
Behavioural Health Factors and Limitations to the Health of Labour Force: Analysis of the Convergence Process of the EU Economies

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Abstract:

Purpose: Assessment of the scale of impact of behavioural factors on the level of burden placed the EU economies with consequences of the so-called chronic conditions in the context of limitation to a potential productivity of human resources and identification of convergence processes taking place in this area.

Design/Methodology/Approach: The scale of impact of behavioural factors on the level of limitations to the health of labour force of the EU countries was measured with a number of years of life lost (YLL) and years lived with disability (YLD) for people of working age due to chronic conditions. Verification of the hypothesis on a persistent high level of dispersion was based on the analysis of the convergence process in a group of the EU states (β and σ) in the years 1997-2017.

Findings: The obtained results indicate that the level of health limitations determined by behavioural factors is subject to strong diversification in the EU-28 group. The observed inequalities concern particularly the Old-New Europe relation, indicating a great burden with health consequences of citizens from Central and Eastern European countries. The conducted assessment of the convergence process in the EU-28 group has indicated that despite the implemented cohesion policy in that area, a high level of dispersion of the studied phenomenon is still maintained.

Practical Implications: The obtained results of an assessment of the convergence process among the EU countries in the area of health inequalities constitute a real basis for the design of measures within the scope of rational cohesion policy and estimation of economic costs of the phenomenon of a limited productivity of human resources.

Originality/Value: The presented analysis results constitute the author's original contribution to the discussion on the scale, reasons, as well as social and economic inequalities in health observed in the context of Old Europe and New Europe.

Keywords: Health capital, labour resources, burden of disease, "old and new" EU.

JEL classification: I14, J21, J24.

Paper Type: Research study.

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1. Introduction

Currently, chronic conditions constitute the main reason of human mortality and morbidity in Europe. This situation is expected to still escalate by 2030. The main sources of this phenomenon should be sought in the process of the population ageing and intensified impact of risk factors, such as unhealthy lifestyle and obesity (Busse, Blümel, Scheller-Kreinsen, Zentner, 2010). Chronic conditions are characterised both with a high mortality rate and in many cases with an accompanied increase in the scale of disability, which results in a decreased capacity for effective work by people of working age (Bartley, Sacker, Clarke, 2004; Haan, Myck, 2009; Oortwijn *et al.*, 2011; Aghion, Howitt, Murin, 2010; Jakubowska, 2016). The level of risk factors determining the level of incidence of chronic conditions in society is particularly noticeable in highly developed countries, where a key problem is an increasing share of years lived with disability against total life years (Hasselhorn, and Wenke, 2015; Jakubowska and Horváthová, 2016).

Among the EU member states, a strong diversification of the burden of chronic conditions is currently observed, determined both by differences in prevalence of particular diseases and in the level of their mortality (Huijts, Stornes, Eikemo, Bamba, 2017). It affects a significant level of differences in health expectancy of the EU citizens, and consequently determines the potential productivity of labour force in particular economies (William and Lewis, 2009). Poor health is currently indicated as one of main reasons of professional deactivation of labour force (Van Rijn, Robroek, Brouwer, and Burdorf, 2014; Rice, Lang, Henley, and Melzer, 2011; Van den Berg, Robroek, Brouwer, and Burdorf, 2010), while relations between the population health and its productivity are becoming the subject of more and more numerous studies (Bloom, Canning, and Sevilla; 2004; Abegunde and Stanciole, 2006; Goryakin and Suhrcke, 2017). In this context, the issue of appropriate identification of human resources' health determinants allowing for the design and implementation of efficient politics within the scope of prevention of diseases and their long-term social consequences becomes crucial (Mackenbach, 2012; Baum and Fisher, 2014).

Research conducted in this area confirms that the currently observed in developed countries phenomenon of an increasing burden with chronic conditions and their long-term consequences is a derivative of a broadly understood life style determined by a social position, education, neighbourhood, etc. The so-called behavioural factors are currently attributed with the majority of burdens resulting from chronic conditions of people of working age, while the recognition of a mechanism of their impact on health limitations is now a significant area of empirical cognition from the point of view of long-term health investment, both at the level of individuals and entire society (Stronks, Van De Mheen, Looman, and Mackenbach, 1996; Richter *et al.*, 2009). Assuming that specific choices within the scope of quality of consumption, access to health care and way of spending free time may be formed by a broadly understood education and existing rules of public order, it must be

accepted that such behaviours may be modified also at the level of public policy (Fuchs 1996; Ashraf, Lester, and Weil, 2008). Therefore, these factors should be treated as a source of significant possibilities of health improvement and reduction of health inequalities, thus increasing the potential of healthy employees in economy (Mushkin, 1962; Grossman, 1972; Grossman, 2000).

The presented analysis aims at the assessment of the scale of impact of the so-called behavioural factors on the level of burden of the EU economies with consequences of chronic conditions. The lost human resources potential has been presented with use of indicators determining a number of years of life lost for people of working age due to chronic conditions. Special attention has been drawn to the issue of existing inequalities in the level of burden with consequences of chronic conditions caused by behavioural factors observed in the relation of Old Europe and New Europe, and then convergence processes taking place in this area were assessed.

