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Summary: During last decades there appeared an increasing number of evidences that income inequality influences negatively such indicators of quality of life as life expectancy at birth or crime rate, both between and within developed countries. Although there are some theoretical (sociological and psychological) explanations of this phenomenon, no consensus has been reached yet according to the very existence of the effect. Some substantial critique takes place, undermining the authenticity of the effect and its interpretation.

This study was performed in order to investigate the possible existence of this effect in Poland. We have chosen some important indicators of quality of life for different voivodeships and compare their values with the differences of inequalities in various regions of the country, using partial correlations and linear models. Generally, we have not detected a negative relationship between inequality and quality of life. In the paper we briefly discuss the possible reasons of such a result.

Key words: indicators of quality of life, life expectancy at birth, crime rate

Introduction

It is often and widely assumed, that income or wealth are positively correlated with both objective and subjective well being of individuals. Although there are many proofs, that is true with respect to within societies comparisons [2, 4, 15, 21, 29, 30], this is not so obvious in regard to between societies or time studies especially with respect to subjective aspects. Richard A. Easternin has stated a question: "Will raising the incomes of all increase the happiness of all?" [8], and the suggested answer is "no", what is called an "Easterlin paradox". There are many evidences, that rising average income of society causes evolution of material expectations of its members and thus eventually keep the individual satisfaction on the same or only slightly shifted level [7, 8, 11, 31], what is known as "habit formation" [25] and its opposite as "relative deprivation" [26]. The ef-

fect of an increase of incomes of all members is much less then the effect of an increase of relative income of an individual. Besides these evidences it is expected, that more objective measures of well-being such as duration of life or health outcomes, will depend strongly on the level of wealth, both across and between societies (countries). And that is indeed the truth, but only to some extent. It seems, that above some level of material prosperity there are another factors that overwhelm the effect of welfare. There is a strong and influential stream within economics of well-being, that identify this factor as (in)equality [6, 14, 16, 18, 27, 35–39].

There are many evidences and much of work has been done to prove, that – given the developed countries of the richest of the world – comparing different countries or different parts of a country, many indicators of quality of life such as life expectancy, number of suicides or infant mortality, depend strongly on the level of inequality. A number of such studies have been performed comparing rich countries [18, 27, 35–39], states of United States [14, 16] and regions of Italy [6], revealing existence of this effect. On the other hand, some researchers gave a critical judgment of these studies. There have been raised questions of selective data use orbeing an artifact of another effects (e.g. nonlinearity of wealth-health dependence) or just calling for more caution in drawing conclusions [12, 13, 17, 19, 20, 22, 34]. Moreover, there have been performed studies showing no supposed effect in Denmark [23], Japan [28] and New Zealand [3].

The aim of this paper is to study relationship between inequality and various indicators of quality of life in Poland, comparing different voivodeships. As we have data about inequalities in different voivodeships available for 2008 year, the study will concern this particular year.

The sources of our data are as follows: as for data concerning countries from all over the world we have used United Nations data (Human Development Report 2008, [33]), while the source of our data with regard to Poland is Statistical Yearbook for 2008 [5], published by Central Statistical Office of Poland and, as for Gini indexes of incomes for different voivodeships, calculations by Prof. T. Panek using data from Eurostat [24]. The data for Polish voivodeships used in this paper is included in Table 5 at the end of the paper.

The paper is organized as follows. In the next section we will examine briefly dependence of life expectancy at birth on average income for the set of countries all over the world and the set of Polish voivodeships. In the following section we will perform a first step analysis of dependence of life expectancy at birth on inequalities for both a set of rich countries and for the set of Polish voivodeships as well. In section 4 we will examine more closely, by means of partial correlation coefficients and estimation of models, dependences of various indicators of quality of life of four variables that are expected to influence the quality of life, including inequalities. In last section a discussion of obtained results is given.

Relation between wealth and life expectancy at birth

Let us here develop a discussion regarding dependence of objective indicators of well-being – in particular life expectancy at birth – on level of incomes. As it was stated in previous section, there are many studies that confirm a very strong association between health and the level of incomes, both on within and between country level. Although there are still discussions about the direction of causation of this dependence, especially in industrial countries, the very effect is not questioned. However, it seems that the effect between countries is somewhat limited, reveling resemblance to the law of diminishing marginal utility, what will be pictured below.

