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Research Article

The Case of the Czech Republic. Determinants of the Recent Favourable Turnover in Mortality

Jitka Rychtaříková

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Max Planck Institute for Demographic Research

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Research Article

The Case of the Czech Republic. Determinants of the Recent Favourable Turnover in Mortality

Jitka Rychtaříková[1]

Abstract

Since the collapse of the socialist system at the beginning of the 1990s, the health situation in the Czech Republic has improved more rapidly than in other CEE countries. Mortality from circulatory diseases decreased significantly at higher ages. The recent decline in mortality is likely to be attributable to technical progress in medical treatment and less affected by the change in lifestyle. While the use of cardiovascular drugs and the number of operations of invasive heart-surgery considerably improved, smoking and alcohol consumption have somewhat augmented at the same time. The recent favourable turnover has currently brought the Czech Republic a little closer to the European average.

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1. Introduction

The theory of epidemiological transition provides a basic framework for investigating patterns of mortality decline during the last two centuries (Omran, 1971). However, since the beginning of the 1970s new phenomena in mortality change (decrease at advanced ages, decline in cardiovascular mortality, lowering of the life expectancy differential between men and women, and the emergence of new communicable diseases including AIDS) have appeared in countries beyond the western border of the Czech Republic. After a delay in the Czech Republic of almost 20 years, this latest developmental stage of mortality change has become visible.

The most frequently investigated determinants of mortality variation are age, sex, and cause. Marital status, educational level, occupational class or regional dissimilarities represent an additional differential perspective. These former factors/variables are useful for evaluating health conditions of population sub-groups. A high level of premature mortality can reflect a lack in health care facilities including modern therapeutic approaches in some areas or a lower standard of living in specific population groups. Different cultures can in various ways utilize new information regarding appropriate medical treatment and/or life style. Another element (not visible at the first glance and acting as a latent factor of mortality change) can also be historical awareness. It is very likely that populations which temporarily deviated from a trajectory of lower mortality regime can revert more quickly to lower mortality settings than populations without this experience. The purpose of this contribution is to begin with a short historical perspective which shows the interwar mortality conditions in the former Czech lands (the current Czech Republic) contrasted with the post-war health situation. However, the focus is on mortality variations in the 1990s compared with the situation in the 1980s. This section deals primarily with the differences in speed of mortality decline in the Czech Republic according to age, sex, cause, and education of populations aged 40 to 84 years. In addition, the impact of the increased use of new medications, modern medical procedures, and surgery (in particular regarding diagnostics and therapy of circulatory diseases) is investigated as well as the role of risk factors and related life styles.

2. Historical perspective of mortality change in the Czech Republic

From the beginning of the 20th century and including the interwar period, mean length of life increased and male and female survival in the Czech Republic was close to the levels observed in France (Figure 1). At that time the Czech lands (Bohemia, Moravia and part of Silesia) belonged among the more economically advanced countries. In

1930, GNP per capita (Note 1) was 720 and productivity in agriculture (Note 2) was 145 (France: 890 and 176 respectively; Austria 715 and 134; Hungary 430 and 78; Poland 420 and 49; and Italy 525 and 73) (Bairoch,1981; Kirk, 1946).

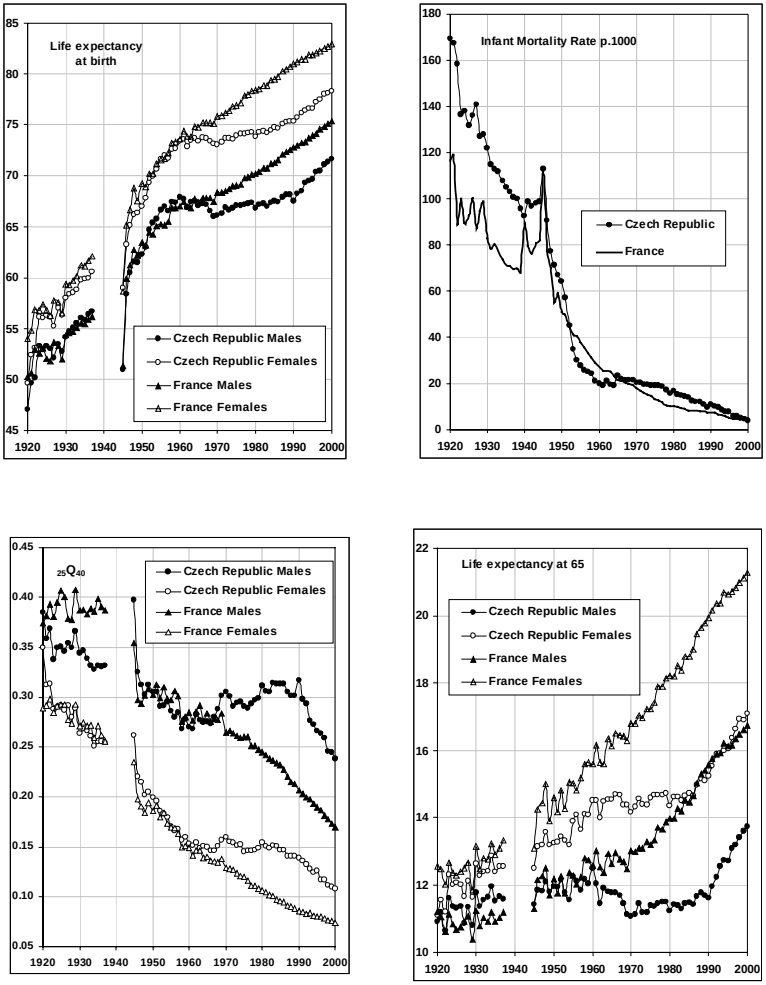


Figure 1: *Development of mortality indicators in the Czech Republic and France since 1920*

After World War II three dissimilar stages in the development of life expectancy at birth became apparent in the Czech Republic: 1) between World War II and the mid-1960s characterized by mortality decrease; 2) from the mid-1960s to the mid-1980s, showing the deterioration of the survival rate; and 3) from the mid-1980s or the beginning of the 1990s to the present with a reappearance of a new decline in mortality.

During the first post-war period (the 1950s), mean length of life increased more rapidly in the Czech Republic than in France. Up to the early1960s life expectancy at birth for Czech females was the same as their French counterparts, but Czech males had a longer mean length of life than French males (Figure 1). This significant decrease in Czech mortality was due to the capability of a socialist country (historically industrialized) to develop rapid coverage of the entire population with basic but comprehensive health services. The "health-extensive approach" - a large number of medical staff with limited expenditures for equipment, drugs and maintenance - was successful in reducing and controlling communicable and infectious diseases among the population as a whole.

The decline/stagnation in health conditions from the mid-1960s to the mid-1980s affected most of the population of Central and Eastern Europe including the Czech Republic. The deterioration was particularly marked for the elderly and middle-aged adults - and primarily for men. A substantial part of the mortality increase was attributable to an "epidemic" of heart diseases. To a lesser degree, an increase in cerebrovascular diseases, lung cancer and cirrhosis of the liver was observed (UNICEF, 2001; Rychtaříková et al, 1989; Rychtaříková, 1997; Vallin et all, 2001). At that time, the gap in life expectancy between the Czech Republic and France began to widen. For example, by the mid-1980s the mortality rate from cardiovascular and cerebrovascular disease was twice as high in the Czech Republic as in France (Rychtaříková et al, 1989). These degenerative diseases required a "health intensive approach" involving specialized training, sophisticated equipment, expensive drugs, and high-cost medical procedures. In spite of growing awareness among the medical profession, the Czech health system was not able to adjust to the changing health needs of the population. Excessive drinking, heavy smoking, environmental contamination, unhealthy diet, and lifestyle represented another set of risk factors responsible for this massive deterioration of health status. However, no completely satisfactory explanation has been given to point out the dominant risk factor of mortality deterioration.

Health conditions had already slightly improved in the Czech Republic in the immediate pre-transition years (1985-1989) and life expectancy at birth began to increase again (Figure 1). The Czech Republic avoided a dramatic increase in the number of deaths (labelled the mortality crisis of the 1990s) observed in most post-communist countries (UNICEF, 1994). The time delay of the Czech Republic in the reduction of mortality rate compared to France has not diminished and life expectancy

at birth has followed an almost parallel trend (Figure 1). In 2002 life expectancy at birth was 72.1 years for men and 78.5 for women (France 75.6 and 82.8). However, the recent increase in life expectancy at birth has currently brought the Czech Republic a little closer to the European average.