2. Literature Review

Greater and greater emphasis put on the need for empirical understanding of reasons of poor health and health inequalities taking place in developed economies causes that the significance of research on psycho-social health determinants is regularly increasing (Lahelma, 2006). It is this group of factors that is seen as providing with more and more capability to affect a size of health disparities observed in reference to particular countries and social groups (Phelan, Link, and Tehranifar, 2010). In the literature on the sociology of health, behavioural factors of health condition are described as the established trends and practices of individuals or social groups, which is expressed in the form of life style that is health promoting or risky to health. Repeatability and relative stability of such behaviours, as well as their connection with social background and cultural context of persons who display such behaviours are important. Behavioural factors constitute much more than just a life style established in social everydayness, but also many other, often occasional activities, performed in a little controlled way under the health-related circumstances (Green and Hiatt, 2009; Sutton, 2004).

Choosing the way of behaviour and lifestyle, such as smoking, lack of activity, poor diet and obesity is related to an increased level of the incidence of cancer, heart diseases, stroke, and diabetes. These risk factors appear to be more hazardous for persons with low socio-economic status (Devaux and Sassi, 2015). Among the main hazard reasons, the following factors are mentioned: unprotected sexual activity, drug consumption, chronic stress, social isolation, and no prophylaxis. The multivariate logistic regression applied by Seeman *et al.* (2008) to establish a relation between the socio-economic status and the level of risk for cardiovascular, metabolic and inflammatory diseases indicated a strong negative correlation between those variables (Seeman *et al.*, 2008).

Despite a seemingly obvious relation between social factors and health condition,

the analysis of causal impact mechanisms is complicated both by the multitude of determinants of this relation and by its endogeneity (Bloom, Canning, and Fink, 2014). Due to this complexity, research on relations between the social status and the health level has become a challenge both for social science (Mackenbach, 2008; Cutler, Lleras-Muney, and Vogl, 2012) and for health science (Adler *et al.*, 1994; Busse *et al.*, 2010). Bharmal *et al.* (2015) describe three main types of approaches applied to the research on mechanisms of impact of social factors on health condition. These authors distinguish the following analysis contexts:

- analysis of social “disadvantages” putting emphasis on a connection between health conditions and neighbourhood, labour conditions, education, income, property and origin, researching a potential causal relationship between stress related to the necessity of dealing with these factors and health effects;
- analysis of life cycle putting emphasis on a connection between health and critical or sensitive periods of risk exposure (negative childhood experience, intergenerational transfer of benefits), potential causal relationship may result here from the impact of social situation on the regulation of genes controlling physiological functions (e.g. functioning of the immune system);
- analysis of inequalities in health focusing on health and social inequalities determined by social and demographic factors, such as material status, education level, gender, sexual orientation, level of intellectual and physical ability.

Each of the above-mentioned theories strongly emphasises the concept of “social position” performing a key role in the formation of social determinants of health inequalities.

In the literature, a series of attempts to identify the source of impact of differences in the social position on health inequalities may also be found. In the presented model of “the mechanisms of health inequality”, Diderichsen mentions as a source of disparity: social environment covering the society structure and social relations causing social inequalities and assignment of people to various social positions; social stratification resulting in differences in the exposure to harmful health conditions due to a diverse access to health care resources, and social stratification determining the diversification of economic, social and health consequences of becoming ill by persons from more or less privileged social groups (Diderichsen, 2004).

3. Materials and Methods

In order to conduct the assumed assessment of a scale of burden of labour force with consequences of chronic conditions caused by behavioural factors, the Institute for Health Metrics and Evaluation (IHME) data from the Global Burden of Disease Study 2017 (GBD 2017) were used. An analysis concerned data on the level of risk of impact of behavioural factors on the level of premature deaths and a number of

years of life lost or lost to disability as a result of chronic conditions of persons of working age. Spatial distribution of those factors in reference to the EU-28 area was assessed.

The detailed analysis of the scale of the EU economies' burden with the impact of behavioural factors causing chronic conditions was based on the indicators determining a number of years of life lost (YLL) and a number of years lost to disability (YLD). The analysed variables were selected based on the review of methodologies of an assessment of the researched phenomenon proposed in the literature (Williams, 1999; Murray and Lopez, 2013). These measures assumedly illustrate a potentially lost time of effective work of persons of working age, simultaneously indicating a level of burden of national economies with consequences of chronic conditions. In the context of the definition of health adopted for the analysis, the term of chronic conditions is basically referred to the so-called non-infectious diseases covering four main disease groups, i.e. cancer, cardiovascular diseases, diabetes and chronic respiratory diseases - and four main risk factors: smoking, unhealthy diet, no physical activity, and excessive alcohol consumption.

While considering the adopted research purpose, the analysed variables were aggregated for the population aged 15-49 and 50-69, adopting that age bracket as a potentially productive age. Comparability of data among the EU states was achieved thanks to the application of intensity indices referring a number of observed cases to a specific size of population. The dispersion scale for the analysed parameters at the level of EU-28 member states was specified with use of statistical measures.

Two state groups were distinguished for the purposes of the research on a level of inequalities in the context of Old and New Europe: (1) EU-15 states representing highly developed economies with market tradition which became the Union member by 2004, and (2) EU-CEE Central and Eastern European countries which became the EU member after 2004, with experiences of systemic transformation. An assessment of a level of inequalities was based on the use of odds ratio (OR), allowing for the determination of a statistical level of the so-called "odds" on the occurrence of negative consequences of chronic conditions (premature death or health loss) of the Central and Eastern Europe citizens against residents of the so-called "old" Union states. The odds ratio (OR) determining the level of inequalities between the researched groups was assessed with use of the following formula:

$$OR_{AxB} = \frac{S(A)}{S(B)} = \frac{P(A)}{1-P(A)} : \frac{P(B)}{P(B)} \quad (1)$$

where: $S(A)/S(B)$ =odds of the event in the exposed group A or group B, $P(A)/P(B)$ =the probabilities from group A or B.

