schools were co-educational, and only in larger towns were there separate schools for boys and girls. In 1790 there were 2,168 trivial schools in Bohemia (*Bulíř,* 1987: p. 4). From this period on, compulsory school attendance was an issue stressed regularly in government orders, and poor children were exempted from paying tuition. In the lower grades the language of instruction was the students' mother tongue (i.e. including Czech); in the upper grades the language of instruction was German and in church schools in some places Latin remained the language of instruction.

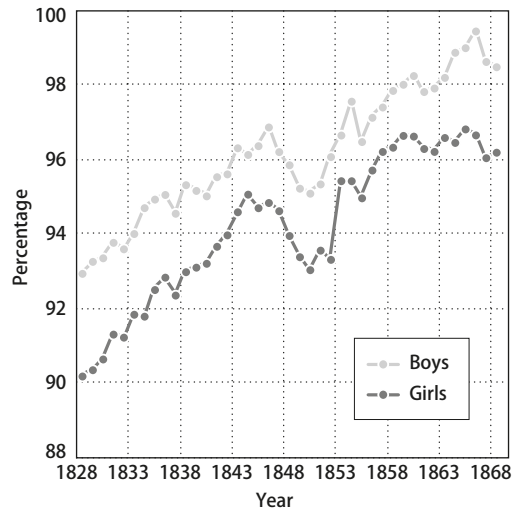
After the death of Josef II (1790) and especially with the reaction that followed the death of Leopold II (1792) and the outbreak of the French Revolution, education became much more restricted and the basic schools were transferred under church authority. This was established in the education code issued in 1805 (*Bulíř,* 1987: p. 5). The code also stipulated that girls could attend only the trivial schools or special schools for girls, or could obtain an education at a convent. Although the compulsory content of education changed over time (religious education at the lowest level and 'trivium', i.e. the basics of reading, writing, and numeracy), the length of compulsory school attendance remained unchanged at 6 years. Older children were also however required to attend so-called revision classes on Sundays (originally until they reached the age of 18, but gradually capped at age 15; from 1805 for girls and from 1823 for boys), attendance at which was required in order to obtain an apprenticeship certificate. After the feudal system was abolished in 1848, the basic schools were funded

solely by the municipalities (the newly established lowest level of territorial administration) and opportunity to study in one's mother tongue was extended slightly into the higher grades.

Although it might seem that all children born after the mid-1760s must have been literate, such was not the case. Particularly in the first years after the new law came into effect it proved impossible to ensure universal school attendance as envisioned by the government. This is also documented in data, even though they are available only from 1781. The data clearly show that in 1785–1789 around 60% of children of compulsory school age (aged 6–12) attended school, in 1800 around 70%, and not until 1828 did the figure exceed 90%. Regional data are also available and show, for instance, that in 1784–1787 relatively the largest school attendance was found in central and northern Bohemia (60%–70%), which were also the most economically advanced regions and where a large share of the population was working in industry, while the lowest attendance (less than one-half of children) was in southern Bohemia, which by contrast was one of the regions with the lowest levels of industrialisation and with backward agricultural development (*Kárníková,* 1965; *Bulíř,* 1984, tab. 1–2). Over the course of the 19th century the percentage of educated children grew and reached 95%, and it remained at that level for a long period. In the late 19th century almost the entire population of the state would have been literate.

Secondary education only advanced gradually. For example, in 1816 there were 28 secondary general schools (gymnasia) with a total of 7 592 students, and by 1870 the number of students had increased to 18 563 (*Srb,* 2004: p. 114), but over the same period the size of the population in the Czech lands grew from 4.8 million to 7.6 million. Specialised secondary schools (secondary vocational and secondary technical schools) were fewer in number and focused on

Figure 1 Percentage of children who attended school in the Czech lands in 1828–1868



Source: Bulíř, 1987.

providing an education in professions that had a long tradition; for example, forestry schools were founded in Hranice in 1851[7] and in Písek in 1885,[8] weaving schools in Liberec in 1852,[9] in Brno in 1860,[10] and in Humpolec in 1888.[11] The number of students, however, was much lower than at the gymnasia and amounted to only several hundred (for example, the weaving school in Liberec had only 139 students in 1854).[12]

Tertiary education also developed gradually. The university in Prague retained its prominent status for many years (in 1773 it came under state control and in 1781 it even began admitting non-Catholics). In the mid-18th century Latin was superseded by German as the language of instruction (Czech was not introduced as a study subject until 1791); at the end of the 18th century the university usually had around one thousand students (e. g. in 1784 there were 596 students enrolled in the Faculty of Theology, 349 in

7) <http://www.lespi.cz/cs/historie-lesnickeho-skolstvi.php>.

8) <http://www.slshranice.cz/>.

9) <http://www.spstliberec.cz/drupal/skola/historie>.

10) <http://encyklopedie.brna.cz/home-mmb/?acc=profil_skoly&load=2007>.

11) <http://pechacpetr.blog.cz/0704/tkalcovska-skola>.

12) <http://www.spstliberec.cz/drupal/skola/historie>.

the Faculty of Arts, and just 73 in the Faculty of Medicine, and 174 in the Faculty of Law; *Zuzánková*, 1979: p. 230). The university in Moravia was converted into a lyceum in 1783 and was re-established as a university in 1827, but until 1856 it had just one faculty – the Faculty of Theology.

Over the 19th century the number of students attending institutions of tertiary education grew: in 1847 there were just 2100 students (10% of which were studying theology, 25% studying law, 30% medicine, and 30% philosophy). In the 1850s the number of students decreased in response to the repression that followed the revolution of 1848, in which university students in Prague actively participated, and the number of students only slowly increased again. In the academic year 1880/1881 there were 2 057 students studying at the university in Prague (fewer than in 1847), of which 52% were students of the Faculty of Law (*Zuzánková,* 1979: pp. 231–232). The university thus continued to train lawyers, medical doctors, and gymnasium teachers.

With respect to higher technical education, next to the polytechnic in Prague, in 1850 a similar school was established in Brno. However, the total number of students at both of these schools combined was no more than one thousand even in the 1860s (*Zuzánková,* 1979: pp. 233–234). The language of instruction in these schools was German.

3 FROM THE LATE 19TH CENTURY TO 1948

In the second half of the 19th century the pace of social development in the Czech lands accelerated rapidly. For example, the population size grew to 10 million by 1910, the share of urban population grew from 18% in 1843 to 42% in 1910 (*Kárníková,* 1965: p. 354), and the share of inhabitants working in industry and trades was already 40% by 1910 (*Srb,* 2004: p. 84). With these changes education also evolved. Universal compulsory school attendance for children aged 6–14 was explicitly stipulated in the education amendment of 2May 1883. This amendment also ended the language divisions in schools, and thereafter there could only be one language of instruction at a school, either Czech or German, and this applied to schools at every level (*Bulíř,* 1987: p. 9).

The first level comprised the so-called national schools, which were further divided into elementary schools (the first five grades) and 'town schools' (three grades, 6 through 8). The schools could be just for boys, just for girls, or co-educational, and they could be public or private. However, the amendment left open the possibility of granting children who regularly attended school for six years a personal exemption from the 7th and 8th grades, which they then did not have to attend. This option was mainly taken advantage of in rural areas, and family penury was usually cited as the excuse (*Bulíř,* 1987: p. 9). After the establishment of the Czechoslovak state this option was cancelled in the Education Act No. 226/1922 (*Bulíř,* 1987: p. 10).

The second level comprised gymnasia or the gymnasium-type schools that some gymnasia were converted into (and where more space was devoted to teaching technical subjects), and secondary real schools (focused on natural science subjects) and secondary technical schools (trade schools, business academies, etc.). The number of students in secondary schools grew rapidly. While in 1870 there were just 18,500 students in gymnasia, in 1910 there were 54,000 (*Bulíř,* 1992: p. 70). The share of young people studying at secondary general and technical schools gradually grew, but by the end of the 19th century still less than 10% of boys and even fewer girls studied there (out of 1 000 born in 1886–1890 who were still living in the year 1950, 48 boys and 17 girls had obtained the school-leaving exam as their highest attained level of education; based on data from the 1950 census; cf. also Figure 4).

Tertiary institutions formed the third level of education. In 1882 Charles-Ferdinand University in Prague was divided into a Czech university and a German university (based on the language of instruction), and this was reflected in an increase in the number of students. The technical universities were similarly divided on the basis of nationality. In 1913 three universities existed on the territory of the Czech Republic (the Czech and German universities in Prague, and the university in Olomouc), four higher technical schools (Czech and German both in Prague and in Brno), the Mining School in Příbram, and the Academy of Arts in Prague; in that year there were 12 831 students.

Secondary and tertiary institutions were a male domain. It was not until 1896 that by special order school-leaving exams were prepared for girls.[13] Women were granted access to study at the Faculties of Arts by special order of the Ministry of Culture and Education issued 23 March 1897, and at the medical faculties by order of the same ministry issued on 3 September 1900 (*Vysoké ...*).[14] Women were granted admission to the Czech higher technical school in 1902. However, tertiary schools were educational institutions to which a very narrow circle of individuals had access. Out of the 1 000 people born in 1886–1890 who were still living in 1950, tertiary education was the highest attained level of education for 29 men and 1 woman (who attended school around the years 1910–1914; based on data from the 1950 census).

It is evident from the above outline that lower forms of vocational education in trade skills were not included in the education system. Master craftsmen trained their successors themselves, and later also some large industrial enterprises provided such training. Apprentices began to be included as a separate category starting with the 1910 population census (at which time there were 170 000 of them; *Pavlík,* 1959: p. 150). Others acquired the necessary occupational skills within the family or learned them by working. Indirect evidence of this is the fact that at the end of the 19th century there were still large numbers of day labourers in the population (in 1900, 15% of the total number of employed men were day labourers; *Pavlík,* 1959: p. 150). Data from later censuses also point to an unclear categorisation of people with an apprenticeship certificate, as even in 1970 graduates of apprenticeship training were categorised among people with basic education (*Jureček,* 1972). They only began to form a separate category in 1980 (cf. note to Figure 4).

Using census data it is possible to examine what the overall effect of the legislation on compulsory school attendance was on the basic literacy of the population. As noted above, the population census only began surveying the population's literacy in 1880. From 1890 it is also possible to trace the percentage of literate people in the population by age. While education statistics indicate that by the 1830s 94% of boys and 92% of girls were attending school, according to the 1890 census 12% of those attending school at that time were illiterate and another 12% were only able to read. This suggests that people who passed through compulsory school attendance lost what skills they had learned over time if they did not use them regularly, and this was primarily the case of people who lived their whole lives in a village and more often of women than men. The border districts in Bohemia and Moravia and especially the mountain regions also had a higher share of illiterate population. For example, in 1880 only 49% of women over the age of 6 living in the district of Valašské Meziříčí knew how to read and write (for men the figure was 61%), in the district of Fryštát it was 56% of women,[15] and in Uherský Brod 59%. Conversely, in the district of Šluknov 95% of women indicated that they knew how to read and write. The average for the Czech lands at that time was 80% (*Sčítání,* 1880).

A more recent piece of evidence shows that the second half of the 19th century brought a significant improvement in the scope of education: according to the 1910 census only 5% of the youngest population had no education (mostly in Silesia, which was made up of numerous immigrants from Galicia where the level of education at that time was still low and where in 1910 only 54% of the population over the age of 10 was literate; *Kuzmin*, 1981: p. 129).

Starting in the late 19th century the structure of the population by highest attained level of education becomes more important than the level of overall literacy, which was by then almost universal. Although

13) There is a considerable amount of literature devoted to the history of the seondary and post-secondary education of women. A summary can be found in the publication by Lenderová et al. (eds) 2009: p. 419 ad.

14) The earliest available statistical datum on the number of women attending the university in Prague dates from 1904. At that time there were 234 women at the university (*Vysoké …*).

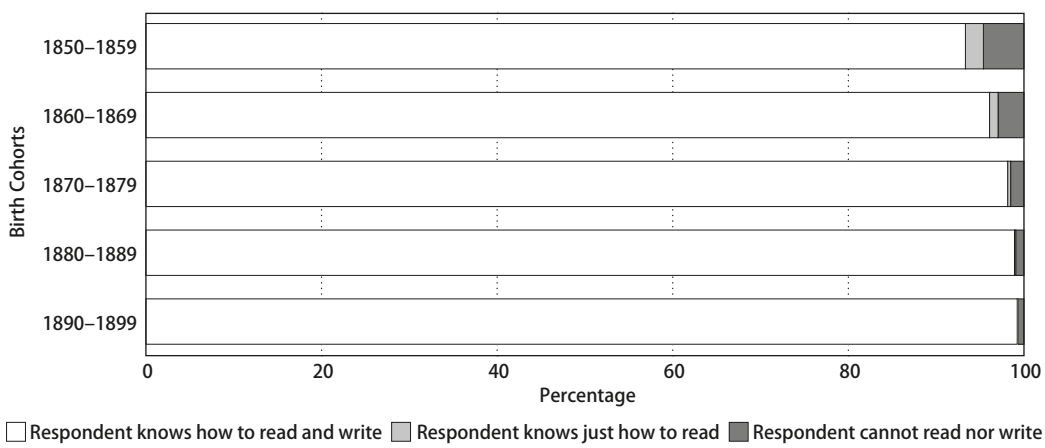
15) However, in this district the percentage was increased by the influx of immigrants from Galicia who did not have basic education. In 1880 just 14% of people in Galicia over the age of 6 knew how to read and write (*Kuzmin,* 1981: p. 128). Note: The town of Fryštát later became part of the district of Karviná, and that name is used for the entire district.

Figure 2 **Literacy structure of the population in the Czech lands according to the 1890 census by year of birth**

Source: Die Ergebnisse der Volkszählung und der mit derselben verbundenen Königreichen und Ländern, Österreichische Statistik I, Band, 2. Heft. 1882. Wien: K. K. statistische Central-Commission und Direction der administrativen Statistik.

data referring to this period are only available with a fifty-year delay (drawn from the 1950 census), they clearly indicate that the generation of children born at the turn of the 20th century was the first in which a higher level of education was being obtained more widely. Initially this applied mainly to vocational and technical education, which prospered in connection with the contemporary industrialisation process and the specialisation of the tertiary sector. As a result there was an increase in the share of men and women who possessed an apprenticeship certificate or had graduated from some form of secondary technical school. The share of students at gymnasium-type schools and institutions of tertiary education only began to grow

Figure 3 **Literacy structure of the population in the Czech lands according to the 1910 census by year of birth**



Source: Die Ergebnisse der Volkszählung und der mit derselben verbundenen Königreichen und LändernÖsterreichische Statistik, Neue Folge, Bd. 1, Heft 2. 1912. Wien. K. K. statistische Central-Commission und Direction der administrativen Statistik.

after the First World War with the emergence of an independent Czechoslovakia.

After its founding, Czechoslovakia retained the existing legislation on education. The proportion of Czech students at secondary and tertiary institutions nevertheless increased rapidly. Secondary vocational schools, secondary technical schools and gymnasia (secondary general schools) developed rapidly. More tertiary institutions were established, especially in Moravia. The objective was to give students from Moravia, who had previously had to go to study in Vienna, which was now in another state, the opportunity to study in their home environment. A university was founded in Brno, as well as an agricultural university and a veterinary university. New theological faculties for the evangelical church were founded. The Czechoslovak state established equality between men and women, even in access to education, and it abolished the rules preventing married women from working in state administration. These changes were reflected in a higher proportion of female students at secondary and tertiary institutions. However, tertiary education was still limited to a very narrow stratum of the population. Among the generations studying during the interwar period, 8% of men and 4% of women in the relevant population cohort had studied any type of secondary school, 2.2% of men and 0.6% of women had studied at any type of tertiary institution (Figure 4).

During the Nazi occupation of Czechoslovakia in the Second World War the Czech tertiary institutions were closed and Czech secondary education was also restricted. The German education system was not restricted. However, many young people who were not allowed to study in 1939–1944 quickly made up for that in the first years after the war. The preponderance of boys in secondary education slightly decreased – according to data from the 1950 census almost 13% of boys and 8.1% of girls in the generation born in 1922–1930 had secondary education with the school-leaving exam as the highest attained level of education. Tertiary education remained the domain of men: 6.2% compared to 1.7% of women born in the same cohorts. The data also suggest that educational attainment was measured not according to the number of graduates of particular types of schools in a certain population cohort, but according to the proportion of people with a given level of educational attainment who survived to a given age in the year of the census. This means that the data are somewhat distorted, especially in two ways: mortality rates vary by education level and tend to be lower among people with higher education (cf., e.g., *Sobotík – Rychtaříková,* 1992); also, the latter are probably better informed about what constitutes a healthy lifestyle, usually work in an environment that is less damaging to their health, and do not perform hard physical labour. The data on educational attainment may also be influenced by migration: first, one-third of the German population in Czechoslovakia was expelled from the country after the Second World War, and then there was a long period of illegal emigration and the emigrants tended more often to be more educated members of the population. It is also important to remember that a large part of the Jewish population, who tended to have higher educational attainment, died during the Second World War.

The data also reveal one more thing: during the war years and immediately after the war a wider circle of people started to obtain apprenticeship certificates or extend their basic education to proceed to a secondary vocational school. There was most notably an increase in the range of schools of this type for girls (Figure 4).

4 PERIOD 1948–1990

In the period of real socialism the education sector was heavily influenced by state intervention. It was a sector that the communist regime took full control over for ideological reasons. Almost immediately after the communist coup in February 1948 teachers and students deemed to be socially unsuitable were immediately expelled from secondary and tertiary institutions; these included teachers and students opposed to the new Marxist ideology and students from an unsuitable family background (e.g. children from families of the former nobility or the bourgeoisie, though this even meant children whose parents were self-employed); priority was given to children of working-class background. At the same time, in order to maintain the leading role of the working class society vocational education was prioritised; number of students at secondary general and technical schools was consequently cut back and apprentices were favoured in their stead, special vocational schools were established for them, usually forming part of large, nationalised industrial plants. But such secondary vocational schools were es-

tablished, for instance, even for shop assistants. Short technical schools (without the school-leaving exam) were gradually cut back in favour of expanding the spectrum of apprenticeship fields of study (this was one way of maintain a higher share of people with an apprentice training in the population). Special attention was also devoted to fields which prepared new teachers for every level of education (in the sense that only specially vetted applicants could study them).

In 1948 the first of many educational reforms that would follow over the next three decades was introduced. But this first reform was the most important one as it introduced a single, uniform education system (cf., e.g., *Bulíř,* 1987: p. 10). The state assumed control over all types of schools, private schools and church schools were abolished, and the state also assumed oversight of the school curricula, the structure of the school system, and the students. Curricula were developed that applied universally to all schools at a given education level. Education was provided free of charge at all types of schools. All types of secondary and tertiary institutions had quotas for how many students (and how many of each sex) could study at a given type of school.

Compulsory school attendance was initially left at eight years, then extended to nine years, and in the 1980s to ten years (the final two years were supposed to be spent at some type of secondary school). How many children were to proceed to blue-collar occupations (i.e. secondary vocational schools set up at industrial plants or in services) upon completing compulsory education and how many were to proceed to secondary general and technical schools and then to university was determined centrally, and different strategies were adopted for boys and for girls. It was assumed that a large number of boys would be trained to enter the 'classic' blue-collar occupations (especially the machine industry) and a certain number to enter technical occupations that required a secondary technical or even a tertiary education. Upon completing basic school girls also went on to secondary vocational education, but a smaller proportion of them, and most obtained a secondary technical education to find work in the tertiary sector (in administration, health care, education), and while more girls studied at a university, their numbers were always fewer than the number of boys of the same age. This quota system gradually polarised entire sectors of the economy according to the gender of its employees (education, health care, administration, and even the textile industry were strong feminised sectors).

The ruling regime, however, realised that the competitiveness of the state depended on the opportunities that existed for applying the results of contemporary science and technology in every area of society. So it also expanded secondary technical and tertiary technical education. The number of faculties at existing universities and higher technical schools grew and some new tertiary institutions were founded, such as universities of economics or agriculture. Faculties of education were established in every region to train teachers for basic schools. From the 1970s the number of students at every type of school gradually increased and the range of subjects studied grew. The number of male and female students became almost equal, but there were considerable differences based on what subjects they studied: while women predominated in the humanities and economic fields of study, there were still mostly men in the technical fields of study.

Population structure according to educational attainment was periodically recorded in censuses. They reveal the real turning point that occurred: while a big proportion of young people born in the 1920s had just basic education or at best an apprenticeship certificate (in total 78% of men and 83% of women), among those born a decade later these figures fell to just 35% of men and 62% of women. The difference in the intensity of at least secondary education with the school-leaving exam did not disappear until the generation born in the 1950s, of which only one-eighth had no more than basic education. Efforts to bolster blue-collar occupations are apparent from the fact that eventually as many as one-half of the emerging generations had some type of vocational education (mainly apprenticeship training). Again this begins to be evident with the generations growing up after the mid-1950s among men and a decade later among women. Unlike the number of people with vocational education, the number of people with secondary general or technical education increased more gradually, and with notable differences by sex. In the generation born in the 1920s one-fifth of boys obtained the school-leaving exam, while the figure for girls was less than one-tenth. In the next generation more than one-quarter of men but

just one-fifth of women obtained at least the school-leaving exam. A big change occurred, however, in the next generation, among those born in the 1940s and 1950s, as one-third of both men and women obtained secondary education with the school-leaving exam. Similarly, the number of male and female university students gradually drew even. Immediately after the Second World War less than one-tenth of young men and just 4% of women studied at any tertiary institution, but a decade later the figures were approximately 14% of men and 12% of women.

5 THE SITUATION AFTER 1990

After 1990 education underwent a number of important changes, basic education however remained compulsory (sometimes set at eight years, other times at nine). Private and church schools were re-opened at all levels, and there was some experimentation with Waldorf education. Education at every grade of the public school system remained free, but other types of schools introduced tuition, so the education system again became socially differentiated. In some areas the system that existed before 1948 was reintroduced, so, for instance, quotas on admissions were abolished, and the number of students admitted to a school is determined by the school's capacity and the number of applicants. While the state still oversees education on a general level (providing accreditation to education programmes), the local authorities, private owners, or churches participate in the actual running of schools, their funding and so on.

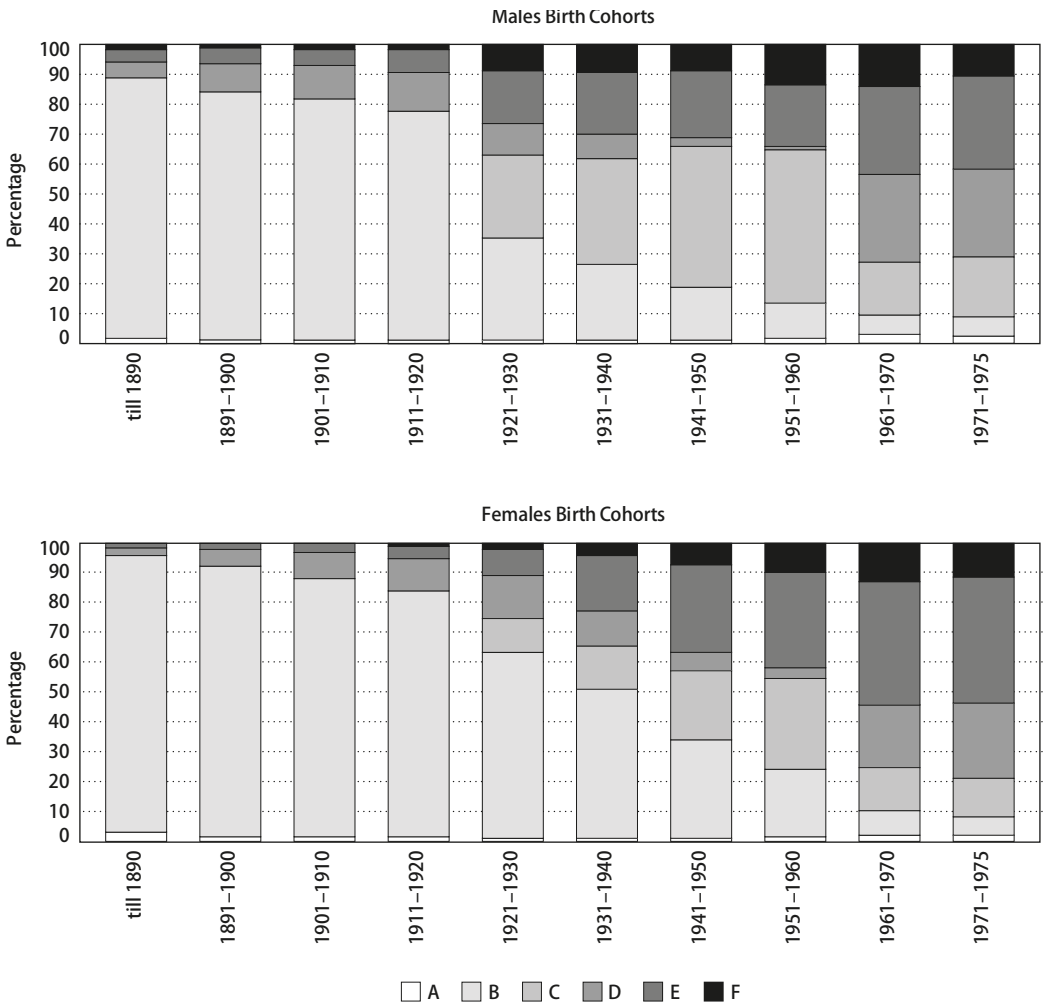
Dramatic changes occurred in every type of education. But the changes became most apparent in the structure of secondary education and in the number of young people attending institutions of tertiary education. With respect to secondary education, apprenticeship training decreased significantly, in part because with the privatisation of industrial, agricultural, and trade enterprises most of the new owners ceased to finance the schools. Some of the specialised training previously offered by these schools was however taken on by newly founded secondary schools. Society generally began to favour other types of education. There was a pronounced increase in the number of different types of secondary technical schools, especially ones with an economic focus. There was an increase in the number of secondary schools providing gymnasium-type secondary education, and a decrease in the amount of interest in secondary technical schools specialising, for instance, in industry and agriculture.

The number of tertiary institutions also grew. In July 2011, according to the Ministry of Education there were 83 universities in the country, of which 26 were public, 57 private, and 2 state-controlled, and above all schools that specialise in educational programmes in the field of economics or technical fields were founded. The new schools are usually comparatively smaller, and most education at this level is provided by public schools. However, an important change is that today there is at least one tertiary institution in each of the 14 administrative regions, which makes them more accessible to the public. This factor also undoubtedly contributed to an increase in the number of students at this level. New higher technical schools have also been founded. They focus on more practically oriented tertiary education. By 2010 the number of young men studying at some type of school (secondary and tertiary) had increased among 15–19 year olds to 80% and among 21–24 year olds to 35%, and the share of young women to 83% and 46%, respectively. Among 25–29 year olds 10% of both men and women are still studying at some type of school (according to data from the Education Statistics Yearbook 2010/2011).[16] However, the liberalisation of education has also meant more opportunities to study abroad (and also more foreigners studying in the Czech Republic). This means it is necessary to view education statistics with some caution if the students are not categorised by citizenship (in the cited year there were almost 38,000 students at Czech tertiary institutions with citizenship other than Czech, but 65% of them were citizens of the Slovak Republic).[17] At the same time, the statistics

16) <www.uiv.cz/soubor/4545; Tab. A1.1.9>.

17) Students from Slovakia do not have to pay tuition in the Czech Republic and the Czech language does not pose much of a language obstacle given the similarities between it and the Slovak language.

Figure 4 **Structure of the population by the highest attained level of education by birth cohort (according to data from the population censuses in 1950–2001)**



Notes: A – No education = people without any education and people with an unknown level of education; B – Basic education (regardless of its duration); C – Apprenticeship training; D – Short secondary technical education (without school-leaving exam); E – Secondary education (with the school-leaving exam); F – Tertiary education.

Data on education were not categorised in the same way in every population census. The original data were aggregated into larger groups for the purpose of this article.

