

Poverty and Health State in Poland: Evidence From Regional Perspective

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Abstract

Purpose: The main goal of the paper is to investigate the association between poverty and health and to assess the Polish NUTS-2 level differentiation with time points of the analysis set for 2013 and 2018.

Design/methodology/approach: In order to collate poverty and health state, two separate data sets have been created, consisting of determinants that describe the various aspects of combined phenomena, differentiated among Polish regions. We use data on poverty and health across Polish voivodships. Our data sets are obtained from Local Data Bank (LDB) of the Polish Central Statistical Office (CSO). On the basis of the proposed indicators, the multidimensional character of the phenomena is examined, and the degree of their intensity and changes in tendencies over time are assessed. Health State Index (*H/S*) and Poverty Index (*PoI*) individual measures were further compiled in the development matrix.

Findings: The results indicate a link between health and poverty at the regional level, while the usage of the development matrix technique allows the assessment of opportunities and threats for selected spatial units. The results confirm both positive as well as negative changes in indices levels in the analysed period. Moreover, the strength of this relationship decreases slightly over the selected time points. The identified changes originate mainly in recorded levels of poverty, while the situation of spatial objects in 2018 (compared to 2013) deteriorates mainly due to reasons related to the state of health.

Research limitations/implications: Because of the design of the development matrix, it is not advised to use the technique for a high number of objects/units. The proposed approach could give certain information on the rate of changes, indicating the increases/decreases in the combined indicator levels. Although the results are summarised by an image of coordinates in the development matrix space diagram, the identification of a unique object might be limited. Hence, only overall tendencies, like for the correlation scatterplot, could be illustrated by the graph. However, this does not diminish the importance

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of this technique, and by applying appropriate sampling, the in-depth study of both poverty and health state could be easily achieved.

Originality/value: The research study assumed to use several groups of indicators for the construction of synthetic indices. The proposed measures highlight a multidimensional concept of the analysed phenomena. The research can be an example of a supportive tool for planning regional strategies that are aimed at improving the health condition or reducing poverty intensity.

Keywords: poverty, health, healthcare, synthetic taxonomic measures, regional diversity.

JEL I32, I10, R1

Ubóstwo a stan zdrowia w Polsce – ujęcie regionalne

Streszczenie

Cel: celem artykułu jest próba powiązania ubóstwa i stanu zdrowia z wykorzystaniem syntetycznych wskaźników oraz ocena ich regionalnego zróżnicowania w ujęciu wojewódzkim w latach 2013 oraz 2018.

Metodologia: w celu połączenia poziomu ubóstwa i stanu zdrowia stworzono dwa odrębne zbiory danych, na które składają się determinanty opisujące różne aspekty obu tych zjawisk, zróżnicowanych w poszczególnych regionach Polski. W artykule wykorzystano dane dotyczące ubóstwa i zdrowia w województwach Polski. Nasze zbiory danych pochodzą z Banku Danych Lokalnych (BDL) Głównego Urzędu Statystycznego (GUS). Na podstawie zaproponowanych wskaźników zbadano wielowymiarowy charakter obu tych zjawisk, oceniono stopień ich natężenia oraz zmiany w tendencjach. Poszczególne miary wskaźnika stanu zdrowia (*HIS*) i wskaźnika ubóstwa (*Pol*) zostały dodatkowo zestawione w macierzy rozwoju.

Wyniki: wyniki wskazują na związek między zdrowiem a ubóstwem na poziomie regionalnym, a wykorzystanie techniki macierzy rozwoju pozwala na ocenę szans i zagrożeń dla wybranych jednostek przestrzennych. Wyniki potwierdzają zarówno pozytywne, jak i negatywne zmiany poziomów indeksów w analizowanym okresie. Ponadto siła tej zależności nieznacznie spada we wskazanych okresach analizy. Zidentyfikowane zmiany mają swoje źródło głównie w odnotowanych poziomach ubóstwa, podczas gdy sytuacja obiektów przestrzennych w 2018 roku (w porównaniu z 2013 rokiem) pogarsza się głównie z przyczyn związanych ze stanem zdrowia.

Ograniczenia/implikacje badawcze: ze względu na konstrukcję macierzy rozwoju nie zaleca się stosowania tej techniki dla dużej liczby obiektów/jednostek. Proponowane podejście mogłoby dostarczyć pewnych informacji na temat tempa zmian, wskazując na wzrost/spadek połączonych poziomów wskaźników. Chociaż wyniki podsumowuje obraz rozrzutu współrzędnych na diagramie przestrzennym macierzy rozwoju, identyfikacja jednostkowego obiektu może być ograniczona. W związku z tym na wykresie można zilustrować tylko ogólne tendencje, tak jak ma to miejsce, np. dla wykresu rozrzutu związków korelacyjnych. Nie umniejsza to jednak znaczenia tej techniki, a dzięki zastosowaniu odpowiedniego podziału próby można z łatwością przeprowadzić dogłębne badanie zarówno stanu ubóstwa, jak i stanu zdrowia.