Before World War II, infant mortality rate was substantially higher in the former Czech lands than in France (Figure 1). The difference is not easy to explain and it might suggest that Czech lands had a weaker social organization and less efficient health care system of mother/child protection. Contrary to the health situation prior to World War II, the infant mortality rate was lower in the Czech territory than in France during the 1950s. This rapid decrease in infant mortality rate at that time contributed the most to an increase in life expectancy at birth. A particularly active maternity and welfare policy, immunization, and universal access to health care resulted in rapid improvement of infant survival in the Czech Republic. On the contrary, the decline in infant mortality lessened from 1961. A more pronounced downward trend reappeared in the 1970s and has continued through the 1990s. In 2002 the Czech Republic and France experienced the same level of 4.1 infant deaths per 1000 live births. Therefore, infant survival in the Czech Republic is among the highest in Europe (Rychtaříková, 1998; Vallin et al, 2001).

Older age groups show different trends in mortality than infants. Prior to World War II life expectancy at age 65 was longer for males in the former Czech lands than in France and only slightly shorter for women. However, the trend in the Czech Republic reversed at the beginning of the 1960s and an increase in mortality of people aged 65+ was observed between 1960 and 1970 (Figure 1). The reduction in life expectancy at 65 primarily influenced a shortened life expectancy at birth. Almost the same pattern is seen for mortality development in the age group of 40-64 years.

During the 1990s a decrease in mortality in the Czech Republic emerged and was primarily due to the reduction of mortality in the older age group, but with a delay of 25-30 years after the decrease had occurred in Western Europe (Rychtaříková, 1998). Is the Czech recovery during the transition period a manifestation of an "historical" factor/awareness and evidence of a reappearance of historical inequalities in health in Europe? It seems that Central and Eastern Europe has become more heterogeneous in repeating historical inequalities in health conditions. During the transition period, the health situation in the Czech Republic has improved more rapidly than in the other CEE countries. Czech males have clearly benefited from the new health conditions and are the closest to their western counterparts when compared to other Central European countries. Will the upward trend of life expectancy at birth be sustained? Will the import of modern medications and medical technologies be accompanied by a change in dietary habits, reduced smoking, decreased alcohol consumption, and increased physical activity? High mortality populations of former socialist Europe still have a

higher risk of CVD than the "West". The recent favourable development in the "former East" is fragile and can easily be halted by insufficient advances in primary and secondary prevention.

3. Improvement in current Czech mortality

What are the reasons for recent health improvement in the Czech Republic? What ages and causes of death have contributed to the observed amelioration? To answer these questions, the differential in life expectancy between 1985 and 2000 was decomposed into age components and according to cause of death. The pre-transition mortality pattern is represented by the year 1985 and 2000 symbolizes a new health situation in the Czech Republic. Figure 2 illustrates the contributions of specified age groups to the overall time differential in life expectancy. The formulae of Pressat (1985) and Pollard (1988) were used for the following decompositions.

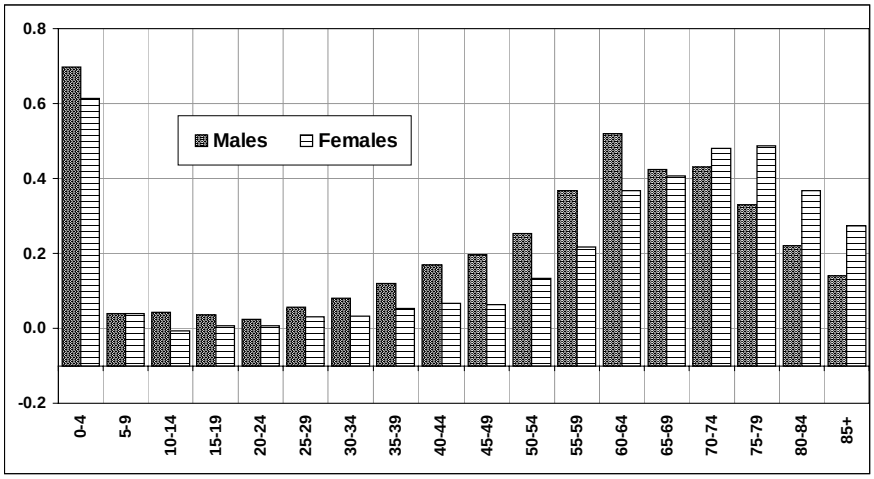


Figure 2: *Czech Republic: Gains in life expectancy at birth between 1985 and 2000 due to mortality change by age*

3.1. Mortality change by age and cause between 1985 and 2000

The age group of 55-79 and the particular group of 60-64 (Figure 2) contributed the most to the improvement of male mortality between 1985 and 2000. These age ranges represent 49.9 and 12.6 percent respectively of total improvement. Similar patterns were observed for females where the gain in life expectancy was due to mortality amelioration at ages 60-84 but primarily in the specific age group of 70-79; (58.0% and 26.6%, respectively). The continuing decline in the infant mortality rate contributed 17% for males and females in the prolongation of life expectancy. The observed favourable change in adult and elderly mortality in the 1990s has a wider impact than a simple lengthening of life expectancy at birth. The improvement has been a qualitative turning point in mortality trends and more closely aligns the Czech Republic to the patterns of low-mortality countries. However, this recovery still lags 20 years behind Western Europe where reduction in mortality at higher ages began in the 1970s. The Czech Republic is currently in the group of European countries with a medium mortality level, i.e., Denmark, Portugal and Ireland (Rychtaříková, 1998). An apparently favourable position of the Czech Republic is evident primarily when compared with other Central and Eastern European countries.

Table 1: *Czech Republic: Gains in life expectancy at birth between 1985 and 2000 due to mortality change by cause and by age groups*

	Males				Females			
cause	0-39	40-64	65+	Total	0-39	40-64	65+	Total
1. Neoplasm of the stomach	-0.002	0.051	0.056	0.106	0.005	0.026	0.056	0.087
2. Neoplasm of the colon, rectum, anus	0.004	0.000	-0.027	-0.023	0.009	0.012	0.008	0.029
3. Neoplasm of larynx and lung	0.014	0.198	0.041	0.252	-0.003	-0.045	-0.043	-0.091
4. b) Neoplasm of prostate (males)	0.001	0.000	-0.025	-0.023	0.019	0.040	-0.011	0.047
5. Remaining malignant neoplasms	0.088	0.001	-0.046	0.042	0.030	0.065	-0.037	0.057
6. Ischemic heart disease	0.051	0.767	0.660	1.477	0.007	0.239	0.727	0.973
7. Other heart diseases	0.010	-0.013	-0.011	-0.014	0.004	-0.002	0.007	0.009
8. Cerebrovascular diseases	0.013	0.251	0.433	0.697	0.013	0.204	0.740	0.957
9. Other circulatory diseases	0.009	0.043	-0.017	0.035	-0.002	0.103	0.007	0.108
10. Influenza and pneumonia	0.032	-0.008	0.043	0.067	0.031	-0.002	0.078	0.106
11. Chronic lower respiratory diseases	0.014	0.100	0.139	0.252	0.004	0.041	0.055	0.100
12. Remaining respiratory diseases	0.017	0.012	0.013	0.042	0.014	-0.005	0.006	0.015
13. Chronic liver disease	0.006	-0.030	0.026	0.003	-0.004	-0.029	0.015	-0.017
14. Remaining digestive diseases	0.040	0.024	0.045	0.109	0.025	0.023	0.056	0.104
15. Transport accidents	-0.092	-0.022	0.004	-0.109	-0.044	-0.003	0.004	-0.043
16. Suicide	0.032	0.034	0.019	0.085	0.032	0.028	0.025	0.084
17. Other external	0.168	-0.004	0.051	0.215	0.067	0.000	0.172	0.239
18. Diabetes mellitus	0.006	0.035	0.034	0.076	0.007	0.050	0.073	0.130
19. Other causes	0.684	0.065	0.102	0.851	0.565	0.101	0.075	0.740
Total	1.094	1.504	1.542	4.139	0.776	0.844	2.013	3.634