Let us picture it for all countries of the world, for which data is available. Figure 1 shows life expectancy at birth versus GDP per capita

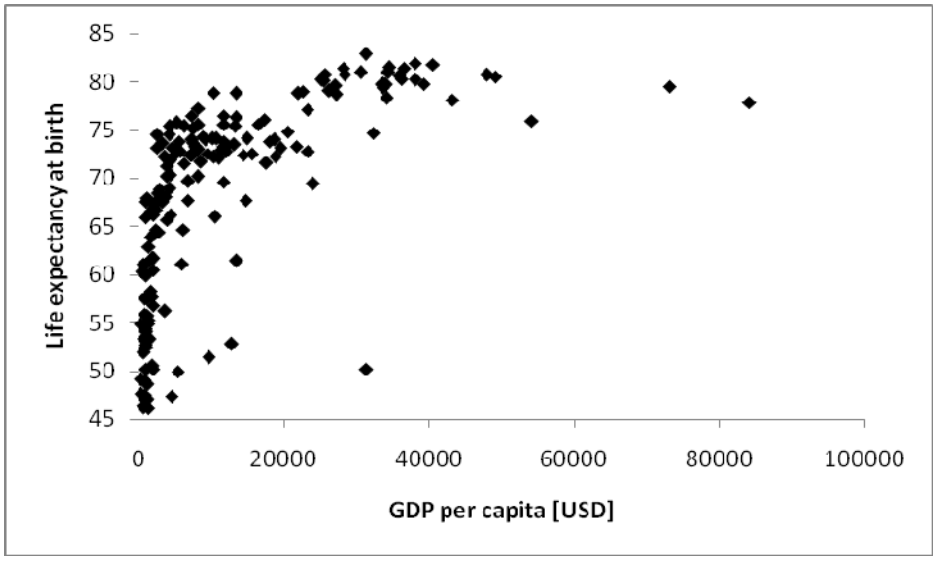

Fig. 1. Life expectancy at birth vs GDP per capita for 176 countries all over the world. Source: own construction based on data from [33].

It may be clearly seen, that for small values of GDP life expectancy increases, on average, rapidly; than this increase is slow down and the dependence becomes almost constant for high values of GDP, that is, for rich countries. In particular, for countries that belongs to the ones of "very high human development" (according to UN, [33]) there is nearly no dependence, and one thousand dollars more "buys", on average, only 10 days of longer life – in contrast to 50 poorest countries, where the same amount of money gives, on average, 6,5 years of longer life (averaged on country level) (see. Fig. 2).

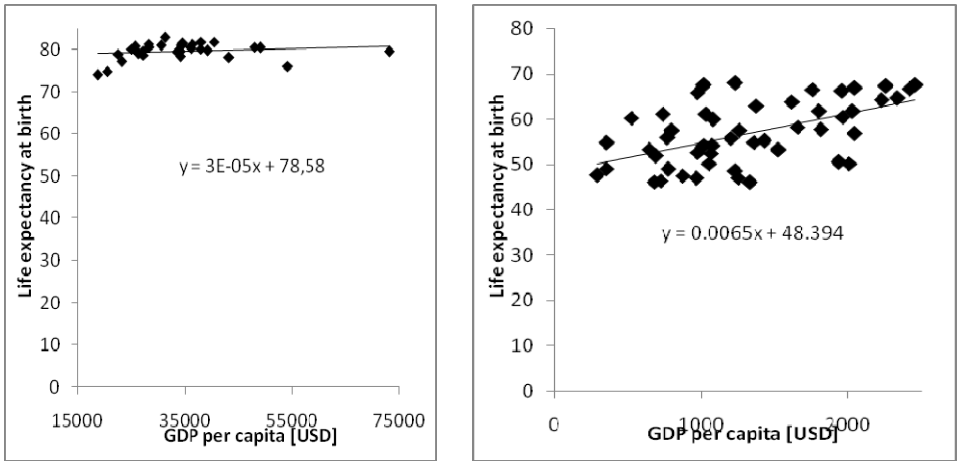

Fig. 2. Life expectancy at birth vs GDP per capita for countries of "very high human development" (according to UN), and 50 poorest countries of the world. Source: own construction based on data from [33].

As for comparison in the group of voivodeships in Poland, the result is shown on Figure 3 for life expectancy at birth for women and men separately. Fig. 3 (left) depicts the relationship between life expectancy at birth and average income per person for all 16 voivodeships, while Fig. 3 (right) – the same relationships for set of voivodeships excluding Mazowieckie.

