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Education and Income as Health Determinants in Central-Eastern Europe

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Summary: The analysis was worked out on the basis of Health Variables of The European Statistics of Income and Living Condition (EU-SILC), European Health Interview Survey (EHIS). The SRH-self-rated health variable in relation to education and income was used in their analysis. There were two research hypotheses put forward and verified during the study. *H1: Education is a stronger determinant than income affecting health inequalities of the populations of the, so called, new UE countries. H2: The state of health inequality, investigated during the period 2006–2015, is increasing in the, so called, new UE countries.*

Keywords: health inequality, health determinants, education, income, the Gini index, health concentration index.

Introduction

Health socio-economic inequalities are defined as “differences or frequency in occurrence of health inequalities between people with higher or lower socio-economic standards” (World Health Organisation, 2013) [51]. As early in 2008, Commission on Social Determinants of Health of the World Health Organization (WHO) defined the health determining factors that are important for health inequalities, i.e. social gradient, stress, early childhood, social exclusion, employment, unemployment, social aid, addiction, food and transport [49]. Socio-economic inequalities are usually determined by income, education and kind of performed profession (World Health Organization, 2010) [50], [31]. The relations between education and mortality has been analysed in Poland and other Central and Eastern Europe countries since the second half of the 20th century. At that time, higher education was not at all connected with high level of income and the studies of the effect of income on health were not carried out [30]. Whereas in the literature on the subject in the eastern countries as well as in the countries of the former USSR a limited number of studies can be found devoted

to Russia (see Bobak et al. 1998, 2000; Gilmore, McKee, and Rose 2002; Andreev, McKee, and Shkolnikov 2003; [7], [8], [2], [32], [33]). Health studies of the Byelorussian community analysing health inequality show that unemployed men and women more often complain of bad health. The risk of bad health diminishes significantly as the level of education increases. During the analysis of groups divided according to age, it was observed that men with incomplete secondary education declare their health as bad three times as often as men with higher education. In the sample group of the inhabitants of Byelorussia, the relation between income and SRH is fairly complex. Men acquiring income report their health weaker and weaker along with the level of their income from quintile one to quintile four. Whereas in the case of women, income does not affect the SPH [17]. Studies of health of the Population of Ukraine show that women are exposed to a higher risk of feeling in a bad way than men, similarly to women living in the country when compared to those living in urban areas [15]. What is more, in Kazakhstan¹, which is a country of the shortest Healthy Life Expectancy in Europe of a basically more equal income distribution than in other countries of the former Soviet Union, like in many other countries difference in health was observed depending on age, gender and, first of all, education, and lack of difference due to performed education, ethnic differences and the married state [1]. SRH self-rated-health is unfortunately lower than in Russia and in Ukraine [15], [7]. In the paper Sipiev et al. (2014), it was shown that there are differences in health depending on education and ownership of a car. The odds ratio of poor health and worsening of health were 0.43 (95% confidence interval 0.32–0.58) and 0.54 (0.44–0.68) for university vs. primary education, respectively, and 0.64 (0.51–0.82) and 0.68 (0.58–0.80) for car ownership, respectively [35].

There are significant social inequalities in self-rated health and long-term health problems among the inhabitants of Latvia. Health inequalities depending on the level of income of the citizens of Latvia seem to be higher than their differences in the level of education. People with lower education had higher indexes of poor self-rated health² – OR – *odds ratio* for men 2,21; 1,31–3,71 95% CI, OR for women 2,48; 1,74–3,54 95% CI. Income inequalities were higher than educational inequalities in self-rated poor health for both genders OR in comparison to men: 5,10; 2,26–11,5, 95% CI, women: OR 3,26; 1,92–5,55 95% CI. Economic activity of the Latvians was also strongly connected with health. No inequalities related to the level of urbanization were found, and the ethnic differences were marked only in the case of long-term health problems of women [29]. In Bulgaria, the study showed significant inequalities in health conditioned by age and education, correlated with financial difficulties and poverty. According to the study, the level of income of the inhabitants of Bulgaria

¹ Partly in Europe – 12% of total area.

