Differences in avoidable mortality according to education attainment: situation in the Czech Republic

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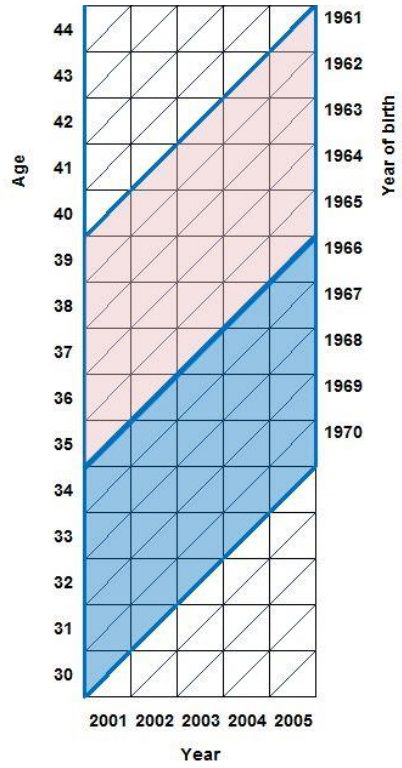
The Czech Republic is typical for its huge differences according to education attainment which was mentioned in several articles or scientific publications even at international level (Plug *et al* 2012). In spite of low social differentiation in former socialist societies and universal access to free health services, important differences in mortality according to education have been observed (Rychtaříková 2004, 2006). It is assumed that education attainment could be used as a proxy variable for the life style, socio-economic status or type of work. Because data about the socio-economic status in connection to mortality are not available in the Czech Republic, as well as in many other countries, the education attainment could be used.

In the Czech Republic, it is possible to tie data from the population census containing information about sex, age and education attainment with data from population registers (registers of deaths). Moreover, from the registers it is possible to get more detailed information about causes of deaths which could be used in the analysis.

The aim of the paper was defined as follows: based on the data from population census and population register we wanted to find and quantitatively describe the differences in mortality according to educational level. The research question entering to our study was whether there still could be found significant differences according to education attainment and moreover, whether there are differences also according to causes of death. For the fulfilling of the proposed goal we selected two types of analysis – the correspondence analysis and multinomial logistic regression. Thanks to the correspondence analysis the differences according to groups of causes of death will be described, the multinomial analysis will quantify the differences according to various factors (not only education, but also age, sex, etc.).

Figure 1: Lexis diagram – structure of data used in the analysis



We designed the analysis in this paper according to Cutler *et al*. (2011), who concluded that not only behavioral risk factors, but above all other factors connected to education (access to health care, living environment and taking care for chronic health problems) are responsible for increasing education mortality gap. For this purpose we defined three groups of causes of death – amenable (treatable), preventable and non-avoidable causes (definitions taken from Office for National Statistics, 2011; for details see Table 1). Out initial hypothesis could be formulated as that higher education level is connected with lower overall mortality level and moreover that higher mortality level is more tied to non-avoidable mortality. On the other hand, for lower education levels rather the preventable and treatable causes of death were supposed to be more common.

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Data from years 2001 to 2005 were used for the analysis. Only persons from age 30 to 84 were included. In lower ages it could be supposed that the education attainment can change, at higher ages the data could be taken as less reliable due to relatively small number of cases. The analysis was done for 5-years age groups with the exception of the youngest age group which was taken as a 10-years age group (ages 30 to 39 years), see Figure 1.[4] Data about deaths were classified into 2nd set of events (Figure 1) defined by the calendar year (years) of the event and birth cohorts of the persons under the risk of the event. Education attainment was defined in 4 levels according to ISCED (International Standard Classification of Education) levels (see Table 2).