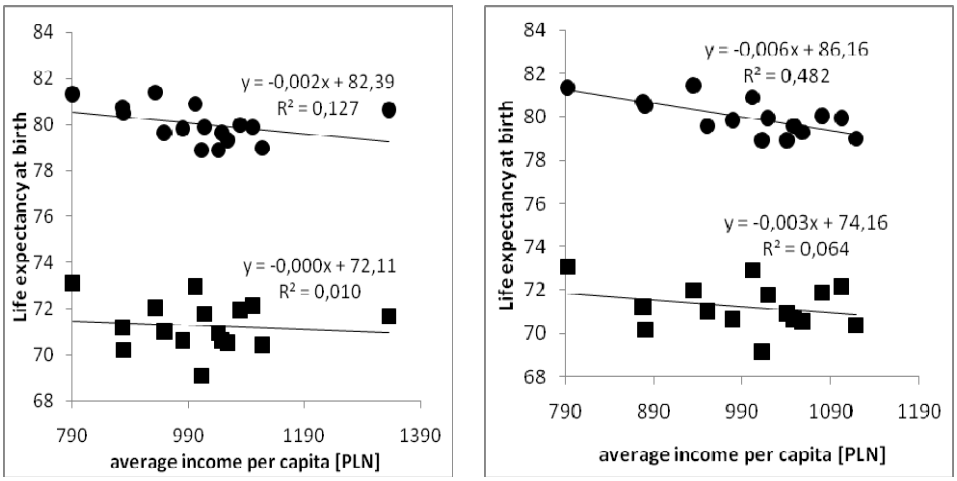

Fig. 3. Life expectancy at birth for women (circles) and men (squares) versus average income per person for 16 Polish voivodeships (left) and for 15 voivodeshifts, excluding Mazowieckie (right). Source: own construction based on data from Appendix 1.

It may be seen that relationship between life expectancy at birth and average income is weak – or in men's case even almost non-existing – and, surprisingly,

negative. It may be suspected, that data regarding incomes may not be reliable, as there are much of undeclared incomes. However, even stronger lack ofdependence appears, while taking into account average earnings or average expenses, see Fig. 4, 5.

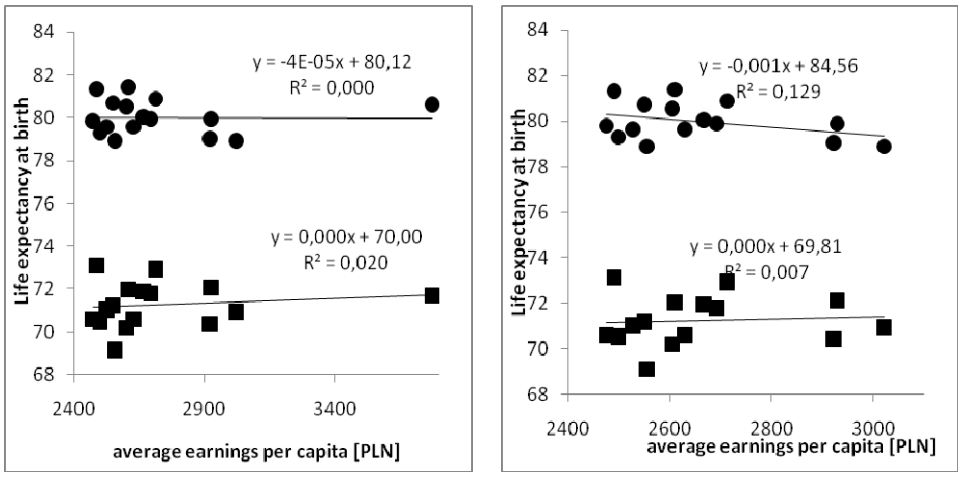

Fig. 4. Life expectancy at birth for women (circles) and men (squares) versus average earnings per person for 16 Polish voivodeships (left) and for 15 voivodeshifts, excluding Mazowieckie (right). Source: own construction based on data from Appendix 1.