² The ratio is calculated with the use of logistic regression function for the probability of occurrence of negative health ratings.

affects their informal economic exchanges in the healthcare system, which allow better access and quality of healthcare in that country [4].

In Serbia, like in many countries during the period of transformation, socio-economic in the field of health inequalities in the field of were not thoroughly investigated [31]. Social gradients in the health of people with poorer education were found. In comparison with people with higher education, people with poor education rated their state of health as poor 4.5 times more often; unemployed (OR 1,64; 1.29–2.10 95% CI), professionally non-active (OR 2,82; 2,49–3,19 95% CI) [21].

The studies carried out in Serbia in 2016 show that the residents of rural areas more often rate their health negatively in comparison with those inhabiting urban areas. The unemployed are five times more exposed to poor health (25.5%) than the employed people (4.9%). The proportion of respondents with primary education, rating their health as poor (36.5%) is three times higher than in the case of people with secondary education (12.1%) and four times higher than in the case of people with higher education (8.3%). The respondents with lower education are two and a half times more exposed to lower rating of their health (OR 2.314) in comparison with people with higher education. A similar pattern was observed in reference to the index of wellbeing, i.e. members of the poor class rate their health three and a half times more frequently as poor (30.3%) than the rich people with high income (8.4%) (OR 2.314) [31]. What is more, the health rating of the Greek population is close to the rating of poor SPH (20% to 55%) of the inhabitants of Western Europe. In Greece, women and the elderly people, the inhabitants insured in the OGA, declared the worst state of health. People insured in the OGA include farmers, i.e. people with poorer education, living in rural areas, who are, at the same time, less affluent.

The international SRH study that Greece and other 21 European countries [25] participated in showed that the higher level of education of a population is connected with a higher level of the SRH and the emotional support is not significantly connected with the SRH without taking into consideration other socio-economic determinants [3], [12].

The research goal is to determine changes in scope of health inequalities of inhabitants of selected European countries that had taken place between 2006 and 2015 analysed in terms of a search for possible implementation of new solutions in our country. The inspiration for analysis was a very moderately described in the literature on the subject [9], [7], [28], [3] of the probability of the relationship between the stronger determinant of education and income and their influence on the SRH [3] in the, so called, new UE countries.

The analysis was worked out on the basis of Health Variables of The European Statistics of Income and Living Condition (EU-SILC), European Health Interview Survey (EHIS). The SRH-self-rated health variable in relation to education and income was used in their analysis.

There were two research hypotheses put forward and verified during the study.

H1: Education is a stronger determinant than income affecting health inequalities of the populations of the, so called, new UE countries.

H2: The state of health inequality, investigated during the period 2006–2015, is increasing in the, so called, new UE countries.

Hypothesis H1 assumed that there is a statistically significant relation, e.g. between education and income, and the health inequality.

Verifying of the H1 hypothesis involves not only the analysis of relations between the health determinants and the levels of inequalities of a population, but it also allows to check the state of health inequalities in the so called countries of the new EU depending on a level of classification of education and income of natural persons calculated with the Gini index and the health concentration index. Taking into account the analysis of differences in health of a population in social groups of the same level of education and different levels of income it was assumed that education stronger than income determines health inequalities.

Verifying of the H2 hypothesis is based on the Corsini statement (2010 that though in the case of a well educated social group of women as well as men, their differences in health inequalities in terms of gender had decreased in previous years, the differences related to education keep growing, and it was assumed that the health inequality in the countries of the new UE keeps increasing.

1. Methodology

The consisted of two parts. The analysis was started from checking the relations between the state of health determined by education as well as income. Variables for European countries in the form of (*SRH-self-rated health*), i.e.: Self-perceived health by educational attainment level, self-perceived health income quintile were used.

