Mortality Patterns: Impact of Education and Medical Cause in the Czech Republic 2001–2005

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Educational level can be considered as a proxy for the socio-economic position/class. Higher education enables usually better working conditions and also influences the lifestyle. Educational inequalities in mortality from all causes of death are large in the Central and Eastern Europe, more particularly in the Czech Republic (Plug et al 2012). In spite of low social differentiation in former socialist societies and universal access to free health services, important differences in mortality according to education were observed (Rychtaříková 2004, 2006). Mortality patterns observed today reflect distinct historical periods: interwar, WWII, socialist regime, economic transformation after 1989. These dissimilar times impacted people in different ages. Older generations completed their education before World War II and often held higher occupational positions regardless of their 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 favorable working conditions for the group of older generations with only basic education, and this situation markedly contributed to their improved health indicators.

The purpose of the study is to examine mortality differentials by four education levels and eighteen groups of causes of deaths in the Czech Republic in the post-census period 2001–2005. Three particular questions are addressed: first, are mortality inequalities still bigger at younger ages and from what causes of deaths? Second, how much are mortality risks by education different between males and females? Third, what causes of death impact the most on mortality differentials by education?

Data used come from two unlinked datasets of deaths and census population. The first data set (deaths) contained 449 968 cases and the second one (Census) 6 065 663 records. Counts of numbers of deaths (the numerator) are related to men and women aged 30–84 years old on January 1, 2001 and followed over the period 2001–2005 by five year birth cohorts (see the Lexis diagram – Figure 3). The death data have been cross-classified according to sex, five year birth cohorts (except the first one of 1961–1970, i.e. age of 30–39), education, and causes of deaths (see the data description in Table 2 and 3). The numbers of population (the denominator) were based on census data and estimated on January 1, 2001.

Table 1 gives the view on mortality differentials based on logistic regression modeling separately for males and females according to four levels of education. Male inequality in mortality by educational attainment exceeds female inequality (Figure 1). The results show a consistency in the effects of education on male mortality. The odds ratios (*OR*) for males range from 7.7 (basic vs. university education) to 1.5 (secondary vs. university education). Males with basic education experienced very poor health conditions due to hard work (mines, construction) and to unfavorable life style (alcohol, smoking). Lesser dispersion of *OR* is seen for females (Table 1). The particular anomaly in the mortality gradient is observed when comparing basic and vocational education among women. Women with basic education show lower mortality level compared to their vocational counterparts. This anomaly appears in age group 45–49 to 65–69 (Figure 1). It can be hypothesized that these women with vocational education worked during socialist era mostly in factories with detrimental working conditions related to obsolete equipment. While less demanding work (agriculture, cleaning, house wife)

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in slightly healthier conditions was practiced by the least educated women. This issue will be investigated more in depth.

The difference in mortality rate was mainly significant in the younger age groups, but converged in the older age groups (Figure 1) except for males with basic education. This pattern is observed in many countries and explained usually by the selection effect.

Multivariate results including causes of death show enormous mortality excess of men with basic education due to life style related causes (alcohol abuse, suicides and other external causes) and from cardiovascular diseases (Figure 2). Mortality differentials among remaining educational groups are of minor importance. Cause pattern for females seems to be similar for all education levels. Compared to men inequalities in mortality are reduced.

The analysis revealed significant educational differences in mortality among men, more particularly between basic and other educational levels. On the contrary, women (whose labor force participation was the highest worldwide and they shared the same conditions regarding health care and life constraints as men) experienced much lower mortality that did not show so significant gaps by education. The only inverted pattern in education gradient was observed between women with basic and vocational education that will be examined using the impact of additional factors and could be revealed also by studying interactions of education and causes of death.

References

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Table 1: Impact of education on mortality intensity

Contrast	Males		Females	
	b	**OR**	**b**	**OR**
basic vs vocational	1.014	2.756	-0.029	**0.971**
basic vs secondary	1.634	5.126	0.634	1.886
basic vs university	2.036	7.662	1.014	2.757
vocational vs basic	-1.014	0.363	0.029	**1.029**
vocational vs secondary	0.620	1.859	0.663	1.941
vocational vs university	1.023	2.780	1.043	2.839
secondary vs basic	-1.635	0.195	-0.634	0.530
secondary vs vocational	-0.620	0.538	-0.663	0.515
secondary vs university	0.402	1.495	0.380	1.462
university vs basic	-2.033	0.131	-1.014	0.363
university vs vocational	-1.023	0.360	-1.043	0.352
university vs secondary	-0.402	0.669	-0.380	0.684

Note: Binary logistic regression. Dependent variable has 2 categories (alive, dead). Predictors are education (4 categories), age groups (30–39, 40–44, 45–49 … 80–84) are used as a control variable. Logistic regression is computed for each sex separately. In red: anomaly gradient for females