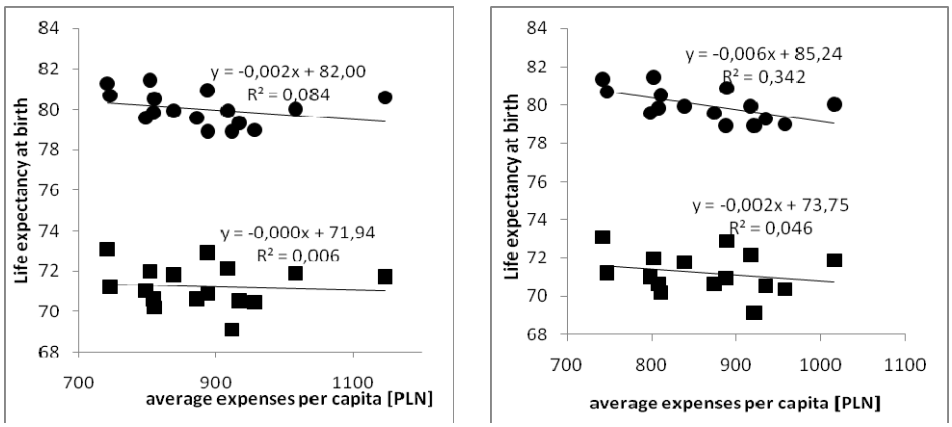

Fig. 5. Life expectancy at birth for women (circles) and men (squares) versus average expenses per person for 16 Polish voivodeships (left) and for 15 voivodeshifts, excluding Mazowieckie (right). Source: own construction based on data from Appendix 1.

It may be suspected, that appearing on some figures negative relationship is an artifact of dependence of life expectancy on other variables, which are in turn somehow related to average income/earnings/expenses. In next sections we will

examine some possible influential variables including the main subject of this paper – inequalities.

Relation between inequality and life expectancy at birth

Let us have a look here at relationship between inequalities, as measured by Gini coefficient, and life expectation, both in the whole world and in Poland. It is often argued [18, 27, 35–39] that in developed countries, where people do not suffer hunger and insufficient basic medical care, the main factor that influence the average of life expectancy in a certain society is not average income but rather the level of inequality. There are also arguments given corroborating the hypothesis of causal relationship between level of inequalities and health outcomes [38]: in general, the main reason for such a connection would be a stress, that is caused by more competitive society and which in turn causes lowering of immunity and more self-destructing behavior.

First of all, let us check the hypothesis of inequalities being correlated with health by simply comparing Gini indexes for chosen rich and developed countries – as for such the effect of inequalities influencing quality of life is claimed– with life expectancy at birth. The countries chosen here are repeatedly chosen in the literature as evident examples of enough rich and highly developed countries. These 18 countries are: Belgium, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and USA. The results are given in Fig. 6. The plot indeed reveals a negative dependence between inequality and life expectancy at birth. On the other hand, there is a positive, but much weaker correlation between GDP per capita and life expectancy at birth, see Fig. 7.

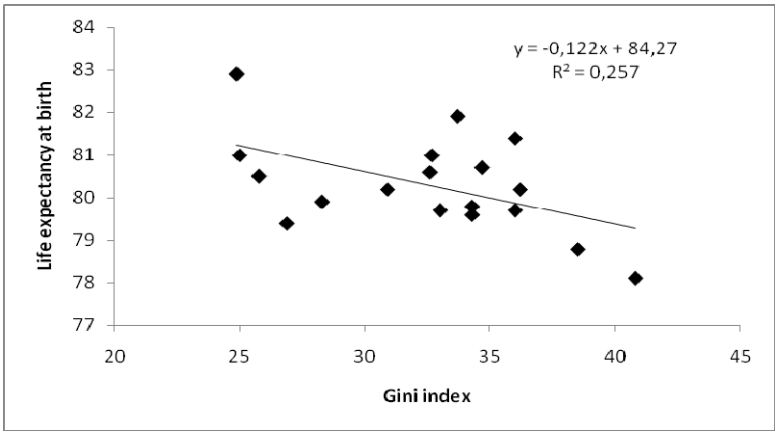

Fig. 6. Life expectancy at birth versus Gini index for chosen countries. Source: own construction based on UN data [33].