The assumed measurement of convergence in a group of EU countries in the level of burden with consequences of an impact of behavioural factors on a number of (YLL) or years lost to disability (YLD) of persons of working age corresponds with the strand of assessment of the so-called social convergence of member states focusing on the improvement of labour conditions and standard of living of their residents. In this case, reduction over time of an average level of the researched factors together with the reduced level of their dispersions constitute an expected result of the convergence process. In the analysis, the beta convergence concept was applied. It took into account various initial conditions of the system and foresaw that individuals falling behind were catching up more quickly in reference to the objective. In addition, the sigma convergence concept was used, defined as a reduction in the dispersion of achieved results.

In the analysis, the assumption was made that in the studied area the beta convergence occurred, if countries with initially poorer value of a given variable (the highest level of YLL or YLD) were catching up, demonstrating a quicker pace of transition to the expected condition (the greater rate of decline over time). Occurrence of the sigma convergence means the achievement of expected reduction in the level of dispersion of the studied feature over time. The coefficient of variation (CV_t) was used as a measure of dispersion. This measure allows to compare dispersion across time periods and was calculated as the standard deviation (σ_t) divided by the mean (μ_t):

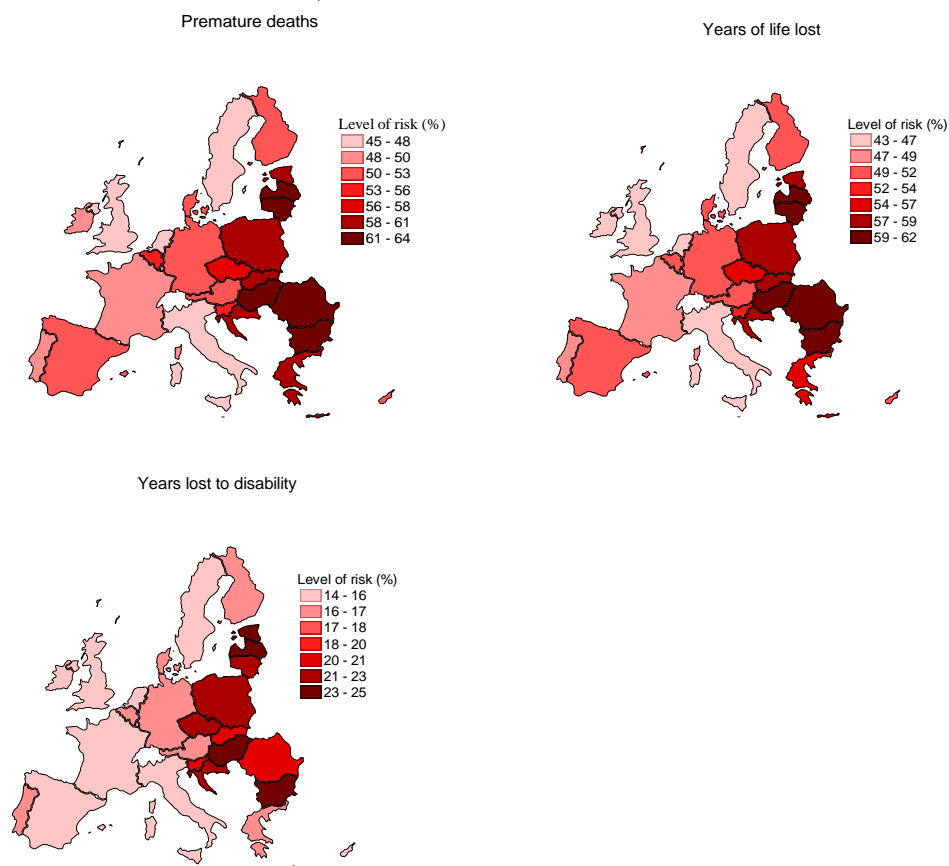
$$CV_t = \frac{\sigma_t}{\mu_t} \quad (2)$$

4. Results

An analysis of the Institute for Health Metrics and Evaluation data concerning the burden of global economies with consequences of chronic conditions (GBD 2017) shows that, depending on a member state, in 2017 the behavioural factors contributing to the development of chronic conditions at persons under the age of 70 were responsible for 45,4 (Italy) to 63,1% (Bulgaria) of premature deaths, 44 (Italy) to 61,9% (Latvia) years of life lost prematurely and 14,1 (Italy) to 24,3% (Estonia) years lost to disability for persons in this age group as shown in Figure 1 below.

An analysis of spatial distribution of the level of risk of impact of behavioural factors on the specified consequences of chronic conditions (Figure 1) indicates that EU states in Central and Eastern Europe bear a particularly high risk. As a consequence, in the case of this group of EU states, there are observed much higher than in other EU countries indicators of a number of years of life lost as a result of premature death – YLL (Table 1a) or to disability (YLD) as a result of an improper life style (Table 2a).

Figure 1. The spatial distribution of the level of risk of impact of behavioural factors on the specified consequences of chronic diseases, persons under 70 years old (the EU Member States, in 2017)



Source: Own study based on the data from *Global Burden of Disease Study 2017 (GBD 2017) Results*, Seattle, United States: *Institute for Health Metrics and Evaluation (IHME)*, 2018 at <http://ghdx.healthdata.org/gbd-results-tool>.