OR: odds ratio; **b:** parameter estimate

Figure 1: Probability of death according to levels of education and age, males, females, Czech Rep. 2001–2005

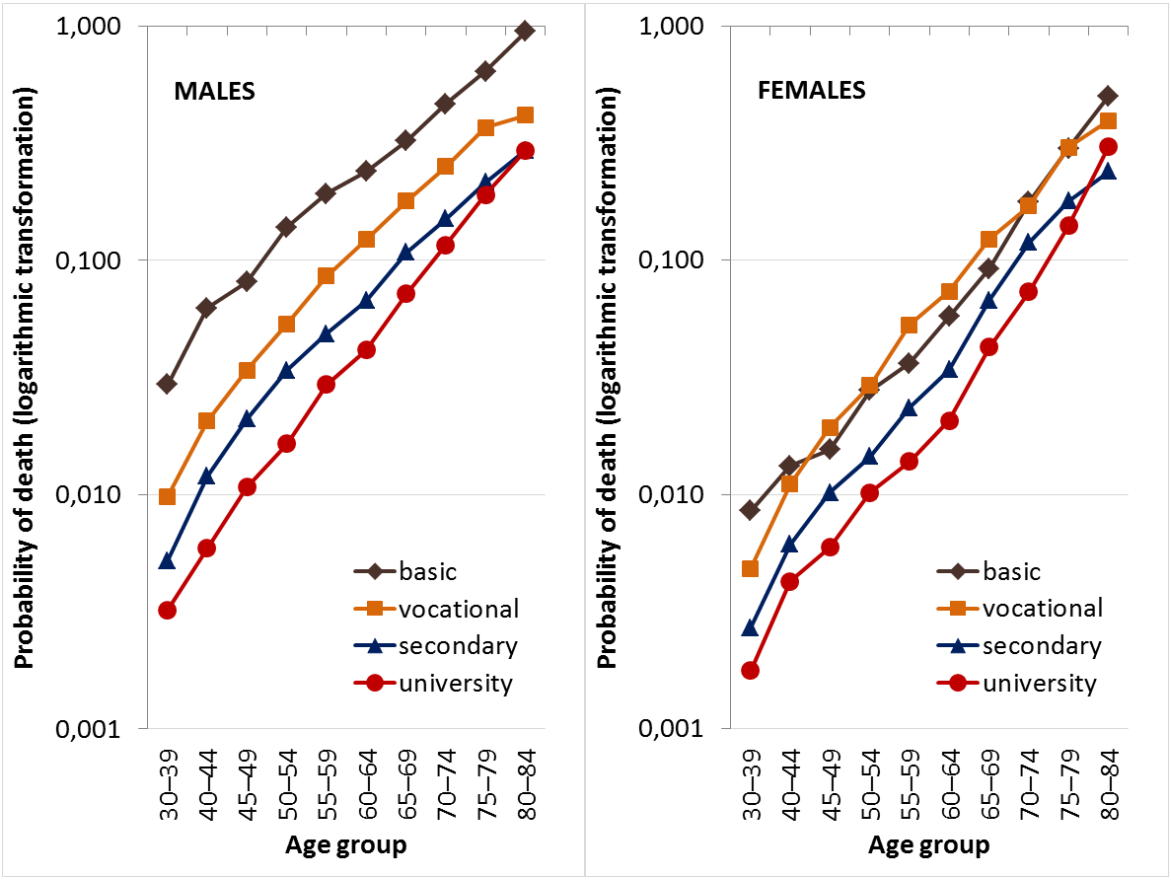
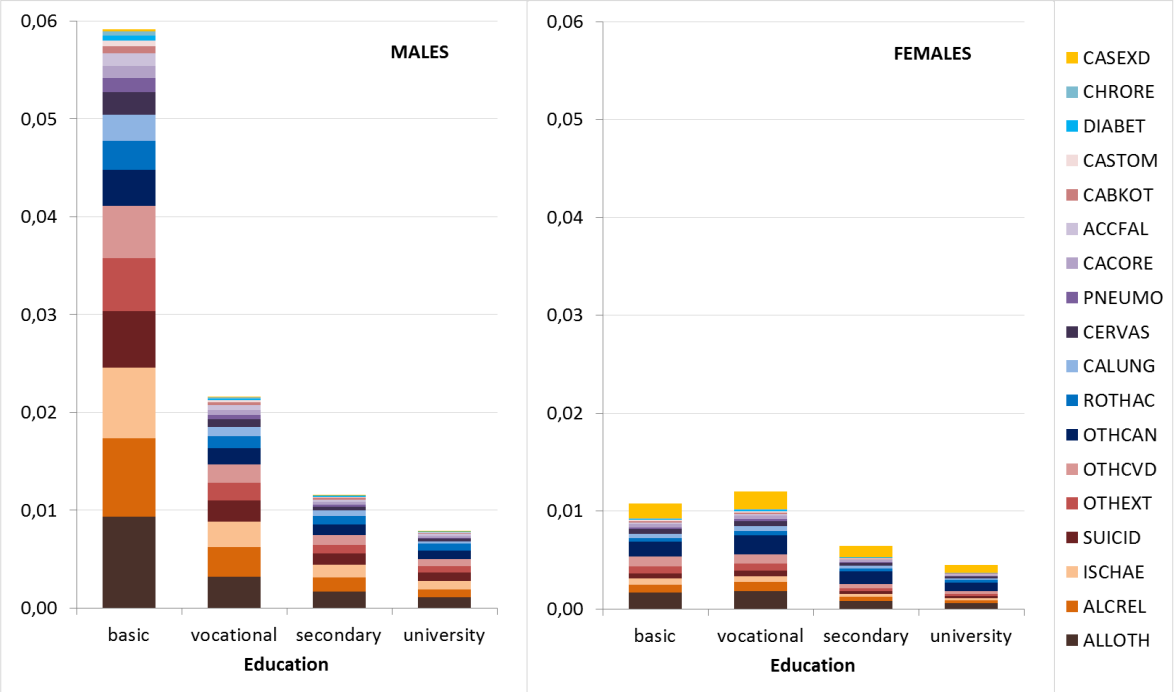