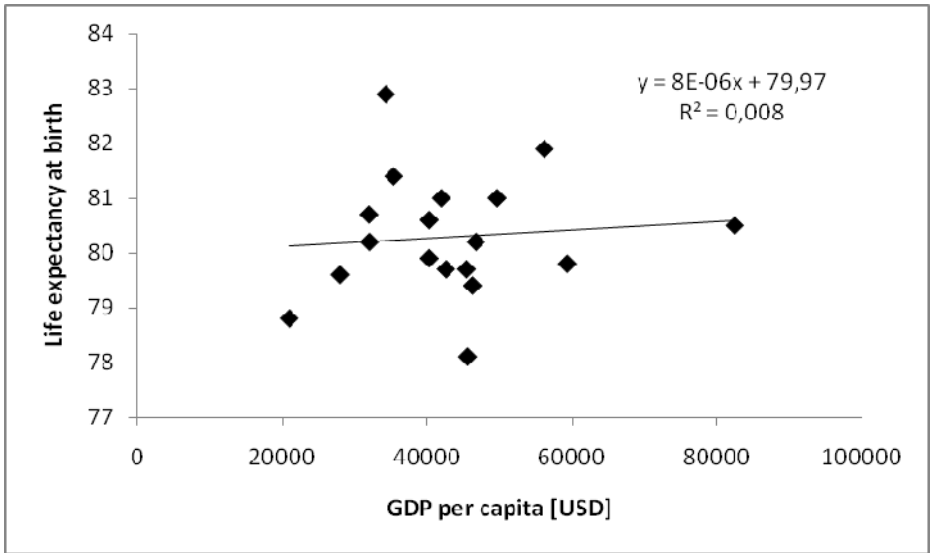

Fig. 7. Life expectancy at birth versus GDP per capita for chosen countries. Source: own construction based on UN data [33].

Taking into regard, that within this bunch of countries correlation between GDP and Gini index is negative ($r = -0{,}405$) it may not be expected, that negative dependence of duration of life on inequality is an artifact of co-dependence on richness. Indeed, while correlation coefficient between Gini index and life expectancy equals −0,507, the partial correlation coefficient between these two variables while keeping GDP constant is even a little bit larger (in absolute value), equal to −0,516.

Examining the same relationship for Polish voivodeships we can see (Fig. 8, upper part), that there is practically no dependence of life expectancy for both women and men on Gini index, in the case of all Polishvoivodeships. Correlation coefficients for women and men are equal to 0,077 and 0,048, respectively.However, it might be an effect of a relationship between inequality and average income in different voivodeships. To check whether this is the cause of the lack of dependence, we have compared correlations coefficients with partial correlations coefficients (keeping the value of average income constant). These latter are equal to 0,540 for women and 0,182 for me, thus suggesting relationship just the opposite the expected one. The plot of life expectancy at birth versus Gini index for the set of all voivodeships but Mazowieckie (Fig. 8, lower part) seems more promising, as correlations between variables in interest are equal to −0,183 (women) and −0,105 (men), thus the direction of dependence is consistent with the expected one. However, having calculated partial correlations between life expectancy at birth and Gini index while keeping average income constant smears this picture over: they equal 0,118 for women – thus the de-

pendence is inverted into the opposite direction, and −0,011 for men, thus the dependence is decreased to nearly no dependence.