Originalność/wartość: w badaniu założono wykorzystanie kilku grup wskaźników do budowy mierników syntetycznych. Zaproponowane miary podkreślają wielowymiarową koncepcję analizowanych zjawisk. Badania mogą być przykładem pomocniczego narzędzia planowania strategii regionalnych, które mają na celu poprawę stanu zdrowia lub zmniejszenie intensywności ubóstwa.

Słowa kluczowe: ubóstwo, zdrowie, opieka zdrowotna, syntetyczne miary taksonomiczne, zróżnicowanie regionalne.

1. Introduction

Poverty is a relative term which is difficult to define due to a large number of factors that affect this phenomenon. Being in poverty does not depend solely on the person's (or household's) individual position. It is a concept influenced also by the social policy and the quality of social services, both carried out at the national and international levels. As a result, poverty is a multifactorial and multidimensional term that not only affects the individual's situation, but also the socio-economic condition of the society. In this sequence, it is a problem that accompanies the development of the humanity itself (Kumor, 2011).

Similarly, the concepts of health and healthcare show a multivariate character, indicating that a good health status is conditioned by a higher welfare level, both in social and economic understanding. Therefore, the perception of health is not only the result of a physical condition characterised by the absence of disease directly, but also it depends on economic and social life (Golinowska et al., 2007; Nojszewska, 2017).

The broader understanding of health and poverty indicates that their assessment requires carrying out research and collecting statistical data within interdisciplinary approach for different levels of data aggregation. Therefore, it makes sense to combine the health state with factors such as income level or financial condition, households' equipment or social benefits. In the literature, relatively little space is devoted to study the collation of such indicators (see, e.g., Spencer, 2000; Montgomery & Hewett, 2005; Campbell-White et al., 2006; Healy, 2017; Brentlinger, 2017; Strand, 2018) and their geographical differentiation (see, e.g., Antony & Rao, 2007).

Therefore, we attempt to set together poverty and health state in Poland from the regional perspective. We try to answer the questions: how to measure both phenomena and how they are varied in time and space. We use data on poverty and health, derived from the Polish Central Statistical Office. Created data sets cover data from six time periods in regional distribution.

The aim of the paper is to build synthetic poverty (*PoI* – Poverty Index) and health state (*HIS* – Health State Index) indices. Proposed measures are designed to capture multidimensional nature of these phenomena. We also use them to investigate the association between poverty and health and to compare changes in both phenomena noted in Polish voivodships in the selected time periods.

The paper is organised as follows: in Section two, subject and range of the investigation are presented; in Section three, the data and the research methodology are described. Section four presents the empirical results. In Section five the findings and conclusions are summarised.

2. Subject and Range of the Investigation

Poverty is a negative and rapidly spreading phenomenon. Researchers most often focus on the economic aspect of the issue, i.e.: deprivation of material living conditions (income, housing conditions and possessed goods). This is due to the easier rationalisation of poverty alleviation and the fact that problems, such as non-participation in social activities, may be also related to other factors. However, since the 1970s, the approach based solely on monetary indicators has been abandoned, the analysis broadened the spectrum with a social context and the multidimensional nature of the phenomenon (Spencer, 2000).

In order to be able to remedy and counteract poverty, it is necessary to recognise the causes of its occurrence. In the literature, most often three groups of causes of poverty are mentioned: personal, subjective and structural (objective) (Kaźmierczak & Łuczyńska, 1996, pp. 32–38). We can distinguish numerous indicators related to this phenomenon (Table 1).

| Causes of poverty | Selected indicators |
|------------------------|--|
| Personal | <ul style="list-style-type: none"> – disability, – mental disability, – long-term illness, – advanced age, – congenital malformations, – acquired diseases, – diseases resulted from catastrophes or traumatic events, – large number of children in the household |
| Subjective | <ul style="list-style-type: none"> – laziness, – lack of principles, – different system of values, – unwillingness to work, – learning and education, – dishonesty and mismanagement |
| Structural (objective) | <ul style="list-style-type: none"> – state aid (it often causes the individual to lose motivation to work, causes moral depression and limits its freedom) |
| Others | <ul style="list-style-type: none"> – differences in: wealth, ownership, income, level of intelligence, ambition, ingenuity, education and qualifications levels, – factors influencing the socio-demographic situation of households, as well as the overall situation of the voivodships and the country |

Tab 1. Selected poverty indicators. Source: Own elaboration based on: Kowalak, 2002; Skorowski et al., 2006; Kumor, 2011.