For the generations born up to 1920 the data from the 1950 population census were used: level B – national and secondary school; D – basic technical school, lower technical school; E –upper technical school, gymnasium, secondary real school, teaching institute; F – tertiary institutions.
For the generations born in 1921–1950 data from the 1980 census was used: B – elementary and 'town school'; C – secondary vocational school; D – technical school (without school-leaving exam); E – secondary general school, secondary technical school (with the school-leaving exam), education in enterprises and post-secondary courses; F – tertiary institutions.
For the generations born in 1951–1960 the data used were from the 1991 population census: B – Basic education, including incomplete basic education; C – apprenticeship training; D – secondary technical education without school-leaving exam; E –secondary technical education with the school-leaving exam and post-secondary education; F – tertiary education.
For the youngest generation the data were from the 2001 census and similar to the data from 1991. In addition GED preparation courses were included in category E, but education obtained in higher technical schools was included in category F. In 2001 the number of people who deliberately did not indicate the level of their education increased; among 30–39 year olds the figure was 1.9% of men and 1.2% of women; this added to the share of people in category A.

do not record the number of Czech students studying abroad, so relevant data on this should again be provided by the population census (2011).

The relatively diverse range of educational programmes, the liberal environment, and a change in the mentality of young people, as not all continue their studies immediately upon completing one type of school and some change their fields or interrupt their studies, means that the age structure of students has also changed. Not only are more young people studying, they are studying longer. And this is another reason why this stage is very important from the perspective of demographic research, as today education not only significantly influences the value system of individuals it also extends the preparatory stage of life. The fact that this stage extends later into life has a significant impact on demographic reproduction.

6 CONCLUSION

On the territory of what is now the Czech Republic, school attendance was made compulsory by law in 1774, and in 1884 a system of three levels was established that, with some changes, still applies today. However, what has changed substantially since then is the number of people in subsequent generations who obtain higher than basic level of education: while among people born in the late 19th century 8% of men and 2% of women had at least complete secondary education, among the generations born in 1941–1950 the figures grew to 31% of men and 36% of women, and among the generations born in 1971–1975 the figures were already 42% of men and 54% of women. From the 1% of the population that had tertiary education at the start of the 20th century, the figure has grown to approximately 14% today. And an even bigger change occurred by gender: while a hundred years ago only a negligible number of girls studied at secondary schools, today they account for one-half or more of the students enrolled at this level of education. As a result, the level of education in the population (or more precisely, the share of people with a secondary or higher level of education) increased gradually, and the level of education in the population has continued to grow as older generations die, because people who are today at the age of the maximal level of mortality generally obtained only basic education.

Glossary (terminology)

- **Formal education** – ('školní výuka') – education provided in the network of schools and educational institutions formally recognised by the official authorities (e.g. Ministry of Education).
- **Basic education** – ('základní vzdělání') – the first stage of formal education corresponding roughly to the period of compulsory school attendance, usually from the age of 6 to 15.
- **Secondary education without the school-leaving exam** – ('střední vzdělání bez maturity') – part of the second stage of formal education, usually focused on education to prepare students to directly enter the labour market, usually from the age of 15 to 17.
- **Secondary education with the school-leaving exam** – ('střední vzdělání s maturitou') – part of the second stage of formal education, usually focused on education enabling students to continue studying at the tertiary level, usually from the age of 15 to 18.
- **Tertiary education** – ('terciární vzdělávání') – the third stage of formal education, enabling students to increase their qualifications, usually starting at the age of 18 or 19.

Basic education:

- **Trivial, main, and normal schools** – ('triviální, hlavní a normální školy') – these schools were essentially the first level of education and provided basic education for children aged 6–12. Main schools were the second level and had an extended curriculum that included vocational subjects to prepare students for a trade. Normal schools had the extended curriculum of the main schools and in specialised courses to prepare candidate teachers, among other things. These three school levels together could be taken as similar to the term 'basic school'.
- **Basic schools** – ('základní školy') – educational institutions providing basic education.
- **National schools** – ('národní školy') – an earlier term for basic schools.

- **Elementary schools** – ('obecné školy') – the first stage of national schools usually 5 years in duration.
- **'Town schools'** – ('měšťanské školy') – the second stage of national schools usually 3 to 4 years in duration.

Secondary education without the school-leaving exam:

- **Apprenticeship training** – ('střední vzdělání s výučním listem') – secondary education preparing students for a trade, usually focusing on trade skills; originally master craftsmen trained their successors themselves, later some large industrial enterprises provided such training.
- **Secondary vocational schools** – ('střední odborná učiliště') – secondary education preparing students for a trade, usually focusing on trade skills; a part of formal education.
- **Basic technical school** – ('základní odborná škola').
- **Lower technical school** – ('nižší odborná škola').
- **(Short) technical school** – ('odborná škola').

Secondary education with the school-leaving exam:

- **Secondary general schools (gymnasia, gymnasium-type schools)** – ('gymnázia', 'školy gymnaziálního typu') – secondary schools mainly focused on teaching general subjects to prepare students for entering a higher level of education.
- **Secondary technical schools** – ('střední odborné školy') – secondary schools mainly focused on teaching technical subjects or the sciences, students are able to go directly into the labour market or they can continue to a higher level of education.
- **Secondary real schools** – ('reálné školy') – secondary schools focused on teaching the sciences, preparing students to study at a tertiary institution and focusing more on educating students towards 'practical' professions.
- **GED preparation courses** – ('nástavbové stadium') – education for secondary graduates without the school-leaving exam; usually 2 years in duration.
- **Post-secondary education** – ('pomaturitní studium') – short (maximum 2-year) courses for secondary graduates with the school-leaving exam.
- **Education in enterprises** – ('podnikové instituty') short-term courses organised for employees at selected enterprises, usually taking the place of study at a tertiary institution.

Tertiary education:

- **Tertiary institutions/institutions of tertiary education** – ('instituce poskytující terciární vzdělávání') – universities or higher technical schools.
- **Higher technical schools** – ('vyšší odborné školy') – institutions providing tertiary education but focused more on preparing students for a technical profession than universities, usually 3 years in duration.

Acknowledgements

The article was prepared with the support of research grant no. MSM 0021620831 'Geographical Systems and Risk Processes in Context of Global Changes and European Integration'.

The author thanks Klára Hulíková and Martin Hulík very much for their help with the translation of special terms of traditional and contemporary types of school and for preparing the glossary.

References

- Bartoňová, D. 2007. Vzestup úrovně vzdělání podle dat sčítání lidu 1961–2001 (The rise of education levels based on data from census conducted in 1961–2001). *Demografie*, 49, pp. 24–39.
- Bulíř, M. 1992. *Gymnázia a školy gymnaziálního typu (Retrospektiva let 1790–1900)* (Gymnasia and gymnasia-type schools (a retrospective of 1790–1900)). Prague: Český statistický úřad.
- Bulíř, M. 1987. *Základní školství v ČR (Retrospektiva let 1780–1986)* (Basic education in the Czech Republic (a retrospective of 1780–1986)). Prague: Český statistický úřad.
- Caldwell, J. C. 1982. *Theory of Fertility Decline*. London: Academic Press.
- Fialová, L. 1994. Charakteristiky obyvatelstva (Population characteristics). *Demografie*, 36, pp. 7–12.
- Hamplová, D. 2004. Vstup do manželství a vzdělání českých žen: generace 1952–1982 (Marriage and education among Czech women born between 1952 and 1982). In: Hamplová, D. – Rychtaříková, J. – Pikálková, S. *České ženy: vzdělání, partnerství a rodina*. Prague: Sociologický ústav, pp. 11–40.
- Jureček, Z. 1972. Současná úroveň vzdělání v ČSSR (Current education levels in the Czechoslovak Socialist Republic). *Demografie,* 14, pp. 296–299.
- Kárníková, L. 1965. *Vývoj obyvatelstva v českých zemí v letech 1754–1914* (Population development in the Czech lands in 1754–1914). Prague: NČSAV.
- Koschin, F. 1999. Klasifikace vzdělání (Educational classification). *Demografie,* 41, pp. 259–261.
- Koschin, F. 2003. Struktury obyvatelstva (Population structures). *Demografie,* 45, pp. 249–255.
- Kučera, M. – Ullmann, O. 1982. Úroveň vzdělání obyvatelstva ČSSR v datech Sčítání 1980 (Education levels of the population of the Czechoslovak Socialist Republic in the 1980 census data). *Demografie*, 24, pp. 193–208.
- Kuzmin, M. N. 1981. *Vývoj školství a vzdělání v Československu* (The development of the education system and education in Czechoslovakia). Prague: Academia.
- Lenderová, M. et al. 2009. *Žena v českých dějinách od středověku do 20. století* (Women in Czech history from the Middle Ages to the 20th century). Prague: Nakladatelství Lidové noviny.
- Livi Bacci, M. 1992. *A Concise History of World Population*. Malden and Oxford: Blackwell Publishers Inc.
- Livi Bacci, M. 2003. *Obyvatelstvo v evropské historii* (Population in European history). Prague: Nakladatelství Lidové Noviny.
- Pavlík, Z. 1959. Dynamika hospodářsko společenské struktury obyvatelstva českých zemí (The dynamics of the economic-social structure of the population of the Czech lands). *Demografie,* 1, pp. 145–155.
- Rychtaříková, J. 2004. Změny generační plodnosti v České republice se zaměřením na vzdělání žen (Changes in generational fertility in the Czech Republic and women's education). *Demografie*, 46, pp.77–90.
- Sobotík, Z. – Rychtaříková, J. 1992. Úmrtnost a vzdělání v České republice (Mortality and education in the Czech Republic). *Demografie*, 24, pp. 97–105.
- Srb, V. 2004. *1000 let obyvatelstva českých zemí* (1000 years of population in the Czech lands). Prague: Nakladatelství Karolinum.
- Zuzánková, N. 1979. Vznik a vývoj vysokého školství v Českých zemích (The rise and development of higher education in the Czech lands). *Demografie,* 21, pp. 223–235.

Data sources

- Die Ergebnisse der Volkszählung und der mit derselben verbundenen Königreichen und Ländern, Österreichische Statistik I, Band, 2. Heft, 1882. Wien: K.K. statistische Central-Commission und Direction der administrativen Statistik.
- Die Ergebnisse der Volkszählung und der mit derselben verbundenen Königreichen und LändernÖsterreichische Statistik, Neue Folge, Bd. 1, Heft 2. 1912. Wien; K. K. Statistische Central – Commission.
- Sčítání lidu a soupis domů a bytů v republice Československé ke dni 1. března 1950. Díl I. Nejdůležitější výsledky sčítání lidu a soupisu domů a bytů za kraje, okresy a města (Population and housing census of the Republic of Czechoslovakia on 1 March 1950. Vol. 1: The most important results of the population and housing census for regions, districts, and towns). 1957. Prague: Státní úřad statistický.

- Sčítání lidu, domů a bytů v ČSSR k 1. 3. 1961 – díl I: Demografické charakteristiky obyvatelstva (Population and housing census of the Czechoslovak Socialist Republic on 1 March 1961. Vol. 1: The most important characteristics of the population). 1965. Prague: Československá statistika, group. A, vol. 37, ÚKLKS.
- Sčítání lidu, domů a bytů v ČSSR k 1. 12. 1970 – Data o obyvatelstvu, domech, bytech a domácnostech, ČSR (Population and housing census of the Czechoslovak Socialist Republic on 1 December 1970: Data on the population, housing, and households, Czechoslovak Socialist Republic). 1974. Prague: Československá statistika, group A, vol. 50/74.
- Sčítání lidu, domů a bytů v ČSSR k 1. 11. 1980 – Obyvatelstvo, domy, byty a domácnosti – tabulky za ČSR (Population and housing census of the Czechoslovak Socialist Republic on 1 November 1980: Population, housing, and households – tables for the Czechoslovak Socialist Republic). Prague: Československá statistika, series SL, vol. 2/82.
- Sčítání lidu, domů a bytů k 3. 3. 1991 – Obyvatelstvo, domy, byty a domácnosti (Population and housing census on 3 March 1991: Population, housing, and households). 1992. Prague: FSÚ.
- Sčítání lidu, domů a bytů k 1.3.2001 – Obyvatelstvo, domy, byty a domácnosti (Population and housing census on 1 March 2001: Population, housing, and households). 2003. Prague: ČSÚ.
- Vysoké, střední a odborné školy v republice Československé roku 1921/1922 (Tertiary, secondary, and vocation schools in the Republic of Czechoslovakia 1921/1922. Prague: Československá statistika, svazek 17, series II, education, folio 4.

LUDMILA FIALOVÁ

has been a lecturer since 1997 in the Department of Demography and Geodemography at the Faculty of Science of Charles University in Prague. She specialises in historical demography and population development of the Czech Republic in a long-term perspective. She is the author and co-author of a number of articles on historical-demographic topics, most of which are published in the journal Historická demografie.

SUMMARY

Studying the long-term trends in population reproduction requires knowledge of the wider context of population development. One of the most important factors in this is the sociocultural level of the given population, but this cannot be measured. In very simplified terms it can be represented by the population's educational attainment. Compulsory school attendance was introduced for children aged 6–12 on the territory of what is now the Czech Republic in 1774. Initially, not all children, especially not in rural areas, attended school. It was not until the 1820s that more than 90% of children were attending school.

At the turn of the 20th century, with the advance of industrialisation and the overall modernisation of society, an increasing share of young people obtained technical education in order to work in factories or services, and the number of students studying at secondary and then tertiary institutions also rose. Secondary and tertiary education expanded after the foundation of Czechoslovakia in 1918, when women were also granted equal access to education, and the number of graduates of all types of schools then accelerated. Nevertheless, among the population born at the end of the 19th century only 8% of men and 2% of women had secondary education and only 1% of men had tertiary education.

Currently only a very small proportion of the population has no education and more than 90% of young people proceed to another educational institution upon completion of basic school. Today more than 50% of people have secondary education with the school-leaving exam, and 14% of the population has tertiary education. The age to which young people continue to be students has also been rising: by 2010 the share of young men aged 15–19 studying at some time of school (secondary or tertiary) had risen to 80%, the share of those aged 21–24 to 35%, and among young women the figures were 83% and 46%, respectively. Among people aged 25–29, 10% are still enrolled in some type of school. The extension of education to an ever later age is one of the most significant factors contributing the rise in the age at which the emerging generations decide to start a family.

THE IMPACT OF ICD10 ON CAUSE-SPECIFIC MORTALITY TRENDS: THE CASE OF THE CZECH REPUBLIC COMPARED TO WEST GERMANY AND FRANCE[1)]

Markéta Pechholdová

ABSTRACT

Unprecedented changes in mortality have occurred in the Czech Republic since the early 1990s. This period is almost entirely covered by the tenth revision of the International Classification of Diseases (ICD10). Given the extent of the innovation brought about by ICD10, it itself is a major issue in mortality statistics. Consequently, before making a deeper analysis of recent mortality trends, a thorough inspection of the cause-of-death series is necessary. This article first discusses the different impact ICD10 has had in several countries and then, based on examples from the Czech Republic (compared to France and West Germany), identifies some problems and proposes possible solutions.

Keywords: mortality, causes of death, bridge-coding, ICD10, comparability, Czech Republic, West Germany, France

Demografie, 2011, **53: 360–380**

INTRODUCTION

Between 1989 and 2008, life expectancy increased by six years for Czech men and by five years for Czech women. This unprecedented turnaround in mortality was accompanied by changes in the pathological profile, similar to those observed in Western countries since the 1970s, and sometimes referred to as the 'cardiovascular revolution' – cardiovascular deaths are postponed and eventually avoided and replaced by other pathologies. To assess the nature of recent mortality trends, reliable and long-term cause-of-death data series are needed.

The International Classification of Diseases (ICD), as well as modern medicine, evolved dramatically during the first half of the 20th century. Nevertheless, since the sixth revision of ICD (dating from 1948), the logic and structure of the classification remained unchanged until 1989, when ICD10 was adopted. ICD10 differs from the previous revision in several respects, but above all in its expected duration. Based on experience with previous ICD revisions, WHO concluded that a ten-year revision interval is too short and the tenth revision has therefore been designed as a 'stable and flexible classification, which should not

1) This paper was written with the support of 'VŠE IP400040' institutional support for long-term conceptual development of science and research and the Faculty of Informatics and Statistics, University of Economics in Prague in 2011.

require fundamental revision for many years to come' (*WHO, 2004*).[2)]

The impact of this fundamental change proved to be a double-edged sword: the classification is now better adapted to current medical knowledge and its use across medical sciences increased, but it also introduced serious discontinuities in the cause-of-death time series. There is a consensus that ICD10 represents the largest change to cause-of-death statistics in over 50 years (*Rooney – Griffiths et al.*, 2002; *Anderson – Minino et al.*, 2001; *Meslé – Vallin*, 2008).

This article deals with the issue of ICD10 in the Czech Republic and compares it to what has been observed in West Germany and France. The first part gives deeper insight into ICD10, its position in the history of WHO classifications and its impact on mortality statistics as observed across several countries. The second part then focuses on the effects of ICD10 in the Czech Republic compared to West Germany and France. Finally, based on several examples possible solutions aimed at connecting ICD10 to previous revisions are proposed.

THE MAIN INNOVATIONS USHERED IN BY ICD10

The most visible innovation of ICD10 is the introduction of an alphanumeric system of codes, which further increased the detail of the classification (from approx. 5,000 to approx. 8 000 codes recognized as causes of death) (*Anderson – Minino et al.*, 2001). The long-term structure of the main ICD chapters was rearranged: Chapter VI of ICD9 has been split into three; the order of Chapters III and IV has been switched; ICD9 Chapters XII and XIII (diseases of the skin and musculoskeletal systems) have been moved to precede diseases of the genitourinary system (Chapter X) and Chapter XV is now placed before Chapter XIV. The two supplementary classifications in ICD9 (the V- and the E-classification) have been merged into ICD10; the total number of chapters thus increased from 17 to 21. Chapter titles have also been changed slightly.

Several ICD items changed their position in the main ICD chapters, and new items which have no connection with previous revisions were created. Like in the previous revisions, there was no single principle behind the rearrangement of the diseases. Thus, according to the principle of aetiology, *myelodysplastic syndromes* (formerly known as 'preleukaemia') were removed from the chapter of the diseases of the blood and blood-forming organs (Chapter IV in ICD9) and placed with neoplasms of uncertain or unknown behaviour in Chapter II in ICD10. Other changes tend to respect the anatomical location of the disease. *Non-specific lymphadenitis*, ranked in ICD9 Chapter IV under Other diseases of blood and blood-forming organs (ICD9 289), is a cardiovascular disease in ICD10 (I88). Several diseases were added to the (anatomical) chapter of musculoskeletal diseases in ICD10: *adult osteomalacia* (M83), attributed previously to vitamin D deficiency (ICD9 268) in ICD9 Chapter III, *gout* (M10) formerly part of endocrine, nutritional and metabolic diseases and immune disorders (ICD9 274), and *polyarteritis nodosa* (M30.0), classified in ICD9 as a circulatory disease (446.0). *Transient cerebral ischemia*, a cerebrovascular disease in ICD9 (435), is now considered a disease of the nervous system (G45).

A few brand new categories were created in ICD10, namely *malignant neoplasms of independent (primary) multiple sites* (C97) and *mesothelioma* (C45). SIDS (Sudden Infant Death Syndrome) was allocated a single 3-digit code (R95), while it was part of sudden death in ICD9 (798.0). The ICD9 code for *fracture, cause unspecified* (E887) no longer has an equivalent among fractures in ICD10; the deaths are now classified as due to a new item: *exposure to unspecified factor* (X59). The new items are particularly problematic, because their corresponding content in ICD9 may be dispersed among many different categories.

Unlike in previous revisions, ICD10 is annually updated by the WHO committee (since 1996). WHO recommends the full implementation of these updates, but the timing and the extent of their adoption is country-specific, which can generate further inconsistencies.

2) p. 110

THE CHANGE IN CODING RULES – THE MAIN SOURCE OF DISCONTINUITY

The main impact on continuity comes from the change in coding rules. The wording and the structure of the ICD10 selection rules are similar to those in ICD9, but the rules became more precise and recognized many diseases as being the consequences of others. The main change concerns diseases listed by Rule 3 and most typically affects pneumonia, because pneumonia is listed as a direct consequence of virtually any disease under ICD10. As a consequence, a dramatic drop in pneumonia is expected after adopting ICD10. On the other hand, we can expect an increase in deaths from septicaemia, which in the ICD10 rules is given preference over pneumonia, and an increase in AIDS, which in the ICD10 rules can provoke any cancer or infection. SIDS (sudden infant death syndrome) is no longer considered an ill-defined cause, so it is more likely to be selected as an underlying cause of death. Selection of the primary site of cancer was also largely affected by a redefinition of pathological causalities and although as a group neoplasms are not affected by ICD10, there may be substantial structural shifts within the chapter (*Anderson – Minino et al.*, 2001).

PART 1: THE DIVERSE IMPACT OF ICD10 ACROSS COUNTRIES

With the adoption of the same classification and coding system, the effects of ICD10 could be expected to be similar across countries. In reality this is not the case because of other factors affecting the selection of the underlying cause of death: the coding habits and the coding system itself. In countries with manual coding, the coders (or medical doctors) first assign ICD codes to the conditions listed on the death certificates. The underlying cause of death is then selected by trained coders at the respective health or statistical offices. Manual coding is therefore, inherently, partially subjective, depending on the coders personality, training, experience, etc. When a new revision is implemented, the manual coding system takes time to adapt, especially when the change in the coding rules is as complex as with ICD10.

The increasing complexity of ICD coding rules has led, in many countries, to the adoption of a modern alternative to manual coding: automated coding systems (ACS). The first attempts at automating cause-of-death data processing date back to the late 1960s, when the NCHS (National Center for Health Statistics – a division of the United States federal agency the Centers for Disease Control and Prevention) developed a system for selecting the underlying cause of death in accordance with the current ICD rules. This decision system is known as the ACME (Automated Classification of Medical Entities) and went on to become an international standard. Contemporary automated coding systems are multi-stage. In the first stages the information written on the death certificate is encoded into medical entities and ICD codes using language-dependent software. The ACME then selects the underlying cause of death. The inconvenience of automated coding is its inability to process all of the death certificate (a part of the death certificate is rejected). The implementation of the ACS can also cause further severe breaks in the continuity of cause-specific statistics, especially in countries where national coding habits extensively diverge from the WHO recommendations.[3)]

BRIDGE-CODING STUDIES – A USEFUL PREDICTOR OF EXPECTED TROUBLES?

So-called bridge-coding studies evaluate the impact of the change in classification or coding. In this type of study, a sample of a death certificate is double-coded according to the old and the new revision. A common output of bridge coding are comparability ratios, calculated by dividing the number of deaths coded to cause *i* in ICD10 by the number of death coded to cause *i* in ICD9:

$$C^i = \frac{D_i^{ICD10}}{D_i^{ICD9}}$$

Prior to ICD10, bridge coding was rare. The serious risk involved in introducing data discontinuities

3) Not to mention that automated coding systems are also subject to corrections and updates.

Table 1 **An overview of available bridge-coding studies**

Country	Sampling	Sample Size	ICD9 coding	ICD10 coding	Data	ICD change	Publication
USA	80% random	2,318,212	MICAR/ACME*	MICAR/ACME	1996	1999	(Anderson, Minino et al., 2001)
Canada	Selected regions	81,600	MICAR/ACME	MICAR/ACME	2000	1999	(Geran, Tully et al., 2005)
E&W	100%	551,093	TRACER/MICAR/		1999	2001	(Rooney, Griffiths et al., 2002)*
France	10% random	53,869	Manual	STYX/ACME	1999	2000	(Pavillon, Boileau et al., 2004)
Italy	100% in 2 months	9,6451	MICAR/ACME	MICAR/ACME	2003	2002	NA
Spain	Sel. regions, 24% of total deaths	8,8084	Manual	Manual	1999	1999	(Ruiz, Cirera Suarez et al., 2002)
Sweden	25% random	25,440	manual/ACME	MIKADO/ACME	1996	1997	NA

Note: * MICAR – Mortality Medical Indexing, Classification, and Retrieval, ACME – Automated Classification of Medical Entities

has motivated an increasing number of countries to perform ICD9/ICD10 double-coding. Table 1 gives an overview of the major bridge-coding studies conducted for ICD10, and a list of published materials. As there is no standardized procedure for bridge coding, the above-cited studies differ in many respects – sampling method, sample size, the detail of the published results.

The case of France is particularly interesting because France passed from manual to automatic at the same time that ICD10 was implemented. The resulting comparability ratios therefore include an additional effect – the effect of automated coding.

The main results of the bridge-coding studies are presented in Table 2. Even on the aggregated level of ICD chapters, ICD9/ICD10 continuity is not assured, and the impact is not consistent across countries. In all countries, infectious and parasitic diseases increased with ICD10 implementation due to the recognition of *HIV* as an underlying cause of death for many diseases, including some cancers, and due to the increased selection of *septicaemia*. The most stable is, traditionally, the coding of cancer: in all studies the comparability ratios were close to 1. A consistent drop was observed for diseases of the blood and blood forming organs (Chapter III), due to addition of *myelodysplastic syndromes* to neoplasms. Endocrine, nutritional and metabolic diseases (Chapter IV) were selected more frequently in ICD10 in all countries except Spain, due to the application of Rule 3 to diabetes.[4)]

As for the chapter of mental and behavioural disorders, an increase was observed in France and in England and Wales, attributable to a change in Rule 3 allocating more deaths to dementia. The decrease of deaths classified to the chapter on mental disorders observed in other countries is explained by the fact that the new ICD10 rules code deaths from liver disease linked with alcoholism (which would have been coded to alcohol dependence syndrome in ICD9) to the chapter of digestive diseases. Another reason for the decrease is the tendency to reassign majority of deaths from *presenile dementia* (290.1) to *Alzheimer disease* (G30), which contributes to the increase of the whole chapter of nervous diseases (Chapter VI). However, the main reason for this striking increase (comparability ratios range from 1.15 to 1.50) was the removal of transient cerebral ischemia from cerebrovascular diseases and its positioning among diseases of the nervous system.

Comparability ratios for cardiovascular diseases hover around 1. Slight increases and decreases were observed, the reasons for the both-ways movements cited by the authors of the respective bridge-coding studies are the following: 1) *cardiac arrest* is consid-

4) In Spain the authors consider the decrease to be due to the exclusion of AIDS (previously classified under 279 in ICD9) (Ruiz et al., 2002).

Table 2 **ICD10/ICD9 comparability ratios for main ICD chapters**

ICD10 Chapter	ICD10	ICD9	Title	France	Canada	England & Wales	Spain	Italy
I	A00–B99	001–139	Certain infectious and parasitic diseases	1.38	1.08	1.10	1.36	1.30
II	C00–D48	140–239	Neoplasms	1.01	1.01	1.03	1.01	1.01
III	D50–D89	280–289	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	0.86	0.91	0.65	0.67	0.86
IV	E00–E90	240–279	Endocrine, nutritional and metabolic diseases	1.13	1.04	1.05	0.86	1.06
V	F00–F99	290–319	Mental and behavioural disorders	1.09	0.84	1.22	NA	0.80
VI	G00–G99	320–359	Diseases of the nervous system	1.25	1.33	1.50	1.33	1.15
VII	H00–H59	360–379	Diseases of the eye and adnexa			1.00		
VIII	H60–H95	380–389	Diseases of the ear and mastoid process			0.71		
IX	I00–I99	390–459	Diseases of the circulatory system	1.00	0.99	1.04	0.97	0.97
X	J00–J99	460–519	Diseases of the respiratory system	0.86	0.85	0.77	1.05	0.97
XI	K00–K93	520–579	Diseases of the digestive system	0.93	1.02	1.01	1.00	0.96
XII	L00–L99	680–709	Diseases of the skin and subcutaneous tissue	0.86	1.05	0.99	1.09	1.30
XIII	M00–M99	710–739	Diseases of the musculoskeletal system and connective tissue	1.09	1.36	1.39	1.07	1.37
XIV	N00–N99	580–629	Diseases of the genitourinary system	0.94	1.01	1.00	1.00	1.08
XV	O00–O99	630–676	Pregnancy, childbirth and the puerperium	1.50	NA	1.10	1.00	NA
XVI	P00–P96	760–779	Certain conditions originating in the perinatal period	1.03	1.03	NA	1.06	NA
XVII	Q00–Q99	740–759	Congenital malformations, deformations and chromosomal abnormalities	1.08	0.91	NA	1.00	NA
XVIII	R00–R99	780–799	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0.93	1.00	1.00	1.14	1.47
XX	V01–Y89	E800–E999	External causes of morbidity and mortality	0.96	1.02	1.01	1.00	0.94

Source: Bridge-coding studies listed in Table 1.

ered an ill-defined cause in ICD10 and therefore is not selected if another more specific cause is present anywhere on the certificate; 2) Rule 3 favours cerebrovascular diseases over pneumonia; 3) *transient cerebral ischemia* moved from cerebrovascular diseases to Chapter VI in ICD10.