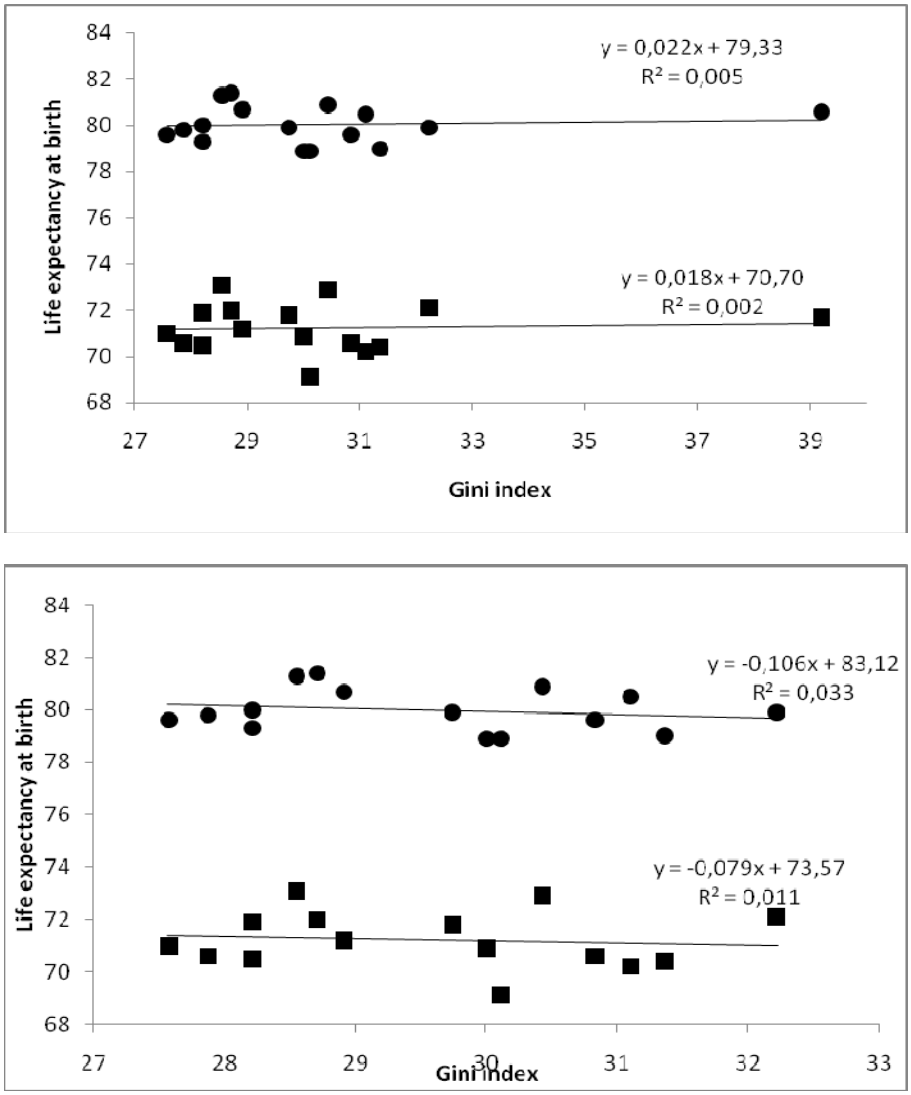

Fig. 8. Life expectancy at birth versus Gini index for all Polish voivodeships (top), for all but Mazowieckievoivodeship (bottom).

While not willing to abandon the hypothesis of negative dependence of quality of life on inequalities prematurely, in the next section we will consider this question even more detailed, including more variables into analysis.

Inequality and various indicators of quality of life

In this section we will examine a few more indicators of quality of life, that is, apart from life expectation at birth (for women and men), we will take into account also infant mortality (number of deaths per 100 000 live births), crimes (number of crimes per 10 thousands' population), mental diseases (deaths caused by mental diseases per 100 thousands' population) and circular diseases (deaths caused by mental diseases per 100 thousands' population). Moreover, we will add, as explanatory variables apart from average income and Gini index also education (percent of people with high school graduation) and expenses for health-care (percent of total expenses on health-care). These two latter (education and expenses of health-care) are widely agreed to be factors influencing health outcomes [1, 6, 17, 21].

In what follows we will use somewhat abbreviated names for these variables, that is: life-F, life-M, infant mort., crimes, mental dis., circ. dis., income, Gini, educ. and health-care.

At first stage of our analysis we have calculated partial correlations between six indicators of quality of life, denoted by symbol X, and four variables, denoted by Y, that are commonly supposed to influence health outcomes and thus quality of life. The results for the set of all Polish voivodeships and without Mazowieckie are shown in Table 1 and Table 2, respectively. In the first column there are correlation coefficients between quality of life indicators and Gini index of income inequalities (denoted as r_{xG}), in the second – partial correlations between quality of life indicators and Gini index while keeping the average income constant, in the third – keeping income and expenses for health-care constant and in the last column – keeping income, expenses for health-care and level of education constant. Bold italics marks these results out, which are in sign in agreement with the hypothesis, that quality of life depends negatively on the level of inequalities.

Table 1. Partial correlations between input QOL indicators, and output QOL indicators.

Y / *X*	$r_{X\text{Gini},Y}$			
	r_{xG}	income	incomehealth-care	income health-care educ.
life-F	0,048	0,182	0,185	0,143
life-M	0,077	0,540	0,541	0,326
infant mort.	−0,076	−0,155	−0,214	−0,327
crimes	***0,136***	***0,268***	***0,123***	***0,016***
mental dis.	−0,069	***0,181***	***0,271***	−0,238
circ. dis.	***0,050***	−0,577	−0,550	−0,462

Source: own calculations.

Table 2. Correlation coefficients between quality of life indicators and explanatory variables, for Polish voivodeships without Mazowieckie

Y / X	$r_{X\text{Gini},Y}$			
	r_{xG}	income	income health-care	income health-care educ.
life-F	***−0,183***	0,118	0,134	***−0,060***
life-M	***−0,105***	***−0,011***	***−0,004***	***−0,010***
infant mort.	***0,334***	***0,240***	***0,194***	***0,011***
crimes	***0,280***	−0,058	−0,036	−0,021
mental dis.	***0,155***	***0,251***	***0,323***	−0,127
circ. dis.	***0,099***	***0,184***	***0,074***	−0,011

Source: own calculations.