Like poverty, the definition of health also shows the multi-faceted nature. In the literature, we can find various definitions of being healthy. As previously mentioned, some of them are general, referring directly to the absence

of disease. On the other hand, there are also more specific definitions, emphasising the multidimensional nature of health. The definition of health implies how it is measured and within the adopted framework, objective and subjective indicators as well as health indices are usually distinguished (Laskowska, 2012, pp. 30–36) (Table 2).

| Type of indicator | Selected indicators |
|-------------------|---|
| Objective | <ul style="list-style-type: none"> – Life Expectancy at Birth – Crude Death Rate (<i>CDR</i>) – Age-specific Death Rates (<i>DR</i>) – Potential Years of Life Lost (<i>PYLL</i>) – Disability Adjusted Life Expectancy (<i>DALE</i>) – Quality Adjusted Life Years (<i>QALY</i>) – Disability Adjusted Life Years (<i>DALY</i>) – Healthy Years Equivalent (<i>HYE</i>) – Saved Young Life Equivalent (<i>SAVE</i>) – Life Years Gained (<i>LYG</i>) – Absence from work due to illness |
| Subjective | <ul style="list-style-type: none"> – subjective assessment (self-assessment) of health – occurrence of conditions – limitations in activities of daily living |
| Indices | <ul style="list-style-type: none"> – Health State Index (<i>HSI</i>) – Multiple Indicator Multiple Causes (<i>MIMIC</i>) model |

Tab. 2. Selected health indicators. Source: Woods et al., 2005; Panek (Ed.), 2007; Ríos-Bedoya et al., 2009; Suchecka, 2010; Laskowska, 2012; van der Vorst et al., 2016.

Most of the indicators presented in Table 1 and Table 2 are related to the assessment of the poverty and health of individuals. What is important, poverty and health are phenomena that should be also considered in the regional dimension. The essential question concerns the changes in poverty and health state in the regions and the reasons that determine them. In this paper, we propose synthetic indices of poverty and health state, calculated for Polish voivodships. Such an approach, on the one hand, requires a higher level of data aggregation. On the other hand, it enables considering multivariate aspects of phenomena. For example, when constructing the indices, we can include determinants connected with the household's size and its socio-economic condition, demographic profile of the local population and the performance of regional healthcare systems.

3. Data and Methodology

We use data on poverty and health across Polish voivodships. Our data sets are obtained from *Local Data Bank (LDB)* of the Polish Central Statistical Office (*CSO*). *LDB* contains data on the economy, the society and

the environment. Data are available, among others, at various aggregation levels, i.e. for communes, poviats and voivodships. Finally, our research covers data for Polish voivodships (NUTS-2 objects) with the time range of the analysis for 2013 and 2018.

In order to collate poverty and health state, two separate data sets have been created, which consist of indicators that describe the various aspects of combined phenomena differentiated among Polish regions. To construct the appropriate measures that might illustrate the multivariate character of both poverty and health state, we propose a set of diagnostic variables (indicators) (Table 3).

| Type of indicator | Poverty | Health state |
|-------------------------|--|---|
| Stimulants (Positive) | <ul style="list-style-type: none"> – average monthly disposable income per capita, – household's equipment in plumbing, sewage and gas installations, – viewers in permanent cinemas per 1000 population*. | <ul style="list-style-type: none"> – life expectancy at birth and at 65 years by sex and NUTS-2 region, – medical personnel per numbers of population, – medical advices in outpatient healthcare per numbers of population, – medical advice in general healthcare per numbers of population, – number of beds in general hospitals, – healthcare entities: hospitals, primary healthcare units. |
| Destimulants (Negative) | <ul style="list-style-type: none"> – number and amounts of housing allowances paid per numbers of population, – subjective assessment of the material situation of households, – being at risk of poverty rate, – poverty coverage rates – share of people in the household with expenditure below a certain level**, – average household size, – share of people receiving social benefits in relation to the average number of persons in a household. | <ul style="list-style-type: none"> – demographic dependency ratio for the elderly indicating higher demand for healthcare services, – disease profile – rate of infectious diseases and poisoning, – death rate, – population per bed in general hospitals, – average monthly expenses on health per capita. |

* We assume this variable as an example of a characteristic that summarises the opportunities to meet entertainment needs of society.

** In the proposed research, we use data on households in: relative poverty (total household expenditure less than half the average household expenditure); statutory poverty (resulting from the obligatory Act on Social Assistance); extreme poverty (lack of satisfaction of the needs resulting from the subsistence minimum) (Jewczak et al., 2018; Jewczak & Korczak, 2019).

Tab. 3. The diagnostic variables. Source: Own elaboration based on data from LDB.

For the purposes of the analyses, synthetic measures have been constructed. This allows expressing multiple aspects of the investigated phenomenon with one aggregated indicator. While constructing taxonomical measures for health state, it is possible to implement an appropriate weighting system that assigns a certain compound of variable impact (Feeny et al., 2002; Salomon et al., 2002), thus synthetic measures demonstrate a significant advantage over univariate indicators, such as: death rate or life expectancy at birth.

The procedure for selecting diagnostic variables should take into consideration both formal conditions and be subjected to substantive interpretation. Substantive criteria are based on experts' opinions; in this sense, it is assumed that the characteristics that differentiate a complex phenomenon capture the most important properties of the analysed variables and at the same time are unambiguously defined and logically consistent, which allows mutual control of quantitative relationships.