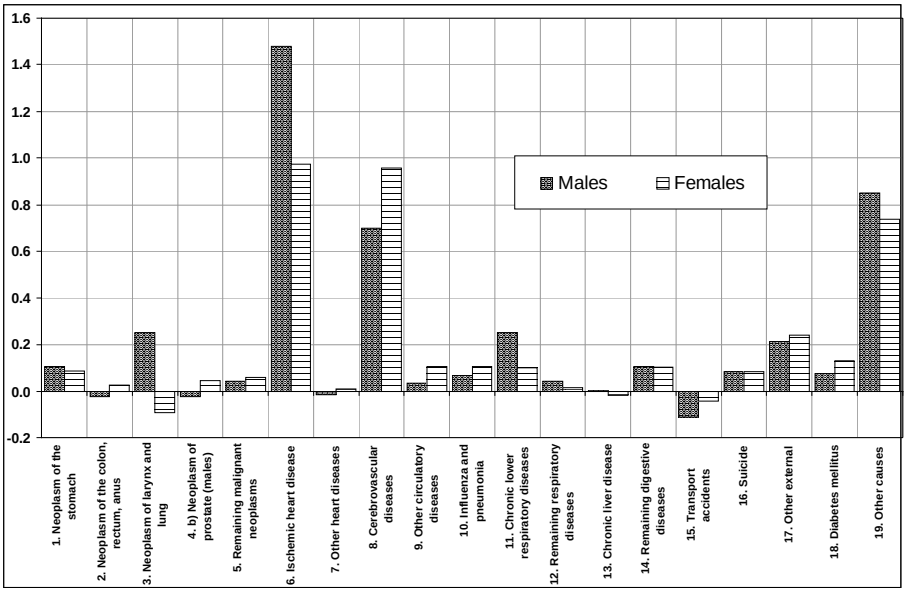


Figure 3: *Czech Repulic: Gains in life expectancy at birth between 1985 and 2000 due to mortality change by cause*

The decrease in advanced ages has been mainly due to diminishing mortality from cardiovascular and cerebrovascular diseases (Figure 3, Table 1). The list of causes and ICD-9 codes valid in the Czech Republic from 1979 to 1993 and ICD-10 codes valid since 1994 are in the Annex. The "cardiovascular" revolution of the West (Vallin et all, 2001) noticed from the 1970s and characterized by a manifest mortality decrease of circulatory diseases has also been observed since the end of the 1980s in the Czech Republic. The decrease in mortality from ischemic heart disease has been initiated primarily by the considerable use of new technologies and practices (heart surgery Table 7, and efficient drugs Figures 11-14) and less by change in negative consumption habits such as alcohol and smoking (Tables 3, 4), the analysis presented later on in detail. For older males and especially for older females the decrease in cerebrovascular diseases has been of particular importance. The decline of cerebrovascular mortality between 1985 and 2000 has resulted in an increase of about 1 year of life expectancy for women and about 0.7 for men. Nevertheless the biggest gains are observed in cases of ischemic heart disease (1.5 years for males and at about 1 year for women).

Malignant neoplasms, as in many European countries, have not shown a particular trend; although some amelioration has been seen for neoplasms of the larynx and lung (males) and for neoplasm of the stomach. There has been, however, a noted rise in mortality in young people due to transport accidents, but has not greatly influenced life expectancy at birth. Collapsing ages into three main groups of 0-39; 40-64; and 65+, the current favourable turnover in mortality pattern by cause is related to an important decrease in the age groups of adults (40-64) and the elderly (65+). In spite of the lower mortality level in the age groups of 40-64 compared with 65+, the contributions are almost equal for males (1.5). Female prolongation of life is predominantly attributable to mortality decrease in the age group of 65+.

3.2. Speed of mortality decline through five time periods

In order to conduct a more in depth study of mortality focusing on the role of education and medical cause of death as differentiating factors of the speed of mortality decline, five time periods have been utilized: 1982-1983; 1984-1985; 1995-1996; 1997-1998; 1999-2000. For these periods mortality data have available information on education on the death certificate. Regarding population distribution by sex, age, and education, data from the censuses of 1980 and 1991 were used (data from the 2001 census are not yet available). The relative frequencies of four categories of education within each age group were estimated: Basic (9 years of school), Vocational (12 years of school), Secondary (at least 12 years of schooling resulting in a ”Maturita” certificate), and University. The proportions (relative frequencies) were calculated for each generation (birth cohort) and applied to population distribution by age and sex on 1st January of 1983; 1985; 1996; 1998, and 2000. These years represent mid-year populations for the above-mentioned two-year time periods. The data deal with the five-year age groups of 40 to 84. Educational level is a reliable variable because it does not change after the age of 40. Sex and age-specific death rates according to education were computed. To measure the speed of mortality decline the rates were transformed to natural logarithms. The average value (i.e., geometric mean) was estimated from five values (corresponding to the five time periods) for each age group. Deviations of individual values from the average within the same age group measure the speed of mortality decline.

The 1980s (1982-1983 and 1984-1985) clearly differ from the 1990s (1995-1996, 1997-1998, 1999-2000) for both males and females (Figure 4). While three curves of deviations referring to the 1990s show continuous mortality decline through 1995-2000, the mortality indices of the 1980s are almost at the same level and reflect a stabilized higher level of total mortality. The speed of decline through time is primarily the same

for each age group. However, slightly increased values in the 1980s confirm that survival in the 1990s increased slightly faster for the older age groups.

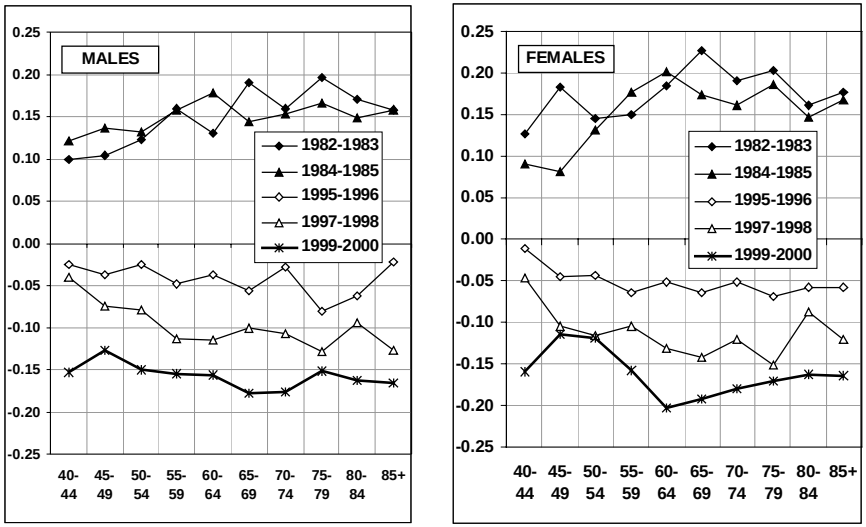


Figure 4: *Czech Republic: Relative deviations from average for a given age in five time periods. Total mortality.*

Mortality from malignant neoplasms does not display any time trend or any specific age profile (Figure 5). This result is in line with the previous investigation dealing with gains in life expectancy decomposed by cause. The absence of a significant change of cancer mortality in the Czech Republic is also observed in most European countries (Vallin et all, 2001).

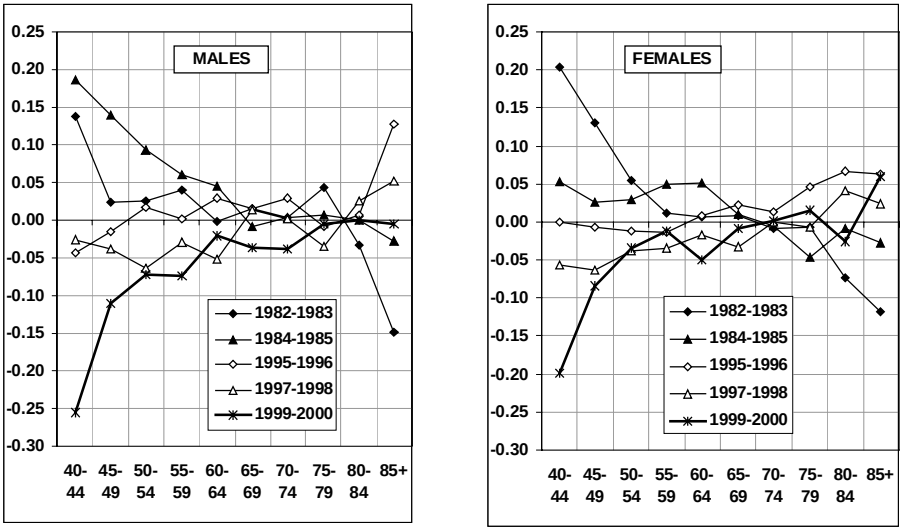


Figure 5: *Czech Republic: Relative deviations from average for a given age in five time periods. Mortality from malignant neoplasms*

Using the deviations, circulatory diseases that contributed the most to prolong life expectancy at birth show the same trend of decrease between the 1980s and the 1990s (Figure 6). Ischemic heart disease and cerebrovascular disease indices of the 1980s are very distinct when compared with the 1990s. While curves of deviations regarding ischemic heart mortality exhibit a continuous decline through the 1990s, the change in cerebrovascular mortality (Figure 7) suggests a clear time break between health conditions in the 1980s and the 1990s. The excess mortality due to heart attack and to some extent due to cerebrovascular diseases was important in the pre-retirement age in the 1980s.