In 2017, in a group of EU-CEE states (countries of Central and Eastern Europe which became a EU member after 2004), as a result of impact of behavioural factors, an average number of years of life lost as a result of premature death (YLL), calculated per 100 thousand persons of working age, was more than twice higher than in a group of EU-15 states. In the population aged 15-49 in the EU-15 group, that indicator took the values from 812.6 (Italy) to 1,626.0 (Greece), with analogous values observed in the EU-CEE group from 1,143.4 (Slovenia) to 3,853.3 (Lithuania). In the population aged 50-69, the YLL ratio calculated per 100 thousand of persons at the same age in the EU-15 group took the values from 6,177.7 (Italy) to 10,885.9 (Greece) and from 10,032.0 (Slovenia) to 24,249.8 (Bulgaria) in the EU-CEE group.

Table 1. The number of years of life lost (YLL) due to chronic diseases as a result of behavioural factors, per 100 thousand persons of working age (the EU Member States, in 2017 and change in the period 1997-2017)

EU Member States	Groups of EU	Population aged 15-49				Population aged 50-69			
		YLL (2017) per 100,000 persons	Change 1997-2017	Rankings 2017		YLL (2017) per 100,000 persons	Change 1997-2017	Rankings 2017	
				2017	1997			2017	1997
Lithuania	EU-CEE	3853.5	-443.7	1	4	19902.3	-5213.6	5	9
Latvia	EU-CEE	3748.2	-486.8	2	6	21254.5	-7667.1	4	5
Bulgaria	EU-CEE	3418.9	-824.9	3	5	24249.8	-6843.7	1	3
Romania	EU-CEE	3059.4	-1958.1	4	2	22117.0	-11214.4	3	1
Estonia	EU-CEE	2987.5	-1581.3	5	3	15397.9	-14345.1	8	4
Hungary	EU-CEE	2181.5	-3655.3	6	1	22638.6	-10654.9	2	2
Poland	EU-CEE	2059.0	-1602.8	7	7	17342.7	-8333.3	6	8
Slovakia	EU-CEE	1888.6	-1258.8	8	8	16566.5	-11053.2	7	6
Greece	EU-15	1626.0	-116.0	9	22	10885.9	-1711.1	11	22
United Kingdom	EU-15	1519.4	-256.0	10	20	7870.7	-6465.8	24	16
Croatia	EU-CEE	1475.5	-1505.8	11	9	14478.3	-11213.2	9	7
Finland	EU-15	1467.0	-967.9	12	11	9093.0	-4333.5	16	21
Czech Republic	EU-CEE	1435.8	-1168.3	13	10	13715.5	-9999.2	10	10
Germany	EU-15	1337.1	-939.3	14	13	10260.1	-5298.9	12	14
Portugal	EU-15	1195.7	-865.1	15	15	8440.7	-5046.7	18	20
Denmark	EU-15	1163.9	-1039.1	16	14	9892.7	-7773.0	14	12
Slovenia	EU-CEE	1143.4	-1207.4	17	12	10032.0	-9312.1	13	11
Luxembourg	EU-15	1120.0	-907.3	18	16	7697.3	-7063.4	25	15
Ireland	EU-15	1104.6	-466.2	19	23	7311.9	-8747.8	26	13
France	EU-15	1084.6	-783.2	20	18	8341.6	-3357.2	19	24
Belgium	EU-15	1066.2	-776.5	21	19	9210.2	-4564.6	15	18
Austria	EU-15	1065.5	-853.6	22	17	8544.9	-5610.3	17	17
Spain	EU-15	1008.5	-735.5	23	21	7899.4	-3651.6	23	26
Malta	-	987.1	-338.8	24	27	8106.5	-3278.3	21	27
Cyprus	-	944.9	-388.9	25	26	8309.4	-4000.4	20	23
Sweden	EU-15	905.9	-333.9	26	28	6568.3	-3815.8	27	28
Netherlands	EU-15	814.0	-712.5	27	24	7910.5	-5668.3	22	19
Italy	EU-15	812.6	-629.2	28	25	6177.7	-5390.0	28	25

Source: See, Figure 1.

Table 2. *The number of years of life lost to disability (YLD) due to chronic diseases as a result of behavioural factors, per 100 thousand persons of working age (the EU Member States, in 2017 and change in the period 1997-2017)*

EU States	Member States	Groups of EU	Population aged 15-49				Population aged 50-69			
			YLD (2017) per 100,000 persons	Change 1997-2017	Rankings 2017		YLD (2017) per 100,000 persons	Change 1997-2017	Rankings 2017	
					2017	1997			2017	1997
Estonia		EU-CEE	2175.4	120.8	1	1	4180.6	-198.9	6	5
Latvia		EU-CEE	2150.0	173.8	2	2	4257.3	248.0	5	10
Lithuania		EU-CEE	1937.5	11.8	3	3	3945.1	-49.5	10	11
Hungary		EU-CEE	1691.2	-34.0	4	4	4778.5	-454.2	1	1
Czech Republic		EU-CEE	1643.6	182.7	5	17	4303.1	-44.4	3	7
United Kingdom		EU-15	1637.2	45.4	6	9	2630.2	-147.3	26.0	26
Bulgaria		EU-CEE	1614.7	105.8	7	14	4319.7	-146.6	2	3
Slovenia		EU-CEE	1602.8	94.0	8	15	3713.8	-544.9	11	8
Ireland		EU-15	1599.5	143.2	9	18	2917.1	-255.1	20	16
Croatia		EU-CEE	1590.9	-62.8	10	6	4294.6	-506.0	4	2
Slovakia		EU-CEE	1561.7	16.3	11	12	3979.0	-388.9	9	6
Finland		EU-15	1541.8	-107.7	12	7	2782.9	-56.6	24	22
Luxembourg		EU-15	1536.8	-143.6	13	5	3100.3	-223.6	15	14
Romania		EU-CEE	1504.0	113.1	14	19	4052.0	-363.8	8	4
Malta		-	1499.7	115.6	15	20	3070.0	59.7	16	20
Belgium		EU-15	1474.8	-61.1	16	13	3294.8	119.0	13	15
Portugal		EU-15	1465.0	142.9	17	25	2983.1	-95.5	19	17
Germany		EU-15	1457.2	-118.8	18	10	3024.0	-44.0	17	18
Greece		EU-15	1453.4	131.9	19	26	3150.7	320.0	14	24
Poland		EU-CEE	1452.3	-24.4	20	16	4087.9	-141.1	7	9
Austria		EU-15	1416.8	38.6	21	21	2859.8	26.8	21	23
Denmark		EU-15	1388.4	-207.1	22	8	3295.5	-480.2	12	12
France		EU-15	1334.3	-15.0	23	24	2371.3	6.3	28	28
Spain		EU-15	1330.9	32.2	24	27	2650.6	-81.9	25	25
Netherlands		EU-15	1330.2	-229.5	25	11	3008.9	-389.3	18	13
Italy		EU-15	1240.1	-122.7	26	23	2476.6	-286.9	27	27
Cyprus		-	1222.2	75.4	27	28	2820.0	-61.8	22	21
Sweden		EU-15	1207.4	-155.7	28	22	2807.6	-237.4	23	19