On the other hand, formal criteria are based on objective measures and form the basis of procedures aimed at eliminating variables with low diagnostics power. According to formal criteria, it is required that diagnostic variables have the following properties (Grabiński, 1992, pp. 43–44):

- measurability in the sense of being able to quantify the level of the attribute,
- the existence of reliable and easily accessible statistical information,
- data completeness for all analysis units.

In this part, statistical criteria concentrate on:

- the ability to discriminate against the units of analysis, which is associated with high variability in characteristics (measured by the variation coefficients),
- variables with no mutual high correlation to eliminate information repetition, and a significant relationship with the main factors identified in the whole set of analysed variables,
- representativeness of diagnostic variables in terms of variables excluded from the study.

In the process of ordering multi-feature objects, diagnostic variables can be defined as stimulant, destimulant or nominant. In order to obtain data comparability, variables are normalised with respect to their specification, as follows (Suchecky, 2010, pp. 57–59):

| | |
|---|---|
| for stimulants: | for destimulants: |
| $z_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}}$ | $z_{ij} = \frac{\max_i \{x_{ij}\} - x_{ij}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}}$ |

where: x_{ij} – value of the original i -th diagnostic variable in the j -th object;
 z_{ij} – value of the normalized i -th diagnostic variable in the j -th object.

The *Health State Index (HSI)* can be calculated as a weighted sum of individual indicators:

$$HSI = \sum_{i=1}^K w_i HI_i, \quad i = 1, 2, \dots, K$$

where: HI_i – i -th indicator of health state, w_i – weight of i -th indicator of health state.

On similar assumptions, it is possible to construct the *Poverty Index (PoI)*:

$$PoI = \sum_{i=1}^K w_i PI_i, \quad i = 1, 2, \dots, K$$

where: PI_i – i -th indicator describing being in poverty, w_i – weight of i -th indicator of poverty.

A popular method for determining the weight levels is to adopt a scheme that allows the estimation of the relative information value (Nermend, 2017, p. 75), as follows:

$$W_i = \frac{V_i}{\sum_{i=1}^m V_{x_i}}$$

where: V_i – variation coefficient for i -th variable, $\sum_{i=1}^m V_{x_i}$ – sum of variation coefficients for variables in the data set.

The values of w_i can be treated as variable weights which indicate the strength of the impact of a given component on the global value of the indicator. In this sense, the higher the value of the ratio is, the stronger the impact of a given variable on the value of the calculated synthetic measure.

Determining the differentiating factors and determinants affecting changes in the level of poverty and health is important in the process of formulating the appropriate strategic goals of regional development. Classification of individual units becomes a useful tool for assessing the level of development of complex phenomena and allows also using the results of analyses in the management process by appropriate targeting activities in the regions while designing strategies and implementing tasks.

The proposed measures (*HSI*, *PoI*) for individual voivodship can be compiled in the form of a scatter chart with marked strategic advancement fields. The development matrix allows identifying the placement of an object in a two-dimensional format that describes the connection between poverty and the health state of Polish regions (voivodships). The development matrix consists of rows and columns that present on a scale of 0 to 1 the level of individual features that differentiate the positions of objects (Figure 1).

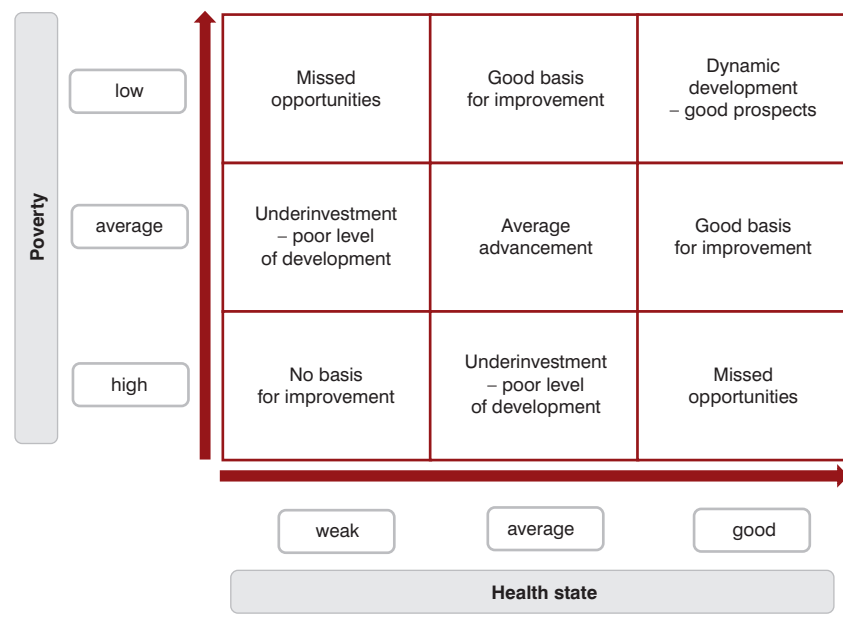


Fig. 1. Scatter chart of development. Source: Own elaboration (see also Hydzik, 2012).