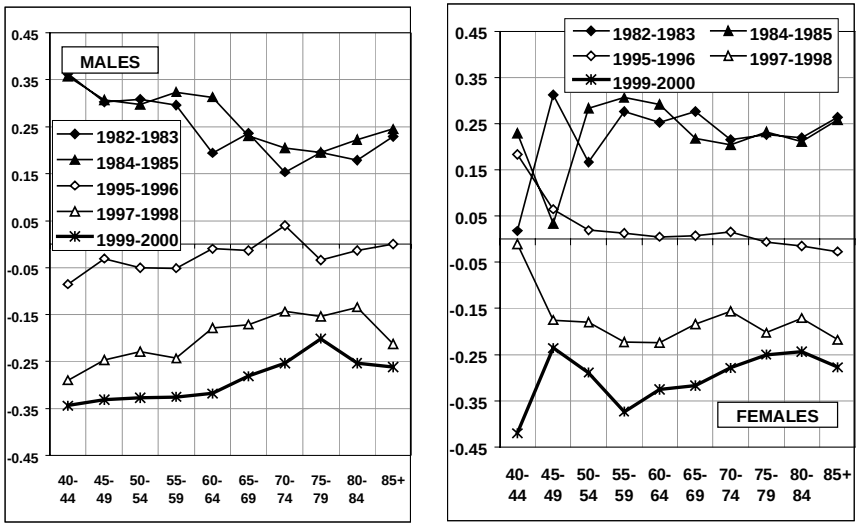


Figure 6: *Czech Republic: Relative deviations from average for a given age in five time periods. Mortality from ischemic heart disease*

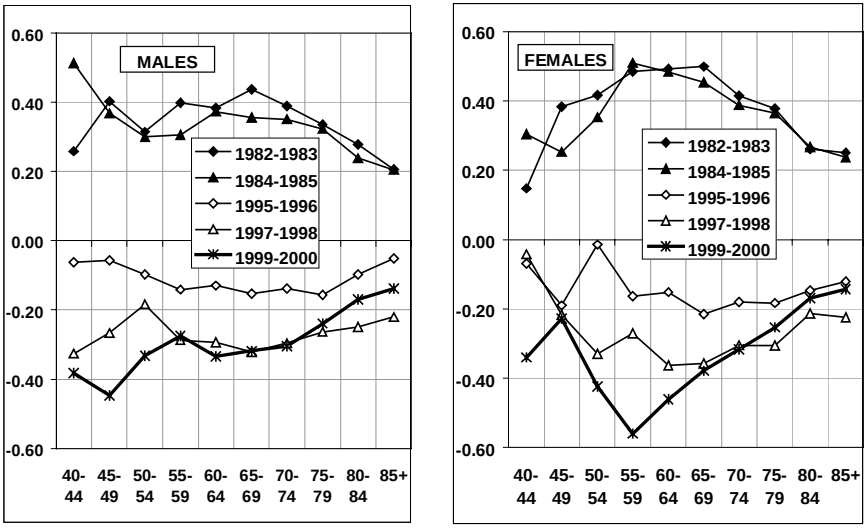


Figure 7: *Czech Republic: Relative deviations from average for a given age in five time periods. Mortality from cerebrovascular disease*

Educational level can be considered as a proxy for the socio-economic position/class. Higher education enables not only better working conditions, but also influences lifestyle. However, the level of acquired education can be dependent on the health situation. In spite of low social differentiation in former socialist societies and universal access to free health services, differences in mortality according to education were observed (Sobotík, Rychtaříková, 1992). University graduates experienced better health conditions than people with only basic education and having higher mortality. The difference in mortality rate was mainly significant in the younger age groups, but converged in the older age groups (Figure 8). This discrepancy can be explained by the fact that older generations completed their education before World War II and often held higher occupational positions regardless of educational level. However, younger people educated during the socialist era had to have a specific diploma for specific occupations. In other words, there were more favourable working conditions for the group of older generations with only basic education, and this situation markedly contributed to their improved health indicators.

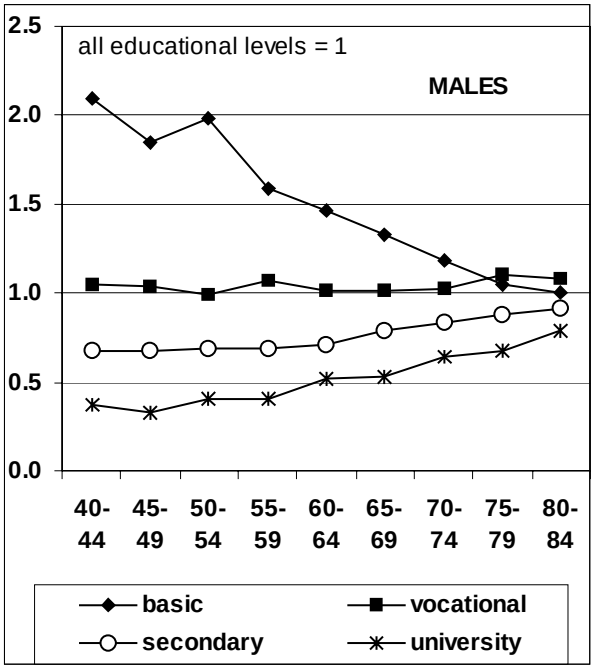


Figure 8: *Excess mortality by education*

Inequalities in mortality according to education are also visible in the data from the Table 2. Excess mortality for males and to a lesser extent for females with basic education is particularly striking at the beginning of the 1980s as well as at the end of the 1990s. When comparing 1982-1983 with 1999-2000, the less improved health situation can be observed for females with vocational education, while people with higher education experienced more important decrease in mortality (Table 2). However, the absolute difference in death rates by education between 1982-1983 and 1999-2000 was almost the same for each educational level in males, but less pronounced for females with vocational and secondary educational attainment. Mortality decline at higher values (populations with lower education) was slower in relative terms but more human lives were saved from the absolute level perspective. The pattern of overall mortality change was primarily due to the changes in mortality from cardiovascular and cerebrovascular diseases (Table 2). The decreased risk for ischemic heart diseases and cerebrovascular diseases was particularly striking for university graduates (half of the 1982-1983 level) while there was "only" a one-third decrease in people with the lowest attained education. Favourable mortality development was also observed in women with basic education. Regarding the number of saved lives (per 1 person at each educational level), the differences are indiscernible among individual educational categories.

Table 2: *Czech Republic: Mortality by education. Standardized death rates (European standard)*

MALES							FEMALES						
MORTALITY from ALL CAUSES						Difference	MORTALITY from ALL CAUSES						Difference
	1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000		1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000
basic	35.0	36.5	33.7	31.3	28.9	6.1	basic	17.4	17.2	13.7	12.6	11.7	5.7
vocational	30.0	27.5	23.7	23.4	22.7	7.3	vocational	14.3	13.1	12.7	12.8	12.7	1.7
secondary	25.0	25.9	19.3	18.1	17.2	7.8	secondary	13.5	15.7	11.9	11.0	11.0	2.5
university	18.4	17.8	13.6	12.8	12.5	5.9	university	12.1	11.1	8.7	8.0	7.5	4.6
total	29.8	29.6	24.1	22.8	21.6	8.2	total	16.5	16.2	13.0	12.2	11.6	4.9
MORTALITY from ISCHEMIC HEART DISEASES							MORTALITY from ISCHEMIC HEART DISEASES						
	1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000		1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000
basic	9.1	9.9	8.8	7.3	6.3	2.7	basic	4.1	4.1	3.4	2.8	2.5	1.6
vocational	8.4	7.9	6.3	5.7	5.4	3.0	vocational	3.2	3.0	2.8	2.5	2.4	0.9
secondary	7.7	8.3	5.3	4.5	4.2	3.5	secondary	2.8	3.3	2.5	2.1	1.9	0.9
university	5.7	5.7	3.9	3.2	3.1	2.6	university	2.6	2.2	1.9	1.5	1.1	1.5
total	8.2	8.5	6.5	5.6	5.1	3.1	total	3.9	3.8	3.1	2.5	2.3	1.5
MORTALITY from CEREBROVASCULAR DISEASES							MORTALITY from CEREBROVASCULAR DISEASES						
	1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000		1982-1983	1984-1985	1995-1996	1997-1998	1999-2000	1982-1983 1999-2000
basic	5.3	5.3	3.8	3.3	3.3	2.0	basic	3.7	3.6	2.2	1.9	1.9	1.8
vocational	4.9	4.4	2.9	2.5	2.7	2.2	vocational	2.9	2.6	1.9	1.7	1.8	1.1
secondary	3.8	3.8	2.3	2.0	1.9	1.9	secondary	2.3	2.8	1.5	1.4	1.5	0.8
university	3.0	2.7	1.6	1.4	1.4	1.6	university	2.4	1.8	1.1	1.0	1.1	1.3
total	4.7	4.6	2.9	2.5	2.5	2.2	total	3.5	3.4	2.0	1.8	1.8	1.7

Age profiles of mortality change showed that the speed of decline was more significant for males (Figure 9) with university or secondary education. However, men having only a basic education have not benefited from mortality amelioration occurring in the 1990s in the Czech Republic (Figure 9). A similar pattern of no relative improvement is also visible for men in pre-retirement age groups and having vocational training, while those with only basic education experience an unfavourable health situation during their entire life. In the 1990s men at the age of 65+ and with vocational and secondary education had a longer life than in the 1980s (Figure 9).