As in other works of the authoress, in order to perform the analysis the variables characterising self-rated health were transformed into the form of dichotomous variables with such categories as: an at least good health status (*very good and good*) and poor health status (*very poor and poor*). Data from the Eurostat database acquired from the survey Health variables of The European Statistics of Income and Living Condition (EU-SILC)³ were used in the empirical research. In order to present the trends in the formation of the phenomenon, the level of health unevenness was estimated in the countries of the so called new UE. The following countries were included in the research: Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia,

³ The European Statistics of Income and Living Condition (EU-SILC) survey contains a small module on health, composed of 3 variables on health status and 4 variables on unmet needs for health care.

Slovenia, Romania. The levels of education and income of natural persons (Table 1) was taken into account in the empirical research. The time period includes the years 2006–2015.

Table 1. Classification of levels of education and income of natural persons

International Standard of Classification Education (ISCED)		Register according to the total value of equivalised income at one's disposal	
(ED0_2)	Pre-primary, primary and lower secondary education	(Q0_20)	First quintile group of equivalised income
(ED3_4)	Upper secondary and post-secondary non-tertiary education	(Q20_40)	Second quintile group of equivalised income
(ED5_8)	First and second stage of tertiary education	(Q40_60)	Third quintile group of equivalised income
		(Q60_80)	Fourth quintile group of equivalised income
		(Q80_100)	Fifth quintile group of equivalised income

Source: own study.

Methodology of the research is based on employment of measures of health inequalities, i.e. the Gini coefficient and the health concentration coefficient. The following formula was used in order to determine the $G(x)$ coefficient:

$$G(x) = \frac{\sum_{i=1}^n (2i - n - 1)x_i}{n^2 \bar{x}} \quad (1)$$

where the used symbols denote:

x_i – unit i -th value of the investigated phenomenon,

\bar{x} – arithmetic mean,

i – position of a series,

n – sample size.

Values of the Gini index are within the range [0; 1], which can be divided into three parts: $<0-0,3(3)>$, $<0,3(3)-0,6(6)>$ and $<0,6(6)-1>$, establishing the weight of the Gini index at the levels: low, medium and high [36].

Next, the health concentration index, which was introduced for the first time by Wagstaff et al. in 1989 [43]–[47], was determined. It is a measure of relative health related inequality, which means that the result of a measurement does not depend on the average standardised health status, and if everybody's health improved e.g. twice, the measure of inequalities would remain unchanged.

The results obtained from this relation can be used in an analysis within the time range and in international comparisons.

In our work, grouped data were used to calculate the index, which allowed to apply the following formula:

$$C = \frac{2}{\mu} \sum_{i=1}^T f_i \bar{x}_i R_i - 1 \quad (2)$$

where:

\bar{x}_i – average health status in t-socio-economic group t ,

f_i – fraction of the socio-economic group t ,

μ – average health status, $\mu = \sum_{i=1}^T f_i \bar{x}_i$,

R_i – the rank of the socio-economic group t .

To check the estimates, an index of health concentration was calculated through estimation of the health regression index in terms of ranks according to the formula:

$$C = \frac{2 \text{cov}(R, x)}{\mu} \quad (3)$$

where:

$\text{cov}(R, x)$ – covariance of the variable representing ranks and health status.

R. Mangalore reports that it is possible to calculate C making use of the formula (3). However, for statistical concluding it is necessary to calculate the standard error for CI. Kakwani et al. (1997) [23] suggested a convenient regression approach' for this purpose, which also has the advantage of yielding an estimate of the CI itself. The convenient covariance result given above is used to define a convenient regression for the CI, given by

$$\frac{2\sigma_R^2}{x} x_i = \alpha_1 + \beta_1 R_i + \varepsilon_{1,i}$$

where σ_R^2 is the variance of R , $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$, R is the fractional rank of income

and ε is an estimate of the C [27] [26].