The first dimension of the scatter chart represents the health state, while the second determines the degree of poverty of spatial units. The starting point in the analysis process is to organise the number of objects characterised by indicators (diagnostic variables) in spatial terms. As a result of the comparison, the final matrix contains points representing the distribution of the examined voivodships in the geometric space. Indicators of poverty and health are measured by linear ordering methods with the use of taxonomic methods that distinguish individual units. One of the advantages of this approach is the objective (quantitative) assessment of the changes identified in the examined objects.

The development matrix is divided into nine equal fields, each representing the characteristics of the phenomena development level and should be interpreted in accordance with the field explanation. When an object is classified in the field of *no basis for improvement*, it indicates a weak health state and a high poverty level. *Good basis for development* and *good prospects for dynamic development* characterise voivodships with the best situation among those analysed in terms of the health state and poverty degree. It can be also stated that regions classified in this fields have the best chance of continuing dynamic development and maintaining the leading position. *Underinvestment – poor level of development* areas indicate voivodships which are characterised by an average level of one of the matrix dimensions

accompanied with a poor health state or a high poverty level. A feature of this relation may be a result of financial or structural underinvestment. Fields of so-called *missed opportunities* allow identifying voivodships with the highest potential in one category (indicating the voivodships' strengths) in relation to a poor level of the second considered category (perceived as a threat or a regional weakness). In both cases, the results of the comparison indicate a justification for an increase in further activity to deal with the poverty problem or issues connected with the health state. Fields of *good development basis* show proper potential for future improvement of their conditions, e.g. by acting to improve the health state or reduce poverty intensity through target programmes implemented within the competence of local government units. Increased activity and involvement may lead to the path of dynamic development.

Using a uniform set of diagnostics variables, it is possible to compare the tendencies of changes in levels of poverty and health state of local populations for two periods of time (or moments). Therefore, it is possible to use a graphic summary or numerical results based on formula of a relative increase (rate of change), calculated as follows:

$$rHSI_{\frac{t}{t-1}} = \frac{HSI_t - HSI_{t-1}}{HSI_{t-1}} \quad \text{and} \quad rPol_{\frac{t}{t-1}} = \frac{Pol_t - Pol_{t-1}}{Pol_{t-1}}.$$

Indications resulting from the change rates in poverty and health state indicators allow for an additional interpretation of observed tendencies, pointing out voivodships which improve and/or deteriorate their advancement of the analysed phenomena.

4. Results and Discussion

In order to determine the advancement of spatial units, it is possible to construct a development matrix based on the analysis of synthetic measures (indicators) (Table 4). Indicators are calculated in accordance with previously referenced formulas.

Based on the analysis results, it can be concluded that in five years the living conditions of households improved – in most of the considered voivodships the poverty degree has decreased (increase in the value of synthetic measures), with the highest dynamics in Warmińsko-Mazurskie (+74.43%), Zachodniopomorskie (+22.65%) and Lubuskie (+21.34%) voivodships. The deterioration of the situation in terms of poverty is the most significant in the following voivodships: Małopolskie (-20.59%) and Mazowieckie (-15.15%).

| Voivodship | Abbrev. | Poverty | | | Health State | | |
|---------------------|---------|---------|-------|-------------|--------------|-------|-------------|
| | | 2013 | 2018 | <i>rPoI</i> | 2013 | 2018 | <i>rHSI</i> |
| Dolnośląskie | DL | 0.679 | 0.695 | 2.40% | 0.610 | 0.553 | -9.46% |
| Kujawsko-pomorskie | KP | 0.388 | 0.440 | 13.31% | 0.473 | 0.406 | -14.09% |
| Lubelskie | LUB | 0.344 | 0.343 | -0.55% | 0.592 | 0.558 | -5.66% |
| Lubuskie | LUS | 0.457 | 0.554 | 21.34% | 0.378 | 0.343 | -9.18% |
| Łódzkie | LD | 0.443 | 0.488 | 10.12% | 0.617 | 0.556 | -9.88% |
| Małopolskie | MP | 0.649 | 0.516 | -20.59% | 0.566 | 0.546 | -3.52% |
| Mazowieckie | MZ | 0.835 | 0.708 | -15.15% | 0.669 | 0.596 | -10.97% |
| Opolskie | OP | 0.685 | 0.736 | 7.45% | 0.371 | 0.347 | -6.40% |
| Podkarpackie | PODK | 0.414 | 0.412 | -0.64% | 0.565 | 0.527 | -6.79% |
| Podlaskie | PODL | 0.322 | 0.312 | -3.07% | 0.499 | 0.490 | -1.89% |
| Pomorskie | PO | 0.608 | 0.696 | 14.39% | 0.253 | 0.255 | 0.96% |
| Śląskie | SL | 0.627 | 0.648 | 3.34% | 0.734 | 0.660 | -10.11% |
| Świętokrzyskie | SW | 0.455 | 0.408 | -10.28% | 0.475 | 0.454 | -4.51% |
| Warmińsko-mazurskie | WM | 0.167 | 0.291 | 74.43% | 0.395 | 0.364 | -7.83% |
| Wielkopolskie | WP | 0.502 | 0.539 | 7.34% | 0.405 | 0.345 | -14.65% |
| Zachodniopomorskie | ZP | 0.575 | 0.705 | 22.65% | 0.489 | 0.419 | -14.35% |