Respiratory diseases consistently decreased as a result of the application of Rule 3 to pneumonia. In Spain the chapter of respiratory diseases increased slightly, but the drop for pneumonia alone was comparable to the rest of the bridge-coding studies (*Ruiz et al.*, 2002). The deaths attributed to the chapter of musculoskeletal and connective tissue diseases increased in all countries due to the above-mentioned inclusion of *gout* and *polyarteritis nodosa*. The chapter of accidents was not seriously impacted by ICD10, there have however been important shifts within it.

PART 2: THE TRANSITION TO ICD10 IN THE CZECH REPUBLIC COMPARED TO WEST GERMANY AND FRANCE

The period of our study begins in 1968 – the year in which ICD8 was adopted in all three countries. We take advantage of the fact that for all three countries continuous time series of cause-specific data for the

period of ICD8 and ICD9 are available along with published documentation: for the Czech Republic (*Pechholdova – Meslé et al.*, 2011) for France (*Meslé – Vallin*, 1996), and for West Germany (*Pechholdova*, 2009).

ICD10 was approved in 1989 and came into effect in 1993. The Czech Republic was among the first countries to adopt it in 1994; Germany adopted it for the mortality statistics in 1998 and France two years later in 2000 (along with the implementation of the automated coding system). Out of the three countries, only France has implemented automated coding (in 2000) and performed a double coding at the time ICD10 was adopted.

ICD10 DATA

For the Czech Republic, data were obtained from a series of deaths by cause published in electronic format on the website of the Czech Statistical Office.[5] The data are provided in the 3-digit level format and the last open age interval is 85+ (95+ since 2008). For the West Germany, data until 2006 were available at the 3-digit level, ending with open age interval 90+. Nevertheless, ICD10 data provided by the German Statistical Office do not cover the same territory as the previous ICD revisions while Berlin is no longer divided into East and West. In 2001 the district reform merged the former 23 Berlin districts into 12 new districts (*Scholz – Jdanov*, 2005). Two of the new districts (Mitte and Friedrichshain-Kreuzberg) are a mixture of former East and West Berlin, which does not allow for a distinction between East and West Berlin anymore. The Max Planck Institute for Demographic Research recombined the official data from the statistical office with data from the registry office (Melderegister) in Berlin: these data kept the former territorial structure until 2004. Until 2004 we could use these reconstituted all-cause death counts to proportionally adjust the cause-of-death data. The solution for data beyond 2004 is still in question. For France, the cause-of-death data were obtained during the author's stay at the 5th research unit of INED (MSE – Mortalité, santé, épidémiologie). ICD10 data cover the years 2000–2006 and provide 4th digit detail and age-cause-specific information up to the age group 105+.

METHOD: THE ABRIDGED LIST

The considerable increase in classification detail on the one hand and the lack of a standardized shortlist suitable for our purpose on the other hand has led us to create our own abridged list of 186 carefully selected groups of causes of death. This subset of causes has several advantages. First of all, it is directly compatible with existing shortlists (the European list of 65 causes of death, and the NCHS list of 113 causes used in the US and Canada). It also allows for specialized demographic analyses, such as analysis of avoidable, smoking and alcohol-related mortality. In order to avoid, as much as possible, any problems with classification and comparability, the list groups causes which are known for common diagnostic or coding confusion (cancer of the colon and rectum or the subcategories of cerebrovascular diseases). Finally, potentially problematic items (issues related to varying coding practices) are kept apart so that we can evaluate the magnitude of the problem and apply corrections, if necessary.

For these 186 causes we established the best-practice ICD9/ICD10 correspondences using three guidelines: 1) the WHO ICD9/ICD10 Translator – an electronic document mapping all the possible correspondences at the 4th digit level (*WHO*, 1997)[6], 2) the correspondences given by the existing shortlists, and 3) our experience with the data itself. The full list of selected items and their ICD9/ICD10 correspondences is given in the annex.

DISEASES AFFECTED BY THE ICD CHANGE

Figures 1 to 8 illustrate the impact of ICD10 on a subset of those items most visibly affected by the change in the classification. The figures represent

5) <http://www.czso.cz/csu/2007edicniplan.nsf/publ/4017-07-(1919_az_2006)>

6) Currently available from <http://libdoc.who.int/icd/hq/1996/>.

Table 3 **List of selected causes affected by the ICD change (and their corresponding codes in the 186-list)**

List number	Title	ICD9 codes	ICD10 codes
013	Septicaemia	038	A40–A41
020	Viral hepatitis	070	B15–B19
052	Malignant neoplasm of other and ill-defined sites	195	C76–C79
054	Malignant neoplasms of independent (primary) multiple sites	—	C97
079	Essential hypertension	401	I10
084	Acute myocardial infarction	410	I21–I22
086	Chronic IHD	412–414	I20, I25
094	Cerebrovascular diseases	433–434, 436–438	I63–I69
096	Atherosclerosis	440	I70
104	Pneumonia	480–486	J12–J18
152	Symptoms and signs	780–796	R00–R94
153	Senility	797	R54
154	Sudden death	798	R96,R98
155	Unknown cause	799	R99

Source: Own selection.

absolute death counts since 1968 (both sexes combined) for the given 186-list item (the presented items and their correspondences in ICD9 and ICD10 are given in Table 3).

On the left side of the graphs, the series represent *reconstructed* data for ICD8 and ICD9, i.e. data controlled for the change between ICD8 and ICD9 and for sudden changes in coding practices. On the right side are the *raw* ICD10 data. While the size of the Czech population is considerably smaller compared to France and West Germany, the Czech death counts are represented on secondary axes (with a smaller scale).

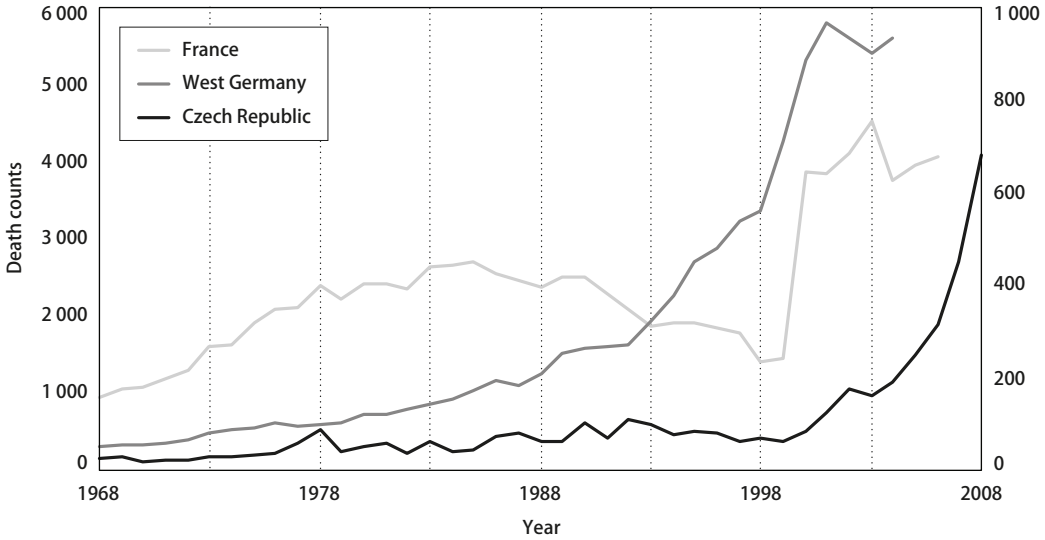
According to the bridge-coding studies, serious breaks occurred for the chapter on the infectious diseases due to septicaemia, viral hepatitis, and HIV. The comparability ratios for septicaemia vary from 1.11 (US, Canada) to 2.70 (France). The rise of septicaemia mortality is explained by the change in Rule 3, according to which septicaemia is given preference when both septicaemia and pneumonia are present on the death certificate.

Due to the implementation of an automated coding system, the increase was sharp and immediate only in France (see Figure 1). In West Germany, where the coding is manual, the increase of deaths due to septicaemia was gradually distributed over the first years after the adoption of ICD10. In the Czech Republic, *septicaemia* remained unaffected by the classification change until recent years.

In 2006–2007 the Czech Republic participated in a European Commission Transition Facility Multi-Beneficiary Programme for Statistical Integration programme (*Štyglerová*, 2008). This project to improve cause-of-death statistics aimed to increase the quality of both the certification and coding of causes of death. For the coding part, it mainly dealt with the removal of those coding rules that did not comply with current WHO recommendations. For some causes the observed changes reflected the rectification of long-term coding habits, while some breaks were related to the recent adoption of ICD10 coding rules. As a result, for many causes of death, including septicaemia, the true impact of ICD10 appeared only 13 years after its adoption. Comparing the Czech data with the other two countries enables better detection of breaks related to ICD10.

Figure 2 shows the trend in the death counts from viral hepatitis. In France, most of the remarkable increase in *viral hepatitis* observed immediately after the adoption of ICD10 was due to its previous misclassification in the chapter of digestive diseases (as ICD9

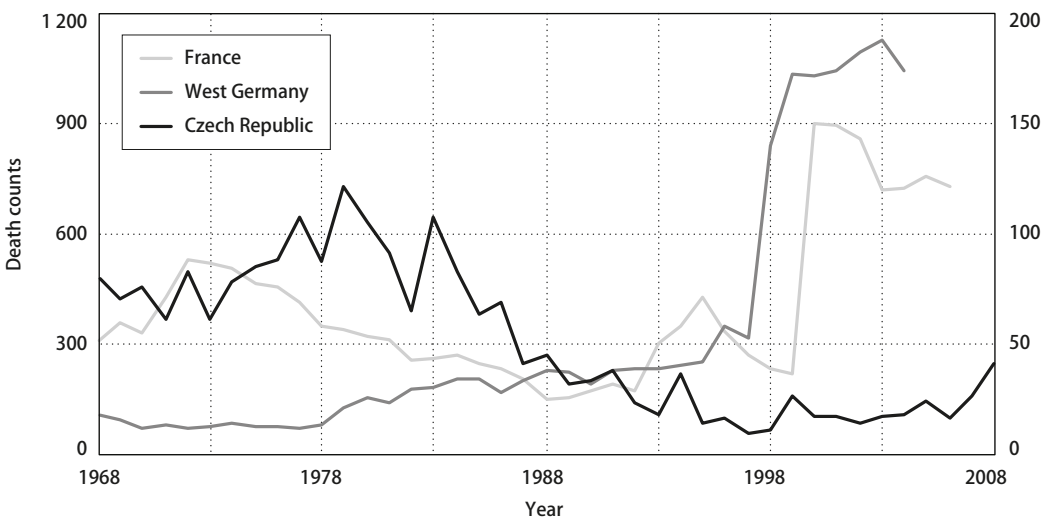
Figure 1 **Septicaemia**



Note: The Czech Republic is represented on the secondary axis.

item 571.4 chronic hepatitis) (*Pavillon – Boileau et al.*, 2004). Even though the WHO manual explicitly stated *not* to classify any acute or chronic hepatitis of infectious origin under ICD9 571, these recommendations were not respected in France or in Germany. Unlike for France and Germany, the Czech data do not show any important break throughout the period of observation.

Figure 2 **Viral hepatitis**



Note: The Czech Republic is represented on the secondary axis.

Malignant neoplasms are, traditionally, the most reliable causes of death. Several ICD9- and ICD10-based studies have reported an agreement of manual cancer coding of over 80% (*Giersiepen – Greiser*, 1989; *Jahn – Jöckel et al.*, 1995; *Jedrychowski – Mroz et al.*, 2001).[7] The stability of the definitions for cancer was also confirmed by our experience from previous ICD transitions.

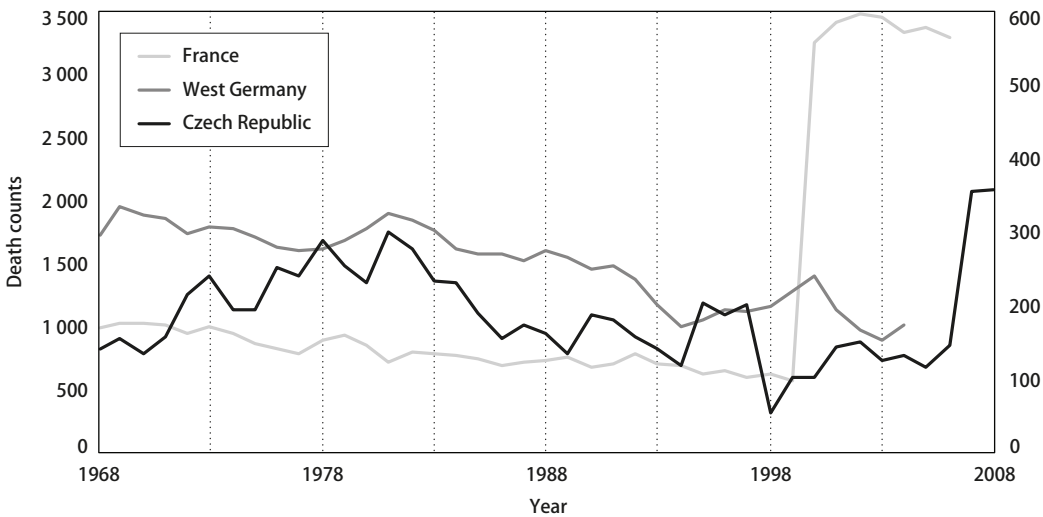
The specified cancer sites passed mostly unaffected into ICD10.[8] ICD10 however revealed substantial diversity in the coding of unspecified cancer – the breaks are (again) striking in the case of the transition to ICD10 in France. Figure 3 represents ICD10-related increase in *malignant neoplasms of other and ill-defined sites*. A similar, but delayed, effect can be observed in the Czech Republic, but is missing in West Germany.

ICD10 introduced a new code for cases where two or more primary sites of cancer are listed on the death certificate and it is not clear which one is the underlying one – Malignant neoplasms of independent (primary) multiple sites (C97). In ICD9 the selection rules would have been applied, in ICD10 the order of entry is not taken into account and specific rules are applied (*Brock – Griffiths et al.,* 2004). From Figure 4 we can see that this new code has immediately been adopted in West Germany and France, while only after 2007 in the Czech Republic.

According to the ICD9/ICD10 Translator, this category should correspond to ICD9 199.0 (Multiple cancer unspecified site, primary or secondary). Nevertheless, in the two bridge-coding studies for which sufficient detail could be obtained (France, England and Wales) not a single death from ICD10 C97 was previously classified under ICD9 199. Instead, the deaths from C97 were evenly distributed among several cancer sites in ICD9; the contributions of individual cancer sites rarely exceeded 10%.

As for essential hypertension, an erroneous application of ICD10 coding rules probably occurred in the Czech statistics in 1994 and was only rectified in 2007 by the coding improvement programme. The presence

Figure 3 **Malignant neoplasms of other and ill-defined sites**

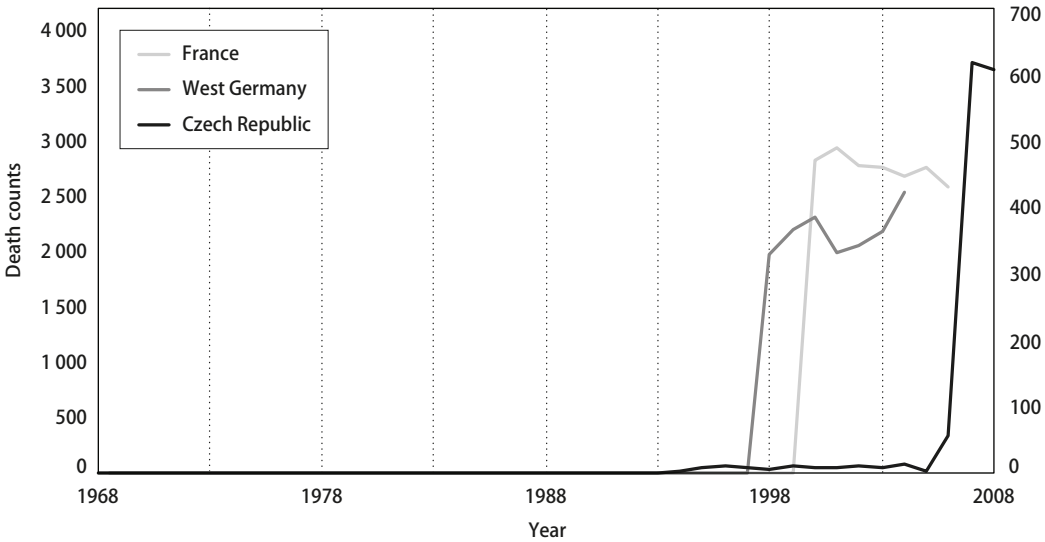


Note: The Czech Republic is represented on the secondary axis.

7) In systems with automated coding, the agreement is even higher.

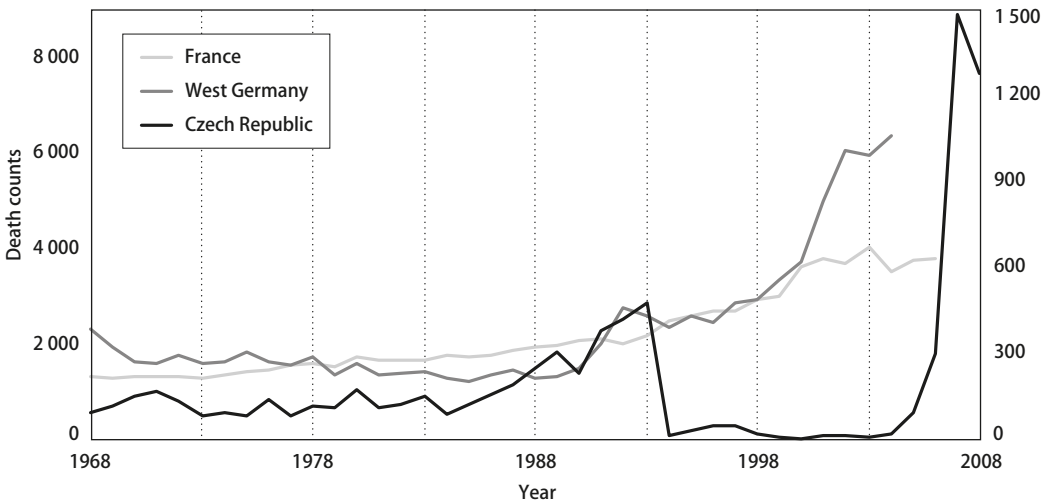
8) *Štyglerová* (2008), however, points out that cancer, regardless of its order on the death certificate, was overselected, and that the recent improvement in coding may have, to a small extent, underlied the observed decrease in cancer mortality.

Figure 4 **Malignant neoplasms of independent (primary) multiple sites**



Note: The Czech Republic is represented on the secondary axis.

Figure 5 **Essential hypertension**

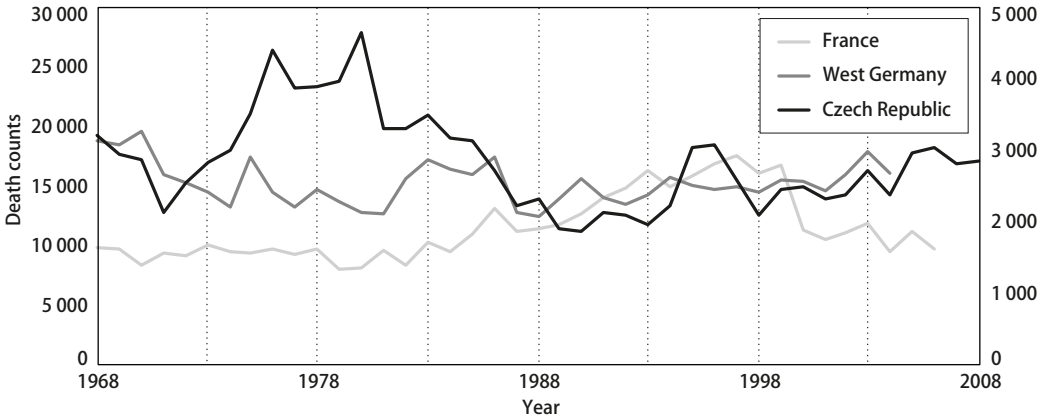


Note: The Czech Republic is represented on the secondary axis.

of a similar increase observed in the two remaining countries at the time of the ICD change suggests that the break is related to ICD10 (Figure 5).

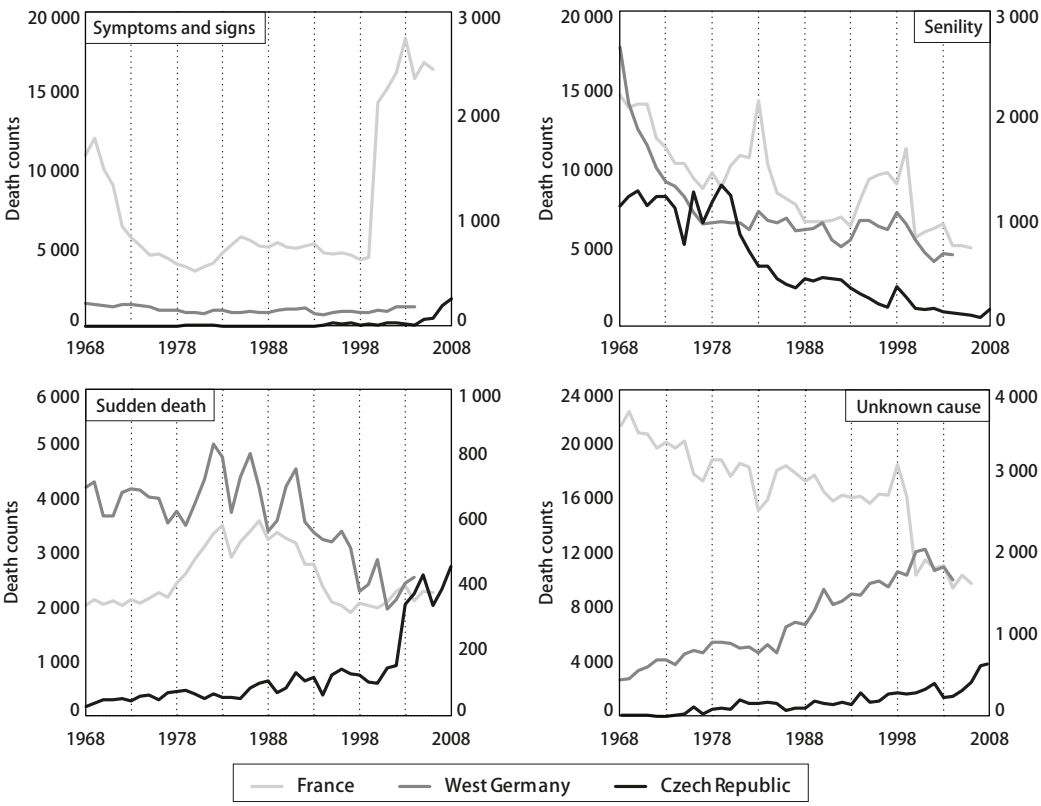
One of the most discussed items with ICD10 is pneumonia. According to the results of the bridge-coding studies, we expected a uniform and dramatic

Figure 6 **Pneumonia**



Note: The Czech Republic is represented on the secondary axis.

Figure 7 **Diverse categories of ill-defined causes of death**



Note: The Czech Republic is represented on the secondary axes.

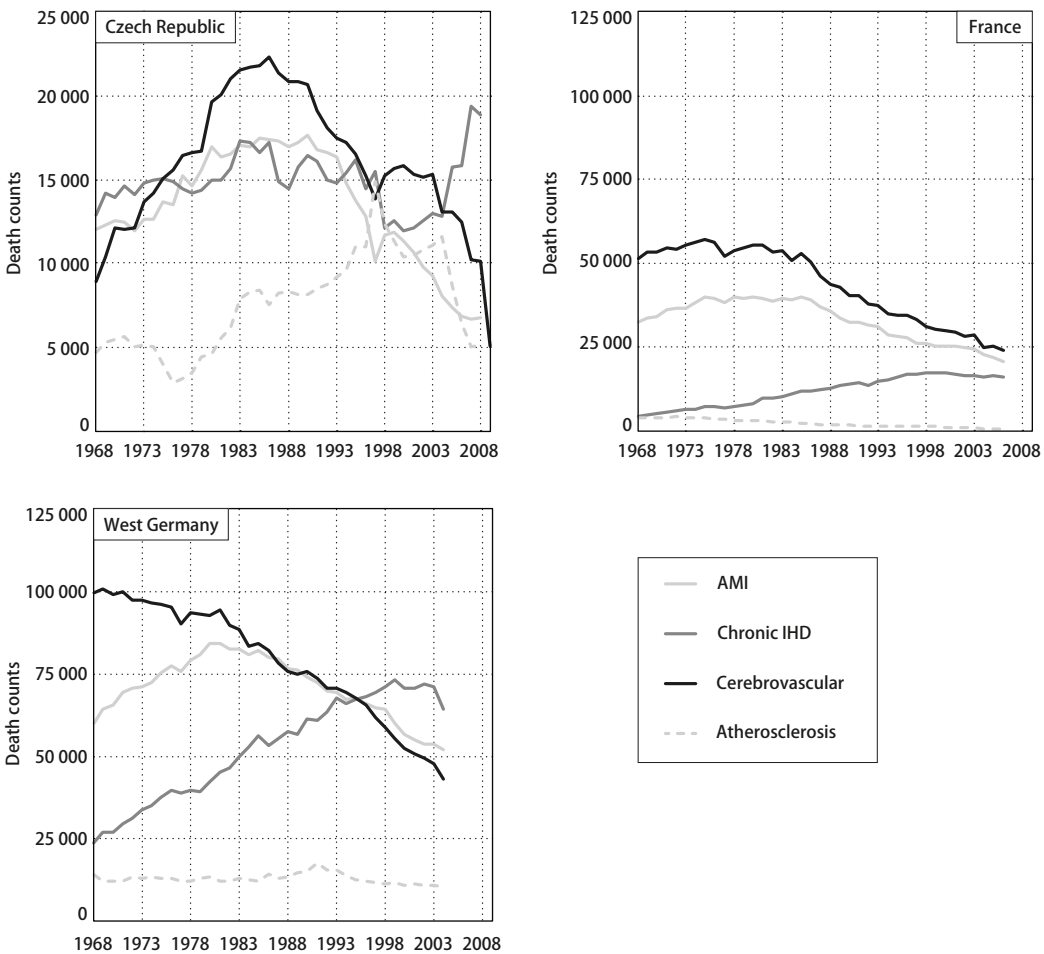
drop in ICD10. It is very surprising that in neither Germany nor the Czech Republic no signs of disruption are visible (see Figure 6).

Ill-defined causes of death remained unchanged by ICD10 in West Germany, but their structure considerably changed in France under ICD10 (see Figure 7). In the Czech Republic, an important increase in the proportion of ill-defined causes (among all deaths) was observed in 2007: the proportion suddenly shifted from a traditionally low level (0.5%) to almost 1.5% in 2008. This increase is probably the result of both the application of new ICD10 coding rules (such as in the case of Symptoms and Signs) and the modification of the long-term practice of 'avoiding' the coding to the ill-defined categories. The 1.5% observed in 2008, however, is still much lower than in West Germany (2.8%) and France (6.5%).