Figure 2: Cumulative values of mortality intensity according to education and causes of death, males, females, Czech Republic, 2001–2005



Note: Multinomial logistic regression. Dependent variable has 19 categories (18 medical causes of deaths and last category is represented by survivors). Model is adjusted for age. Logistic regression is computed for each sex separately.

Table 2: Groups of causes of death used in the analysis. their abbreviations and ICD 10 codes

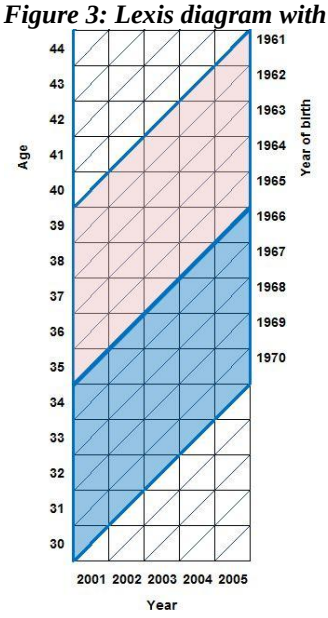
Causes of death	**Variable name**	**ICD 10 codes**
Ischaemic heart disease	ISCHAE	I20-I25
Cerebrovascular disease	CERVAS	I60-I69
Other circulatory diseases	OTHCVD	Rest (I00-I99)
Cancer of trachea. bronchus and lung	CALUNG	C33-C34
Cancer of colon-rectum	CACORE	C18-C21
Cancer of stomach	CASTOM	C16
Sex-specific neoplasms: Cancer of breast. uterus.corpus and cervix uteri (females). Cancer of prostate and testis (males)	CASEXD	C50,C53-C55, C61-C62
Cancer of bladder. kidney. and other urinary organs	CABKOT	C64-C68
Other neoplasms	OTHCAN	Rest (C00-D48)
Diabetes mellitus	DIABET	E10-E14
Pneumonia and Influenza	PNEUMO	J10-J18
Road and other traffic accidents	ROTHAC	V01-V99,Y85
Suicide	SUICID	X60-X84
Accidendal fall	ACCFAL	W00-W19
Other external	OTHEXT	Rest (V01-Y98)
Alcohol related	ALCREL	C00-C15, C22, C32, F10, I42.6. K70, X45
Chronic lower respiratory diseases	CHRORE	J40-J44, J47
All other	ALLOTH	Rest (A00-Y98)

Note: Adapted from *Eikemo T. A. Mackenbach J.P. (eds) (2012) EURO GBD SE: The potential for reduction of health inequalities in Europe : Final Report. Department of Public Health, Erasmus MC, University Medical Center Rotterdam, The Netherlands*

Table 3: Levels of education used in the analysis. their abbreviations and ISCED codes

Level of education	**Educational attainment (ISCED 97)**	**Educational attainment (ISCED 2011)**
Basic	ISCED 2	ISCED 2 and lower
Vocational	ISCED 3C	ISCED 35
Secondary	ISCED 3A	ISCED 34
University	ISCED 5A and higher	ISCED 64 and higher

Figure 3: Lexis diagram with the illustration of data structure



Note: The age was defined as the age at the beginning of the studied period (January 1, 2001), five year age groups were defined by the years of birth. Two youngest age groups (30–34 and 35–39, shown in the diagram) were collapsed (as the age group 30–39)