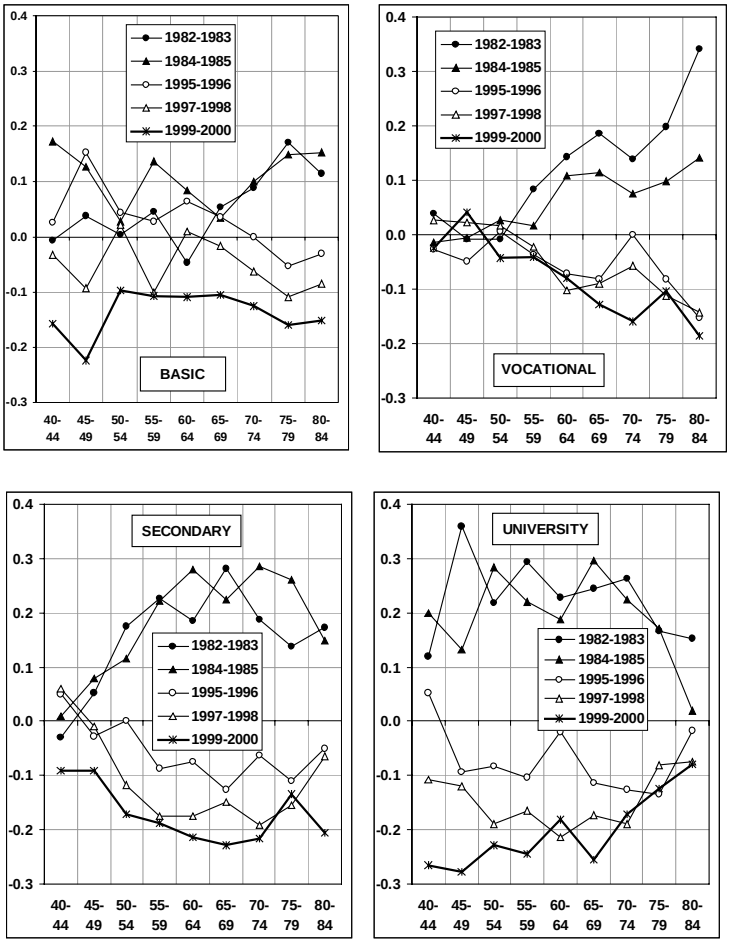


Figure 9: *Czech Republic: Relative deviations from average for a given age in five time periods. Male mortality by education*

For females, the patterns are less clear. The information on women's education is less expressive in demographic analyses because the indicators are significantly correlated with a partner's level of education (Figure 10). Unlike men, women with basic education have benefited from improvements in health conditions in the 1990s (Figure 10). The progress for women with a university degree or secondary education is

observable. On the contrary, those with vocational training do not show any specific decline in mortality (Figure 10).

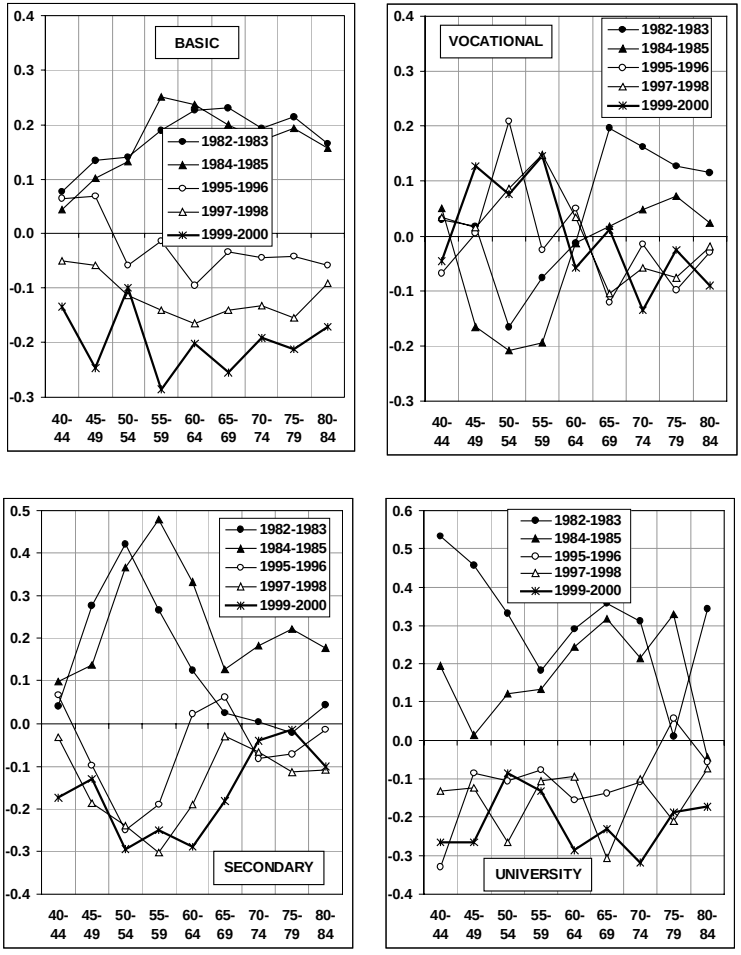


Figure 10: *Czech Republic: Relative deviations from average for a given age in five time periods. Female mortality by education*

4. Has new lifestyle or new medicine driven the recent health transition of the Czech Republic?

The change in lifestyle of western populations is considered as a major determinant of mortality decrease during the fourth stage of the epidemiological transition. People in former communist countries of Central and Eastern Europe had experienced unhealthy lifestyles (heavy smoking and drinking, diet based on saturated fat, etc.) and outdated diagnostic and medical technologies including medications. The Czech Republic, as regards harmful lifestyles, an obsolete health care system, and a high circulatory mortality, belonged to the former socialist settings. The end of the Communist era was the beginning of a new social, political, and economic stage. The open market has given way to imports from the West, including access to healthier food (fruits, vegetables), and wider variety of foodstuffs. The health care system has also been transformed particularly in the area of prevention, diagnostics and therapy, including cardiovascular pharmacotherapy, cardiological procedures, and cardiac surgery (Bruthans 2000).

However, the increased risk of cardiovascular diseases and many others is associated with risk factors such as hypertension, high blood cholesterol levels, and obesity or overweight. A healthy lifestyle can modify the effect of the aforementioned risk factors and consequently decrease morbidity and mortality levels.

4.1. The role of lifestyle

Smoking injures blood vessel walls and speeds up the process of hardening of the arteries. Cigarette and tobacco use doubles the risk of heart attack and the chance of suffering a stroke. According to the data on consumption per capita of cigarettes (Table 3), there has not been a decrease in the Czech Republic during the 1990's. MONICA surveys (Table 4) have shown a slightly more optimistic perspective, i.e., a decrease in the percentage of male smokers. However, this trend was reversed in the second half of the 1990's.