Table 1: Classification of causes of death (ICD-10) into amenable, preventable, and non-avoidable causes used in the analysis

Amenable	Preventable	Non-avoidable
A00–A09, A33, A38–A41, A46, B50–B54, G00, G03, L03, C18–C21, C50, C53–C55, C62, C67, C73, C81, C91–C95, D1–D2; D30–D36,E00–E07, E10–E14, G40–G41, I01–I14, I15, I60–I69, J00–J08, J2–J3, J45–J49, J5–J9, K25–K28, K35–K38, K40–K46, K80–K83, K85–K86, K915, N00–N07, N13, N17–N19, N20–N21, N25, N27, N35, N40, N991, O00–O99, P0–P8, P90–P96, Q00–Q99, Y60–Y69, Y83–Y84	A15–A19, A35–A37, A80, B05, B15–B24, B90, C00–C16, C22, C33–C34, C43–C44, F10–F16, F18–F19, K70, K73–K74, K860, G312, G621, I426, K292, I20–I26, I77, I801–I803, I809, I829, J09–J18, J40–J44, V00–V99, W0–W5, X6–X7, X80–X89, X9, Y1–Y2, Y0, Y30–Y34, U509	Others

Source: Office for National Statistics (2011) with minor modifications

Table 2: 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

The technique of correspondence analysis could be taken as "an analogue of principal components analysis, which is appropriate to discrete rather than to continuous variates" (Hill, 1974, p. 340).

The correspondence analysis revealed again the typical pattern of mortality differences – for both sexes it is clear that lower education level is more tied to preventable causes of death or amenable causes of death. On the other hand, higher education (especially university education) is connected rather with non-avoidable causes. For seniors (ages 65–84 years) the pattern was even more clear, above all in the case of males (Figure 2 and 3).

[4] The age was defined as 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 age group 30–39)

Figure 2: Correspondence analysis, males 30 to 64 years

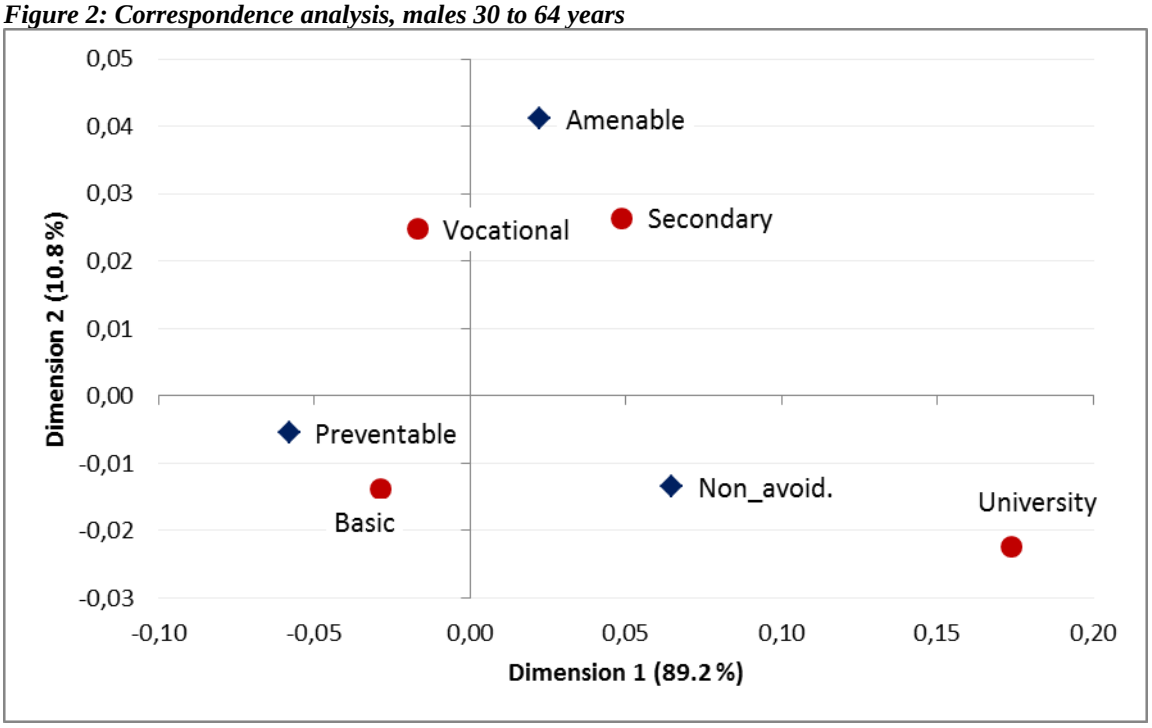
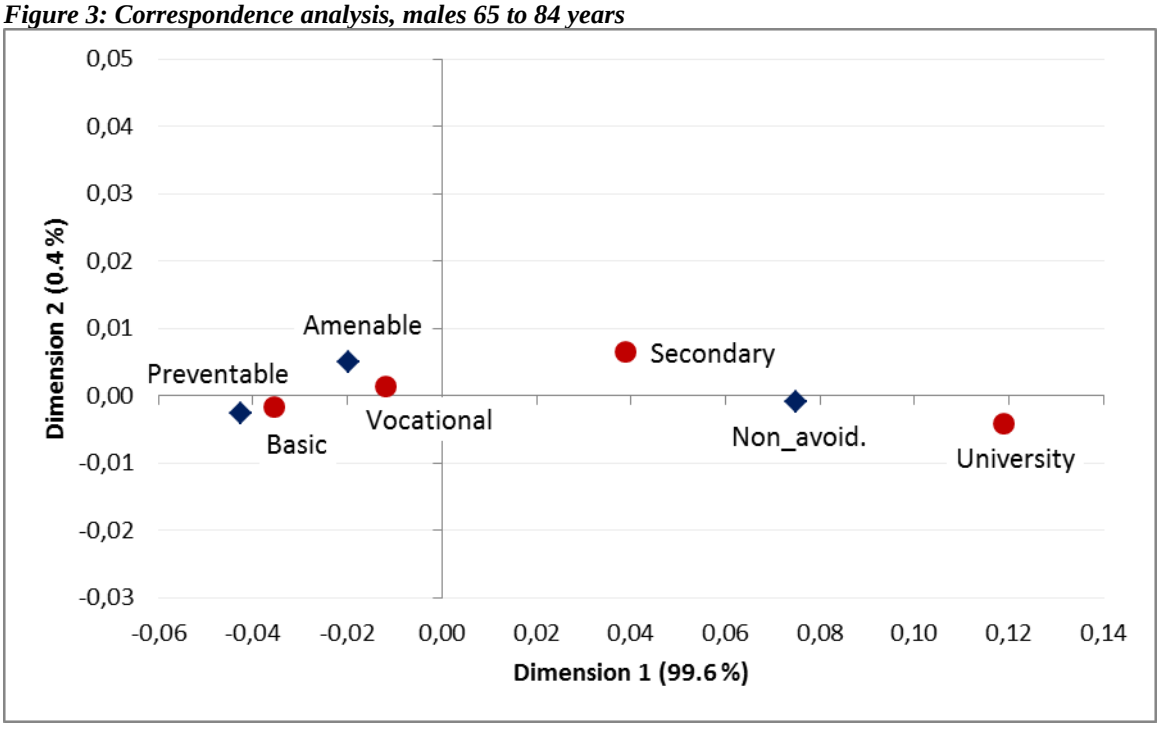