The value of the index can range from -1 to +1, indicating whether health is concentrated around the negative (poor) status of the investigated social group ($C < 0$), or positive (good) status ($C > 0$) or evenly distributed ($C = 0$) on different values of the prosperity variable [10], [41].

Health distribution determined by the health concentration index was described by many authors [45] [39] [22], [40], [41], [42], [54], [55], [12], [53], [13], [18], [19], [20].

2. Results and discussion

Making use of the formula (1), the Gini index health GIH and the Gini index without health GIWH were calculated according to distinctive categories of the level of education and incomes of natural persons (Table 1). The level of positive concentration of health inequality measured with the Gimi index was determined with the use of the data collected in the ECHI studies taking into account those rating their health status at least as good. The level of negative concentration of health inequality was determined analogically, taking into account persons rating their health status as poor.

Small disproportions of values can be noticed in social groups divided into categories of the level of education within the time range from 2006 until 2015.

Table 2. Value of the Gini health index with division into level of education and income of natural persons in the years 2006–2015

Indexes of inequality	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GIH-ED0-2	0.016	0.008	0.003	0.009	0.005	0.015	0.021	0.021	0.010	0.014
GIH-ED3-4	0.012	0.000	0.008	0.007	0.008	0.014	0.016	0.023	0.022	0.021
GIH-ED5-8	0.006	0.001	0.018	0.021	0.013	0.013	0.024	0.025	0.030	0.025
GIH-Q0_20	0.011	0.023	0.052	0.058	0.040	0.043	0.045	0.055	0.052	0.059
GIH-Q20_40	0.010	0.014	0.017	0.029	0.021	0.032	0.037	0.047	0.043	0.045
GIH-Q40_60	0.008	0.010	0.001	0.012	0.007	0.001	0.005	0.014	0.011	0.001
GIH-Q60_80	0.026	0.023	0.009	0.014	0.011	0.010	0.001	0.006	0.004	0.006
GIH-Q80_100	0.026	0.014	0.015	0.011	0.011	0.009	0.005	0.006	0.003	0.007

Source: own study.

The calculated health inequalities of the Gini index health according to education and income of social groups in the years 2006–2015 have low value. Yet the highest diversity and at the same time the highest average health inequality measured with the Gini index was observed in the social group with the lowest total equivalent disposable incomes (Q0_20).

During the 10 years of the research. The mean value of all indexes of the positive Gini index Health (ED0-2), (ED0-3-4), (ED0-5-8) was 0.014 and for the (Q0_20) (Q20_40) (Q40_60), (Q60_80), (Q80_100) it was 0.020. There was no significant downward trend of the education and income indexes in social groups in the years 2005–2015. It is obvious that there was an increase in health inequality, which does not concern only the rich in social groups (Q60_80), (Q80_100).

What is more, a similar situation was observed in the Gini index without health in terms of education and income groups in the years 2006–2015.

Table 3. The value of Gini index without health divided into categories of the level of education and income of natural persons in the years 2006–2015

Indexes of inequality	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GIwH-ED0-2	0.023	0.007	0.018	0.004	0.003	0.016	0.019	0.016	0.008	0.009
GIwH-ED3-4	0.018	0.002	0.007	0.001	0.014	0.016	0.028	0.052	0.041	0.029
GIwH-ED5-8	0.013	0.009	0.034	0.042	0.041	0.063	0.105	0.104	0.142	0.092
GIwH-Q0_20	0.038	0.038	0.062	0.059	0.052	0.061	0.054	0.078	0.061	0.085
GIwH-Q20_40	0.016	0.031	0.019	0.028	0.027	0.038	0.042	0.071	0.070	0.057
GIwH-Q40_60	0.011	0.031	0.050	0.052	0.026	0.005	0.004	0.014	0.004	0.027
GIwH-Q60_80	0.064	0.071	0.069	0.062	0.028	0.060	0.041	0.050	0.018	0.075
GIwH-Q80_100	0.068	0.043	0.094	0.073	0.060	0.058	0.045	0.088	0.087	0.131

Source: own study.