Source: See, Figure 1.

Table 3. *The number of years of life lost (YLL) and years of life lost to disability (YLD) due to chronic diseases as a result of behavioural factors, per 100 thousand persons of working age - selected statistics*

EU Member States	Groups of EU	Population aged 15-49			Population aged 50-69		
		per 100,000 persons in 2017	Change 2017	1997-	per 100,000 persons in 2017	Change 2017	1997-
Years of life lost (YLL)							
Average	EU-28	1659.8	-957.2		12150.6	-6843.8	
Interval		3040.9	3539.3		18072.1	12634.1	
Average	EU-15	1152.7	-692.1		8407.0	-5233.2	
Interval		813.3	923.1		4708.3	7036.7	
Average	EU-CEE	2477.4	-1426.7		17972.3	-9622.7	
Interval		2710.1	3211.7		14217.7	9131.5	
Years of life lost to disability (YLD)							
Average	EU-28	1537.8	9.3		3398.4	-157.8	
Interval		968.1	412.1		2407.2	864.9	
Average	EU-15	1427.6	-41.8		2890.2	-121.7	
Interval		429.8	372.6		924.3	800.3	
Average	EU-CEE	1720.4	63.4		4173.8	-235.5	
Interval		723.2	245.4		1064.7	793.0	

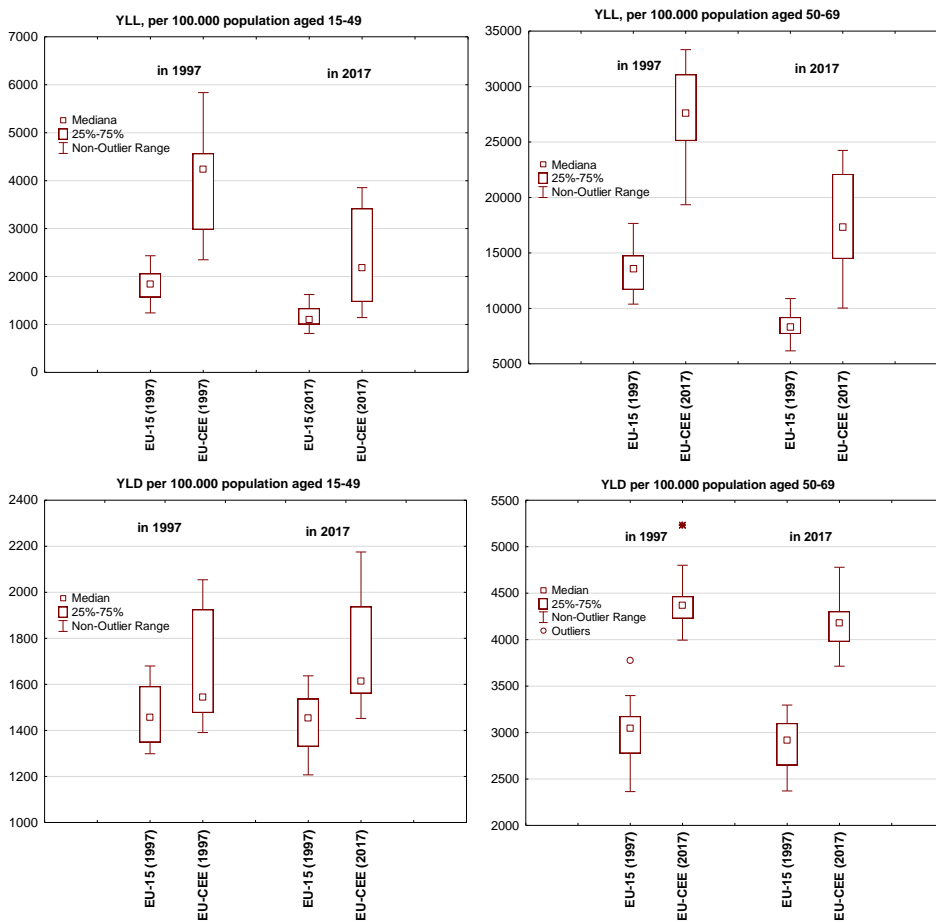
Source: See, Figure 1.