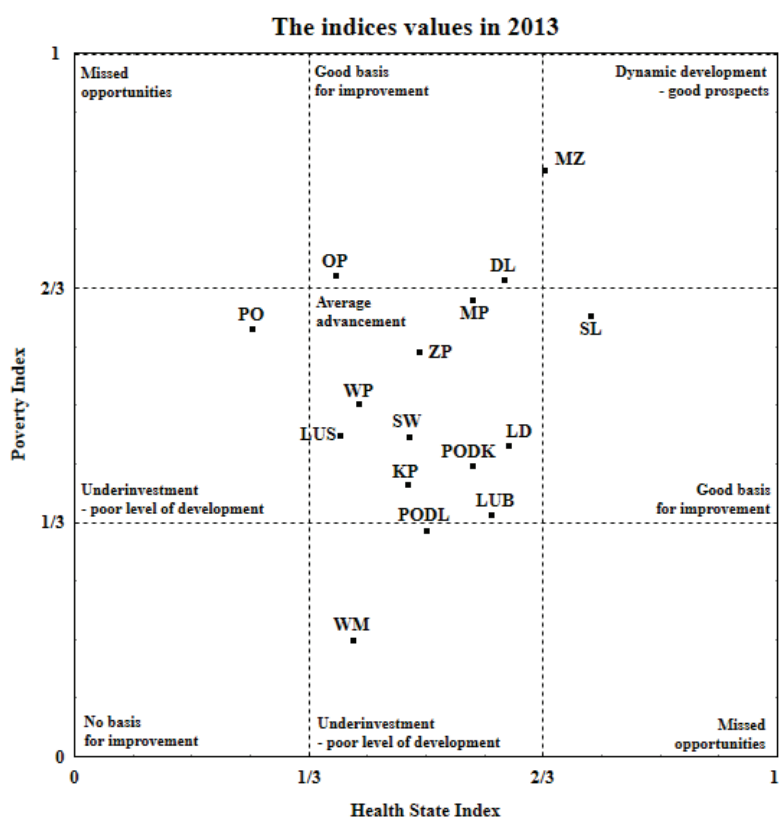
Tab. 4. Indicator values and the rates of changes in years 2013–2018. Source: Own elaboration based on data from LDB.

On the other hand, the reverse situation for the state of health is observed. Only for Pomorskie (+0.96%) has the voivodship's overall health condition improved. The highest decrease in the *HSI* is recorded in Wielkopolskie (-14.65%), Zachodniopomorskie (-14.35%) and Kujawsko-Pomorskie (-14.09%).

The acquired measures are consequently joined in a development matrix, which due to intuitive interpretation allows for assessing relationships, differentiation and observed changes in both poverty and health state indices.

In 2013, the best situation in terms of both the level of poverty and the health state (Figure 2) is recorded for Mazowieckie voivodship, which as the only one is classified as an object with a dynamic development level with good prospects for the future. Dolnośląskie and Opolskie (low poverty) and Śląskie (good health condition) voivodships have a good basis for further improvement. The worst situation is recorded in Warmińsko-Mazurskie, which, according to its placement in the development matrix and the values

of diagnostic variables, reveals an underinvestment situation and at the same time the highest poverty level accompanied by mediocre health state. In the same matrix box, Podlaskie is also identified, which however due to a lower poverty level nearly reaches the middle field of average advancement. Quite an opposite situation is observed for Pomorskie voivodship – in this case, the region records lower poverty, unfortunately with poor health state. Most of the analysed regions are identified in the average advancement category – this indicates that lower poverty should be related with a better health state level. The geometric distribution of points in the development matrix reflects a positive relationship between the state of health and the level of poverty of the regions.