It may be noticed, that there is no such an indicator of quality of life that in consistent way depend negatively on inequalities, neither for the case of all voivodeships nor for the set without the capital one. There are some cases which seems promising – crimes, infant mortality and mental diseases – do not withstand all stages of analysis, as they lose the strength of the supposed effect while including subsequent variables (infant mortality) or including the last one (mental diseases and crimes). Moreover, in the case of crimes the supposed effect apperas only within the set of all voivodeships including the capital one, once even reverting the direction while exclude it from the analysis. As for the life expectancy for men for the case of voivodeships without Mazowieckie, the effect of negative relationship seems to be stable in direction, however, its strength is negligible.

Additionally to the above analysis we estimate a linear models for these same six endogenous variables (indicators of quality of life),and four exogenous variables:income, Gini index, expenses for health care and education. The results for all voivodeships and all but the capital one are presented in Tables 3 and 4, respectively.

Table 3. Linear models for all Polish voivodeships

	const.	Gini	income	health-care	educ.
life-F	79,5339	0,196612	−0,005953	−0,21515	***0,0224734***
life-M	71,2701	0,132792	−0,002779	−0,070024	−0,018254
infant mort.	373,974	−21,122	0,239003	29,4476	8,98655
crimes	227,773	−17,0908	0,463827	***−13,4887***	2,57097
mentaldis.	5,13807	−0,603252	***−0,009508***	***−4,88032***	0,786294
circ. dis.	53,3331	***0,714922***	***−0,063357***	110,462	1,95602

Source: own calculations.

Table 4. Linear models for Polish voivodeships, Mazowieckie excluded

	const.	Gini	income	health-care	educ.
life-F	84,9239	***−0,03927***	−0,00627	−0,28127	***0,060546***
life-M	74,5643	***−0,01137***	−0,00297	−0,11044	***0,005014***
infant mort.	−127,624	***0,829727***	0,268207	35,6011	5,4435
crimes	−145,835	−0,7404	0,485579	***−8,90535***	***−0,06802***
mentaldis.	0,81392	−0,41401	***−0,00926***	***−4,82727***	0,75575
circ. dis.	84,0071	−0,62748	***−0,06514***	110,086	2,17269

Source: own calculations.

Bold italics again indicates these values, which signs are in agreement with the hypothesis, which may be summarized as follows: less inequality, more income, more expenses on health-care and better education are connected with better quality of life. It is obvious, that the signs of values in the third column of Tables 3 and 4 have to correspond to the signs of partial correlation contained in the last column of Tables 1 and 2, respectively, and values on these same positions are marked out. As partial correlations give us more information – not only the directions but also the strength of dependences, it would be useless presenting here results of models if they gave not, in consistent way, also more information about the direction of dependence between all quality of life indices and four selected explanatory variables. We can see in Tables3 and 4 that minority of them complies with the standard assumptions about what influence the quality of life. For example, we can see, that rising income is connected with shorter life for both women and men, in the set of all voivodeships and excluding the capital one as well; and more expenses on health care are connected with greater infant mortality, again, in the set of all voivodeships and excluding the capital one as well.

In the next section we will proceed to the discussion possible explanations of these results.

Discussion

In this section we will discuss possible explanation of results of previous ones. We have seen, that it seems, in the set of Polish voivodeships there is no effect of negative dependence of quality of life indicators on inequalities, which has been suggested recently by many authors to appear within developed world. We will concentrate on four questions: 1) quality of data; 2) validity of voivdeships as units for comparative study; 3) specificity of Poland; 4) the very existence of the supposed effect.

The question, whether data according to incomes and their inequalities is reliable, is known and has been repeatedly stated [10]. It is well known not only in the scientific circles, that some part of incomes is not declared ("twilight zone"); there are also methodological problem while calculating and comparing inequalities measures. For example, rank correlation coefficient between Gini indexes for European countries as given by UN [33] and Eurostat [9] ranges, according to our calculations for a few different years, between 0,7 and 0,8.

The other question to be raised here is adequacy of applying such an analysis to voivodeships. Although the influence of inequalities on equality of life is suggested also within a given country, so far few such studies have been performed. As for positive examples, reveling the supposed effect, the authors know (numerous studies) concerning states of United States (e.g. [14, 16]) and one for regions of Italy [6]. However, states of United States are much more populated then Polish voivodeships, with California almost reaching whole population of Poland and 21 of states having populations larger than the most populated Polish voivodeship. On the other hand, Italian regions are comparable to Polish voivodeships as far as population is concerned. Anyway, Polish voivodeships may differ from Italian regions on other features, that we are not aware of. Moreover, the sole example of Italy may not be considered as enough corroboration of hypothesized effect of inequalities within countries.