A smaller variation of researched parameters was observed in the case of impact of behavioural factors on a number of years of life lost to disability due to a chronic condition (YLD). In a group of Central and Eastern European countries, that indicator calculated per an analogous group of 100 thousand persons of working age was approx. 30% lower than an average result in the EU-15 countries. In the case of a number of years of life lost to disability (YLD) due to chronic conditions caused by behavioural factors, that indicator level in the population aged 15-49 calculated per 100 thousand persons at the given age took the values from 1,207.4 (Sweden) to 1,637.2 (United Kingdom) in the EU-15 group and from 1,452.3 (Poland) to 2,175.4 (Estonia) in the EU-CEE group. In the population aged 50-69, that ratio came, respectively, from 2,371.3 (France) to 3,294.8 (Belgium) in the EU-15 group and from 3,713.8 (Slovenia) to 4,778.5 (Hungary) in the EU-CEE group. Fig. 2 shows the level of dispersion of the analysed parameters in the EU-15 and EU-CEE groups.

An assessment of a level of inequalities of the impact of behavioural factors on health of persons of working age observed in the Old Europe-New Europe relation, performed with use of the odds ratio (OR), allowed for the determination of a level of the so-called “odds” on the occurrence of negative consequences of chronic conditions (premature death or health loss) determined by life style among the Central and Eastern Europe citizens against residents of the so-called “old” Union states. The obtained OR values (YLL) indicate that the so-called “odds” for a EU-

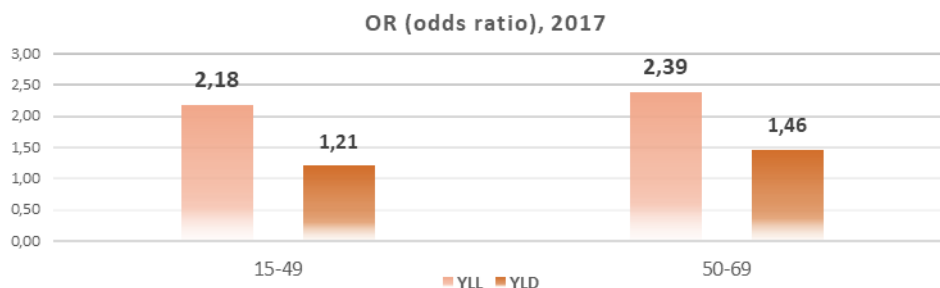
CEE citizen aged 15-49 on experiencing negative consequences of chronic conditions (premature death) caused by behavioural factors are much higher than for a EU-15 resident (OR=2.18). It was also established that the “odds” level was growing together with age and in reference to an analogous situation of a person aged 50-69 it is more than twice that value (OR=2.39). Smaller disparities between two groups of EU states were observed in the case of OR analysis (YLD) performed in the context of “odds” on potential years of life with disability. That ratio level came respectively to 1.21 (OR=1.21) in the 15-49 age group and to 1.46 (OR=1.46) in the 50-69 age group (Fig. 3).

Figure 2. Dispersion of the parameters: a) years of life lost (YLL) and b) years of life lost to disability (YLD) due to chronic diseases as a result of behavioural factors, per 100 thousand population aged 15-49 and 50-69 for two groups of EU states: EU-15 and EU-CEE (in 1997 and 2017)



Source: See, Figure 1.

Figure 3. OR index: “odds” on the occurrence of negative consequences of chronic conditions (premature death or health loss) as a result of behavioural factors among the Central and Eastern Europe citizens against residents of EU-15 states (in 2017)



Source: See, Figure 1.

The assumed assessment of the convergence process in the EU-28 group in the area of health and associated expected reduction over time in the disparity of a scale of negative impact of behavioural factors on the level of burden with chronic conditions of people of working age was based on the assessment of changes in a level of studied YLL and YLD indicators specifying a number of healthy life years lost calculated per 100 thousand persons. While assuming different initial conditions for particular EU states determined with a level of YLL and YLD variables in 1997, the pace of the change in the analysed parameters was determined for particular countries in the years 1997-2017 (relation 2017/1997). It was assumed that in the case of member states with difficult initial conditions (high levels of YLL and YLD) that relation should be as small as possible, indicating the fast pace of the decrease in the given parameter providing with an effect of group catch-up (beta convergence). Figure 4 shows the obtained results in distinguished age groups.

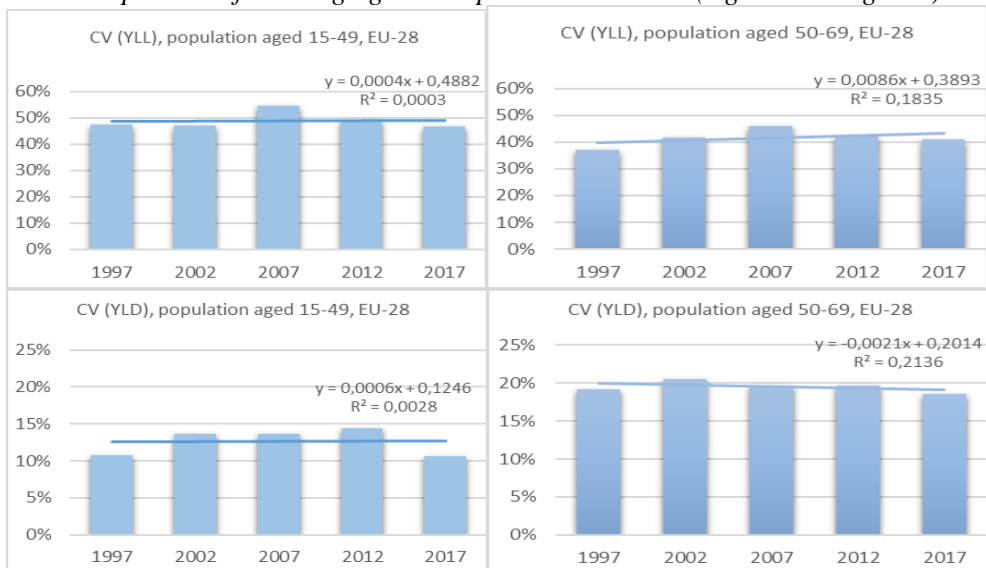
The obtained results of beta convergence indicate that only in the case of YLD defining a number of years of life lost to disability due to a chronic condition in the population aged 15-49 a downwards trend is noted, which suggests the expected reduction of the level of this parameter over time together with a partial equalisation of distance by countries that fall behind. In the case of other variables, the trend location indicates the lack of significant convergence effects. An additional analysis of changes in the level of dispersion of studied indicators in the years 1997-2017 conducted with use of the volatility index (sigma convergence) confirmed the persistent high level of diversification of the studied parameters in the analysed 20 years (Figure 5).