ISSUES NOT RELATED TO THE CLASSIFICATION CHANGE

In all three countries, the main circulatory diseases transitioned smoothly into the ICD10. Figure 8, however, provides evidence of a break that occurred in the Czech data after 1997: acute myocardial infarction and cerebrovascular diseases increased considerably, while

Figure 8 Diverse coding practices for the main circulatory conditions



chronic ischemic heart disease and atherosclerosis declined. After the change of the Czech coding in 2007 these trends reversed. According to *Štyglerová* (2008), prior to 2007 the chronic ischemic heart disease claims was strongly underestimated – due to the preference for atherosclerosis over a cerebrovascular condition if both were listed on the death certificate. This statement is also supported by our data, especially in the period 1997–2007.

The number of deaths coded to atherosclerosis in the Czech Republic is exceptionally high – the share of this cause-of-death among all deaths in 1997 was more than 13%, unlike in France and West Germany, where the share is less than 0.5% and 2%, respectively. In 2007, an important part of this excessive coding of atherosclerosis was removed by the coding improvement programme, resulting in a drop to 4.8% (of all deaths) in 2007. The specificity of the trends for circulatory conditions suggest a persisting confusion over the coding for diverse categories of circulatory diseases in the Czech Republic.

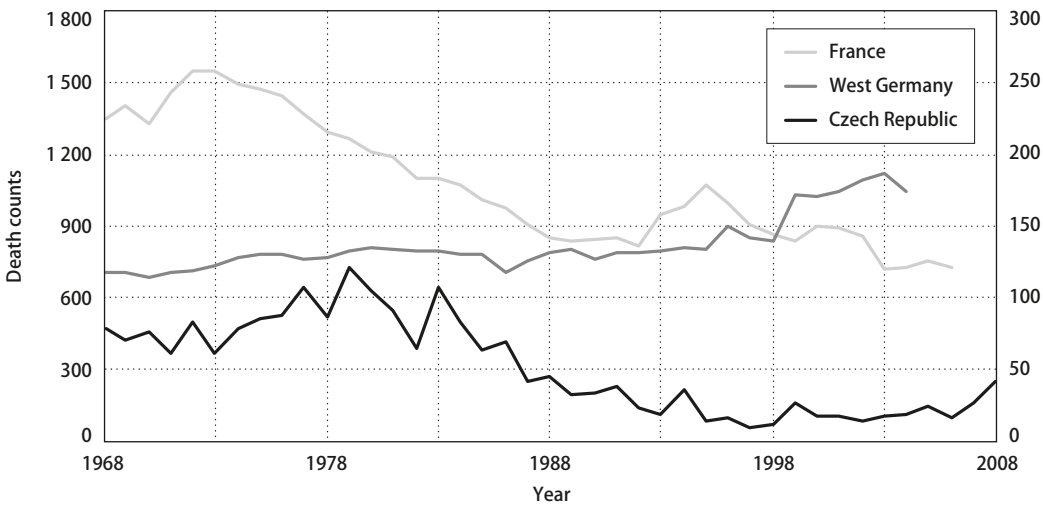
HOW TO DEAL WITH THE BREAKS?

More than with any previous ICD revision, the ICD10 breaks in continuity result from the complex changes to the coding rules. We cannot therefore simply rely on comparing the definitions of the diseases. The problem was already well demonstrated in the example of the breaks in pneumonia and septicaemia in France, where neither of the three proposed methods (the French bridge coding, the US and UK bridge coding, multiple causes of death) yielded a satisfactory solution (*Meslé – Vallin*, 2008). In these problematic diseases, increased attention must therefore be paid to avoiding a misinterpretation of the trends.

However, solutions could be found for many of the causes of death given as examples in this study. The break in the *viral hepatitis* (as was seen in Figure 2 for France and West Germany) can be corrected by adding a portion (based on the magnitude of the break, we estimated this portion to be 4%) of *chronic liver disease and cirrhosis* (ICD9 571), where chronic viral hepatitis was misclassified previously. The result of this operation can be seen in Figure 9.

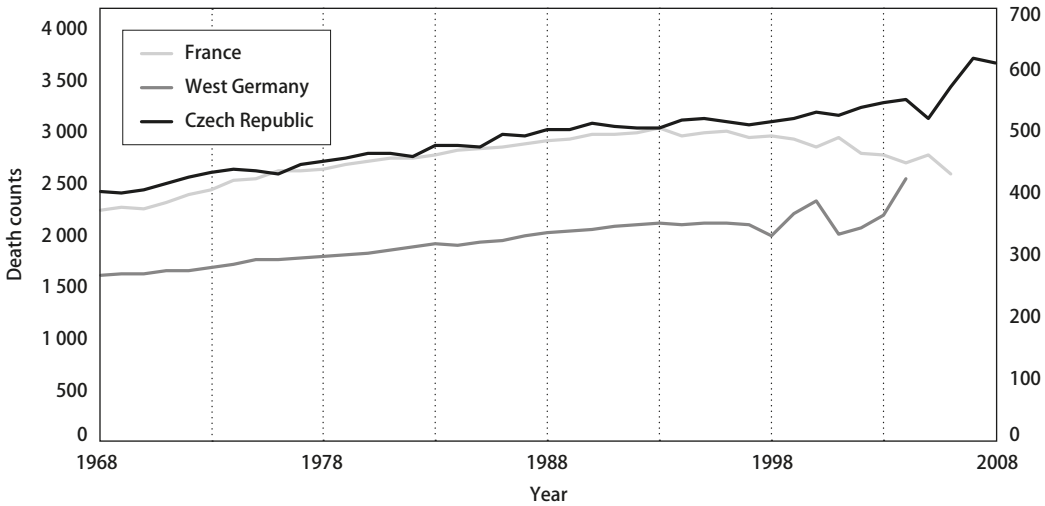
The category *malignant neoplasm of independent (primary) multiple sites* (Figure 4) is new in ICD10. It encompasses a large variety of cancer sites and no simple correspondence can therefore be identified. Based on the information from bridge-coding studies, however, it is possible to reconstruct this new ICD10 item. In our case, we applied the French bridge-coding coefficients for all the three countries and re-created

Figure 9 **Viral hepatitis, corrected for France and West Germany**



Note: The Czech Republic is represented on the secondary axis.

Figure 10 **Malignant neoplasm of independent (primary) multiple sites: re-created based on the information from the French bridge coding**



Note: The Czech Republic is represented on the secondary axis.

the item from various cancer sites. The result – which is quite satisfactory – is shown in Figure 10.

As for the ill-defined causes of death (the breaks were visible in Figure 7), the issue of coding change can be disregarded – their proportional redistribution among well-defined causes and accidents will nullify this problem. Moreover, the redistribution of ill-defined cause will improve comparability between countries and periods with different levels of ill-defined causes of death.

In the case of the Czech Republic, corrections have to be applied with respect to the change of coding in 2006 and with respect to national coding specifics. The first step is to correct the excessive coding of atherosclerosis to adjust past levels to the levels observed since 2007. The second step would be to adjust the series for acute myocardial infarction, chronic ischemic heart disease and cerebrovascular diseases between 1997 and 2006. For the time being, however, there is not enough information about how to correct: the period of new coding practice is short, and, more importantly, the implementation of automated coding is under way and further changes are expected. The Czech continuous time series should therefore be revised again a few years after the implementation of ACS, when the effects of automated coding become more tangible.

CONCLUSION

In the entire history of ICD, the definitions and the structure of the classification have changed regularly. However, these changes have been easily traceable and correctable by the '*a posteriori*' reconstruction method based on tracking medical content back in time. With the tenth revision, the applicability of this method is limited. As this time the new coding roles have caused breaks, an alternative method and sources must be sought. Dual (bridge) coding is probably the most accurate guideline – if it is available and on the condition that the double-coded sample is representative enough.

This study mostly dealt with issues related to the adoption of ICD10 in the Czech Republic, West Germany and France. Unprecedented breaks due to the change in coding in ICD10 were found in all three countries. Our experience shows that when it comes to the items seriously affected by the change in the coding rules (represented here by the viral hepatitis, septicaemia, pneumonia, ill-defined causes of death), the impact may substantially vary. The Czech Republic is a special case in this regard, because the new coding rules were only applied in 2007 as part of a coding improvement programme.

Almost two decades after its adoption, ICD10 thus still represents a major issue in mortality statistics. We

proposed an abridged list of 186 items with carefully defined correspondences between ICD9 and ICD10. In the second step, we looked at continuity and finally we applied numerous corrections according to national coding specifics (if possible, with the help of bridge-coding studies). In the case of the Czech Republic, where the coding was recently updated and further change is expected with the upcoming implementation of automated coding, further corrections of long-term time series are to be proposed in the near future, when the new trends will 'settle down' and form a stable time series. The varied nature of the impact of ICD10 observed in the three European countries thus virtually excludes the existence of a unique transition tool. More than ever before, the cause-specific trends must be studied and interpreted with caution and experience.

Acknowledgements

The author would like to acknowledge France Meslé and Jacques Vallin for continuous supervising and consulting of the work on mortality time series reconstruction, as well as for providing reconstructed and raw data for France.

References

- Anderson, R. N. – Minino, A. M. et al. 2001. Comparability of cause of death between ICD-9 and ICD-10: preliminary estimates. *National Vital Statistics Reports*, 49(2), pp. 1–32.
- Brock, A. – Griffiths, C. et al. 2004. The effect of the introduction of ICD-10 on cancer mortality trends in England and Wales. *Health Statistics Quarterly*, 23, pp. 7–17.
- Geran, L. – Tully, P. et al. 2005. *Comparability of ICD-10 and ICD-9 for Mortality Statistics in Canada.* Ottawa.
- Giersiepen, K. – Greiser, E. 1989. Coding of cause of death for mortality statistics--a comparison with results of coding by various statistical offices of West Germany and West Berlin. *Offentl Gesundheitswes*, 51(1), pp. 40–47.
- Jahn, I. – Jöckel, K. H. et al. 1995. Studie zur Verbesserung der Validität und Reliabilität der amtlichen Todesursachenstatistik. *Schriftenreihe des BMG Band 25.* Baden Baden.
- Jedrychowski, W. – Mroz, E. et al. 2001. Validity study on the certification and coding of underlying causes of death for the mortality statistic. *Przegl Epidemiol*, 55(3), pp. 313–322.
- Meslé, F. – Vallin, J. 1996. Reconstructing long-term series of causes of death: the case of France. *Historical methods*, 29(2), pp. 72–87.
- Meslé, F. – Vallin, J. 2008. Effet de l'adoption de la CIM-10 sur la continuité de la statistique des décès par cause. Le cas de la France. *Population*, 63(2), pp. 383–396.
- Pavillon, G. – Boileau, J. et al. 2004. *Double codage CIM9 – CIM10. Année de décès 1999.* Paris, Inserm, Le Vésinet, CépiDc: 122.
- Pechholdova, M. 2009. Results and observations from the reconstruction of continuous time series of mortality by cause of death: Case of West Germany, 1968–1997 *Demographic Research*, 21(18), pp. 535–568.
- Pechholdova, M. – Meslé, F. et al. 2011. Metoda rekonstrukce souvislých řad úmrtí podle příčin: výsledky aplikace na Českou republiku (The Reconstruction of Continuous Time Series on Mortality by Cause of Death: Its Application to the Czech Republic). *Demografie*, 53(1), pp. 5–18.
- Rooney, C. – Griffiths, C. et al. 2002. The implementation of ICD-10 for cause of death coding – some preliminary results from the bridge coding study. *Health Statistics Quarterly* (13), pp. 31–41.
- Ruiz, M., L. Cirera Suarez, et al. (2002). Comparability between the ninth and tenth revisions of the International Classification of Diseases applied to coding causes of death in Spain. *Gac Sanit*, 16(6), pp. 526–532.
- Scholz, R. D. – Jdanov, D. A. 2005. *About mortality data for West Germany*. Human Mortality Database, University of California, Berkeley and Max Planck Institute for Demographic Research.
- Štyglerová, T. 2008. Vývoj obyvatelstva v České republice v roce 2007 (Population Development of the Czech Republic in 2007. *Demografie*, 50(3), pp. 153–172.
- WHO .1997. *International Classification of Diseases: Translator: Ninth and Tenth Revisions.* Geneva: World Health Organization.

• WHO. 2004. ICD10: *International Statistical Classification of Diseases and Related Health Problems: tenth revision.* Geneva: World Health Organization.

MARKÉTA PECHHOLDOVÁ

Markéta Pechholdová graduated from the doctoral programme in demography at the Charles University Faculty of Science. Her main field of interest is mortality trends with a special focus on causes of death. In the past she worked at the Max Planck Institute for Demographic Research in Rostock and at the Institut national d'études démographiques (INED). So far, her main publications have dealt with the issue of cause-specific methodology and analysis: Pechholdova, M. – Results and Observations from the Reconstruction of Continuous Time Series of Mortality by Cause of Death: The Case of West Germany, 1968–1997 (2009), Pechholdova, M., F. Meslé, et al. – Metoda rekonstrukce souvislých řad úmrtí podle příčin: výsledky aplikace na Českou republiku [The Method of Reconstructing Cause-of-Death Time Series: The Results of Applications in the Czech Republic] (2010). At present she is a member of the Department of Demography at the University of Economics in Prague.

SUMMARY

The processes taking now place in the field of population health began in the late 1960s. Therefore for to the study of recent mortality changes, reliable data in a longer perspective are needed. For many countries, including the Czech Republic, France and West Germany, detailed cause-of-death time series were reconstructed until the ninth revision of the International Classification of Diseases (ICD9). By the end of the millennium, most countries had switched to the current, tenth ICD revision. Compared to previous ICD revisions, ICD10 has introduced a large amount of innovation, resulting in serious breaks in the continuity of mortality statistics. These breaks are mostly due to the complex change in the rules for selecting the underlying cause of death. To connect the ICD10 mortality data to previous classifications, we proposed a short list of 186 items and tested them for continuity in the Czech Republic, France and West Germany together. In general, the biggest impact of ICD10 was observed in France, where automated coding was introduced at the same time as the new classification. In the Czech Republic the main impact of ICD10 only became apparent after 2006, when coding practices were modified to be more compliant with WHO recommendations. Moreover, a turnaround can yet be expected with the ongoing implementation of automated coding. The WHO ICD9/ICD10 Translator and the bridge-coding studies from other countries are useful resources for building and evaluating the time series. However, owing to the complicated coding rules, the coexistence of automated and manual coding systems and persistent international differences in coding practices, they cannot replace the systematic detailed comparison and evaluation of the series.

Annex

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
001	Typhoid and paratyphoid fevers	002	A01
002	Other salmonella infections	003	A02
003	Other food poisoning (bacterial)	005	A05
004	Dysentery	004, 006	A03, A06
005	Other intestinal infections	001, 007–008	A00, A07–A08
006	Ill-defined intestinal infections	009	A09

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
007	Respiratory TBC	010–012	A15–A16, J65
008	Other TBC	013–018	A17–A19
009	Diphteria	032	A36
010	Whooping cough	033	A37
011	Meningogoccal infection	036	A39
012	Tetanus	037	A35
013	Septicaemia	038	A40–A41
014	Syphilis	090–097	A50–A53
015	Other bacterial diseases	020–031, 034–035, 039–041, 098	A20–A34, A38, A42–A43, A48–A49, A54
016	HIV disease	042–044	B20–B24
017	Acute poliomyelitis	045	A80
018	Slow viral infection of nervous system	046	A81
019	Measles	055	B05
020	Viral hepatitis	070	B15–B19
021	Other viral diseases	047–054, 056–066, 071–079	A82, A85–A89, B00–B04, B06–B09, B25–B34
022	Malaria	084	B50–B54
023	Mycoses	110–118	B35–B49
024	Other and unspecified infectious diseases	136	B59, B89, B99
025	Other infectious and parasitic diseases	080–088, 099–104, 118–135,137–139	A04, A44, A46, A55–A79, A83–A84, A90–A99, B55–B58, B60, B64–B88, B90–B92, B94–B97
026	Malignant neoplasms of lip, oral cavity and pharynx	140–149	C00–C14
027	Malignant neoplasm of esophagus	150	C15
028	Malignant neoplasm of stomach	151	C16
029	Malignant neoplasms of colon	153	C18
030	Malignant neoplasm of rectum and anus	154	C19–C21
031	Malignant neoplasms of liver and intrahepatic bile ducts	155	C22
032	Malignant neoplasm of pancreas	157	C25
033	Other malignant neoplasm of digestive system	152, 156, 158, 159	C17, C23–C24, C26, C48
034	Malignant neoplasm of larynx	161	C32
035	Malignant neoplasms of trachea, bronchus and lung	162	C33–C34
036	Malignant melanoma of skin	172	C43
037	Malignant neoplasm of skin	173	C44
038	Malignant neoplasm of breast	174,175	C50
039	Malignant neoplasm of cervix uteri	180	C53
040	Malignant neoplasms of corpus uteri and uterus	179, 182	C54–C55
041	Malignant neoplasm of ovary	183	C56
042	Malignant neoplasm of prostate	185	C61

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
043	Malignant neoplasm of testis	186	C62
044	Malignant neoplasm of bladder	188	C67
045	Malignant neoplasms of kidney and other urinary organ	189	C64–C66, C68
046	Malignant neoplasms of meninges, brain and other parts of central nervous system	191–192	C70–C72
047	Hodgkin's disease	201	C81
048	Non-Hodgkin's lymphoma	200, 202	C82–C85, C96
049	Multiple myeloma and immunoproliferative neoplasms	203	C88, C90
050	Leukemia	204–208	C91–C95
051	Other cancer	163–171, 181, 184, 187, 190, 193	C30–C31, C37–C41, C45–C47, C49, C51–C52, C57–C63, C69, C73–C75
052	Malignant neoplasm of other and ill-defined sites	195	C76–C79
053	Malignant neoplasm without specification of site	199	C80
054	Malignant neoplasms of independent (primary) multiple sites	---	C97
055	In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behaviour	210–239	D00–D48
056	Thyroid gland disorders	240–246	E00–E07
057	Diabetes mellitus	250	E10–E14
058	Malnutrition	260–263	E40–E46
059	Other nutritional deficiencies	264–269	E50–E64
060	Other endocrinologic and metabolic diseases	251–259, 270–279	E15–E16, E20–E35, E65–E68, E70–E90
061	Anemias	280–285	D50–D64
062	Other blood diseases	286–289	D65–D89
063	Parkinson's disease	332	G20–G21
064	Alzheimer's disease	331	G30
065	Alcohol abuse	291, 303	F10
066	Drug abuse	292, 304–305	F11–F19, F55
067	Multiple sclerosis	340	G35
068	Senile dementia	290	F01, F03
069	Other mental disorders	293–302, 306–319	F02, F04–F99
070	Meningitis	320–322	G00, G03
071	Epilepsy	345	G40–G41
072	Ill-defined paralytic syndromes	342, 344	G81–G83
073	Inflammatory and toxic neuropathy	357	G61–G62
074	Other diseases of nervous system	323–330, 333–337, 341, 343, 346–359	G01, G02, G04–G34, G36–G37, G42–G60, G63–G80, G90–G99
075	Diseases of the eye and adnexa	360–379	H00–H59
076	Diseases of the ear and mastoid process	380–389	H60–H95
077	Acute rheumatic heart fever	390–392	I00–I02
078	Chronic rheumatic heart diseases	393–398	I05–I09
079	Essential hypertension	401	I10

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
080	Hypertensive renal disease	403	I12
081	Hypertensive heart disease	402	I11
082	Hypertensive heart and renal disease	404	I13
083	Secondary hypertension	405	I15
084	Acute myocardial infarction	410	I21–I22
085	Other acute IHD	411	I24
086	Chronic IHD	412–414	I20,I25
087	Acute and subacute endocarditis	421	I33
088	Diseases of pericardium and acute myocarditis	420, 422–423	I30–I31, I40
089	Other diseases of endocardium	424	I34–I38
090	Heart failure	428	I50
091	Cardiomyopathy	425	I42
092	Other heart disease	415–417, 426–427, 429	I26–I28, I44–I49, I51
093	Hemorrhagic stroke	430–432	I60–I62
094	Cerebrovascular diseases	433–434, 436–438	I63–I69
095	Transient cerebral ischemia	435	G45
096	Atherosclerosis	440	I70
097	Aortic aneurysm	441	I71
098	Other diseases of arteries, arterioles and capillaries	442–448	I72–I78
099	Embolism, trombosis and phlebitis of veins	451–453	I80–I82
100	Other circulatory diseases	454–459	I83–I99, I15
101	Acute respiratory infections	460–465	J00–J06, J22
102	Acute bronchitis and bronchiolitis	466	J20–J21
103	Influenza	487	J09–J11
104	Pneumonia	480–486	J12–J18
105	Bronchitis, chronic and unspecified	490–491	J40–J42
106	Emphysema	492	J43
107	Asthma	493	J45–J46
108	Other chronic airway obstruction	496	J44
109	Bronchiectasis	494	J47
110	Pneumocoises and chemical effects	500–506	J60–J66, J68
111	Pneumonitis due to solids and liquids	507	J69
112	Empyema	510	J86
113	Pleurisy	511	J90, J92, J94
114	Other interstitial respiratory diseases	514–518	J80–J84
115	Other respiratory diseases	470–478, 495, 508, 512–513, 519	J30–J39, J67
116	Gastric and duodenal ulcer	531–533	K25–K27
117	Gastrojejunal ulcer	534	K28
118	Gastritis and duodenitis	535	K29
119	Diseases of appendix	540–543	K35–K38
120	Hernia	550–553	K40–K46

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
121	Enteritis, colitis and other intestinal diseases	555–566, 569	K50–K63
122	Chronic liver disease and cirrhosis	571	K70, K73–K74
123	Cholelithiasis and other disorders of gallbladder	574–575	K80–K82
124	Other digestive disases	530, 536–537, 567–568, 570, 572–573, 576–579	K00–K23, K30–K31, K65–K67, K71–K72, K83–K93
125	Diseases of skin and subcutaneous tissue	680–709	L00–L99
126	Rheumatoid arthritis and osteoarthrosis	714–715	M05–M06, M15–M19
127	Other musculosceletal diseases	710–713, 716–739, 274, 446	M00–M03, M07–M14, M20–M94
128	Acute and rapidly progressive nephritic and nephrotic syndrome	580–581	N00–N01, N04
129	Other nephritis and nephropathy	582–583, 587	N02–N03, N05–N07, N14, N26
130	Renal failure	584–586	N17–N19
131	Other disorders of kidney	588–589	N25, N27
132	Infections of kidney	590	N10–N12, N15
133	Urolithiasis	592, 594	N20–N23
134	Other diseases of kidney and ureter	591, 593	N06, N13, N28
135	Other diseases of urinary tract	595–599	N02, N30–N36, N39
136	Hyperplasia of prostate	600	N40
137	Inflammatory diseases of female pelvic organs	614–616	N70–N77
138	Other diseases of genital organs	601–611, 617–629	N41–N64, N80–N99
139	Pregnancy with abortive outcome	630–639	O00–O07
140	Other complications of pregnancy, childbirth and puerperium	640–676	O10–O99
141	Birth injury and neonatal hemorrhage	763, 767, 772	P03, P10–P15, P50–P52, P54
142	Short gestation/low birthweight	765	P07
143	Intrauterine hypoxia and birth asphyxia	768	P20–P21
144	Respiratory distress syndrome	769	P22
145	Other respiratory disease of newborn	770	P23–P28
146	Infections specific to the perinatal period	771	P35–P39
147	Other conditions originating in the perinatal period	760–762, 764, 766, 773–779	P00–P05, P08–P21, P29, P53, P55–P96
148	Congenital malformations of nervous system	740–742	Q00–Q07
149	Congenital malformations of heart	745–747	Q20–Q28
150	Other congenital malformations, deformations, and chromosomal abnormalities	743–744, 748–759	Q10–Q18, Q30–Q99
151	Sudden infant death syndrome (SIDS)	798.0	R95
152	Sypmtoms and signs	780–796	R00–R94
153	Senility	797	R54
154	Sudden death	798	R96, R98
155	Unknown cause	799	R99
156	Motor accident	E810–E825	V02–V04, V09, V12–V14, V20–V79

186-list number	Title	Category codes according to ICD9	Category codes according to ICD10
157	Land transport accidents	E800–E809, E826–E829, E846	V01, V05–V08, V10–V11, V15–V19, V80–V89
158	Water,air, space and other and unspecified transport accidents	E830–E845, E847–E848	V90–V99
159	Accidental falls	E880–E888	W00–W19
160	Accidental discharge of firearms	E922	W32–W34
161	Accidental drowning and submersion	E910	W65–W74
162	Accidental exposure to smoke, fire and flames	E890–E899	X00–X09
163	Accidental poisoning by alcohol	E860	X45
164	Accidental poisoning by other substance	E850–E869	X40–X44, X46–X49
165	Inhalation and ingestion	E911, E912	W78–W80
166	Mechanical suffocation	E913	W75–W77, W81, W83–W84
167	Occupational and machine injuries	E919, E920	W24–W31, W45,X17
168	Suicide and self-inflicted poisoning by ingestion and inhalation	E950–E952	X60–X69
169	Suicide and self-inflicted injury by hanging, strangulation, and suffocation	E953	X70
170	Suicide and self-inflicted injury by submersion [drowning]	E954	X71
171	Suicide and self-inflicted injury by firearms, air guns and explosives	E955	X72–X75
172	Suicide and self-inflicted injury by other and unspecified means	E956–E958	X76–X84
173	Fight, brawl, rape	E960	Y04–Y05
174	Assault by firearms and explosives	E965	X93–X96
175	Assault by cutting and piercing instrument	E966	X99
176	Assault by other and unspecified means	E968	X97–X98, Y01–Y03, Y06–Y09
177	Other assault	E961–E964, E967	X85–X92, Y07
178	Ingestion and inhalation of undetermined intent	E980–E982	Y10–Y19
179	Submersion [drowning] of undetermined intent	E984	Y21
180	Injury by firearms, air guns and explosives of undetermined intent	E985	Y22–Y25
181	Fall of undetermined intent	E987	Y30
182	Other event of undetermined intent	E983, E986, E988	Y20, Y28, Y34
183	Treatable complications of medical and surgical care	E870–E879	Y60–Y69, Y83–Y84
184	Other complications of medical and surgical care	E930–E949	Y40–Y59
185	Operations of war	E990–E999	Y36
186	Other accidents and late effects of accidents (remainder)	E900–E909, E914–E918, E921, E923–E929, E959, E969–E978, E989	W20–W23, W35–W44, W49–W60, W64, W85–W94, W99, X10–X16, X18–X39, X50–X54, X57–X59, Y00, Y26–Y27, Y29, Y31–Y33, Y35, Y70–Y82, Y85–Y91, Y95–Y98

THE FAMILY AND HOUSEHOLD BETWEEN THE 16TH AND 20TH CENTURIES[1)]

Ludmila Fialová

Knowledge of family and household structures is very important for understanding the demographic regime of a given time. For this reason, as well as being a subject of consistent interest to social historians, historians of everyday life, cultural anthropologists, ethnographers, and gender studies, they are also a study focus in historical demography. And although Czech production on this subject recently has been somewhat scanty (a separate study devoted to the history of the Czech family was published fourteen years ago),[2)] the family and households nonetheless remains a focal interest of historians.

The book reviewed here comprises eight studies that cover a relatively long time span, from the 17th to the 20th centuries. Although some of them have a rather narrow focus, their common denominator is that in one way or another they all touch on family life or the structure of families and households. And with one exception, they are centred on the Czech lands.

The volume opens with a study by *Eduard Maur*, **'The History of the Family in Czech Historiography'**, in which the author summarizes the most important stages in research on the family, and sets this research into the wider context of Czech historiography. This is a very valuable overview that provides readers with a quick orientation in existing research and acquaints them with the most important findings. Maur also sets Czech research within the wider European context. Among other things, he points out how Czech research has profited from the renewed opportunity for intensive international cooperation since the 1990s, most notably Czech-Austrian joint projects focusing on the social history of the Czech lands in the 17th and 18th centuries in which researchers from other countries also participated. However, the author correctly notes that Czech research on the family remains uneven and the subject does not yet receive the amount of attention it deserves.

The other studies are devoted to a variety of cases and themes, hint at the broad range of possibilities open to research on the family and households, a field of study that has long limited itself just to analysing their structure, and more widely touch on the conditions behind the formation or breakdown of families and other aspects of family life. And these possibilities are not of course exhausted by the studies included in this volume.