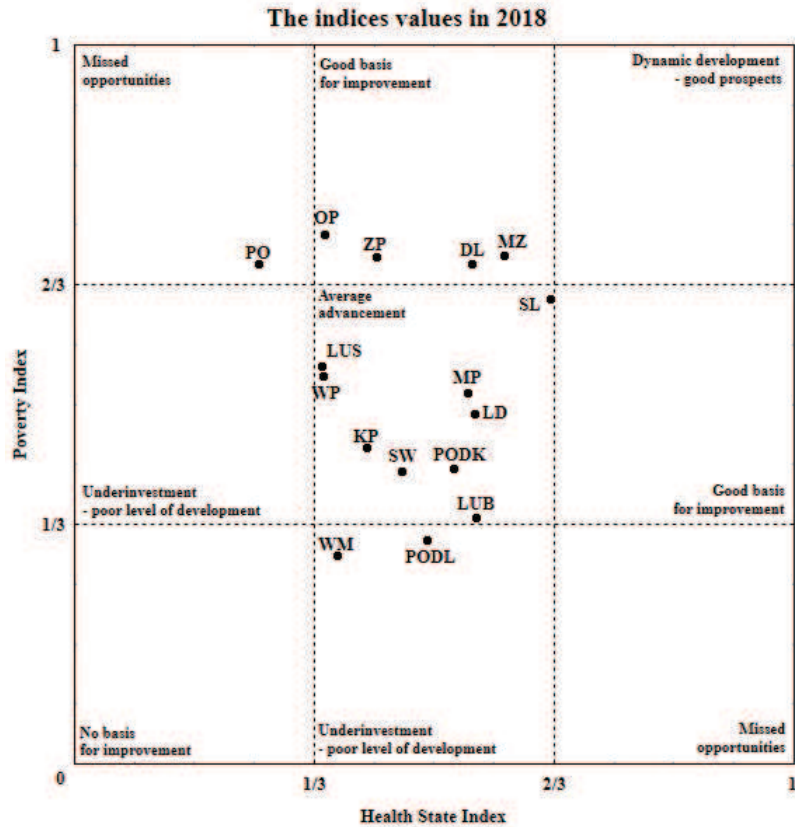


Note: abbreviations as in Table 4.

Fig. 2. Development matrix for 2013. Source: Own elaboration.

In 2018, none of the regions is classified as having a good prospect (Figure 3). Among objects with a good basis for further improvement,

Dolnośląskie, Opolskie, Dolnośląskie and Mazowieckie voivodships can be indicated. At the same time, Pomorskie voivodship is identified as an object of missed opportunities – this object appears to improve its situation as far as poverty is concerned, but at the same time it does nothing for improving the health state of its citizens and healthcare functioning (only 0.96% increase in *HSI* index). Warmińsko-Mazurskie region enhances its performance, mainly due to an improvement in the level of poverty, however is still defined as an object with underinvestment and a poor level of development for both indicators – in this category Podlaskie is also identified, which leads to the conclusion that in the 5-year period there were no significant changes in those voivodships that could influence their scorings. In the final period of the analyses, Śląskie shifted from good basis for development to average advancement because of the decrease in the overall health state.



Note: abbreviations as in Table 4.

Fig. 3. Development matrix for 2018. Source: Own elaboration.

The potential sources of differences in changes in both spheres: poverty and health in selected voivodships may have various causes. As first appear the methodological issues – the proposed approach depends on a flexible weighing system for the individual components for both synthetic measures. Therefore, in the initial period of analysis some components may have had a higher weight and others lower than in the previous year. These changes were examined and for the *Health State Index* the convergence of the weights adopted for 2013 and 2018 amounted to 99%, which would indicate that changes in the *HSI* measures result from changes in recorded values of the variables in the data set. For the index expressing the poverty level (*PoI*), weighting profiles converged to a lesser extent of 80.4%, however it could also be assumed as high.

The situation of Pomorskie voivodship, indicating an improvement in the regional health level, is the result of an increase in the number of physicians, which was also accompanied by a significant rise in the number of consultations in general and outpatient healthcare, as well as in the growing number of outpatient clinics. Mazowieckie voivodship is losing its position as an object of good prospects and dynamic development mainly due to the increase in the number of recorded cases of infectious diseases. This characteristic also applies to Lubuskie, Kujawko-Pomorskie and Świętokrzyskie voivodships. In Opolskie voivodship, the deterioration of the health situation is a result of decreasing numbers of outpatient clinics and available beds in general hospitals. Expenses for health purposes of people aged 65+ significantly increased in Zachodniopomorskie and Dolnośląskie voivodships, which negatively affected the health profile of regional populations.

In assessing the state of poverty, the most important from the research perspective were the determinants describing households being in extreme, statutory or relative poverty, as well as the amount and the number of granted housing allowances. Warmińsko-Mazurskie voivodship is a leader in improving the economic situation, which – due to an increase in the level of disposable income and a decrease in the number of households at risk of poverty of all three types – recorded a decrease in the overall level of poverty. The improvement of the situation in Zachodniopomorskie was mainly caused by a decreased number of families being in poverty and the development of the housing situation (in subjective terms). The spatial units that recorded the largest decreases in the Poverty Index (worsening of poverty) include: Mazowieckie and Małopolskie. In the case of Mazowieckie, this situation is the result of a decrease in the number and amount of housing allowances granted and below-average growth in number of people satisfied with their housing conditions. In Małopolskie, we can observe a growing number of households classified as being in poverty (extreme, statutory and relative) – this is the only voivodship which recorded an increase in all three types of poverty in the analysed time period. In Małopolskie also a significant reduction in housing assistance (the number and the amounts) is observed.