Figure 4. The effect of group catch-up in the EU-28 group, YLL and YLD per 100 thousand persons of working age in 2017 and change in the period 1997-2017 (beta convergence)



Source: See, Figure 1.

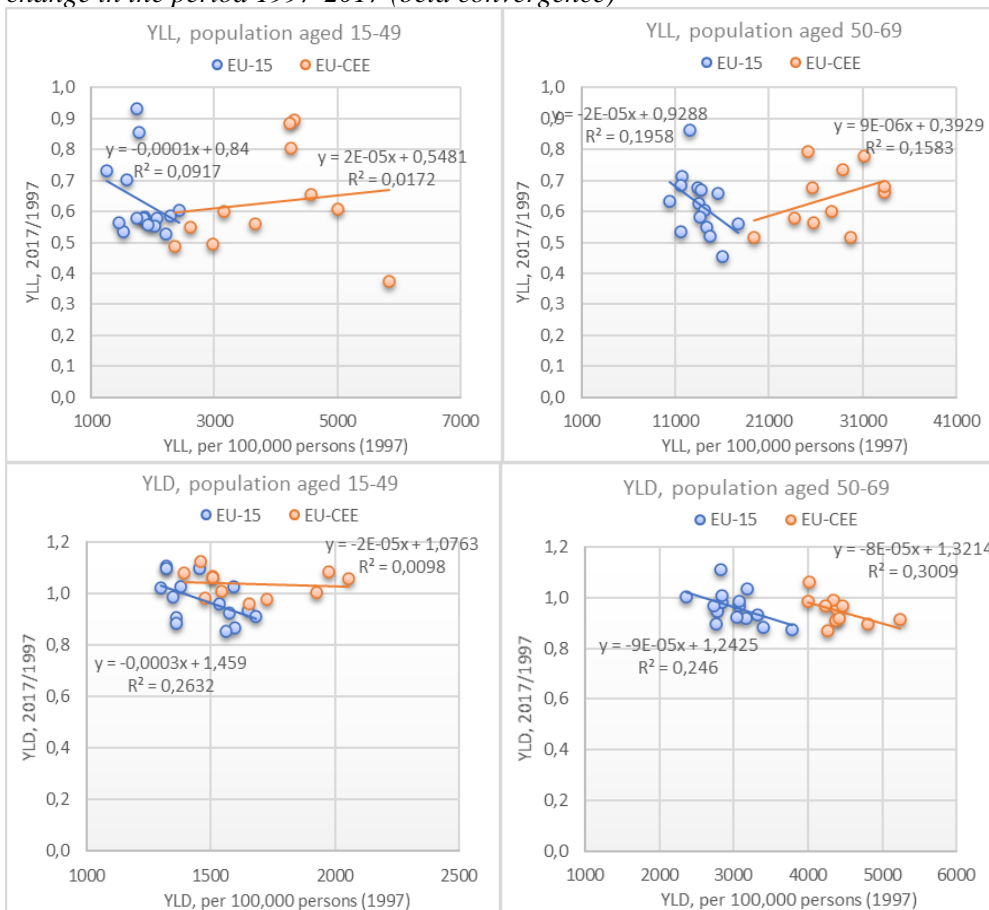
Figure 5. The coefficient of variation CV in the EU-28 group, YLL and YLD per 100 thousand persons of working age in the period 1997-2017 (sigma convergence).



Source: See, Figure 1.