The studies are ordered chronologically rather than by content. The first one, *Jaroslav Dibelka's* **'The Defence Strategies of Men and Women Accused of Adultery on the Třeboň Estate at the Turn of the 18th Century'** presents interesting insight into how, at a time when marriage was an indissoluble union for the life of the spouses, people dealt with marital infidelity and how they dealt with adultery in cases where it came out in public and the guilty parties had to appear before a judge (where they faced the possibility of a harsh punishment).

In **'Extramarital Sexuality, Marriage Permission, and Social Discipline of the Serf Population on the Estate of Hluboká nad Vltavou (1661–1760)'**, *Pavel*

1) *Rodina a domácnost v 16.–20. století.* 2010. Acta universitatis Carolinae. Philosophica et historica, Studia Historica LX. Prague: Karolinum, 2010, p. 134.

2) Horský J. – Seligová, M. *Rodina našich předků*(The families of our ancestors). Prague: Nakladatelství Lidové noviny, 1997, p. 143.

Matlas points to the significance of the wider circumstances leading to marriage. He draws on the docket of cases maintained by the feudal administration on the studied estate and shows how the position the estate's administration towards marriages among its feudal subjects changed in relation to the economic situation of the estate and to the opinions of the owners of the estate. While in the late 17th century, when the lord tried to compensate for the decrease in the number of inhabitants on the state as a result of the Thirty Years' War, there was an apparent attempt to pressure serfs to marry (or even to overlook certain misdemeanours, such as the birth of a child before marriage), but gradually, once the required number of labourers had been regained, the attitude changed and the lord not only punished serfs for extramarital relations but refrained from granting the guilty parties permission to marry. Over the 18th century benevolent periods alternated with restrictive ones, usually in direct response to the current social situation of the rural population. The author points out that no sanctions succeeded at preventing extramarital relations and this agenda was consequently a regular part of the feudal administration.

Alice Velková's study **'The Changing Understanding of Property Interests in Families of Holders of Rural Farmsteads in 1650–1850'** is based on the author's long-term study of population development on the estate of Šťáhlavy. From her detailed study of the genealogies of families living on the estate and the records of transfers of rural farmsteads noted in the land registers the author is able to show that even the family strategies of past generations were not stable but rather changed in relation to the overall economic situation and the opportunities for individual family members to find work; she shows what role was played by the external circumstances in which people lived: e.g. the opportunity, or lack thereof, to divide up a farmstead, or inheritance customs in general. She also suggests links to the character and intensity of the population's geographic mobility.

Of interest on every level is *Jürgen Schlumbohm's* **'Die Schule des Lebens. Zur Sozialisation von Kindern im vorindustriellen Deutschland'** (The School of Life: The Socialisation of Children in Preindustrial Germany). The author points to the possibilities in the use of biography to study individual stages of the life cycle, in this case childhood. He identifies the differences in the experience of childhood in rural and urban environments, among boys and girls, and the influences of the family and the wider environment, and he also highlights common features and features specific to the individual experiences of the biographies' subjects. His findings are valuable, among other things, for studying the position of individual members inside the family.

Martina Halířová's **'The Provincial Foundling Hospital in Prague and Foundling Care in the Early 19th Century'** deals with a little studied phenomenon. She was interested in identifying what reasons led to the children's admission to the hospital. Against a detailed study of applications for the admission of a child to the hospital, she documents the circumstances in which parents would decide to send their child to an orphanage if they were no longer able to care for their child, either owing to prolonged poverty or to illness.

The emphasis on the significance of social conditions for the everyday life of individual families is also apparent in the study by *Věra Hrušková*, **'The Employment of Families in a Suburban Village in the Second Half of the 19th Century (Přezletice, Prague-East)'**. This study is based on detailed knowledge of the development of the population obtained through the reconstitution of families, by which means the author was able to provide evidence for a number of theories surrounding the change in reproductive behaviour at that time (the start of the demographic revolution), as, for instance, family size began to decrease, infant and child mortality began to decline, the intensification of agricultural life began to have an impact on the life of families (especially the high rate of economic activity of all family members – men, women, and adolescents), children's education levels began to rise (only boys at that time). The author describes the different family and personal strategies determined by social status and explains the changes in rural society located near important industrially developing town, which among other things provided job opportunities to a population originally engaged in farm labour.

The last study brings the volume into the first third of the 20th century. The author is *Martin Jemelka*, who presents the results of his research on the devel-

opment of the Ostrava industrial region in a study titled **'The Family and Households in the Mining Colony in the Ostrava Region (1890–1930)'**. This research is devoted to a specific social stratum, which in the Czech lands is found in just a handful of regions characterized by advanced mining and metallurgy industry – besides the Ostrava region, mining colonies were also found in the Kladno Region, the Rosice-Oslavany Region, the Most Region, and there were several built also in Prague. The author focused on analysing the composition of families and households in two colonies. He devotes special attention to night lodgers and boarders, who in the late 19th century were still usually free immigrants moving to the Ostrava region; as the standard of living rose, their numbers decreased substantially in the 20th century. His findings on population development compare well with findings on overall population development in this region: they show a high fertility rate among the originally rural population that began moving to the Ostrava Region in the last third of the 19th century, which then significantly decrease during the first third of the 20th century.

Each of the studies in this volume is the outcome of research on the family and households from a different angle or touching on a different aspect of reproductive behaviour. In sum they demonstrate the significance that this research holds for both historiography and demography and suggest areas where further research can be directed and is needed.

THE DEMOGRAPHIC SITUATION IN THE CZECH REPUBLIC (METAMORPHOSES AND CONTEXTS 1993–2008)[1)]

Jitka Langhamrová

In 2010 SLON publishers (Sociology Publishing House) published a book titled *The Demographic Situation in the Czech Republic (Metamorphoses and Contexts 1993–2008)*. It is a unique publication that deals with population development in a complex perspective.

The publication acquaints readers with the most important trends in population development in the Czech Republic at the turn of the 21st century. Since the 1990s population development in the Czech Republic has been undergoing significant changes in connection with socio-economic development. The authors report a long-term drop in the number of birth below the limit of simple reproduction and the associated ageing of the population as a significant result of changes in demographic behaviour.

They also identified increasing atomisation of society, where the proportion of people living in traditional families is declining. They note the role played in the transformation by the state's attractiveness as a migration destination. The Czech Republic has become an immigration country instead of emigration country, which it was in the 1990s.

The Czech Republic was established on l January 1993. While the name of the publication refers to the years 1993–2008, it obviously takes into account

1) Burcin, B. – Fialová,L. – Rychtaříková, J. et al. ISBN 978-80-7419-024-7

population development beyond this short period. Population development is the result of previous socio-economic development. The publication describes the changes in demographic structures and demographic reproduction in the Czech Republic. The reasons for these changes and their implications for future population and social development are presented here.

In their evaluation of population trends the authors used not only traditional methods of demographic analysis, but also methods of transverse and longitudinal data analysis from census and demographic statistics. Their analysis also worked with individual data. The methods are chosen properly and always with regard to the nature of the data. Population trends in the publication are continuously compared with development in selected European countries. Chapters are usefully complemented by tables and graphs.

The publication originated in the research activities of members of the Department of Demography and Geodemography, Charles University in Prague, and is indirectly linked to a number of publications issued in 1994–2002, 2007 and 2008.

The publication itself is made up of 10 well-ordered chapters. The first chapter, for clarification of the linkages and relationships of social and economic development is the first chapter, entitled **'Post-war Trends in Demographic Behaviour on the Territory of the Czech Republic up to the Beginning of the 1990's'**, clarifies the links and relationships between social and economic development. There is a brief outline describing the situation in demographic development between the two world wars and then post-war developmental changes. The chapter focuses on trends in fertility, mortality, natural increase, infant mortality in the Czech lands, France and the Slovak Republic from 1920 to 2008. Attention is also paid to the age structure of the population of the Czech Republic and Slovak Republic in relation to historical development. It also presents trends in family formation and breakup and survival trends. It concludes with an analysis of the demographic situation in Europe in the mid-1980s. In the 1960s the Czech Republic's demographic characteristics ranked it among developed countries. Later, its demographic patterns of behaviour ranked it among so-called socialist countries.

The second chapter, titled **'The New Demographic Situation in the Czech Republic since the Start of the 1990's'**, describes in detail the major changes that have occurred since 1989 in the Czech population's demographic behaviour. The dynamics of the demographic behaviour of the Czech population underwent an unexpected change. In the early 1990s, it was very difficult to predict what future demographic development in the Czech Republic would be like. The prevailing notion was that demographic behaviour would converge with the usual behaviour of 'Western' countries. The quick change in socio-economic conditions resulted in very significant changes in demographic behaviour. Natality and mortality showed unexpected trends, life expectancy at birth for males increased, and the level of fertility declined to a very low rate. For the first time since the First World War, the population is declining through natural change. This chapter details the new trends in fertility, nuptiality, and mortality in the age structure. All the directions above are compared with trends in the Slovak Republic and France.

The third chapter, titled **'Fertility Decline: the Main Factor of Population Change'**, describes the decline in fertility levels in several stages. It describes the significant fluctuations caused by pronatal measures. It also discussed the question of whether motherhood at younger ages ensures more children. It also describes the generational trends of fertility and total fertility transversal biological order: 1950–2008. Women's rising education levels and extramarital birth are cited as new inhibitors of fertility. During the 1990s, the value of the total fertility rate fell below 1.5 live births per woman. The rate of childlessness significantly increased.

The fourth chapter, titled **'Long-Term Decline and Structural Changes in the Mortality Rates of the Population of the Czech Republic'**, describes the changes that occurred in the development of mortality in the 1990s and the first decade of the 21st century. The life expectancy of men in the Czech Republic grew fastest in Europe. Due to changes in the intensity of mortality the demographic ageing of the Czech Republic has continued. The chapter contains a table that presents the basic indicators of infant mortality, the probability of death by age and sex, deaths by main groups of causes of death, all in

the years 1987–2008. There are also standardized rates and contributions of selected causes of death by age groups to increase life expectancy at birth. There is a comparison of the Czech Republic and France.

The fifth chapter, **'Migration and Foreigners in the Czech Republic'**, describes changes occurring in migration. Foreign migration has changed in both quantitative and qualitative terms. A list is presented of the most significant immigration flows to the Czech Republic by country of origin. Part of the chapter is devoted to foreigners in the Czech Republic. There is also a detailed description of internal migration and its causes. Everything is situated in the socio-economic context.

Chapter Six, **'Changes to the Population Structure and Trends in the Numbers of the Population of the Czech Republic'**, it describes the effects of fluctuations in fertility and mortality rates in a historical perspective on changes in the composition of the population by age, gender and marital status. In tables and graphs are visible most fundamental changes that have occurred. The population is ageing. Development of the age structure of the population noted a significant decrease in the number of children born between 1994 and 1996. Small birth rates in those years led to the closure of preschools, schools etc. Some chapters are dedicated to the development of the population by marital status. The following section is devoted to changes in the structure of families and households in the Czech Republic. In conclusion, the development of the population of the Czech Republic and its increments is presented.

Chapter Seven, **'The Formation and Breakdown of Relationships'**, is devoted to issues of marriage and divorce in all its breadth. After 1989 marital behaviour changed. The differences in marriage behaviour among the countries of Eastern Europe and the rest of Europe began to converge. Changes in marriage and divorce behaviour are described in detail.

Chapter Eight, **'Planned Parenthood and Reproductive Losses'**, addresses in detail issues related to the matter of free choice to plan their reproduction. It describes the context of the trends in fertility and abortion rates. Everything is accompanied by clear figures and tables with basic indicators. Attention is also paid to the contraceptive behaviour of women. There is also an international comparison of the level and structure of artificial abortion.

Chapter Nine, **'Family Policy and Its Pronatal Significance'**, reflects on family policy as a substitute for population policy. It describes family policy before and after 2000. It shows the trend in financial support for families with children. It is also developing the terms of the compatibility of work and family. Furthermore, it puts the current character of family policy in the Czech Republic in an EU framework. At the end of the chapter there is a review of the impact of family policies on reproductive behaviour.

Chapter Ten, **'A Forecast of Population Development in the Czech Republic to 2070'**, describes the population forecast for the Czech Republic for the period 2008–2070. The prognosis was calculated using the classical cohort component model of population development. Three variants of development were calculated for the prognosis: the medium variant, which is the most probable one, and the low and high variants. Scenarios of expected development of fertility, mortality and migration are also presented. The authors also compare their prognoses with CZSO forecasts. The conclusion summarizes the most important results of the predicted development. The central problem of the future development of the Czech population is identified as population ageing.

The publication is accompanied by methodological notes and descriptions of basic indicators. There is also a rich use of literature.

A short English summary of each chapter follows.

The authors of individual chapters are leading experts in the field. The book should serve not only students of demography, but also all interested professionals and politicians who need more detailed information on population development in the Czech Republic in a broader context.

MIGRATION AND (I)MMIGRATION IN THE CZECH REPUBLIC[1)]

Jarmila Marešová

Last year SLON publishers printed an interesting book written by researchers from the GEOMIGRACE centre, which operates under the umbrella of the Department of Social and Regional Geography at the Faculty of Science in Prague. Based on well-known facts and relations the book systematically describes and explains the Czech migration and integration reality.

As the authors mention, the book represents a significantly modified and extended version in the Czech language of the national research report that was carried out under the international project IDEA (2007–2009) – Mediterranean and Eastern Europe Countries as New Immigration Destinations in the European Union.

The book is divided into nine chapters. The first chapter is dedicated to migration development on the territory of the Czech lands from the middle of the 19th century to 1989. The next chapter describes migration and socioeconomic and demographic developments in the Czech Republic in the period of 1989–2008. The authors examine the history of the statistical observation of migration, mobility and migration flows, statistics and characteristics on foreigners, applicants for international protection, illegal migrants, the geographical distribution of foreigners on the territory of the Czech Republic and in Prague, and the internal migration of foreigners within the Czech Republic. The chapter also provides a description of the wider demographic and labour market contexts.

The third chapter is titled '**Migration Policy in the Czech Republic in the Period 1990–2008'**. In this chapter the authors distinguish four periods of development of migration and integration policies, namely 1990–1992, 1993–1998, 1999–2002, 2003–2008, which differ from each other in terms of the alternating active/passive approaches to immigrants. A separate subchapter is devoted to the acquisition of state citizenship by foreigners.

The fourth chapter focuses on the integration of migrants. The authors present the range of integration indicators used and their limitations. Then they look at the integration of foreigners from the point of view of the district's advisory organs for integration. Attention is also paid to empirical studies of the integration of immigrants in the Czech Republic and the participation of foreigners in Czech public life. Last but not least, the authors describe the position of foreigners in the Czech state social system, devoting special attention to social insurance and pensions, state policy of employment, state social support and other forms of social assistance, health insurance, educational system and housing.

'The Effects and Conditional ties of Migration' are the topic of the fifth chapter of the book. First, the authors use the examples of some studies and researches to explain the economic dependences and the demographic effects of migration to the Czech Republic. They also look at criminality among foreigners and organised crime. Settlement concentration, cultural impacts and changes in the social structure are mentioned by the authors as other effects of migration, even though they are still rather negligible in the Czech Republic at present.

The sixth chapter concerns the perception of foreigners and migrants by the Czech majority. It presents the results of a survey and a comparison of the results of selected public opinion surveys carried out by the Public Opinion Research Centre at the Institute of Sociology of the Academy of Sciences of the Czech Republic since the 1990s.

The seventh chapter is aimed at migration trends in central Europe. It presents a comparison of three states – the Czech Republic, Poland and Hungary since the 20th century. It describes developments both in

1) Drbohlav, Dušan a kol.: *Migrace a (i)migrace v Česku.* Praha, SLON, 2010.

the field of migration and migration policies. Special attention is paid to the phenomenon of migration transition in these countries and its conditional ties.

The subject of the eighth chapter is a very current issue – the impact of the global economic crisis on migration and migrants in the Czech Republic. This chapter examines the changing number of foreigners in the Czech Republic as a consequence of the economic crisis. It also tries to provide a picture of the social situation and behavioural strategy of migrants in the time of the crisis. Last but not least, it looks at measures developed by the Czech state targeting migrants in the time of crisis.

The conclusion summarizes the findings of the previous captures.

The book considerably contributes to enriching the knowledge about the migration history, current migration and the integration situation in the Czech Republic. As it is built on the conceptual framework of the so-called 'migration transformation', it presents to the reader a picture of migration reality not only in the Czech Republic, but also in neighbouring central European states, i.e. Poland and Hungary, while it points out the similarities in the migration developments of these countries, which over time have transformed from source migration countries to designation countries. It is worth pointing out some newly introduced topics in the book, such as the impact of the global economic crisis on migration, the position of migrants in the state social system, and the perception of the migrants by the majority society. Last but not least, the subchapter on the geographical distribution of foreigners within the capital of Prague provides completely new, previously unpublished data.

It is written in a readable, accessible style, and I can recommend it not only to specialists in the field of migration, but also to the wider public.

SUBSTANCE USE IN A COMPARATIVE PERSPECTIVE. THE CASE OF BULGARIA, CZECHIA, CROATIA, ROMANIA AND SLOVAKIA.[1)]

Ladislav Csémy

A team of authors led by *Dagmar Dzúrová* and *Arnošt Veselý* undertook the difficult task of comparing trends in the use of addictive substances in five countries that share a historical post-war political and economic past as Soviet bloc countries, but at the same time are very different in terms their language, geographical location, cultural tradition, and last but not least, the social and economic transformation they have undergone in the past twenty years.

The whole concept of substance abuse problems is largely influenced by the theoretical orientation of the authors in the social sciences and public health, which has distinct advantages, especially if they are able to integrate the genetic and biomedical determinants and health consequences of substance use-related problems into this approach.

1) Veselý A. – Dzúrová D. (Eds): Substance Use in a Comparative Perspective. The Case of Bulgaria, Czechia, Croatia, Romania and Slovakia. Prague: Charles University in Prague, Karolinum Press, 2011, 273 pp.

The book is divided into four sections. The title of the first chapter (not counting the Introduction) is **'Environmental Factors as Determinants of Substance Use'**, but its content is even wider. The first part gives a clear explanation of basic concepts (use, abuse, dependence, disorder etc.) and information about diagnostic and classification systems (DSM-IV and ICD-10). The second part of the chapter presents three groups of substances, and these are then addressed in more detail: alcohol, tobacco and other addictive substances (illicit drugs). The properties and effects of these compounds are described briefly, yet accurately. The third part of the chapter critically reviews risk and protective factors and related research work on this issue. I especially value the critical discussion that correctly points out that risk and protective factors must be understood not as an agents acting in isolation, but as mutually conditioned and complex interacting forces in a system operating on multiple levels, from the individual level through to the level of family relationships and peer influences to the community and society-wide level. The last part of the chapter represents a successful attempt to integrate the impact of factors on micro-, meso-and macro-social levels on alcohol use, tobacco use and drug consumption into a comprehensive model. The selection of research studies (used in the analysis) is adequate and publications from the countries of Central and Eastern Europe are included, too.

The next chapter, **'Risk Behavior in Comparative Perspective'**, has a markedly different character. It presents basic descriptive data on the use of alcohol, tobacco and drugs in the five countries compared and data on the health and social consequences of the use of these substances (the standardized mortality rate for diseases caused by tobacco or alcohol, traffic accidents and injuries caused under the influence of alcohol, etc.). The cross-country comparison of differences in trends since 1990 may be especially interesting to readers. An added value of the chapter is its selection of truly comparable indicators, their clear descriptions, and the precise references to data sources. The other thing that makes this chapter interesting is the insertion of frames with expert opinions. Expert opinions are of course no substitute for research studies, but they often contain stimulating observations or interpretations with which we can either agree or argue.

Part 4 (**'Risk Behavior in Five Post-Communist Countries'**) offers a kind of 'country profile' for each of the five countries. The main contribution of this chapter is a better understanding of the basic social, medical and legal characteristics of each country and a brief description of the development of these domains in the period of social transformation after 1989. For each country the field of alcohol, tobacco and drugs is examined using the results of national (or local) research. Without these subchapters the situation of individual countries and the developments in them would be incomplete and barely comprehensible. The country reports also help researchers to identify areas where information is still lacking and thus obtain a good orientation in the direction of research in the future.

Finally, the fifth chapter analyses health behaviours at the individual level. It draws on data from a survey carried out by the Institute of Health Information and Statistics in 2003, which was the first to apply the EMCDDA model questionnaire focusing on drug use in the adult population. Advanced statistical approaches of multilevel modelling are applied in the analyses of alcohol consumption and tobacco smoking. I found the analysis of predictors of heavy episodic drinking (binge drinking) to be very interesting, and they confirmed male gender, marital status (unmarried or divorced), low educational level and low employment status (or status of unemployed) as strong predictors of heavy drinking. A similar pattern of predictors was established for smoking, perhaps because excessive alcohol consumption is closely associated with tobacco use. The analyses of illicit drug use focused on the explanatory variables of marijuana use.

In sum, I consider the book to be a well-informed, carefully prepared and scientifically competent contribution to the subject of substance use/abuse in selected Central and Eastern European countries. The work represents not only an authoritative description of the existing situation in the area, but also a source for obtaining a better understanding of substance use from the perspective of the social sciences and public health. The evidence reviewed in the publication could provide an important impulse for further studies and research as well as for practice in the field of social and health policy.

Professor Zdeněk Pavlík at 80!

On the last day of March in 2011 Prof. Ing. Zdeněk Pavlík, DrSc., the man who has taught probably every contemporary Czech demographer and social geographer and many a scholar in the social sciences and sciences, celebrated his eightieth birthday.

Zdeněk Pavlík said himself that he has had an interest in population issues ever since he was a student of statistics at the University of Economics in Prague, from which he graduated in 1956. After graduation he worked for two years as a statistician for the Institute of Hygiene, and in 1958 he began working for the Institute of Economics at what was then the Czechoslovak Academy of Sciences (ČSAV) in Prague. It was there that demography first came to form the main focus of his work, and it was also there that in 1962 he obtained the title of Candidate of Sciences in Economics. Two years later he established his place among the geographers at the Faculty of Sciences, Charles University, where – with the exception of the three years he spent in New York working for the Population Division of the United Nations in the late 1960s and early 1970s – he has worked ever since, for the past seven years with the title of emeritus professor of demography. In 1972 Pavlík was awarded his habilitation qualification at Charles University with a thesis on demographic development on the African continent, and in 1982 he gained the title of doctor of economic sciences at Moscow State University. He was appointed professor of demography at Charles University in 1990. In 2004–2007 he held the function of Dean of the Socio-economics Faculty at J. E. Purkyně University in Ústí nad Labem. Zdeněk Pavlík has lectured and continues to lecture on demography at universities in the Czech Republic and in countries abroad, including the United States, Russia, France, Germany, Ireland, Italy, Poland, the former Yugoslavia, and Egypt.

Professor Pavlík significantly contributed to advancing almost every branch of Czechoslovak and Czech demography during most of the second half of the 20th century. He was one of the founding members of the Czechoslovak Demographic Society (ČSDS) at ČSAV. He was first its scientific secretary (1964–1968) and from the second half of the 1970s he was for many years the chair of the ČSDS and then of its successor the Czech Demographic Society (1977–1999). Since 1999 he has been its honorary chair. For decades Zdeněk Pavlík has also been a member of the Editorial Board of the journal *Demografie*. As an important figure in continuing the tradition of education in demography at Charles University in Prague, in 1990 he was instrumental in achieving the field's new institutional establishment with the foundation of the Department of Demography and Geodemography at the Faculty of Science. His organizational work, however, has not been confined to the domestic stage. In the early 1980s he and other top European demographers Dirk J. van de Kaa and Nico van Nimwegen of the Netherlands, Guillaume Wunsch of Belgium, Charlotte Höhn of Germany and Andras Klinger of Hungary founded the European Association for Population Studies (EAPS), and Zdeněk Pavlík was the deputy chair of its board for its historically first two terms (1983–1987 and 1987–1991).

Professor Pavlík has engaged in similar professional and organizational work for various national and international scientific bodies. For example, since 1964 he has been a member of the International Union for the Scientific Study of Population (IUSSP), the oldest international association of experts in Population Studies, and since 1993 he has represented the Czech Republic in the Population Committee of the Council of Europe. His activities beyond the field of demography domestically include his membership in the Scientific Council on Geology and Geography of ČSAV, of which he was deputy chair in 1990–1992,

and from 1993 to 1999 he held a number of functions in the Czech Science Foundation – in 1993–1996 he was a member of the sub-discipline committee for history, ethnography, art history, and music history; in 1996–1997 he was a member of the committee for the social sciences; and in 1998 and 1999 he was chair of the same body. From 1992 to 1994 he also held the function of deputy chair of the Grant Agency of, first, the Czechoslovak Academy of Sciences and then the Academy of Sciences of the Czech Republic.

All the work Professor Pavlík has done for professional organisations he carried out on top of his extensive and very significant work as a scientist. He has written more than two hundred studies, which document the scope of his work, especially in the field of basic research, and they include several monographs, some of which were published into foreign languages. The thematic range of Professor Pavlík's scientific work can be divided into four basic areas or directions. The oldest and to a certain degree fundamental focus of his work is population development in the world and its patterns, which then drew him to the issue of the demographic revolution. The temporal and thematic boundaries of this interest coincided with his work on the monograph 'An Outline of World Population Development' *(Nástin populačního vývoje světa),* which was published in 1963, and the monograph 'The Demographic Revolution as a Universal Law of Population Development' *(Demografická revoluce jako obecná zákonitost populačního vývoje),* published in Polish in 1982. His attention to this subject was followed in the late 1960s by a detailed interest in fertility trends and in the transformation of the structure of fertility trends during the demographic revolution. This theme included research on the population climate in Czechoslovakia in the 1970s, the results of which were summarized in a monograph in 1977. The theoretical studies written by Professor Pavlík – whether independently or together with other authors, in particular the geographers Martin Hampl and Karelm Kühnl – represent the main line of research that emerged after his focus on demographic development in different countries and the demographic revolution. These studies not only draw on the theory of demographic revolution, but elaborate and advance it in some areas. This line of research begins with a text co-written with M. Hampl and published in Den Haag in 1975, in which the authors differentiate between demographic systems on the basis of their development and rank, focusing especially on developing countries. Research in this area basically ends with his article on the 'Global Context of Demographic and Geodemographic Development', which Pavlík again wrote with Hampl and which was published in Berlin in 1986. In connection with this it is important to mention also a number of research reports he wrote on outcome from projects conducted under the state plan for fundamental research from around the same time. These reports constitute original and in many respects principal contributions to the field of knowledge about general patterns of development of different population systems and their place in relation to other systems. The fourth thematic area that Zdeněk Pavlík systematically focused on is a concept of population optimum, an issue connected with his interest in theoretical issues and population policy. In 1986–1987 he and Ivan Kuchár together published a series of interesting and yet to be fully appreciated articles in *Demografie* in which they discussed the concept in detail.

Alongside these themes, Professor Pavlík also dealt to a greater or lesser degree with a wide variety of other empirical, methodological and theoretical issues. For instance, he studied the theory and methodology of demographic knowledge, the development of the population in the Czech lands and in other countries, population policy, the relationship between demography and other fields, the ontological significance of statistical structures, Malthus and Marx and their contribution to the understanding of patterns of population development, migration, and many other issues. In his work he combines a serious scientific approach to the given issue with a vast wealth of knowledge, originality, and well-structured and well-argued texts.

Another area of Zdeněk Pavlík's professional interest that in impact extends beyond the previous two is his work teaching the next generations of demographers, geographers, economists, and other scholars, both in the Czech Republic and abroad, and his involvement in the actual organisation of the education process. Over almost half a century of working in education he has significantly contributed to the educational development of many experts. A key un-

dertaking in his career as a teacher was the founding of the Department of Demography and Geodemography at the Faculty of Science, Charles University, in 1990, and the creation and implementation of the basic three-level system of education in demography with three bachelor, one master's and one doctoral study programmes in demography. Since the mid-1990s, largely thanks to Zdeněk Pavlík, the Faculty of Science, Charles University in Prague, was the only educational institution in Europe that not only offered but also fully realized study programmes in demographic subjects at all three levels of university study. Professor Pavlík was also the initiator and backer of the world-famous and even today frequently recalled courses in general and special demography and a series of ten international summer schools in demography that were held between 1987 and 1999 and attended by around 250 participants and approximately 70 lectures from more than 50 countries around the world.