On the average, the highest negative health inequality was found in two social groups with the category of the highest level of education (ED5-8) – 0.065 and the highest income of natural persons (Q80_100) – 0.075.

Next, values of positive and negative health concentration index divided into education and incomes of natural persons categories in the years 2006 – 2015 were calculated.

Table 4. Values of positive health concentration index divided into education and incomes of natural persons categories in the years 2006–2015

health concentration index	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
C(p)-ED0-2	0.049	0.048	0.036	0.039	0.039	0.038	0.040	0.044	0.041	0.034
C(p)-ED3-4	0.039	0.042	0.037	0.034	0.035	0.034	0.031	0.032	0.030	0.034
C(p)-ED5-8	0.046	0.046	0.050	0.045	0.049	0.047	0.046	0.041	0.041	0.046
C(p)-Q0_20	0.019	0.036	0.034	0.032	0.040	0.039	0.035	0.036	0.028	0.031
C(p)-Q20_40	0.008	0.036	0.033	0.029	0.032	0.028	0.031	0.031	0.030	0.028
C(p)-Q40_60	0.008	0.043	0.038	0.038	0.034	0.036	0.036	0.033	0.032	0.036
C(p)-Q60_80	0.023	0.048	0.044	0.040	0.039	0.040	0.039	0.041	0.037	0.040
C(p)-Q80_100	0.027	0.050	0.048	0.045	0.049	0.045	0.042	0.039	0.039	0.042

Source: own study.

Table 5. Values of negative health concentration index divided into education and incomes of natural persons categories in the years 2006–2015

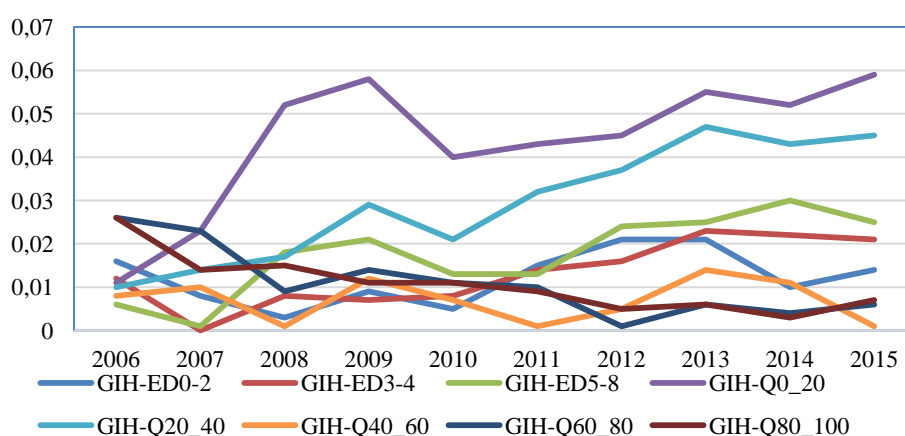
health concentration index	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
C(n)-ED0-2	-0.012	-0.014	-0.013	-0.020	-0.012	-0.020	-0.013	-0.010	-0.009	-0.011
C(n)-ED3-4	-0.004	-0.030	-0.021	-0.023	-0.023	-0.237	-0.013	-0.009	-0.009	-0.014
C(n)-ED5-8	-0.014	-0.010	-0.013	-0.019	-0.026	-0.016	-0.015	-0.023	-0.012	-0.016
C(n)-Q0_20	-0.002	-0.018	-0.016	-0.026	-0.011	-0.022	-0.017	-0.014	-0.003	-0.015
C(n)-Q20_40	-0.007	-0.011	-0.016	-0.016	-0.021	-0.025	-0.017	-0.011	-0.012	-0.001
C(n)-Q40_60	-0.003	-0.014	-0.014	-0.022	-0.022	-0.029	-0.011	-0.010	-0.013	-0.017
C(n)-Q60_80	-0.007	-0.012	-0.009	-0.017	-0.024	-0.031	-0.001	-0.014	-0.009	-0.018
C(n)-Q80_100	-0.018	-0.016	-0.008	-0.017	-0.002	-0.024	-0.023	-0.009	-0.007	-0.003

Source: own study.