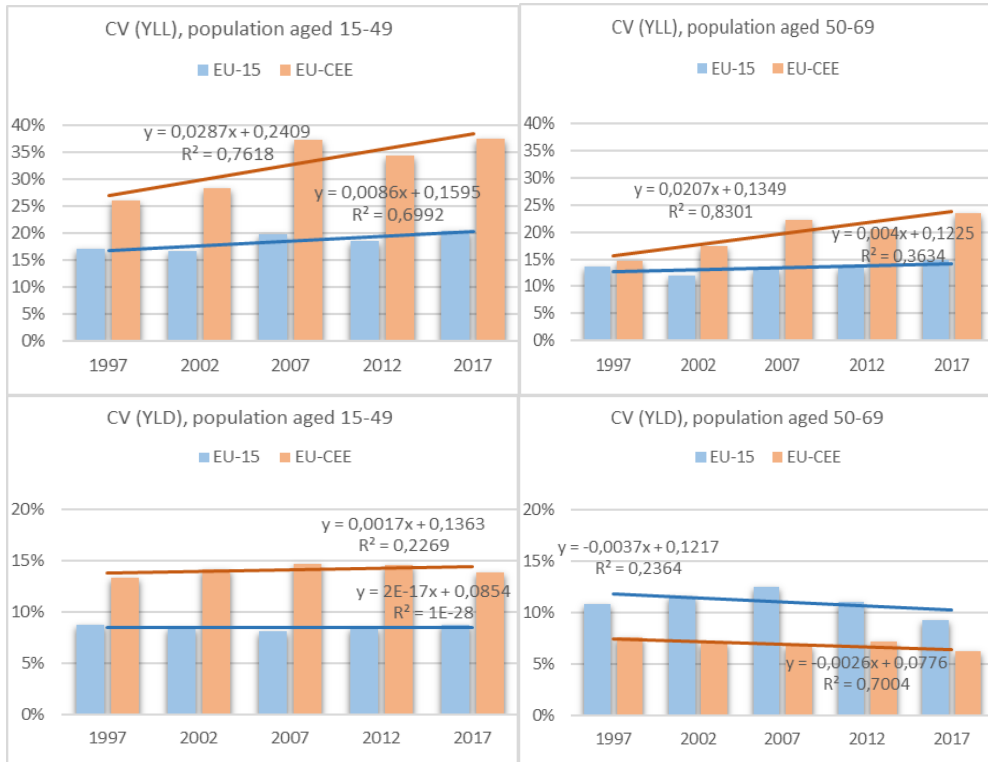
In order to assess whether the similarity of initial conditions determined the level of convergence effects present in the group of EU states, an analogous analysis was performed in reference to two groups of member states (EU-15 and EU-CEE) distinguished for the research purposes. The assumption was made that experiences of systemic transformation constituted a significant factor determining a series of social behaviours, thus they determined the level of impact of behavioural risk factors on a scale of burden of society with consequences of chronic conditions. Fig. 6 and 7 present the results of the beta and sigma convergence analysis with regard to two studied groups.

Figure 6. The effect of group catch-up in two groups of member states: EU-15 and EU-CEE, YLL and YLD per 100 thousand persons of working age in 2017 and change in the period 1997-2017 (beta convergence)



Source: See, Figure 1.

Figure 7. The coefficient of variation CV in two groups of member states: EU-15 and EU-CEE, YLL and YLD per 100 thousand persons of working age in the period 1997-2017 (sigma convergence)



Source: See, Figure 1.

The obtained results indicate a much better match of the researched system considered in the adopted division into Old Europe and New Europe. In the period under research, a level of diversification of particular parameters was subject to slight changes, but much lower levels of their dispersion against the results obtained for the entire EU-28 group must be noticed. Clearly positive effects of system catch-up and result improvement (beta convergence) are noticed in the EU-15 group in reference to YLL and YLD, however no expected decrease in dispersion level was observed for both parameters.

An opposite effect (divergence) was noted in the EU-CEE group in reference to the YLL parameter that defines a number of years of life lost as a result of premature death caused by behavioural factors. For this parameters a simultaneous upward trend for the studied variable was noted, suggesting an increase in an average level of burden with the risk of premature death, as well as an increase in the level of dispersion of this feature, indicating the issue of internal dispersion deepening over time.

Positive convergence effects in the group of Central and Eastern European countries were observed in reference to the YLD variable determining a number of healthy life years lost as a result of chronic conditions caused by behavioural factors, which in the group of persons aged 50-69 was subject to trends indicating the reduction in an average level of that feature and in disparities among countries.

5. Conclusions

The analysis of factors determining the population's health level, conducted under the global research on health determinants, indicates that in the case of European countries it is the level of the so-called behavioural factors that constitutes the largest determinant of a number of years of life lost, getting ahead of such risk factors as biological and environmental conditions. The estimated average values of impact of behavioural factors on health consequences for the EU citizens show that these factors are responsible for more than 40% of all premature deaths resulting from chronic conditions and almost 30% of a number of healthy life years lost to disability. While referring only to people of working age, as a consequence of negative impact of behavioural factors on chronic conditions the EU economy has lost more than 1.2 million of life years due to premature deaths of its citizens, while another 4.3 million of life years have been burdened with disability. The analysis results have also confirmed a disproportionately high share of the Central and Eastern European countries in this phenomenon. The diagnosed high level of inequalities between the Old Europe and New Europe countries within the scope of impact of behavioural risk factors concerned mainly persons aged 50-69. In addition, a significant issue of the EU-CEE countries is constituted by a high level of mortality determined by a negative scheme of population behaviours observed both for persons aged 15-49 and 50-69.

The analysis of the system catch-up process concerning countries in the least privileged situation (the highest level of burden with consequences of chronic conditions), conducted in the EU-28 group, has indicated that positive convergence effects might be discussed only for the YLL indicator (years of life lost) and concerned the group of persons aged 15-49. Other groups did not notice a real effect of disparity reduction over time with regard to levels of the researched indicators.

In the light of the obtained results, it may be stated that the issue of impact of behavioural factors on the health level identifies a series of challenges necessary to understand the role of social health determinants in the level of reaching equality in health by societies. The complicated causal paths connecting these factors with health, as well as the fact of existence of many additional variables related to the phenomenon of health inequalities cause significant limitations on the capability to study these factors with use of scientific experiments. However, due to the scale of the problem and the scope of consequences (loss of life or health), the issue of enforceable measures within the scope of reducing inequalities should become a component of the rational cohesion policy.

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