Although this retrospective of the life work of Prof. Ing. Zdeněk Pavlík, DrSc. is not and was not meant to be exhaustive, it shows much of it deserves to be highlighted on the occasion of his jubilee year. This text is also intended as an expression of thanks and appreciation from all of us whose professional interests and careers were decisively influenced by Zdeněk Pavlík. We want to give him our thanks and wish him all the best in the years to come.

Tomáš Kučera

STATISTIKA, ECONOMY AND STATISTICS JOURNAL NO. 4–2011

CONTACTS

e-mail: statistika.journal@czso.cz | web: http://www.czso.cz/statistika_journal | address: Journal of Statistika, Czech Statistical Office, Na padesátém 81, 100 82 Prague 10, Czech Republic

Subscription price (4 issues yearly) | CZK 356 (incl. postage) for the Czech Republic | EUR 110 or USD 165 (incl. postage) for other countries.

Printed copies can be bought at the Publications Shop of the Czech Statistical office (CZK 66 per copy).

Subscriptions and orders

IRIS: LANGUAGE-INDEPENDENT CODING SOFTWARE – IMPLEMENTATION IN THE CZECH REPUBLIC

Magdaléna Poppová

INTRODUCTION

Causes of death statistics are based on the concept of the underlying cause of death, which is defined by World Health Organization (WHO) as the 'a) the disease or injury which initiated the train of morbid events leading directly to death, or b) the circumstances of the accident or violence which produced the fatal injury' (*WHO*, 2004). The underlying cause of death is selected from diagnoses reported by a physician in a death certificate. The selection follows a convoluted set of rules and guidelines, which are included in the International Classification of Disease (ICD) Volume 2. 'Some instructions are very detailed and only apply to a specific condition, but others are expressed in general terms and are open to various interpretations' (*Johansson – Pavillon*, 2007). Comparative studies show that there are important variations between medical coders due to interpretation differences or errors. The best solution of this problem is to use common software. The first such software (Mortality Medical Data System – MMDS) was developed by the US National Centre for Health Statistics in 1967.

At present it includes a set of modules: SuperMICAR, MICAR, ACME, TRANSAX. **SuperMICAR** transforms the text diagnosis, which physicians fill in the death certificate, to standardized expressions that are linked with an ERN code (Entity Reference Number) – the input for the MICAR module. The ERN codes have been introduced in order to obtain the most detailed information about causes leading to death. **MICAR** applies rules for multiple-cause coding and transforms ERNs into ICD codes that are entries for the ACME module. **ACME** selects and modifies the ICD code of the underlying cause according to WHO rules. 'ACME module is considered as the *de facto* standard for countries using automated coding systems' (*Johansson – Pavillon*, 2007). **TRANSAX** compiles multiple-causes of death.

The implementation of the MMDS involves the translation of standardized expressions, which are linked to the entries for the MICAR module, into a national language. International experience with implementation of the MICAR module showed that it is difficult to translate all standardized expressions, which are more detailed than the ICD-10, into languages other than English. Sometimes the translated equivalent of an expression is used in national medical practice in a different way than in the United States. ACME without MICAR does not work properly, so an effort was made to develop a language-independent software for automated coding.

IRIS – LANGUAGE-INDEPENDENT CODING SOFTWARE

IRIS is an international project of experts from France, Germany, Hungary and Sweden (L. A. Johansson – SE and G. Pavillon – FR, founders). IRIS is a superstructure of the MICAR and ACME modules. The developers of IRIS examined ERNs and discovered that it is possible to assign an ICD code to a single ERN code and that this innovation has no effect on the selection of the underlying cause of death. The ICD codes are international and they are defined in different languages, and in this independence of language was achieved.

The universality of IRIS is guaranteed through the implementation of the international version of the death certificate into an interface of IRIS (see Figure 1). IRIS can run two ways; both ICD codes and text diagnoses can serve as data entries. The sec-

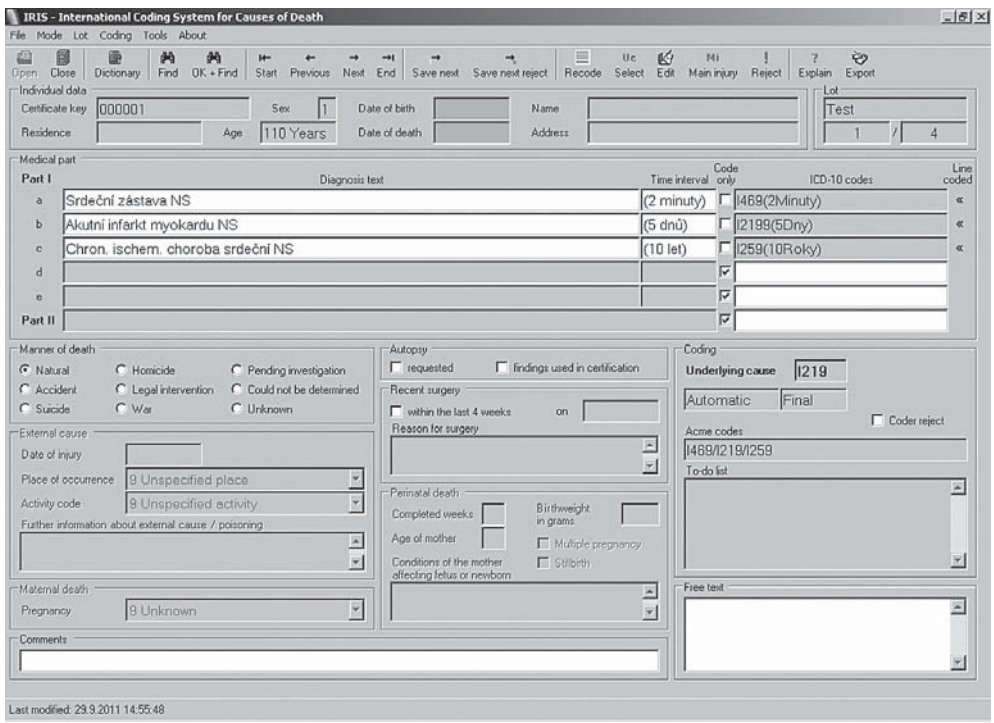
ond choice involves building a dictionary of text diagnoses and ICD codes. Using the tabular list of the ICD as a dictionary is not sufficient. Physicians fill in death certificates with shorter expressions than what are included in the classification and they often use Latin expressions and abbreviations. IRIS contains a tool for maintaining the dictionary and moreover has a special instrument, a standardization tool, for pre-processing language expressions in order to reduce the size of the dictionary.

Another intention of the developers was to ensure the interactivity of the program. Selection of the underlying cause of death with the support of the MICAR and ACME modules is combined under one step, unlike MMDS software, whose modules run separately. Users can open a report and see, how modules selected an underlying cause of death, all in one window. This report is also useful for training new coders. The software is accompanied by a validation tool, which checks the relation between the cause of death and sex, age, rare disease, and diagnoses that should not or cannot be used as the underlying cause of death.

The implementation of an automated coding system does not mean the end of manual coding. The US software processes imperfectly external, maternal and perinatal causes of death and main injury is selected completely manually. Then there are special cases, where the coder has to consider whether the precondition for modifying an underlying cause of death has been met.

IRIS is freely downloadable software and at the time of writing this article its 4.0.38 version was available. MS Access is a default database for IRIS. However, it is possible to connect it to other types of databases, e.g. Oracle, MySQL, and Paradox. This version of IRIS contains a tool for an easy translation of IRIS's interface. IRIS is used or its implementation is ending in eight European countries (Belgium, Czech Republic, France, Germany, Hungary, Norway, Spain and Sweden), and a number of countries outside Europe are also interested in IRIS (e.g. Thailand, Israel, some South America countries).

Figure 1 **The 4.0.38 version of IRIS with the English interface (with an anonymized notification)**



INTRODUCTION TO THE SITUATION IN THE CZECH REPUBLIC

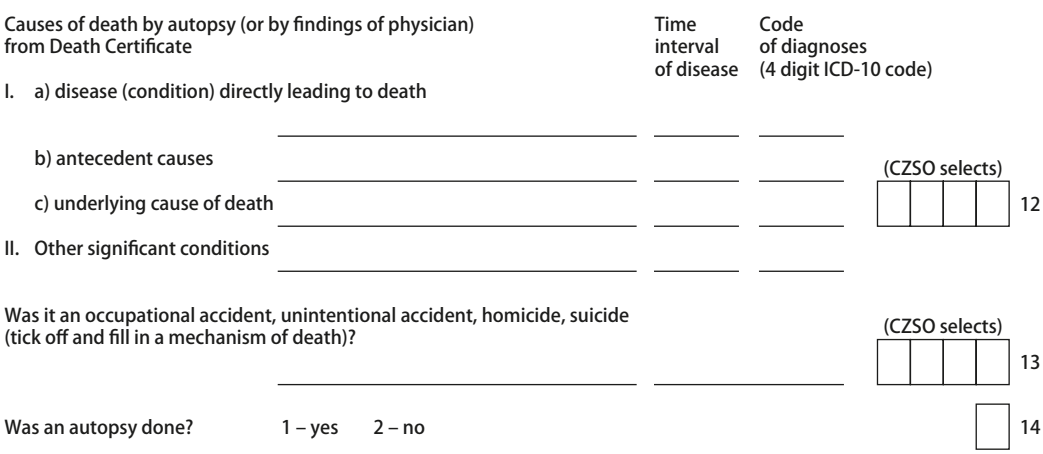
The flow of mortality data in the Czech Republic is as follows: a physician completes a death certificate containing administrative, demographic data and text diagnoses including ICD-10 codes, and then the death certificate is sent to the registration office. The registration office completes a statistical notification of death based on the death certificate and sends it to the Czech Statistical Office (CZSO). Notifications of death are processed centrally. The current death certificate includes a medical section with three lines in part I, one line in part II, fields for the specification of time intervals in parts I and II, space for specifying the manner of death and one line to describe the external cause of death (see Figure 2). Finalized data are stored in an Oracle database.

Until 2010 (before the implementation of the automated coding system under a grant project of the European Commission: 'Quality Improvement of Causes of Death Statistics by Automated Coding'), coders (i.e. 14 persons in the CZSO in 2010) selected the underlying cause of death manually and since 2007 did so with the support of ACME decision tables in paper form. Only the underlying cause and, in the case of an external cause as the underlying cause, also the main injury were electronically processed. Selected underlying causes were verified using a national validation tool with checks on sex, age, rare disease, and diagnoses that should not or cannot be used as the underlying cause of death. The national validation tool was prepared by experts of the Institute of Health Information and Statistics of the Czech Republic, which is responsible for ICD issues and certification. This tool was based on a validation tool produced by the Eurostat Task Force on Quality Control and was supplemented by several nationally specific checks.

THE IMPLEMENTATION OF IRIS IN THE CZECH REPUBLIC

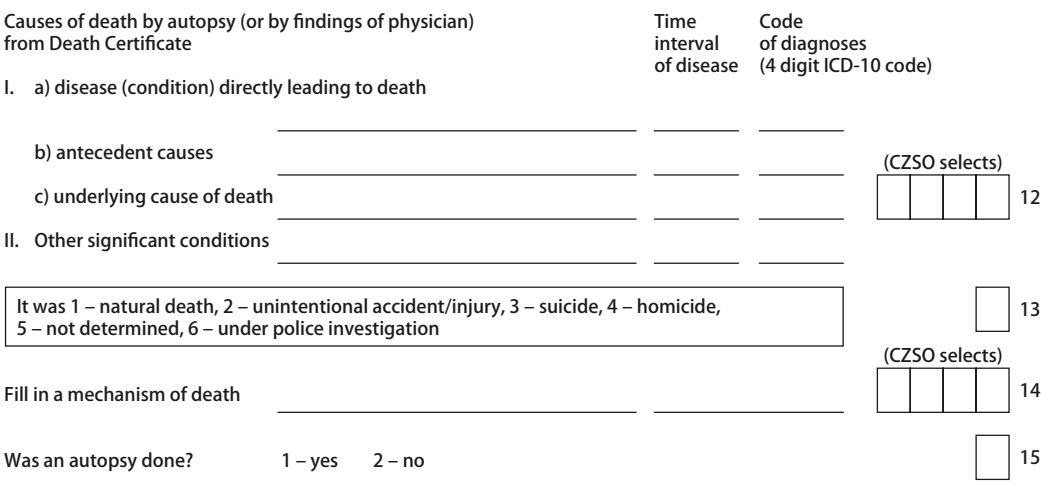
The implemented version of IRIS is connected to an Oracle database that stores mortality data. ICD-10 codes were chosen as entries for IRIS because of their frequent presence on death certificates and their good reliability. Nevertheless, before the coder enters the ICD-10 code into the system, the manual check on correspondence with a text diagnosis has to be done. If they do not correspond, the code should be changed according to the text diagnosis (except in cases where the ICD-10 code is more specific[1]). The list of items

Figure 2 **Statistical notification of death valid until 2010**



1) An ICD code usually has four digits. A three-digit code is used for a single condition. The fourth digit introduces the inner variety of the condition. If an ICD code is more specific on the fourth digit than a text diagnosis, the ICD code is used.

Figure 3 **Statistical notification of death valid from 2011**



for manner of death used in the statistical notification of death was extended from 4 items to 6 for processing in IRIS (see Figures 2 and 3).

Data for IRIS has to be imported into two basic tables, one stores demographic and administrative data (Ident) and saves the results from automated coding, and the second stores the medical part of a death certificate (MedCod). Demographic and administrative data cannot be changed in IRIS, so a whole statistical notification is processed via a web intranet form and then data are converted into IRIS tables. Although IRIS includes its own validation tool, it is designed for the whole world and European specifications have to be inserted. The national validation tool was reduced in parts, which were already included in IRIS, and retained for the verification of manually coded notifications and for detecting badly completed certificates.

An assessment of how a change in the coding system influenced causes of death statistics, i.e. a bridge-coding study, constituted one part of the grant project. A data sample selected for the bridge-coding study comprised 25 thousand statistical notifications of death in 2010, which accounted for 23.4% of all deaths. Owing to the fact that the implemented version of IRIS includes ICD-10 updates[2)] valid in the Czech Republic from 2011, a detailed analysis of changes in causes of death statistics will be published after the 2011 data release and as the second part of this article. Another result of the bridge-coding study was the finding that 86.4% of notifications were processed automatically.

THE POSITIVE AND NEGATIVE ASPECTS OF THE IMPLEMENTATION OF THE AUTOMATED SYSTEM

Benefits of automated coding:

- The process of selecting the underlying cause of death is standardized.
- The extension of data processing to all diagnoses reported in a death certificate makes it easier to detect the influence of the implementation of ICD updates, mainly changes in coding rules, and can be a base for comorbidity statistics.

2) A conception of the ICD-10 includes the idea of the continuous updating of the classification between regular revisions. Since 1996 WHO has published ICD-10 updates. In 2004 the second revised edition was published by WHO. This edition and some other updates were implemented for first time in 2009 (Tabular list) and in 2010 (Instruction manual) in the Czech Republic.

Advantages of IRIS:

- Common types of databases can be connected with IRIS.
- Language independence is respected in all parts of IRIS.
- IRIS's interface is easily translatable into a national language.
- The interactivity of the software.

Important remarks for the implementation of IRIS:

- It is necessary to know how MMDS works.
- If text diagnoses are chosen as data entries, a dictionary should also contain expressions that are usually written in a death certificate.
- The dictionary does not have to be extensive. Using regular expressions (standardization) reduces the size of the dictionary (e.g. handles synonyms, misspelling diagnoses).
- It can take a long time to build the dictionary, as the experience of other countries has shown.
- The laboriousness of processing text expressions has decreased with the introduction of the scanning of death certificates or the electronic version of certificate.
- All medical information reported in a death certificate has to be processed.

Disadvantages of automated coding:

- ICD-10 updates or a new revision of ICD is possible to implement on national level only after a conversion of these changes into automated software.

References:

- *About the Mortality Medical Data Systém.* [cit. 13. 7. 2011]. <http://www.cdc.gov/nchs/nvss/mmds/about_mmds.htm>.
- Eurostat. 2007. *Implementation of the recommendations of the ad-hoc Task Force on Quality Control.* Methodological document.
- Harteloh, P. – Brün, K. – Kardaun, J. 2007. The reliability of cause of death coding in the Netherlands. In *European Journal of Epidemiology,* 25, pp. 531–538.
- Schelhase, T. 2010. *IRIS: State of art, ongoing project and future development.* Document Tech-CoD/10/09. Technical group causes of Death.
  Luxembourg, 4.–5. 5. 2010.
- Johansson, L. A. – Pavillon, G. *Coding: IRIS (language independent coding software).* Document Tech-CoD/07/11-3. Technical group causes of Death. Luxembourg, 11.–12. 10. 2007 .
- Johansson, L. A. et al. 2011. *IRIS version 4.0.36 manual.* [cit. 13. 7. 2011].
  <http://www.cepidc.vesinet.inserm.fr/inserm/html/IRIS/download.htm>.
- Kretschmerová T. 2006. Co je automatizované kódování příčin smrti. In *Demografie,* 48, pp. 143–148.
- *Minutes of the Iris User Group Meeting in Paris, November 21st 2008.* [cit. 13. 7. 2011].
  <http://www.cepidc.vesinet.inserm.fr/inserm/html/IRIS/Events.htm>.
- Poppová, M. 2011. *Final Report of Eurostat Grant Contract No. 10501.2009.002-2009.460.* Documentation of the grant project. Czech Statistical Office. 2011.
- Poppová, M. 2011. *Zápis ze zahraniční pracovní cesty IRIS User's group meeting 7.–8. 9. 2011.* Internal document. Czech Statistical Office. 2011.
- World Health Organization. 2004. *International classification of disease and related problems – 10th Revision, Volume II.* 2004 – Second edition. Geneva: World Health Organization. 2004.

TRENDS IN LIFE EXPECTANCY CHANGE IN CENTRAL EUROPEAN COUNTRIES

Martina Miskolczi – Jitka Langhamrová –
– Jana Langhamrová

This article was supported by the Internal Grant Agency of the University of Economics, research project no. F4/29/2011 'Analysis of Population Ageing and Impact on Labour Market and Economic Activity' and research project no. 2D06026 'Reproduction of Human Capital' financed by Ministry of Education, Youth and Sports under the National Programme of Research II

INTRODUCTION

Life expectancy e^0_x is an important indicator drawn from life tables that reflects the mortality experience of the studied population. For a person now aged x it describes how many years of life he/she may expect to live. In developed countries it is usually published on an annual basis and tends to rise steadily. The most frequently used indicator is life expectancy at birth, which shows the average number of years to be lived by a group of people at the age of 0 years. (*Klufová – Poláková*, 2010)

Trends in life expectancy for males and females are commented for the following countries: the Czech Republic (CR), the Slovak Republic (SK), Hungary (HU), Poland (PL) and Austria (AT). The comparison of selected countries is provided as well. All those countries share similar history and location in Central Europe. Results are mostly presented separately for males (M) and females (F) as they have different mortality behaviour.

This article makes a projection of the development of the human capital of the Czech Republic and its regions based on the latest demographic projection. The purpose is first and foremost to demonstrate what consequences future demographic development in the Czech Republic could have from the viewpoint of the development of human capital. The development of education can usually be influenced much more easily than, for instance, demographic development, where the effect of population policy measures is usually only short term.

This article thus focuses on presenting a projection of the development of the education level of the inhabitants of the Czech Republic up to 2050. Because in the normal course of school attendance it can be expected that the tertiary education will be attained at the age of 20–24 completed years, the overall results are given only for persons aged 25 or over.

TERMINOLOGY

The term CAGR will be used in the article:

- **The Compound Annual Growth Rate** (CAGR) is the year-over-year growth rate of an indicator over a specified period of time. It can be understood as the geometric average of annual growth rates. It is calculated by taking the t^{th} root of the total percentage growth rate, where t is the number of years in the period.

$$\text{CAGR} = \sqrt[t]{\frac{y_t}{y_0}} - 1,$$ where y_0 is the beginning value and y_t the ending value. In demography, this originally economic indicator can be used to analyse long-term trends, where it describes average annual growth.

CURRENT LEVEL OF LIFE EXPECTANCY AT BIRTH

The Central European countries that joined the European Union in 2004 (CR, SK, HU, PL) currently occupy positions below the rank of fifty, whereas Austria ranks approximately twentieth in the ranking of life expectancy at birth in the world. The Czech Republic ranks among the countries with a relatively good standing.

The world average for males is 65.2 years and 69.1 years for females (*The World Factbook*, 2011). In our five selected countries life expectancy at birth in 2009 was higher than the world average (64.5 years for males, 68.8 years for females; *The World Factbook*, 2009) by 6 to 14 years. On the other hand, only Austria exceeds the average for the European Union (76.4 years for males and 82.4 years for females in 2008; *Eurostat*, 2008). The highest life expectancy at birth is in:

- Monaco, Macau, San Marino and Andorra for males, from larger countries it is Singapore, Australia, Japan, Canada and Sweden,
- Monaco, Macau, San Marino, Japan, Singapore, France and Italy for females (*The World Factbook*, 2011).

Table 1 **Life expectancy at birth, 2009, males and females**

	CR	SK	HU	PL	AT*
Males	74.2	71.4	70.2	71.5	77.6
Females	80.3	79.0	78.2	79.9	83.0

Note: * year 2008.
Source: Human Mortality Database, <http://www.mortality.org>.

After Austria the next-highest position is occupied by the Czech Republic and the last position is held by Hungary. Differences between males and females range from 5.3 (AT) to 8.4 years (PL). (*Langhamrová*, 2010)

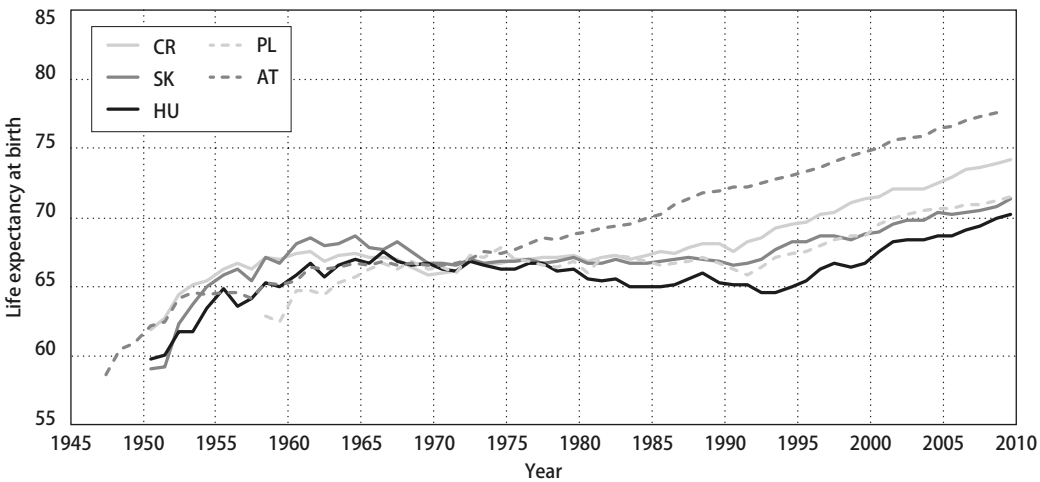
TREND IN LIFE EXPECTANCY AT BIRTH

After the Second World War, life expectancy at birth rose dynamically till the beginning of the 1960s.

In the period of 1960–1990

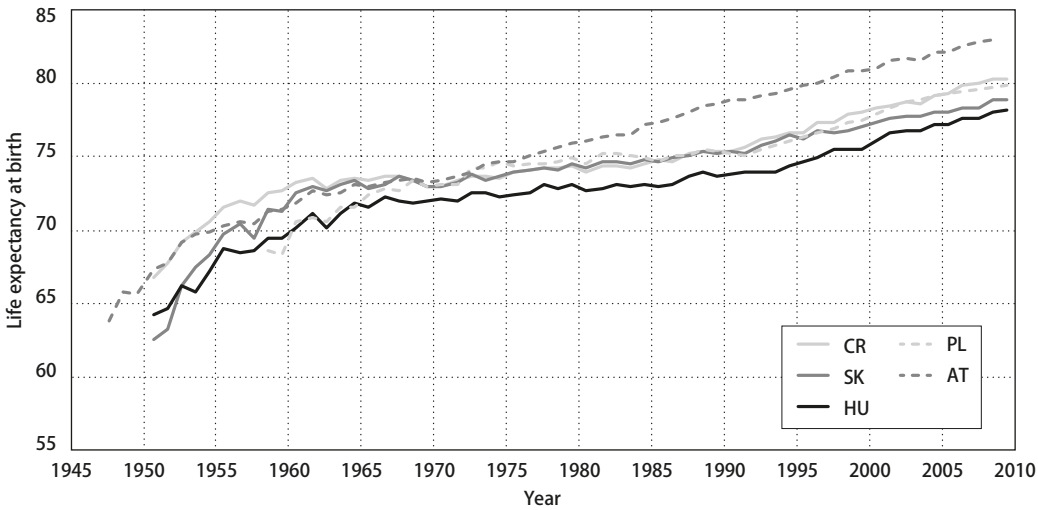
- the trend for males fluctuated; in Slovakia and Hungary e^0_0 even decreased by 2.36% and 1.17%, respectively; the average annual growth rate (calculated by CAGR) was the highest for Austria (+ 0.33% per year), while in the Czech Republic it was + 0.0025%,

Figure 1 **Trend in life expectancy at birth, 1947–2009, males**



Source: Human Mortality Database, <http://www.mortality.org>.

Figure 2 **Trend in life expectancy at birth, 1947–2009, females**



Source: Human Mortality Database, <http://www.mortality.org>.

- life expectancy at birth for females continued to grow with lower intensity; the fastest trend was again in Austria (an increase of 9.69%, annually + 0.31%) and lowest in the Czech Republic (an increase of 2.82%, annually + 0.09%) with local decreases,

- the position of Austria differs from other selected countries and from approximately the beginning of the 1970s we can see a faster increase and a roughly linear trend.

The political and economic changes after 1989 led also to changes in life expectancy trends: the indicator accelerated in CR, SK, HU and PL, especially among males. (*Fialová* et al., 2007; *Koschin et al.,* 1998)

THE DYNAMICS OF LIFE EXPECTANCY AT BIRTH

The analysed indicator changed mostly in the first phase (till 1960); in the case of Slovakia on average by 1.5% each year both for males and females. For males, changes were still noticeable up to 1970, whereas life expectancy at birth for females developed more gradually.

From the 1970s, the group of countries comprising CR, SK, HU and PL clearly exhibits a different type of trend from that in Austria: the average annual growth rate (calculated as the CAGR) in the period of 1971–1990 decreased to below ± 0.20% per year in contrast to the annual growth rate in Austria of between 0.35% and 0.47% per year.

After 1990, Austrian life expectancy at birth continued its growing trend but has slowed in the past several years (the average annual growth rate represented by CAGR in 2001–2008 was + 0.33% for males and + 0.21% for females compared to + 0.43% for males and + 0.29% for females in 1991–2000).

In CR, SK and PL we can see an acceleration in the rise of this indicator for males right after the year 1990, as life expectancy at birth increased faster than in the previous period. This effect is also visible for Hungary later, approximately from 1994. In the first half of the 1990s life expectancy at birth for males in Hungary developed more slowly compared to the Czech Republic, lagging behind by as much as 4.5 years (in 1993 and 1994). After 2000 all four countries still have positive increments, but they are smaller. For example, e^0_0 for males increased in the Czech Republic by 9.83% in 2009 compared to 1990, by 3.66% in 2009 compared to 2000, and by 1.71% in 2009 compared to 2005.

The trend for females, like that for males, shows a faster increase after 1990, with Hungarian women lagging behind (by 2.3 years in 1992–1994 compared to CR), and a subsequent deceleration of this growth. For example, e^0_0 for females in CR increased by 6.51% in 2009 compared to 1990, by 2.53% in 2009 compared to 2000 and by 1.30% in 2009 compared to 2005.

Table 2 presents the compound annual growth rates for life expectancy at birth by decades.