Table 3: *Czech Republic: Per capita consumption of the most important kinds of food and cigarettes*

Indicator		Unit	1985	1990	1995	1997	1998	1999
Meat, total[1]		kg	89.3	96.5	82.0	81.5	82.1	83.0
	Pork	kg	43.9	50.0	46.2	45.8	45.7	44.7
	Beef	kg	29.5	28.0	18.5	16.1	14.3	13.8
	Veal	kg	0.8	0.4	0.3	0.3	0.3	0.2
	Poultry	kg	10.6	13.6	13.0	15.3	17.9	20.5
Fish, total		kg	5.6	5.4	4.9	5.5	5.3	5.2
Fats and oils[2]		kg	23.8	25.2	22.7	23.0	23.4	23.1
Lard and bacon		kg	6.5	6.9	5.2	5.1	5.1	5.0
Butter		kg	9.7	8.7	4.5	4.1	4.0	4.0
Vegetable edible fats and oils		kg	11.0	12.8	15.4	16.2	16.7	16.4
Milk and milk products[3]		kg	252.2	256.2	187.8	195.2	197.1	207.3
Milk		l	103.1	91.5	64.6	57.7	58.1	58.4
Cheese		kg	6.8	7.7	6.5	8.6	8.8	9.3
Curd and cottage cheese		kg	4.4	4.6	2.8	2.9	3.2	3.7
Eggs		pieces	337.0	340.0	290.0	311.0	319.0	297.0
Cereals[4]		kg	157.4	155.5	160.8	141.3	136.2	135.2
Wheat flour		kg	82.0	85.8	88.1	86.0	85.3	86.3
Rolls, pastries, cakes and biscuits, of wheat		kg	32.5	32.5	42.1	42.0	41.6	41.8
Pasta		kg	2.7	3.5	3.8	4.7	5.1	5.6
Rye flour		kg	22.9	21.8	20.0	15.0	12.7	11.0
Bread		kg	57.0	54.4	58.5	56.1	55.4	55.2
Rice		kg	3.6	4.3	4.4	4.2	4.5	4.3
Sugar		kg	36.6	44.0	38.9	39.1	37.6	37.1
Chocolate sweets, chocolate, cocoa		kg	3.8	4.1	4.8	4.8	4.8	4.8
Chocolate-free sweets		kg	3.2	2.9	2.7	2.5	2.5	2.4
Potatoes		kg	81.9	77.9	76.5	76.0	76.1	75.9
Pulses		kg	1.3	1.7	1.9	1.9	2.0	2.0
Vegetables valued as fresh		kg	68.1	66.6	78.0	81.1	82.2	85.3
Fruit valued as fresh		kg	61.6	59.7	72.1	71.5	72.5	75.6
	Citrus fruits	kg		11.5	15.4	15.4	14.9	14.0
Coffee (roasted)		kg	1.7	1.8	2.3	2.5	2.5	2.6
Tea		kg	0.2	0.2	0.3	0.3	0.3	0.3
Alcoholic beverages[5]		l	9.0	8.9	9.4	9.8	9.8	9.9
Spirits (40 %)		l	6.6	7.2	7.9	8.3	8.2	8.3
Beer		l	146.9	155.2	156.9	161.4	161.1	159.8
Wine		l	15.3	14.8	15.4	15.9	16.0	16.1
Non-alcoholic beverages		l	94.4	110.1	121.3	147.0	158.0	180.0
	Mineral water	l		16.0	18.0	26.0	35.0	41.0
Cigarettes		pieces	1877	2151	2185	2354	1852	2090

Notes:
[1] Beef, veal, pork, mutton; goat, horse and rabbit meat; poultry and game in terms of carcass weight, incl. offal
[2] In terms of net fat
[3] In terms of milk, excl. butter
[4] In terms of grain
[5] In terms of pure ethanol (100 %)
Source: Statistická ročenka České republiky, (Statistical Yearbook of the Czech Republic), ČSÚ, Praha 2001. Statistická ročenka Československé socialistické republiky 1987, Federální statistický úřad, Český statistický úřad, Slovenský štastistický úřad, Praha 1987

Alcohol abuse can raise blood pressure. Excessive alcohol intake increases the risk of stroke and also harms the liver, brain, and heart. One drink a day for women and two drinks a day for men are not considered to be harmful. The consumption per capita of alcohol (Table 3) displayed a continuous increase during the 1990's in the Czech Republic, irrespective of the kind of alcoholic beverage. In 1993, average alcohol consumption exceeded the EU average.

Eating habits are rooted in local culture and food production. The last decade differed from the former socialist times by more variation in foodstuffs due to increased imports to the Czech Republic. Table 3 shows an increased consumption of vegetables, fruits, poultry, and vegetable edible fats and oil with a decreasing consumption of butter, lard, eggs, and beef. A positive element is that the current Czech diet has seen a reduction in the amount of saturated fats. However, the overall structure of food consumption is still far from being a healthy eating regime. Too high consumption of saturated fats, decreased amount of milk (in particular women) and cereals (mostly males) places the Czech Republic closer to the „Northern European eating model" as opposed to the Southern European model that is rich in vegetables and fruits. As a result, an increased body mass index for males and a constant BMI for females has been observed in the Czech population. Average value of BMI places the Czech population into the overweight category (Table 4). According to the survey conducted in 1996 by the Institute of Health Statistics and Information (ÚZIS), 10,1% males and 12,1% females were obese with a BMI of greater than 30. A diet relatively rich to saturated fats leads not only to obesity but also affects cholesterol levels.

Table 4: *Risk factors of cardiovascular diseases according to MONICA surveys in 6 districts of the Czech Republic*

	1985	1988	1992	1997/98	2000/01
Males					
n (sample size)	1253	1357	1134	969	1012
Respondence, %	81.5	85.5	73.2	63.4	62
BMI (Body Mass Index)	27 ± 4	27,7 ± 3,8	27,1 ± 3,8	27,5 ± 3,8	28,1 ± 4,4
Systolic Blood Pressure, mmHg	135,8 ± 19,18	134,9 ± 19,24	134,2 ± 20	132,3 ± 16,91	131,9 ± 16,77
Diastolic Blood Pressure mmHg	85,9 ± 11,02	84,4 ± 11	86,1 ± 11,36	84,5 ± 10,04	83,79 ± 9,65
Total cholesterol mmol/l	6,21 ± 1,29	6,29 ± 1,21	5,98 ± 1,3	5,65 ± 1,14	5,88 ± 1,08
HDL-cholesterol, mmol/l ("good")	1,35 ± 0,36	1,33 ± 0,32	1,34 ± 0,49	1,28 ± 0,32	1,25 ± 0,32
LDL-cholesterol, mmol/l ("bad")	4,85 ± 1,35	4,96 + 1,26	4,65 + 1,33	4,36 + 1,16	4,63 + 1,11
Smokers (%)	49.2	44.9	43.9	36.8	37.8
Females					
n (sample size)	1317	1411	1209	1021	1066
Respondence, %	81	88.4	76.7	66.2	63.8
BMI (Body Mass Index)	27,3 ± 5,4	27,7 ± 5,4	26,9 ± 5,3	27,1 ± 5,5	27,3 ± 5,7
Systolic Blood Pressure, mmHg	131,6 ± 20,19	130,7 ± 20,91	130,2 ± 22,04	125,2 ± 18,05	125,9 ± 18,78
Diastolic Blood Pressure mmHg	82,5 ± 11,25	81,4 ± 11,19	82,5 ± 12,13	79,3 ± 9,79	79,3 ± 9,8
Total cholesterol mmol/l	6,18 ± 1,26	6,22 ± 1,21	5,95 ± 1,29	5,53 ± 1,21	5,82 ± 1,13
HDL-cholesterol, mmol/l ("good")	1,57 ± 0,36	1,56 ± 0,34	1,53 ± 0,46	1,50 ± 0,36	1,49 ± 0,38
LDL-cholesterol, mmol/l ("bad")	4,61 ± 1,29	4,66 + 1,26	4,44 + 1,32	4,03 + 1,24	4,33 + 1,18
Smokers (%)	27.6	26.6	28.9	25.9	25.6

Notes:
BMI: Normal weight = 18.5-24.9
Overweight = 25-29.9
Obesity = BMI of 30 or greater
Normal blood pressure is less than 130 mm Hg systolic and less than 85 mm Hg diastolic
Optimal blood pressure is less than 120 mm Hg systolic and less than 80 mm Hg diastolic
Total cholesterol: less than 5.2 desirable, more than 6.2 high
HDL (High-density lipoprotein): more than 1.5 optimal, more than 6.2 high
LDL (Low-density lipoprotein): less than 2.6 optimal; more than 4.2 high
Population aged of 25-64 years
Districts: Praha-východ, Cheb, Chrudim, Jindřichův Hradec, Benešov, Pardubice
MONICA: Multinational Monitoring of Trends and Determinants in Cardiovascular Disease
Table compiled by J.Bruthans

High blood cholesterol is one of the major risk factors for heart disease and a decreased cholesterol level is important for everyone. The results from MONICA surveys not only give us the values for total cholesterol but also for LDL and HDL. High levels of LDL (bad) cholesterol increase cholesterol buildup and blockage in the arteries. HDL (good) cholesterol helps prevent it from building up in the arteries and therefore provides protection from heart disease. Higher numbers of HDL and lower numbers of LDL are better. The first half of the decade shows a decrease in the total cholesterol level and a reversal in the second half (Table 4). Both types of cholesterol contributed to the change in the trend, i.e., the decrease of LDL accompanied by an increase of HDL in the first time period (positive trend) and an opposite (negative) trend in the second half of the decade. It is very likely that the import of a new variety of foods promptly led people to consume more vegetables, citruses and lower saturated fats, and available at lower prices than prior to 1989. However, most of the negative components of the Czech diet have been preserved and the positive change in a diet style has not been maintained. The total cholesterol level (5.9 males and 5.8 females) exceeds the desirable level of 5.2 (Table 4).