Although Poland was classified by UN in 2009 as a country of "high human development" (note, that not "very high") [33], in which classification also the GDP per capita plays the role, it has never been involved into analysis revealing the effect of inequalities influencing the quality of life. This effect is supposed to appear within and among richest countries of the world, and the least wealth among them, Portugal, has almost twice as much per capita as Poland does. Thus, it seems possible, that Poland has not yet reached the level, above which the main factor influencing quality of life is the level of inequality within a society.

The last possibility is, that the quality of life being dependent on inequalities is just, as claimed by opponents, some artifact (in studies, in which it appear), and Polish example is an element of the proof of the contrary. However, taking into regard the three above points, the authors would be careful with drawing such definite conclusions. In authors opinion, the problem of inequality influence on quality of life in general and in Poland in particular is a very interesting and burning question, which is worth further and still deepened studies.

Table 5. Values of 10 variables for Polish voivodeships for 2008 year.

Voivodeship	income	Gini	educ.	health -care	life-F	life-M	infant mort.	crimes	mental dis.	circ. dis.
dolnośląskie	1118,57	31,36	56,8	3,3	79	70,4	737	366	1,9	508,3
kujawsko-pomorskie	949,94	27,57	48,3	2,5	79,6	71	585	285	5,6	444,5
lubelskie	880,62	31,1	58,2	3,2	80,5	70,2	643	231	9,6	527,7
lubuskie	1058,86	28,21	52,9	3,0	79,3	70,5	537	376	7,2	401,3
łódzkie	1013,36	30,11	56,0	3,5	78,9	69,1	529	280	10,3	568,5
małopolskie	1000,74	30,43	56,2	3,2	80,9	72,9	494	251	0,0	444,5
mazowieckie	1336,46	39,19	64,3	3,1	80,6	71,7	485	263	3,6	472,1
opolskie	1080,08	28,21	51,0	3,4	80	71,9	588	280	0,1	467,0
podkarpackie	791,27	28,55	53,4	3,5	81,3	73,1	540	181	5,1	422,8
podlaskie	935,48	28,71	57,3	2,7	81,4	72	527	214	9,8	407,5
pomorskie	1102,19	32,22	57,1	2,7	79,9	72,1	554	339	10,9	318,3
śląskie	1041,08	30	57,4	2,9	78,9	70,9	677	330	7,9	470,9
świętokrzyskie	878,18	28,91	54,1	3,1	80,7	71,2	471	272	6,3	523,3
warmińsko-mazurskie	979,06	27,87	49,2	2,5	79,8	70,6	508	276	6,7	355,8
wielkopolskie	1018,51	29,74	52,1	2,7	79,9	71,8	557	269	2,4	401,7
zachodniopomorskie	1048,91	30,83	52,1	2,6	79,6	70,6	511	315	5,2	424,0

Source: [5].

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Nierówności dochodowe a jakość życia w Polsce

Synopsis: W ostatnich dekadach w literaturze pojawia się coraz więcej sugestii dotyczących negatywnego wpływu nierówności dochodowych na różne wskaźniki jakości życia, jak oczekiwana długość życia czy wskaźnik przestępczości. Efekt ten, dotyczący krajów rozwiniętych, pojawia się zarówno w porównaniach międzynarodowych jak i wewnątrzkrajowych. Choć na uzasadnienie tej zależności podawane są różne uzasadnienia, socjologiczne i psychologiczne, to samo jej istnienie wciąż bywa kwestionowane. Wysuwane wątpliwości dotyczą zarówno selektywności wybieranych do interpretacji danych, jak i interpretacji wyników, które mogą być artefaktem innej zależności socjoekonomicznej. Celem niniejszej pracy jest zbadanie, czy sugerowany efekt można zaobserwować w Polsce. Przy użyciu korelacji cząstkowych oraz modeli liniowych przeprowadzona została analiza zależności wybranych wskaźników jakości życia od poziomu nierówności w polskich województwach. W ogólności, analiza ta nie wykazała istnienia ujemnej zależności pomiędzy nierównościami a jakością życia. W pracy przeprowadzono krótką dyskusję otrzymanych wyników w odniesieniu do wyników uzyskiwanych dla innych krajów oraz porównań międzynarodowych.
Słowa kluczowe: wskaźniki jakości życia, oczekiwana długość życia, wskaźnik przestępczości