According to the CAGR, the coefficient of variance, as one of the possible characteristics of variance, also changes along the lines observed above. All four of our selected countries have the highest variability (but still generally a very low level) in the first phase (to 1960) and then in the period of 1991–2000. All four countries show a decrease in variability in the period of 2001–2009, when the acceleration began to slow. Austria differs from the group of CR, SK, HU and PL: variability in AT in the period of 1961–1990 grew whereas in the other countries it declined.

Development for males and females is very similar. For females, development in CR, SK and HU is very alike and exhibits a high degree of homogeneity.

Table 2 **The CAGR of life expectancy at birth, by decades, males and females**

CAGR	CR	SK	HU	PL	AT*
Males, 1960/1951	0.81%	1.57%	1.03%		0.51%
Males, 1970/1961	–0.26%	–0.31%	–0.08%	0.28%	0.02%
Males, 1980/1971	0.11%	0.02%	–0.10%	0.01%	0.38%
Males, 1990/1981	0.05%	–0.04%	–0.06%	–0.15%	0.47%
Males, 2000/1991	0.53%	0.37%	0.41%	0.61%	0.43%
Males, 2009/2001	0.33%	0.29%	0.32%	0.23%	0.33%
Females, 1960/1951	0.89%	1.52%	0.90%		0.65%
Females, 1970/1961	–0.08%	–0.01%	0.14%	0.35%	0.10%
Females, 1980/1971	0.08%	0.15%	0.10%	0.20%	0.35%
Females, 1990/1981	0.15%	0.10%	0.13%	0.00%	0.36%
Females, 2000/1991	0.38%	0.30%	0.31%	0.41%	0.29%
Females, 2009/2001	0.25%	0.18%	0.23%	0.22%	0.21%

Note: * Austria to the year 2008.
Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

Table 3 **Coefficient of variance of life expectancy at birth, by decades, males and females**

coefficient of variance	CR	SK	HU	PL	AT*
Males, 1951–1960	2.11%	3.83%	2.77%	1.55%	1.23%
Males, 1961–1970	0.84%	0.97%	0.66%	1.18%	0.27%
Males, 1971–1980	0.49%	0.21%	0.56%	0.79%	1.09%
Males, 1981–1990	0.51%	0.29%	0.49%	0.44%	1.52%
Males, 1991–2000	1.56%	1.07%	1.45%	1.56%	1.26%
Males, 2001–2009	1.10%	0.77%	0.97%	0.60%	0.92%
Females, 1951–1960	2.34%	3.80%	2.50%	1.50%	1.61%
Females, 1961–1970	0.39%	0.44%	0.84%	1.30%	0.47%
Females, 1971–1980	0.42%	0.52%	0.45%	0.62%	1.02%
Females, 1981–1990	0.57%	0.40%	0.51%	0.29%	1.12%
Females, 1991–2000	1.09%	0.76%	0.98%	1.13%	0.90%
Females, 2001–2009	0.86%	0.56%	0.72%	0.64%	0.65%

Note: * Austria to the year 2008.
Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

CONVERGENCE OF MALES AND FEMALES

The differences between the life expectancy of males and females in the observed periods range between 3.4 years (Slovakia, 1950) and 9.3 years (Hungary, 1995). In 2008 in Austria the difference was 5.35 years, which means that males have a lower life expectancy at birth by 6.45% than females; in 2009 for the Czech Republic it was 6.14 years (7.64%), for Slovakia 7.59 years (9.61%), for Hungary 8.02 years (10.25%) and for Poland 8.44 years (10.56%).

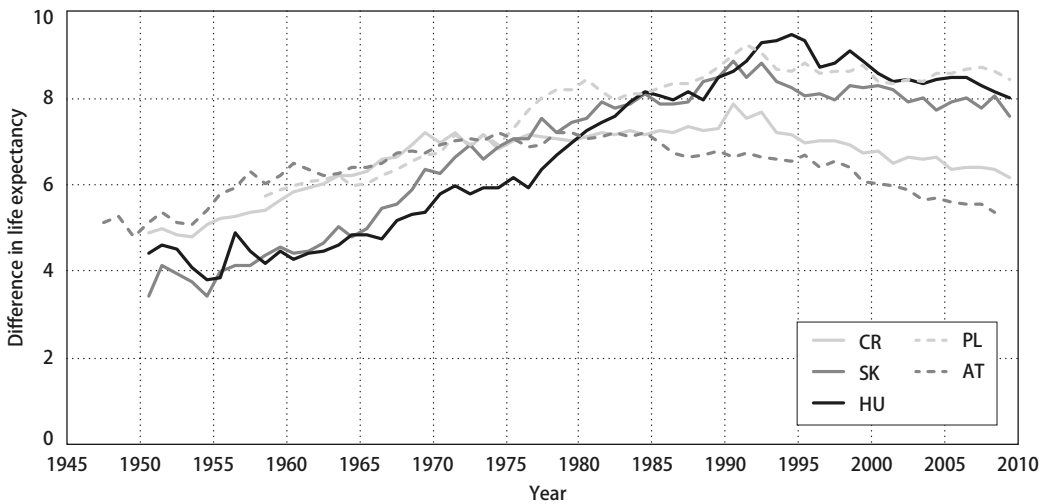
In this case, the Czech Republic is more like Austria in terms of the size of the difference, but the trend follows the same patterns as in the group of SK, HU and PL. Over time the difference between males and females in the observed countries continued to grow until 1978 (AT), 1990 (the CR, SK), 1991 (PL) and 1994 (HU). After peaking (in the indicated years) the difference decreased in all five countries.

There has been a trend towards the convergence of males and females in Central Europe that has lasted for at least 20 years and it is also present in other developed countries. This trend can moreover be expected to continue.

LIFE EXPECTANCY AT OTHER AGES

For further analysis ages x = 20, 40, 60 and 80 years were chosen in order to describe the entire life cycle and trends of life expectancy in selected European countries. The development of the expected length of life at other ages than 0 (at birth) again shows differences between males and females and between

Figure 3 **Difference between females and males, life expectancy at birth, 1947–2009**



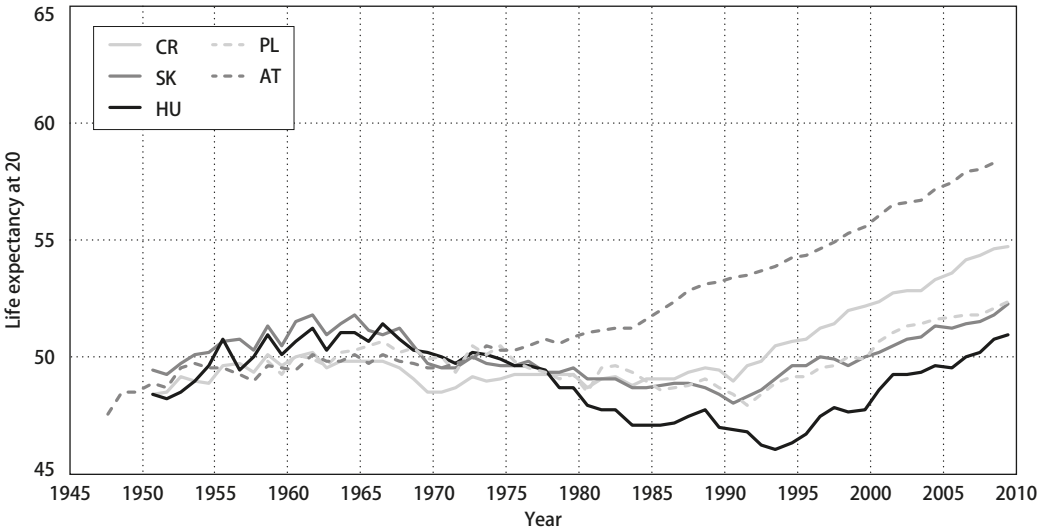
Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

Table 4 **Maximum and minimum differences between females and males, life expectancy at birth, 1947–2009**

Difference	CR	SK	HU	PL	AT*
Maximum	7.87	8.87	9.46	9.22	7.21
Year of max.	1990	1990	1994	1991	1978
Minimum	4.79	3.41	3.80	5.76	4.77
Year of min.	1953	1950	1954	1958	1949

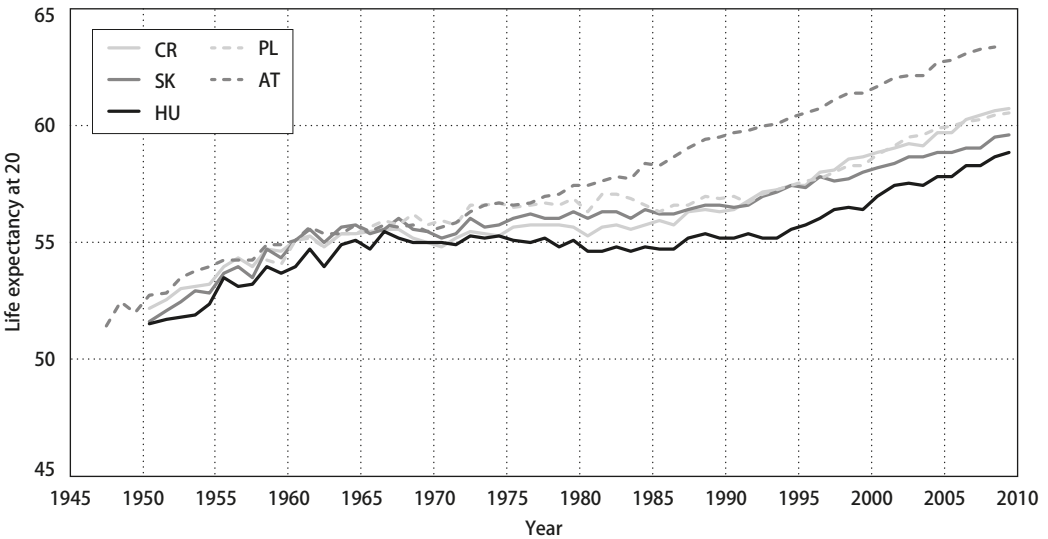
Note: * Austria to the year 2008.
Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

Figure 4 **Trend in life expectancy at x=20, 1947–2009, males**



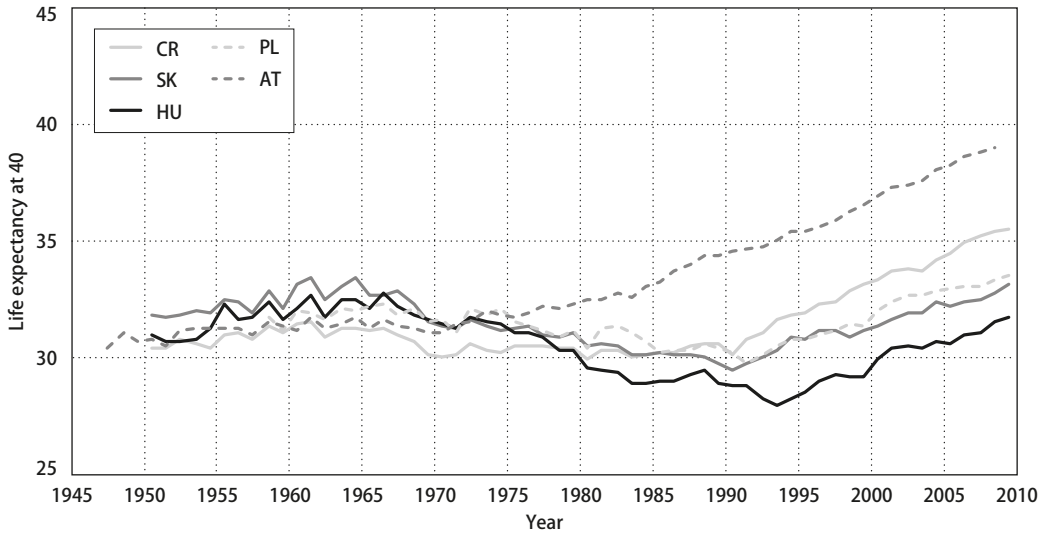
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 5 **Trend in life expectancy at x=20, 1947–2009, females**



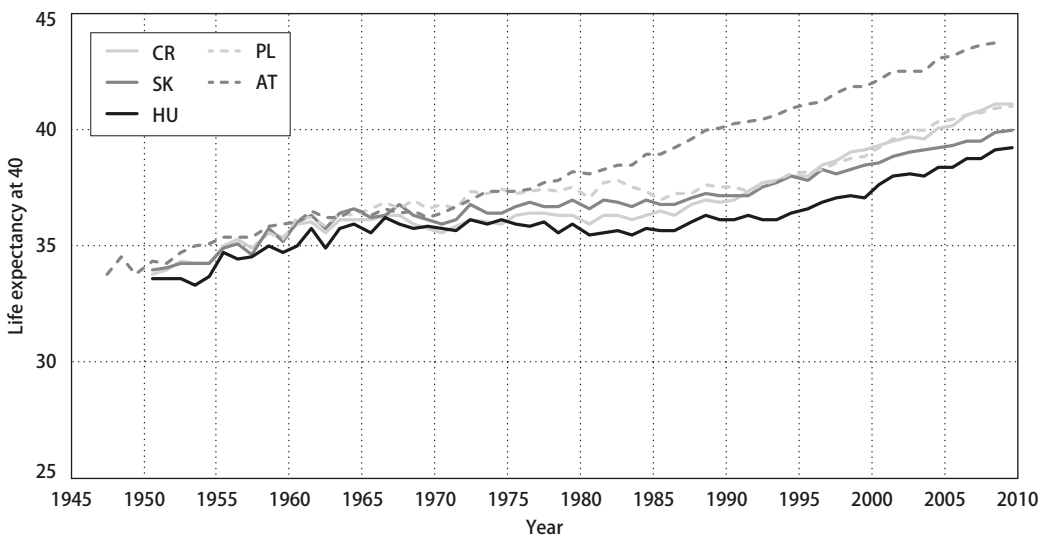
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 6 **Trend in life expectancy at x=40, 1947–2009, males**



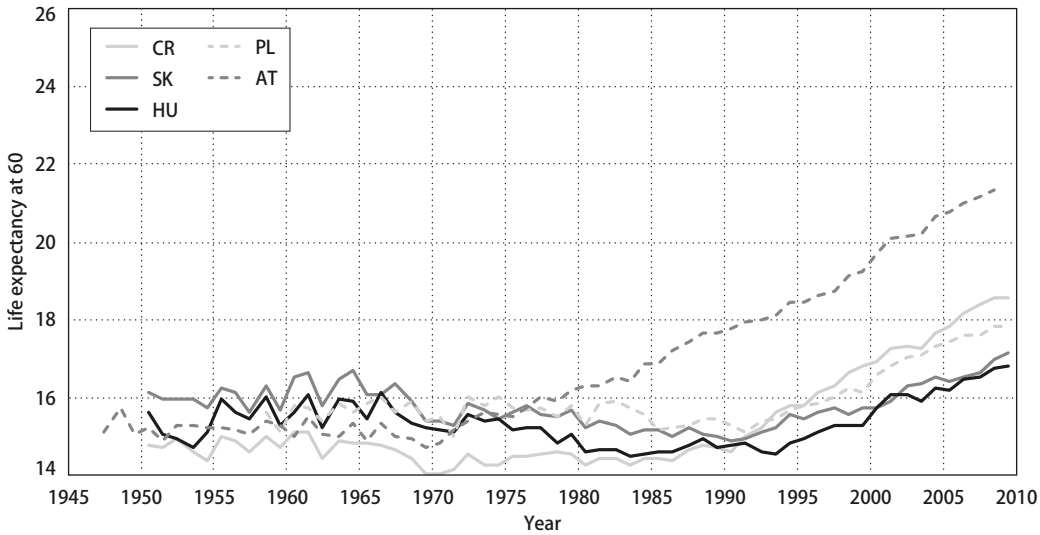
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 7 **Trend in life expectancy at x=40, 1947–2009, females**



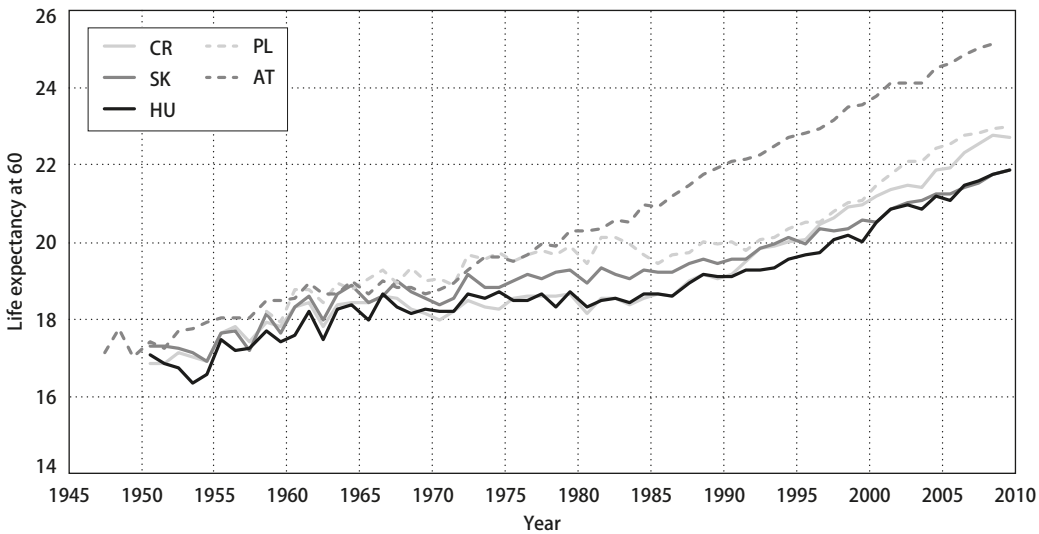
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 8 **Trend in life expectancy at x=60, 1947–2009, males**



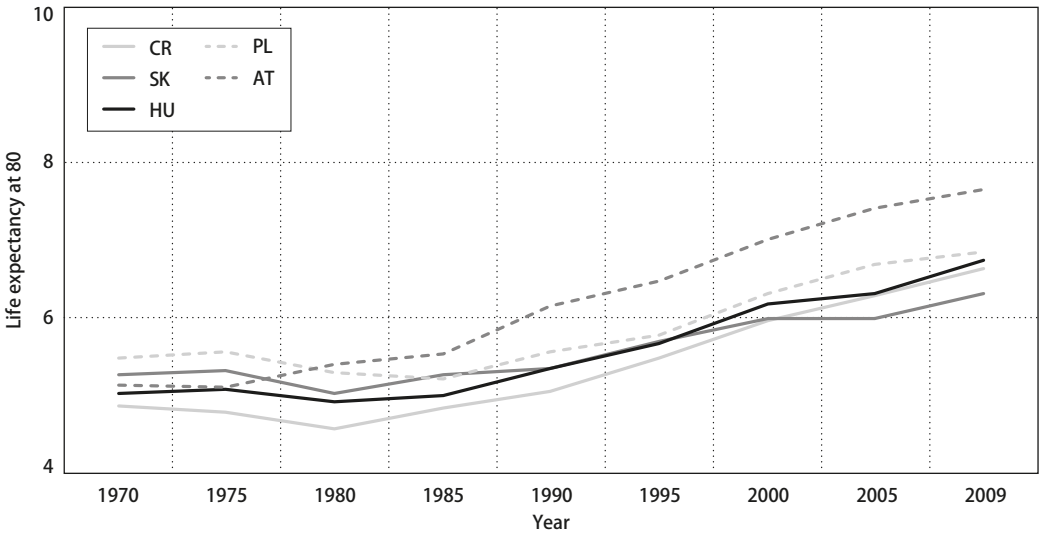
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 9 **Trend in life expectancy at x=60, 1947–2009, females**



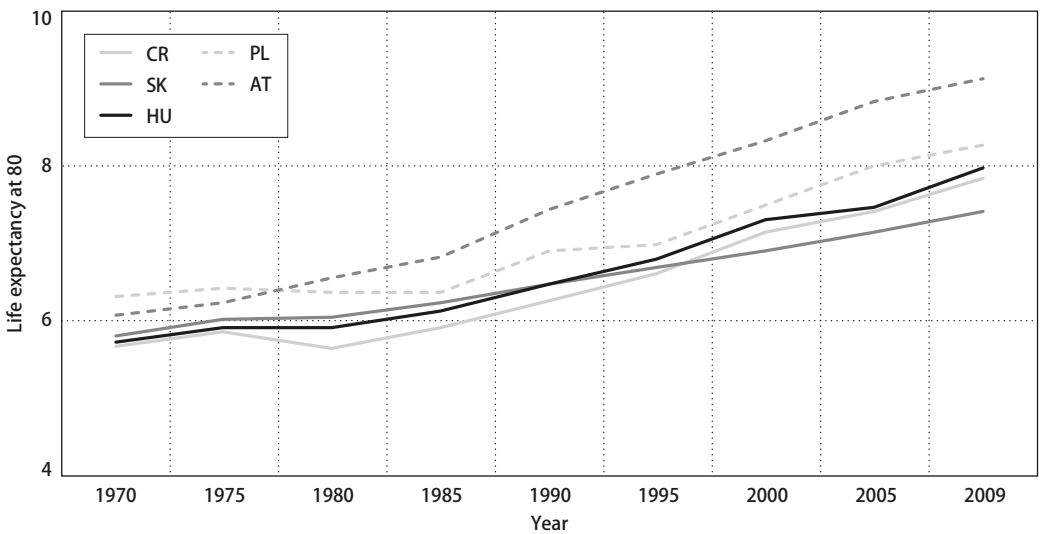
Source: Human Mortality Database, <http://www.mortality.org>.

Figure 10 **Trend in life expectancy at x=80, 1970–2009, males**



Source: Human Mortality Database, <http://www.mortality.org>.

Figure 11 **Trend in life expectancy at x=80, 1970–2009, females**



Source: Human Mortality Database, <http://www.mortality.org>.

selected countries (see Figures 4–11). At higher ages (here x = 80 years) the ageing process is apparent, which is confirmed by the increase in life expectancy at other ages. (*Fiala – Langhamrová – Langhamrová*, 2009; *Langhamrová – Fiala*, 2007)

It is evident that life expectancy in Austria both for males and females grew in the past 50 years and was the highest among our selected Central European countries for both genders and in all our selected age groups.

In the other four countries (CR, SK, HU, PL), Hungary separated from the rest of the group at ages x = 20 and 40 years with the lowest life expectancy. In the case of Hungarian males, the trend in life expectancy at the given ages even substantially decreased between 1965 and 1994, after which it increased rapidly and converged with the other countries in the region. The Czech Republic has a higher life expectancy at ages 20 and 40 years for males, while for females the figures for the CR, SK and PL are very similar. (Figures 4–7)

However, the situation changes with increasing age: at age x = 60 years, life expectancy for males grows in the Czech Republic and Poland faster than in the Slovak Republic and Hungary. The development of life expectancy for females follows a similar pattern for all four countries. (Figures 8 and 9)

At age x = 80 years the position of Hungary is entirely comparable with that of the CR, SK and PL. The lowest values are found in the Czech Republic and Slovakia. (Figures 10 and 11) Poland has the highest life expectancy with the exception of Austria, both for males and females.

The CR, SK and PL represent a homogenous group of countries with similar levels and trends of life expectancy at various ages. The Czech Republic has at younger ages (20, 40 years) a higher life expectancy, but at higher ages (60, 80 years) it has the second-lowest e^0_{80} for both males and females. Hungary, on the other hand, has a delayed trend with lower life expectancies at ages x = 20 and 40 years but comparable with the CR at age x = 60 years and even better than the CR at age x = 80 years.

FUTURE PREDICTION

There are numerous ways of predicting life expectancy at birth. Three simple approaches will be introduced here.

Using a simple linear regression model for the Czech Republic, regression coefficients can be estimated with the ordinary least square method (OLS) for two periods: 1971–1990 and 1991–2009. The reason for this division is the different nature of the time series for each period.

From the results it is evident that the third phase (1991–2009) develops faster (the slope of the regression equation is higher than the increment in the previous phase 1971–1990; for example for males e^0_0 is + 0.325 years for each calendar year compared to + 0.073 years in the previous phase). Moreover, the trend for females is slower, so the two genders converge.

On the other hand it is not probable that life expectancy can grow permanently with the same linear increment. More likely, the growth rate will decelerate. Assuming the same growth rate as in the period 2005–2009 we can predict an increase very similar to the linear regression estimate (in the figure it is indicated as 'growth2').

When other growth rates (expert estimates[1)]) are considered that gradually decrease but still remain positive to 2030, the result could look like the lines for 'growth3'. Here decelerating growth is visible along with the continuing convergence of males and females.

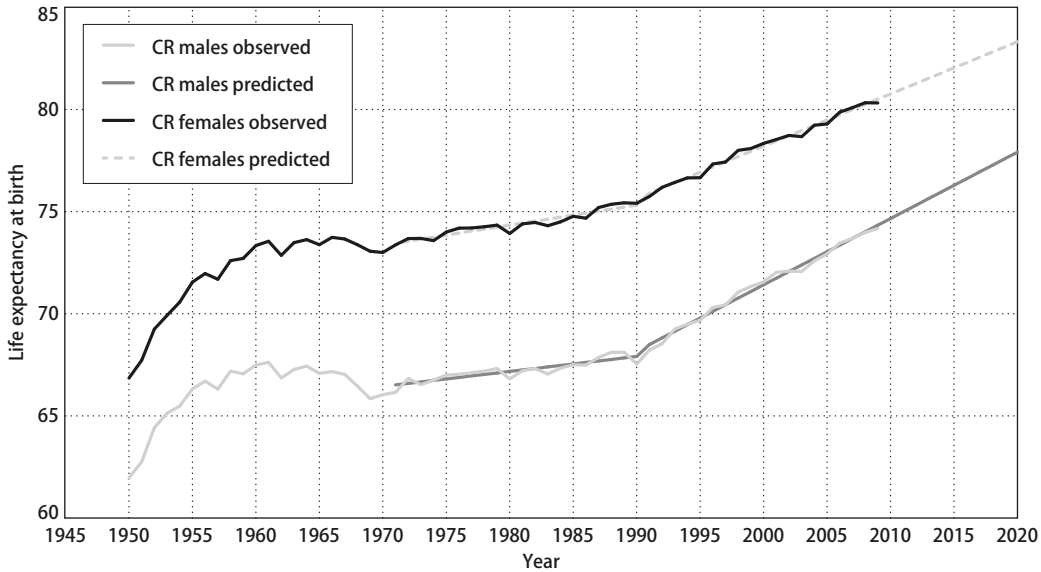
However, the prediction of future trends of life expectancy at birth is difficult and requires deep analy-

Table 5 Linear regression estimates, life expectancy at birth, Czech Republic

Linear trend, CR	a	b	R^2	F-test
Males, 1971–1990	66.445	0.073	0.777	62.6
Males, 1991–2009	68.166	0.325	0.990	1 602.2
Females, 1971–1990	73.358	0.098	0.899	160.8
Females, 1991–2009	75.651	0.256	0.988	1 393.5

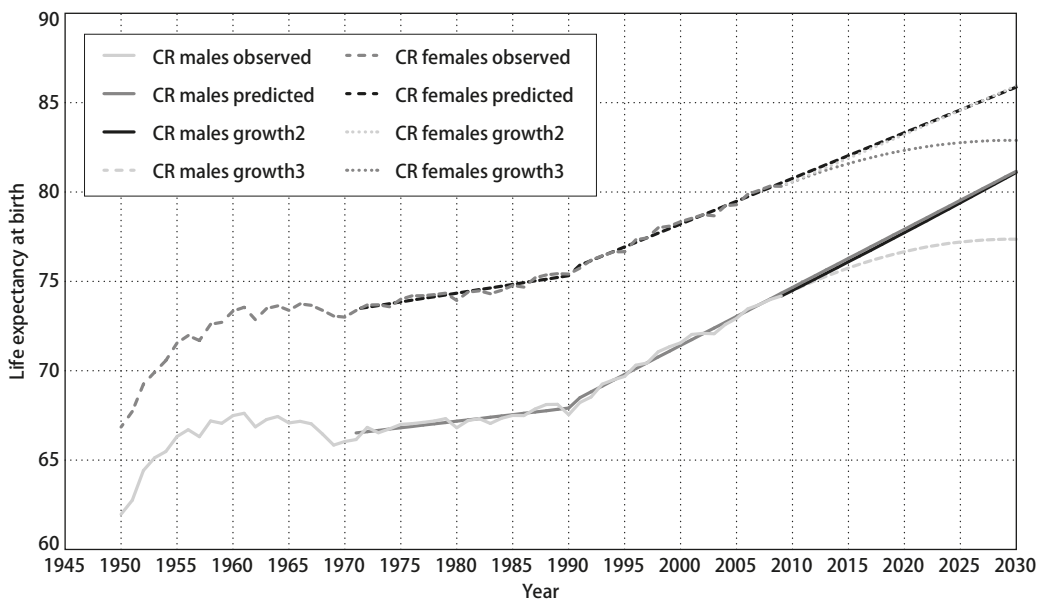
Source: Own calculation.