5. Conclusion

In this paper, we investigate the penetrating character of poverty and health state of Polish voivodships. Our research strategy is to use several groups of indicators for the construction of synthetic indices. The proposed measures highlight a multidimensional concept of the analysed phenomena. The results confirm both positive as well as negative changes in indices levels in the analysed period. Our research can be an example of a supportive tool for planning regional strategies that are aimed at improving the health condition or reducing poverty intensity. This type of activity can lead on the path of dynamic development.

Our main conclusion is that there is a relationship between poverty and health state, however as the research results show it is weakening over time. The identified changes have their origins in transition in intensity of the poverty phenomenon. The situation of spatial objects in 2018 (compared with 2013) most generally deteriorates especially in terms of the health state level, with the most severe worsening in Wielkopolskie, Zachodniopomorskie and Kujawsko-Pomorskie. Only for one region, Pomorskie, is an improvement in the *HSI* recorded, however this increase amounts to 0.96% (Figure 4).

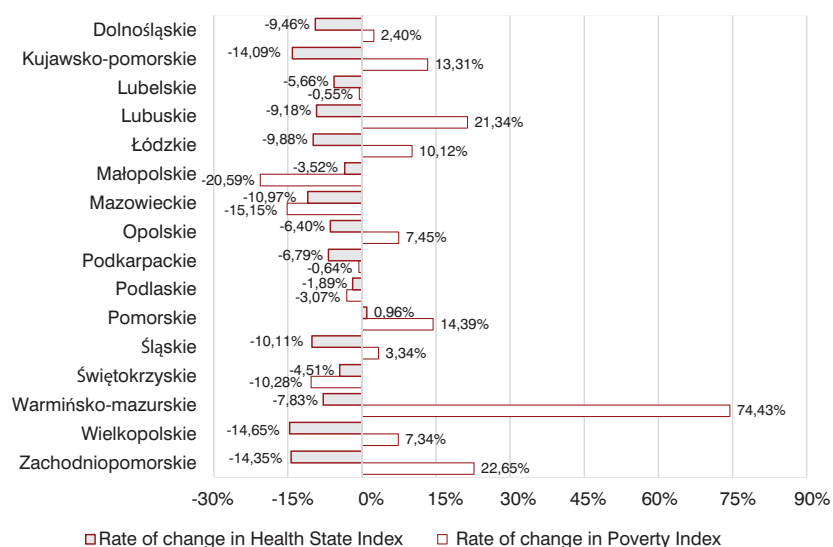


Fig. 4. Rates of change in Poverty and Health State Indices between 2013 and 2018. Source: Own elaboration.

As a positive feature, one should perceive the results obtained on the basis of the research which mostly indicate the improvement on the

side of poverty. Only for three voivodships: Mazowieckie, Małopolskie and Świętokrzyskie did the poverty phenomena deteriorate. On the other hand, the highest increases in the level of poverty are recorded in Warmińsko-Mazurskie, Zachodniopomorskie and Lubuskie voivodships, which indicates that the economic situation of their citizens is getting better.

The comparison of the change rates of *HSI* and *PoI* measures indicates the opposite direction of the relationship, which may prove that households constantly (and at the same time unconsciously) shift between good health and ensuring themselves higher (better) living and material conditions. The concentration of households on dealing with poverty issues today could result in improving health in the following years.

Therefore, it is reduced to priorities which are defined differently than it is observed in experiences for more developed countries, in which better health is accompanied by a lower level of poverty or otherwise the lack of (or smaller) material and existential restrictions allow societies to focus on ensuring better health state. The identified changes in the regional *HSI* values also confirm the findings observed in international comparisons in which Poland, on the background of other European countries in the years 2013–2018, is ranked in the third ten of advancement (see: <https://www.numbeo.com/health-care>).

We also faced some limitations of our study. Firstly, in the literature we can find different concepts of perceiving, defining and evaluating poverty and health status (see, e.g.: Spencer, 2000; Laskowska, 2012). Differences in definitions can be a source of difficulties in the aspect of data comparability and conducting broader analyses, e.g. from the international perspective. Secondly, the data availability in Polish central and regional databases is limited. For that reason, it is not possible to include all diagnostic variables related to poverty and health state (i.e. absence from work due to illness).

We can also outline some potential extensions to the conducted research. Firstly, an attempt can be made to use data on poverty and health state with different (higher) level of NUTS aggregation for poviats or even communes. This could be the source of more accurate indications on poverty and health situation spatial diversification. The obtained results could be used by competent local government entities. Secondly, it would be also desirable to include variables describing individual health status – this type of information might be obtained while conducting questionnaire research based on SF-36 or EQ-5D forms that concern, among others, also health. Thirdly, it is possible to extend the analysis to include path modelling that allows investigating thoroughly both direct and indirect connections (according to specified paths) between diagnostic variables for health and poverty.

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