4.2. The role of medicine

Improvements in early detection and therapy, including a decrease in mean blood pressure levels and blood cholesterol levels, lower not only risks of heart disease and stroke but also related mortality. The proportion of total expenses on health care to the gross domestic product was continually increasing during the 1990's (Table 5). According to the data of the State Institute for Drug Control, the volume of distributed medicaments in the period 1990-2000 increased on the scale of defined daily doses per 1000 inhabitants per day (ddd/1000/d) from 864 to 1125 (Table 5). While the number of hospitalizations per 100 000 inhabitants for all diseases has become stable, the average duration of stay in a hospital has shortened (Table 5). This trend indicates practicing more efficient health care because mortality has significantly decreased. The reduction of days spent in a hospital is also evident in cases of hospitalization for myocardial infarction. For this diagnosis not only duration of hospitalization has decreased but also the number of cases (Table 6). In particular, males from 50 to 69 years of age have shown a very pronounced drop in hospitalization. This tendency is combined with the remarkable decline of mortality from ischemic heart diseases, especially for males (Table 1). It can be assumed that not only mortality but also morbidity requiring hospital care has been reduced for acute forms of cardiovascular diseases. However, chronic forms of circulatory diseases have not decreased (Bruthans, 2000) and they will be very likely progressing in the future. A distinct situation has

been found in cerebrovascular diseases where mortality has also declined but hospitalization and the number of days spent in a hospital has not changed (Table 6).

Table 5: *Health care indicators in the Czech Republic in the 1990's*

	Proportion of total expenses on health to the GDP in %	**Volume of distributed medicaments in DDD/1000/d**		**Cases of hospitalization per 100 000inhabitants**	**Average duration of stay in days in a hospital**		
					all diseases	myocardial infarction	cerebrovascular diseases
Year							
1990	4.99	864	1981	18565	16.3		
1991	5.24	678	1986	18544	13.5	18.4	17.5
1992	5.42	689	1992	17369	11.8	16.8	18.0
1993	7.16	756	1993	18191	11.6	16.5	17.4
1994	7.31	911	1994	19841	10.3	14.6	16.3
1995	7.29	945	1995	20733	9.5	12.6	15.1
1996	7.06	986	1996	20630	9.2	11.5	13.9
1997	7.08	1045	1997	20334	8.7	12.0	13.7
1998	7.07	1105	1998	21151	8.1	10.5	13.8
1999	7.15	1188	1999	20803	7.9	9.8	13.5
2000	7.24	1196	2000	21203	7.9	8.9	14.3
2001	7.40	1125					

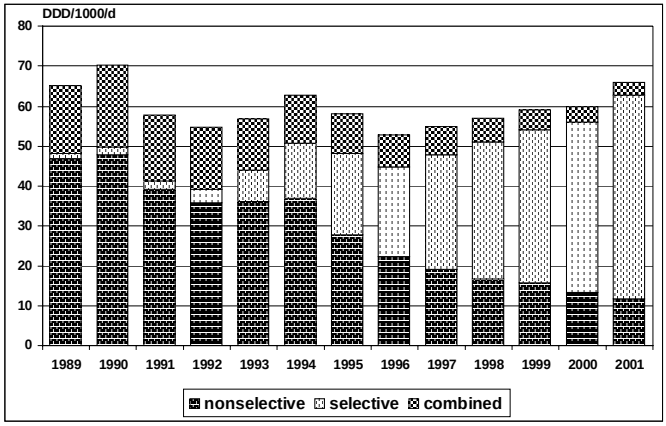
Notes:
GDP: Gross domestic product
DDD/1000/d: Defined daily doses per 1000 inhabitants per day
Source: UZIS (Institute of Health Information and Statistics of the Czech Republic)

Table 6: *Cases of hospitalization by age per 100 000 inhabitants in the Czech Republic*

	for myocardial infarction (410/I21-22) age groups						for cerebrovascular diseases (430-438/I60-69) age groups					
	0 - 49	50 - 59	60 - 69	70 - 79	80 +	Total	0 - 49	50 - 59	60 - 69	70 - 79	80 +	Total
Year			MALES						MALES			
1986	73	868	1322	1580	1229	348	73	906	1724	3248	4480	510
1992	69	696	1210	1630	1550	324	82	827	1808	3384	5269	533
1993	62	635	1147	1626	1649	310	78	786	1799	3447	5436	536
1994	60	610	1099	1558	1599	301	70	686	1680	3393	5596	515
1995	66	593	1128	1672	1792	318	76	722	1744	3477	5969	544
1996	61	592	1107	1678	1637	313	68	787	1876	3629	6108	572
1997	49	471	847	1314	1453	252	62	726	1827	3614	6121	561
1998	49	492	885	1380	1438	265	65	782	1989	3888	6488	609
1999	49	461	860	1288	1357	257	64	757	1945	3777	6141	599
2000	50	472	885	1365	1604	273	61	736	1876	3840	6574	609
			FEMALES						FEMALES			
1986	14	236	541	911	788	182	45	441	1030	2556	3701	487
1992	17	216	602	1028	1108	206	53	424	1130	2694	4597	543
1993	16	200	549	1044	1114	201	50	428	1146	2722	4723	557
1994	14	179	519	925	1170	190	43	363	1043	2596	5057	544
1995	14	188	520	985	1221	199	48	373	1070	2735	5183	570
1996	15	153	485	1008	1258	196	45	390	1172	2945	5680	616
1997	10	129	417	827	1075	165	44	375	1123	2912	5651	606
1998	9	130	396	827	1037	162	43	385	1205	3105	6156	648
1999	9	127	388	791	1020	159	42	380	1148	3069	5763	630
2000	9	124	375	851	1100	168	42	368	1096	3051	6279	648

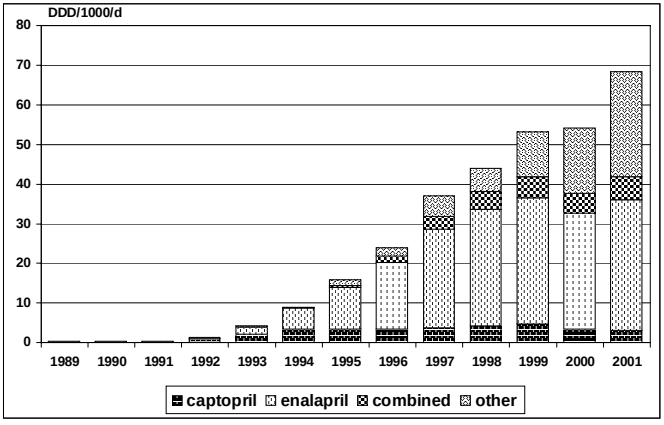
Source: UZIS

The changes in the health care system in the Czech Republic after 1989 have been particularly observable in the development of prevention and therapy of circulatory diseases. The improvement of diagnostics has been accompanied by better therapy, including the swift development of invasive cardiologic procedures, cardiac surgery, and modern, more efficient medications.