Figure 12 **Observed and predicted values, life expectancy at birth, Czech Republic, 1950–2020, males and females**



Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

Figure 13 **Observed and predicted values, life expectancy at birth, Czech Republic, 1950–2030, males and females (comparison)**



Source: Human Mortality Database, <http://www.mortality.org>; own calculation.

sis and consideration of the aspects that affect its development (which is not the purpose of this article). Using only time series analysis is not sufficient. (*Langhamrová*, 2010)

CONCLUSION

The life expectancy indicator is one of the important demographic indicators based on the mortality of the population. The data presented here for the Czech Republic, Slovak Republic, Hungary, Poland and Austria revealed that the Czech Republic has been developing similarly to other countries in the region of Central Europe but in some cases show characteristics like those observed in developed western countries, specifically at younger ages.

It was shown that the CR has the same patterns of life expectancy at birth for both males and females as in the Slovak Republic and Poland, whereas in Hungary the development of this indicator was delayed in the first half of the 1990s (by 4.5 years for males and 2.3 years for females). Austria's performance differs completely from these four countries; its life expectancy has grown continuously without interruption or significant fluctuation and with a stagnation period in the 1960s.

Life expectancy at younger ages (20 and 40 years) resembles the trend of e_0^0; the Czech Republic has the highest life expectancy among CR, SK, HU and PL for males and one of the highest for females (together with Poland). Trends in life expectancy at older ages (60 and 80 years) show an improvement in the position of Hungary and its convergence with Slovakia, while e_{80}^0 for the Czech Republic is even lower than that in Hungary both for males and females.

All five countries show a convergence of the life expectancy of males and females and a deceleration of the rising trend witnessed in recent years.

Three possible predictions were provided, but whether life expectancy stops growing or even starts to decrease cannot be answered directly and based solely on a statistical analysis of time series. Biological, health and social aspects must also be taken into account.

1) For males: annual growth rates start at the level 0.40% for 2010/2009 and decrease with linear trend by 0.02 percent point each year, so they reach level 0.00% in 2030/2029. For females, starting growth rate is defined as 0.30% for period 2010/2009 with decrement 0.015 percent point each year, so the last annual growth rate used is 0.00% in 2030/2029.

References

- Fiala, T. – Langhamrová, J. – Langhamrová, J. 2009. Changes in the Age Structure of the Population in the Czech Republic and its Economics Consequences. Uherské Hradiště 27. 8. 2009–28. 8. 2009. In *AMSE 2009 Applications of Mathematics and Statistics in Economy*. [online]. Praha: Oeconomica, pp. 137–148. ISBN 978-80-245-1600-4. <http://amse2009.vse.cz/proceedings.pdf>.
- Fialová, L. et al. 2007. *Population Development in the Czech Republic 2007.* 1st ed, Prague : Sociologické nakladatelství (SLON). 144 p. ISBN 978-80-7419-021-6.
- *Human Mortality Database.* 2010. University of California, Berkeley (USA) and Max Planck Institute for Demographic Research (Germany). [online]. [cit. 7. 11. 2010]. <http://www.mortality.org>.
- Klufová, R. – Poláková, Z. 2010. *Demographic Methods and Analyses.* Demography of Czech and Slovak Population. 1st ed. Prague : Wolters Kluwer ČR. 306 p. ISBN 978-80-7357-546-5.
- Koschin, F. – Fiala, T. – Langhamrová, J. – Roubíček, V. 1998. *Mortality in the Czech Republic in 90th.* 1. ed. Prague: University of Economics. 68 p. ISBN 80-7079-574-3.
- Langhamrová, J. 2010. Life expectancy in the Czech Republic and EU countries. Prague 13.12.2010 –14.12.2010. In *RELIK 2010*. [online]. [cit. 3. 7. 2010]. ISBN 978-80-245-1697-4. <http://kdem.vse.cz/resources/relik10/Index.htm>.
- Langhamrová, J. – Fiala, T. 2007. *The Ageing of the Population and its Consequences.* Forum Statisticum Slovacum, Vol. III., No. 6, pp. 79–83.

- The World Factbook. 2019. CIA Factbook. *World. People and Society.* [online]. [cit. 22. 10. 2011]. <http://en.wikipedia.org/wiki/List_of_countries_by_life_expectancy >.
- The World Factbook. 2011. CIA Factbook. *World. People and Society.* [online]. [cit. 22. 10. 2011]. <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>.

Data sources

- Human Mortality Database. <http://www.mortality.org/>.
- Eurostat. Life expectancy at birth, by gender. <http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do;jsessionid=9ea7d07e30ddb4b2f9fb8eca4b0daf33d8b3870fa6ba.e34OaN8Pc3mMc40Lc3aMaNyTa3uPe0?tab=table&plugin=1&pcode=tps00025&language=en>.

List of Abbreviation

AT – Austria
CAGR – compound annual growth rate
CR – Czech Republic
EU – European Union
F – females
HU – Hungary
M – males
OLS – ordinary least square method
PL – Poland
SK – Slovak Republic

PRELIMINARY RESULTS OF THE 2011 POPULATION AND HOUSING CENSUS

This year's Census (2011 Population and Housing Census) revealed many new trends in the society, which appeared during the last decade. According to the first preliminary results of the Census, the number of foreigners, who live for a long time in the Czech Republic, is rapidly increasing. The number of people with higher education as well as people without education is growing, there are less marriages, more divorces, ownership of dwellings as well as the way how they are heated is markedly changing. It also turned out that people are protecting their privacy more than in the past as they largely used the possibility not to answer the optional questions on nationality and religion.

<http://www.scitani.cz/sldb2011/eng/redakce.nsf/i/preliminary_results_of_the_2011_population_and_housing_census>

<http://www.scitani.cz/sldb2011/eng/redakce.nsf/i/census_results>

Population and vital statistics of the Czech Republic in towns with population above 50 thousands: 2010

Town	Population 1 July	Population 31 December	Marriages	Divorces	Live births	Abortinos	Deaths	Increase (decrease)			Marriages	Divorces	Live births	Deaths	Total increase
								Natural	Net migration	Total	per 1 000 inhabitants				
Praha	1 251 726	1 257 158	5 978	3 524	14 792	4 427	12 266	2 526	5 606	8 132	4.8	2.8	11.8	9.8	6.5
Brno	370 951	371 371	1 764	1 250	4 511	1 306	3 814	697	–725	–28	4.8	3.4	12.2	10.3	–0.1
Ostrava	304 888	303 609	1 389	1 013	3 307	1 131	3 410	–103	–2 294	–2 397	4.6	3.3	10.8	11.2	–7.9
Plzeň	169 551	168 808	806	504	1 819	807	1 735	84	–1 211	–1 127	4.8	3.0	10.7	10.2	–6.6
Liberec	101 580	101 865	494	344	1 257	497	882	375	–135	240	4.9	3.4	12.4	8.7	2.4
Olomouc	100 202	100 233	498	344	1 154	291	1 030	124	–253	–129	5.0	3.4	11.5	10.3	–1.3
Ústí nad Labem	95 439	95 464	433	312	1 132	524	1 019	113	–126	–13	4.5	3.3	11.9	10.7	–0.1
České Budějovice	94 750	94 754	478	304	1 136	471	924	212	–323	–111	5.0	3.2	12.0	9.8	–1.2
Hradec Králové	94 373	94 318	458	310	1 011	409	945	66	–241	–175	4.9	3.3	10.7	10.0	–1.9
Pardubice	90 198	90 401	419	217	1 022	240	914	108	216	324	4.6	2.4	11.3	10.1	3.6
Havířov	82 425	82 022	397	272	796	343	830	–34	–840	–874	4.8	3.3	9.7	10.1	–10.6
Zlín	75 538	75 469	356	212	831	307	773	58	–303	–245	4.7	2.8	11.0	10.2	–3.2
Kladno	70 347	70 665	334	301	864	329	703	161	566	727	4.7	4.3	12.3	10.0	10.3
Most	67 485	67 466	315	253	667	348	710	–43	–9	–52	4.7	3.7	9.9	10.5	–0.8
Karviná	61 157	60 679	250	167	600	257	721	–121	–1 148	–1 269	4.1	2.7	9.8	11.8	–20.7
Opava	58 286	58 274	290	192	577	309	653	–76	–90	–166	5.0	3.3	9.9	11.2	–2.8
Frýdek-Místek	58 405	58 200	255	201	679	247	587	92	–474	–382	4.4	3.4	11.6	10.1	–6.5
Děčín	51 792	51 691	241	141	574	291	516	58	–627	–569	4.7	2.7	11.1	10.0	–11.0
Jihlava	51 203	51 154	227	145	603	178	503	100	–168	–68	4.4	2.8	11.8	9.8	–1.3
Teplice	51 217	51 146	199	165	572	343	546	26	–88	–62	3.9	3.2	11.2	10.7	–1.2
Karlovy Vary	51 303	51 115	224	181	479	201	566	–87	–118	–205	4.4	3.5	9.3	11.0	–4.0
Chomutov	50 037	50 441	243	176	583	314	490	93	553	646	4.9	3.5	11.7	9.8	12.9

Radek Havel

Population and vital statistics of the Czech Republic: 2010, areas and regions

Area, region	Population 1 July	Population 31 December	Marriages	Divorces	Live births	Abortinos	Deaths			Increase (decrease)			Marriages	Divorces	Live births	Deaths	Total increase
							Total	Within 1 year	Within 28 days	Natural	Net migration	Total	per 1 000 inhabitants				
Česká republika	10 517 247	10 532 770	46 746	30 783	117 153	39 273	106 844	313	196	10 309	15 648	25 957	4.4	2.9	11.1	10.2	2.5
Praha	1 251 726	1 257 158	5 978	3 524	14 792	4 427	12 266	40	28	2 526	5 606	8 132	4.8	2.8	11.8	9.8	6.5
Střední Čechy	1 257 194	1 264 978	5 732	4 130	15 212	4 878	12 440	32	20	2 772	14 673	17 445	4.6	3.3	12.1	9.9	13.9
Jihozápad	1 209 933	1 210 751	5 436	3 489	13 175	4 746	12 232	38	21	943	302	1 245	4.5	2.9	10.9	10.1	1.0
Severozápad	1 143 415	1 143 489	4 949	3 601	12 588	5 749	12 009	60	40	579	–924	–345	4.3	3.1	11.0	10.5	–0.3
Severovýchod	1 510 555	1 511 909	6 578	4 272	16 862	5 712	15 124	36	22	1 738	413	2 151	4.4	2.8	11.2	10.0	1.4
Jihovýchod	1 667 565	1 669 223	7 315	4 876	18 397	5 321	16 671	34	19	1 726	797	2 523	4.4	2.9	11.0	10.0	1.5
Střední Morava	1 232 120	1 232 042	5 239	3 295	13 028	3 909	12 809	37	26	219	–1 260	–1 041	4.3	2.7	10.6	10.4	–0.8
Moravskoslezsko	1 244 739	1 243 220	5 519	3 596	13 099	4 531	13 293	36	20	–194	–3 959	–4 153	4.4	2.9	10.5	10.7	–3.3
Hl. m. Praha	1 251 726	1 257 158	5 978	3 524	14 792	4 427	12 266	40	28	2 526	5 606	8 132	4.8	2.8	11.8	9.8	6.5
Středočeský kraj	1 257 194	1 264 978	5 732	4 130	15 212	4 878	12 440	32	20	2 772	14 673	17 445	4.6	3.3	12.1	9.9	13.9
Jihočeský kraj	637 910	638 706	2 891	1 863	6 933	2 323	6 416	20	14	517	546	1 063	4.5	2.9	10.9	10.1	1.7
Plzeňský kraj	572 023	572 045	2 545	1 626	6 242	2 423	5 816	18	7	426	–244	182	4.4	2.8	10.9	10.2	0.3
Karlovarský kraj	307 619	307 444	1 280	1 028	3 313	1 420	3 097	15	11	216	–408	–192	4.2	3.3	10.8	10.1	–0.6
Ústecký kraj	835 796	836 045	3 669	2 573	9 275	4 329	8 912	45	29	363	–516	–153	4.4	3.1	11.1	10.7	–0.2
Liberecký kraj	439 483	439 942	1 928	1 351	5 120	1 942	4 251	8	5	869	46	915	4.4	3.1	11.7	9.7	2.1
Královéhradecký kraj	554 296	554 803	2 484	1 640	6 021	2 179	5 553	16	9	468	–67	401	4.5	3.0	10.9	10.0	0.7
Pardubický kraj	516 776	517 164	2 166	1 281	5 721	1 591	5 320	12	8	401	434	835	4.2	2.5	11.1	10.3	1.6
Kraj Vysočina	514 800	514 569	2 216	1 328	5 357	1 591	5 105	8	3	252	–675	–423	4.3	2.6	10.4	9.9	–0.8
Jihomoravský kraj	1 152 765	1 154 654	5 099	3 548	13 040	3 730	11 566	26	16	1 474	1 472	2 946	4.4	3.1	11.3	10.0	2.6
Olomoucký kraj	641 661	641 681	2 675	1 823	6 922	2 006	6 748	17	12	174	–534	–360	4.2	2.8	10.8	10.5	–0.6
Zlínský kraj	590 459	590 361	2 564	1 472	6 106	1 903	6 061	20	14	45	–726	–681	4.3	2.5	10.3	10.3	–1.2
Moravskoslezský kraj	1 244 739	1 243 220	5 519	3 596	13 099	4 531	13 293	36	20	–194	–3 959	–4 153	4.4	2.9	10.5	10.7	–3.3

Radek Havel

Abstracts of Articles Published in the Journal Demografie in 2011 (No. 1–3)

Markéta Pechholdová – France Meslé – Jacques Vallin

THE RECONSTRUCTION OF CONTINUOUS TIME SERIES OF MORTALITY BY CAUSE OF DEATH: APPLICATION TO THE CZECH REPUBLIC

Analysing long-term trends in cause-specific mortality requires continuous series of comparable data. However, the continuity of cause-of-death data is periodically interrupted by revisions to the International Classification of Diseases (ICD) and changes to the coding of the underlying cause of death. In an international perspective, comparability also suffers from variations in national interpretations of the classification. This article describes the methodology used to reconstruct continuous time series of mortality by cause of death as applied to Czech data for the period 1968–1993.

Keywords: mortality, cause of death, ICD, Czech Republic **Demografie,** 2011, **53: 5–18**

Lucie Vítková

HAS DEMOGRAPHIC REPRODUCTION BECOME HOMOGENISED IN DEMOGRAPHICALLY DEVELOPED COUNTRIES?

The article examines the tendency towards the homogenisation of demographic reproduction in countries that have already undergone the demographic revolution. Demographic reproduction is a process determined by biological and social factors. Changes in the demographic features of the population are mainly caused by social factors and these factors have become increasingly influential in those populations that have already undergone the demographic revolution. On the other hand, the biological determination of demographic reproduction strengthens the tendency towards homogeneity. The article examines the total fertility rate, the infant mortality rate and life expectancy since 1950 in demographically developed countries.

Keywords: long-term demographic development, demographic revolution, homogeneity of demographic development, statistical structure **Demografie,** 2011, **53: 19–32**

Radek Horák

NUPTIALITY IN KUTNÁ HORA BETWEEN 1725 AND 1755

This article focuses on nuptiality in Kutná Hora during the second third of the 18th century. The data quoted here have been excerpted from parish registers and from other sources, in particular the 'Theresian land register'. Nuptiality influenced many other demographic features, because only marriage legalised the cohabitation of people of the opposite sex and only legitimate children were fully-fledged members of society at that

time. Before the demographic transition the fertility was not intentionally reduced. Owing to this fact, it was nuptiality that influenced fertility (especially in connection with the age of engaged couples and the percentage of married people).

In the Czech Republic, that era is connected with the start of so-called proto-industrialisation (especially after the ceding of Silesia in 1742) when, as compensation for this, many manufactures were developed in the north-west and north-east areas of Bohemia. Clearly this must also have had a strong influence on the demographic behaviour of the population of these areas, especially compared to the rest of this country at that time, where traditional agricultural and handicrafts still dominated, and for this reason the demographic behaviour remained invariable. According to the economic characteristics, the town of Kutná Hora belongs to the latter group mentioned, and the aim of this study is to verify that assumption.

Keywords: historical demography, nuptiality, Kutná Hora, 18th century **Demografie,** 2011, **53: 33–43**

Jitka Rychtaříková

DEMOGRAPHIC FACTORS OF AGEING

The article examines the impact of the main determinants of population ageing (fertility and mortality) in the Czech Republic is examined using stable population modelling. Unlike western and northern European countries where decreasing mortality at an older age contributes the most to population ageing, in the Czech Republic population ageing will be additionally influenced by a permanently low fertility level. By 2060, the Czech Republic together with former socialist countries, will rank with the oldest populations worldwide. According to factor analysis, the younger EU populations from former socialist countries currently share more hostile attitudes towards the elderly than their older age-structure counterparts elsewhere.

Keywords: population ageing, Czech Republic, stable population, attitudes towards the elderly **Demografie,** 2011, **53: 97–108**

Natalia S. Gavrilova – Leonid A. Gavrilov

AGEING AND LONGEVITY: MORTALITY LAWS AND MORTALITY FORECASTS FOR AGEING POPULATIONS

The increase in the number of people surviving to an advanced age poses a serious challenge to the government pension systems of industrialised societies. Therefore, accurate estimates of mortality at advanced ages are essentials to improve forecasts of mortality and the population size of the oldest old age group. In this article the authors present some new approaches to mortality and population projections at older ages using Swedish period life table data. Using two simple assumptions about age- and time patterns of mortality change (log-linear decline of mortality over time and exponential growth of hazard rates with age up to very advanced ages), the authors made mortality projections for Swedish males and females for the next fifty years.

Keywords: pageing population, mortality laws, Gompertz-Makeham law, background (component of) mortality, senescent (component of) mortality, mortality at advanced ages, mortality forecast **Demografie,** 2011, **53: 109–128**

Jenny de Jong Gierveld

LONELINESS IN OLDER ADULTS LIVING ALONE IN WESTERN EUROPE

Nowadays, many older adults are living in one-person households. This is positive in that it guarantees autonomy, but negative for social isolation and loneliness. The central research question is which factors enable older adults living alone to alleviate loneliness? The data for this study were drawn from the Generations and Gender Surveys. Women and men aged 60 years and over were selected from two countries. Results showed that more than 50% of people in this age group in each country are moderately or severely lonely. Support provided to (grand)children and the availability of confidants are important elements of an overall package of loneliness-alleviating interactions for older adults.

Keywords: older adults, family, intergenerational support, living alone, loneliness

Demografie, 2011, **53: 129–139**

Iva Holmerová – Monika Válková – Hana Vaňková – Božena Jurašková

SELECTED ASPECTS OF HEALTH AND LONG-TERM CARE FOR THE AGEING POPULATION

The demographic trend of population ageing and the development of health care are two closely linked areas. Transformations are occurring in the epidemiology of illnesses and the significance of chronic illness, especially neurodegenerative, often accompanied by disability. The article summarises the basic factors influencing the provision of care to the very elderly population and the specific needs of seniors during illness and in situations of long-term dependency. It highlights the strong and weak points of the current provision of acute geriatric care and long-term care in the Czech Republic.

Keywords: population ageing, geriatric syndromes, acute geriatric care, long-term care for older people

Demografie, 2011, **53: 140–151**

Michaela Němečková

POPULATION DEVELOPMENT OF THE CZECH REPUBLIC IN 2010

This article describes the demographic situation in the Czech Republic in 2010 and evaluates it in the context of recent development. The study analyses the changes in age and marital status structures and stagnation in fertility, as well as the development of mortality, nuptiality, divorce, and the abortion rate. Migration is also discussed. The analysis is based on data processed by the Czech Statistical Office.

Keywords: demografphic development, population, age structure, nuptuality, divorce, fertility, abortion, mortality, migration, Czech Republic

Demografie, 2011, **53: 185–204**

Zdeněk Dušek – Šárka Šustová

ANALYSING MARITAL STATUS USING MULTISTATE DEMOGRAPHIC MODELLING

The main aim of this article is to present the main results of marital status analysis using multistate demographic modelling in the Czech Republic between 1993 and 2008. First, the authors present the history of the use of multistate demographic modelling, followed by a short introduction to multistate demographic theory is made. Finally, the main results of analysis are stated. Among other findings, the authors present life expectancies according to marital status, the probabilities of transition between different marital statuses, and mean ages at the time of the first and subsequent marriages, divorce, and widowhood.

Keywords: marital status analysis, multistate demography, increment-decrement life tables

Demografie, 2011, **53: 205–214**

Dagmar Bartoňová – Ondřej Nývlt

FAMILY HOUSEHOLDS IN THE LABOUR MARKET: THE ECONOMIC ACTIVITIES OF MOTHERS AND FATHERS BY THE AGE OF THEIR CHILDREN

Households can be viewed from various perspectives. Census households are suitable for providing basic information about the formation and dissolution of households. A household defined as a housekeeping unit includes all the individuals who have an economic interest in the given household. From this point of view we can analyse the economic activity of individual partners in a complete family household or of the father or mother in a lone-parent family household. In the context of work-life balance it is important to analyse the flexibility of work arrangements of each individual parent, especially when mothers take advantage of opportunities for part-time work.

Keywords: family household, dependent children, labour market, economic activity of mothers

Demografie, 2011, **53: 215–222**

Luděk Šídlo

THE AGEING OF PRIMARY HEALTH CARE PHYSICIANS IN THE CZECH REPUBLIC

This article aims to introduce the current situation of the number and age structure of primary care physicians, including an outline of their movement within the system (i.e. incoming and outgoing physicians). It also presents a forecast of future development based on current figures (i.e. if the number of physicians entering and existing the system remains the same for the next thirty years). Above all, the uneven age structure in all branches of activity will be highlighted, which – in combination with low numbers of graduates specialising in the fields of primary medicine – will most likely lead to a significant decrease in the number of primary health physicians within just a few years.

Keywords: primary health care, physicians, age structure, demographic aging, smoothing of demographic curves, demographic forecast

Demografie, 2011, **53: 223–233**

MANUSCRIPT SUBMISSION

The journal accepts manuscripts in print or electronic format accompanied by a cover letter with complete contact information, including an email address.

MANUSCRIPT FORMAT

Articles should not exceed 20 standard pages (1 SP = 1800 characters with spaces) or 36 000 characters with spaces. Submissions to the Discussion and Summaries sections should be a maximum of 8 standard pages and reviews a maximum of 4 standard pages. Along with the manuscript please submit a five-line abstract and a twenty-line summary in English, a complete list of references in alphabetical order, and a brief (five-line) biography about the author with information on the author's specialisation and most important publications. The preferred format for manuscripts is Word, Excel for the source data for tables and figures, and *.tif, *.jpg, or *.eps for illustrations and maps. Manuscript pages should be numbered and tables, figures and illustrations should be numbered consecutively and their placement indicated in the text.

The peer-review procedure is double-blind. Decisions whether to publish are made by the Editorial Board and the author is informed of their decision within fourteen days of the Editorial Board's meeting.

MANUSCRIPT PREPARATION

A. ARTICLES (IN MS WORD)

1. Use the 'align left' attribute to align paragraphs.
2. In-text highlighting (italics, bold) and the use of indexes will be formatted as submitted.

B. FIGURES, ILLUSTRATIONS

1. Figures must be submitted with source data in Excel along with the preferred type.
2. All illustrations – e.g. maps, photographs – should be submitted as a separate file in *.tif, *.jpg, *.eps, with a reference in the text to its placement .

C. REFERENCES AND HEADINGS

Examples of reference formats:

Books

- Roubíček, Vladimír. 1997. *Úvod do demografie*. Prague: Codex Bohemia.
- Hantrais, Linda (ed.). 2000. *Gendered Policies in Europe. Reconciling Employment and Family Life*. London: Macmillan Press.
- *Potraty*. 2005. Prague: Ústav zdravotnických informací a statistiky.

Articles in periodicals

- Bakalář, Eduard and Kovařík, Jiří. 2000. 'Fathers, Fatherhood in the Czech Republic.' *Demografie*, 42, pp. 266–272.

For periodicals that use consecutive page numbering within a volume it is not necessary to indicate the issue number.

Chapter contributions

Daly, Mary. 2004. 'Family Policy in European Countries.' In *Perspectives on Family Policy in the Czech Republic*, pp. 62–71. Prague: MPSV ČR.

Electronic sources

1. Specify the medium (on-line, CD ROM, database, data set, CD)
2. date downloaded [cit. 29. 10. 2005]
3. web address (<http://www.czso.cz>)

Conference papers

Maur, Eduard. '*Problems with the Study of Migration in the Czech Lands in Early Modern History*.' Paper presented at the conference 'The History of Migration in the Czech Lands during the Early Modern Period. Prague, 14. 10. 2005.

References

The list of references must be in alphabetical order. References to two or more works by the same author are listed in order of the year of publication. If two or more publications by one author date from the same year, distinguish between them adding the letter a, b, c, etc. to the year of publication. Example:

Syrovátka, Augustin. 1962a. 'Injuries in the Household.' *Czech Paediatrics*, 17, pp. 750–753.

Syrovátka, Augustin. 1962b. 'Child Mortality from Automobile Accidents in the Czech Lands.' *Czech Medical Journal*, 101, pp. 1513–1517.

In-text references

(*Srb*, 2004); (*Srb*, 2004: pp. 36–37); (*Syrovátka et al.*, 1984).

Table and figure headings

Table 1: Population and vital statistics, 1990–2010

Figure 1: Relative age distribution of foreigners and total population of CR, 31 Dec 2009

ADDRESS OF THE EDITORIAL OFFICE:

Czech Statistical Office
Editorial Office of Demografie
Na padesátém 81, 100 82 Prague 10-Strašnice
Tel: 274 052 834, e-mail: redakce@czso.cz
http://www.czso.cz/eng/redakce.nsf/i/demografie_review_for_population_research

Demografie

Review
for Population Research

Demografie, Review for Population Research
Demografie, revue pro výzkum populačního vývoje

Published by the Czech Statistical Office
Vydává Český statistický úřad

Address of the Editorial Office: Na padesátém 81, 100 82 Prague 10 – Strašnice, Czech Republic
Phone: +420 274 052 834
E-mail: redakce@czso.cz
www.czso.cz

The journal is published quarterly. As of 2011, three issues are published in Czech (articles are accompanied by abstracts and summaries in English) and one issue in English. *Demografie* is published in print format and three months after publication each issue is also released in electronic format on the website of the Czech Statistical Office (http://czso.cz/csu/2011edicniplan.nsf/engp/1803-11).

Subscriptions and orders: Myris Trade, s.r.o., P.O.Box 2, 142 01 Prague 4, Czech Republic, e-mail:myris@myris.cz. Newspaper posting permitted by Czech Post, ref. No. Nov6364/98.

Typesetting: Jana Chocholoušová, DiS.; Helena Knotková, DiS.; Tomáš Kubašta, DiS.
Design and layout: Ondřej Pazdera, DiS.
Print: Czech Statistical Office
Issues of the journal can be bought from the CZSO Publications Shop (58 CZK per copy). The price of an annual subscription is CZK 310 for the Czech Republic, EUR 145 for other countries (postage included).

Index number 46 465, ISSN 0011-8265, Reg. Zn. MK ČR E 4781

Unsolicited manuscripts are not returned to senders.
Number 4/2011, volume 53
This issue was published in December 2011