Figure 3: Correspondence analysis, males 65 to 84 years



In the logistic analysis, the reference category was age group 40–44 years and vocational education. All the results are statistically significant at 5% level of significance. The response variable had 4 values (1 = amenable causes of death, 2 = preventable causes of death, 3 = non-avoidable causes of death and 4 = survived), the reference category is "survived".

Results from the multinomial logistic model (calculated separately for males and females) are in Table 3. The odds ratios confirm the previous results – the risk of death for any group of causes of death is ca 1/3 for university educated persons in comparison to population with vocational education. This holds for males as well as for females. Secondary education halves the risk of death in

comparison to vocational education, especially in case of preventable causes of death for females. Basic education is highly unfavorable in case of males, their risk of death is nearly triple in comparison to vocational education – above all for preventable causes of death. In case of females there is almost no difference for basic and vocational education.

Table 3: Odds ratios from the multinomial logistic regression, separated models for both sexes, reference category: Vocational education

	Education			
	Basic	**Vocational**	**Secondary**	**University**
Cause of death	**Males**			
Amenable	2.794	1.000	0.529	0.345
Preventable	2.806	1.000	0.512	0.309
Non-avoidable	2.716	1.000	0.575	0.435
	Females			
Amenable	0.980	1.000	0.516	0.368
Preventable	1.026	1.000	0.492	0.311
Non-avoidable	0.910	1.000	0.534	0.373

Note: Reference category: vocational education

The results confirm significantly different mortality pattern according to education attainment for males and females in the Czech Republic. Moreover differences according to causes of death were revealed, above all for males. It corresponds to the assumption that level of education is connected with the life style, care for own health and proper treatment.

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