3. Conclusions

Subjective health measurement contributes to evaluation of health problems, weight of diseases and health needs at population level. The perceived health status is not a substitute for more objective indexes, but an index, which monitors, among other things, the relation between education, income and the level of health.

Health inequalities measured with the Gini index, positive and negative health analysed in terms of selected categories of education show differences (Figure 4). It results from specific determinants in functioning of the groups within a society with different levels of education and income.

**Fig. 4.** Gini index health according to education and income of social groups in the years 2006–2015

Source: own study.

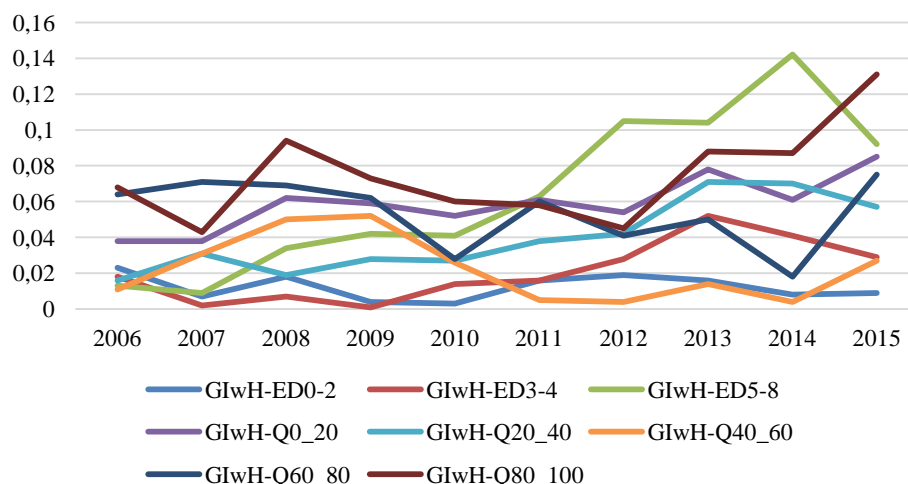


Fig. 5. Gini index health according to education and income of social groups in the years 2006–2015

Source: own study.

The first hypothesis was, in the course of verification process, confirmed, proving that education is stronger than income determinant affecting the health inequalities in the population of new EU countries.

The second hypothesis was also confirmed. Estimated indicators showed, that during 10 years there was an increase in health inequalities in the countries of the new EU.

One of the major goals of the “Health 2020” is improvement of the health status parallel to reduction of health inequalities (World HEALTH Organisation, 2013). Monitoring inequalities in the field of health in all topics concerning health at the global, national and sub-national level and reducing inequalities in health must be a common target of all sectors of the society (governmental, non-governmental, organizations and institutions at the national, regional and local level), which is possible to implement through joint, integrated political strategies.

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Wykształcenia i dochód determinantą zdrowia w Europie Środkowo-Wschodniej

Synopsis: Analizę opracowano na podstawie Health variables of The European Statistics of Income and Living Condition (EU-SILC), European Health Interview Survey (EHIS). Do analizy wykorzystano zmienną *SRH-self-rated health* w zależności od wykształcenia i dochodu. W toku pracy postawiono dwie hipotezy badawcze, które poddano weryfikacji w badaniach. *H1: Wykształcenie jest silniejszą od dochodu determinantą wpływającą na nierówności zdrowotne populacji w tzw. krajach nowej UE. H2: Stan nierówności zdrowotnej badany w okresie 2006–2015 roku zwiększa się w tzw. krajach nowej UE.*

Słowa kluczowe: nierówność zdrowotna, determinanty zdrowia, wykształcenie, dochód, współczynnik Giniego, health concentration index.