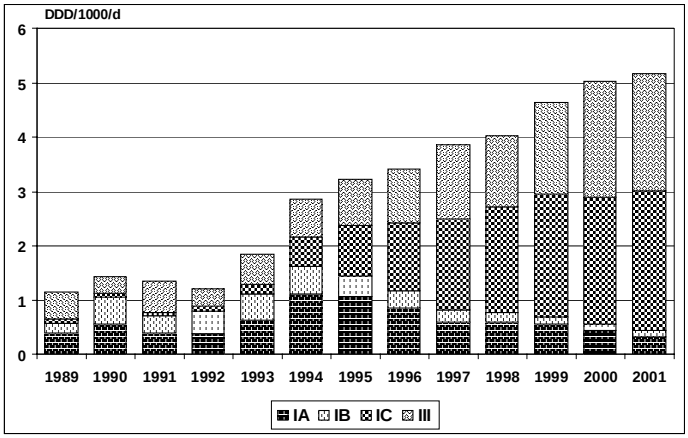
DDD/1000/d: Defined daily doses per 1000 inhabitants per day

Figure 11: *Use of Beta Blocker drugs in the Czech Republic*



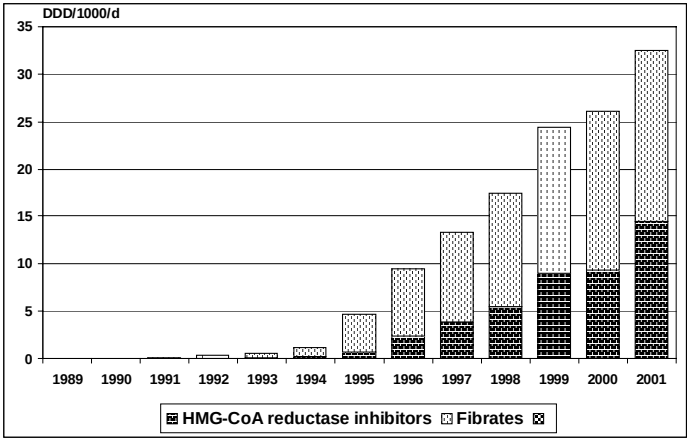
DDD/1000/d: Defined daily doses per 1000 inhabitants per day

Figure 12: *Use of ACE inhibitor drugs in the Czech Republic*



DDD/1000/d: Defined daily doses per 1000 inhabitants per day

Figure 13: *Use of antiarrhythmic drugs in the Czech Republic*



DDD/1000/d: Defined daily doses per 1000 inhabitants per day

Figure 14: *Use of antihyperlipidemic drugs in the Czech Republic*

The new generations of beta blockers (selective) have been increasingly used for treatment of both hypertension and myocardial infarction (Figure11). Angiotensin converting enzyme (ACE) inhibitors and other modern antihypertensives are currently utilized (Bruthans 2000). They widen or dilate blood vessels to improve the amount of blood circulation, lower blood pressure, and in most indications decrease mortality. Classical antihypertensives (diuretics, or Ca channel blockers of the first generation) have been prescribed less and have been replaced by more effective medications. Antiarrhythmics (used to treat abnormal heart rhythms or to correct irregular heartbeats) have changed the spectrum (Figure 13). More advanced classes (III, IC) have been increasingly applied than the earlier less effective classes IA or IB. The preventive therapy also started using more antiaggregants and anticoagulants for treatment of arrhytmia, heart failure or ischemic heart disease (Bruthans 2000).

The use of cholesterol lowering drugs (antihyperlipidemics) has grown rapidly in the Czech Republic since the mid-1990's (Figure 14). They lower LDL, 'bad' cholesterol, and have a mild effect in raising HDL, the 'good' cholesterol. These drugs are the first line of treatment for most people with high cholesterol. However, cholesterol-lowering medicine is most effective when combined with a low-cholesterol diet. The recent Czech development of consumption does not offer an optimistic prognosis.

In addition to the rapid use of modern medications, the fast increase has also been observed in the number of non-surgical procedures and cardiac surgery (Table 7). Angioplasty (balloon angioplasty or stents) as non-surgical procedures (used for opening blocked heart arteries) are currently provided not only for preventing heart attack but also for the treatment of myocardial infarction. Coronary artery bypass graft surgery (CABG) or other cardiac surgery, practised to a limited extent before 1990, has become a regular solution for the repair of blocked arteries.

Table 7: *Czech Republic*

	Invasive cardiology procedures			Cardiac surgery	
	PTCA	PTCA*	Stents	CABG	other
1989	120		0	703	907
1990	200		0	677	879
1991	310		0	736	921
1992	601		0	798	1 027
1993	919		0	1 138	1 318
1994	1 157		46	1 784	1 659
1995	1 829		289	2 372	1 636
1996	3 481		1 842	3 222	1 821
1997	5 262	651	3 507	4 044	1 899
1998	6 558	920	4 490	4 525	1 938
1999	7,663	1,737	5335	4 882	1 986
2000	9,517	1,955	6613		

Notes:
PTCA: coronary angioplasties
PTCA*: coronary angioplasties used for treatment of AIM
Stent: a small, expandable metal scaffold insetrted into the artery and expanded
CABG: coronary artery by pass grafting
Other: other cardio-surgery operations
Source: J. Bruthans: Zpráva o vývoji kardiovaskulárních onemocnění v České republice po roce 1989. ISBN 80-7262-055-X

Under central planning, the typical health system consisted in many hospitals per thousand of population, patients were more frequently referred to hospitals, and stayed in hospitals for longer periods. Medical technologies and medications were outdated. Primary health care (general practitioners/family doctors) was less developed compared with Western Europe. The new restructuring of the public health system since the 1990s, evident from above figures, has significantly contributed to improve health outcomes in the Czech Republic.

5. Conclusion

In the Czech Republic from the beginning of the 20th century and during the interwar period, mean length of life increased and was close to the levels observed in France. During the post-war period, in particular from the mid-1960s to the mid-1980s, deterioration of the survival rate was observed. Forty-one years of socialist government

control placed former Czechoslovakia into the Eastern European block at least from two perspectives - economic and demographic. However, since the collapse of the socialist system at the beginning of the 1990s there has been a reappearance of a new decline in mortality. The recent favourable development has currently brought the Czech Republic a little closer to the European average. During the transition period, the health situation in the Czech Republic has improved more rapidly than in other CEE countries. It is very likely that having a lower past mortality prior to WWII and related to a specific cultural setting contributed to a more rapid return to a lowered mortality rate. From a relative perspective, people who already had lower mortality levels (the more educated) before 1989 have experienced a faster decline in death rates. Considering absolute change in mortality rates, the differences have been indiscernible among specific education categories.

There are two sets of factors (medical and social/behavioural) to be considered for explaining the recent favourable turnover of mortality. During the 1990s mortality from circulatory diseases decreased significantly. At the same time the use of cardiovascular drugs and the number of operations of invasive heart-surgery considerably increased. In addition, the structure of treatment shifted from traditional medicines to the new generations of drugs {new beta blockers, long acting Calcium channel blockers, ACE (angiotension converting enzyme) inhibitors, hypolipidemics - statins, etc.}. ACEI, hypolipidemics and antiplatelets have become predominant in the use of cardiovascular drugs. The surgical and invasive procedures such as coronary artery by-pass grafts, valve replacements and angioplastics have also significantly increased. Regarding lifestyle, smoking and alcohol consumption have slightly increased. However, there has been a positive shift from animal to vegetable fats and increased opportunity to buy a wider variety of healthy fruits and vegetables. The recent decline in mortality is likely to be attributable to technical progress in medical treatment and less affected by the change in lifestyle.

Notes

1. Real GNP per capita in 1960 US dollars and prices (see Bairoch Table 1.4))
2. Per capita productivity in agriculture is the average per capita productivity of persons dependent on agriculture related to European average equaling 100 (see Kirk p.262)

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Statistická ročenka České republiky, (Statistical Yearbook of the Czech Republic), ČSÚ, Praha 2001

Annex

Selected causes of death with their ICD-9 codes and ICD-10 codes

CAUSE OF DEATH	ICD – 9	ICD - 10
Neoplasms:		
1. Neoplasm of the stomach	151	C16
2. Neoplasm of the colon, rectum, anus	53 – 154	18-C21
3. Neoplasm of larynx and lung	161 – 162	C32-C34
4. a) Neoplasm of breast (females)	174 – 175	C50
b) Neoplasm of prostate (males)	185	C61
5. Remaining malignant neoplasms	Remainder of 140 – 208	C00-C97
Circulatory diseases:		
6. Ischemic heart disease	410 – 414	20-I25
7. Other heart diseases	420 – 423, 425 – 429	I30-I52,
8. Cerebrovascular diseases	430 – 438	I60-I69
9. Other circulatory diseases	Remainder of 390 – 459	I00-I99
Diseases of the respiratory system:		
10. Influenza and pneumonia	487, 480 – 486	J10-J11, J12-J18
11. Chronic lower respiratory diseases	490 – 494, 496	J40-J47
12. Remaining respiratory diseases	Remainder of 460 – 519	J00-J99
Diseases of the digestive system		
13. Chronic liver disease	571.0 – 571.9	K70, K73-K74
14. Remaining digestive diseases	Remainder of 520-579	K00-K93
External causes of death:		
15. Transport accidents	E800 – E848	V01-V99
16. Suicide	E950 – E959	X60-X84
17. Other external	Remainder of E800 – E999	V01-Y89
18. Diabetes mellitus	250	E10-E14
19. Other causes	Remainder of 001 – E999	A00-Y89