

## **GEOGRAPHIC AND SOCIO – ECONOMIC HEALTH INEQUALITIES IN NEAMT COUNTY, ROMANIA**

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**Key words:** inequalities, health status, indicators, socio – economic deprivation

**Abstract.** Geographic and socio – economic health inequalities are realities that cannot be denied as characteristics for every human community. In this paper, authors based on two composite indicators created to reflect socio – economic deprivation and population health status in Neamt County, conducted a territorialisation of the mentioned dimensions, with the main purpose to underline the differences between territorial - administrative units. To assess the intensity of the relationship between deprivation and health and to identify the correlation degree between the two elements, statistic analysis was used. It is well known that a low level of socio – economic development of a population is accompanied by a poor health. The results can be used as starting points to calibrate public health policies according to local characteristics, measures needed when reduction of geographic and socio – economic inequalities are to be obtained.

### **Introduction**

Socio – economic health inequalities within the same country and between countries are an important point on the agenda of public health issues. In 2005 WHO established the Commission on social determinants of health to draw attention on the importance of creating better social conditions in order to maintain and improve health.

In this context arises the necessity of making comparisons of the magnitude of this phenomenon and the need to evaluate how inequalities change over time, in order to monitor trends, to inform policy makers and to assess the effects of the interventions (Moser, K. Et al., 2007).

To describe the existing inequalities, three concepts are frequent used:

- differences or variations in health status between different groups;
- inequalities in health status;
- inequities.

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Kunst and Mackenbach gave the following definition for health inequalities “*Differences in the prevalence or incidence of health problems between individual people of higher and lower socio-economic status*”. It is important to mention that although the definition refers to individuals, the main characteristic is that they belong to different social classes.

Although words like differences, disparity or heterogeneity have different connotation, in this context have the same meaning as inequality. Some aspects of health distribution imply moral interest and precisely this moral dimension in health is known as inequity.

The most used methods for measuring health inequalities involves indicators or indices to assess health. Also implies decisions on how groups or areas are to be compared, which is the most appropriate form of analysis to investigate the study hypothesis.

In this article authors decided to identify territorial inequalities determined by different socio – economic development level of administrative units and by different population health status and to identify and establish the connection between health and deprivation. Scientific approach meant the construction of two indicators to reflect the previously mentioned aspects.

Inequalities in health and inequalities in mortality levels are frequently referred as systematic, and most of the time avoidable, differences in the general level of health between different social groups. It is known that groups with lower socio-economic status are more likely to present diseases and disabilities, and lower life expectancy compared to those with higher socio-economic status (Whitehead, M., 1990). The most used indicators to define social classes are educational attainment, occupation, income or, more broadly, level of well being.

### **1. Methodology and data sources**

As one of the aims of this study was the analysis of population health status from socio – economic perspective, one essential step of the research was to establish whether there is a relationship between the health of Neamt county population and socio-economic level, which was conducted with the help of statistical analysis.

The scientific approach involved the construction of two indicators, called deprivation index and health index, needed to quantify these two dimensions.

The main problems related to the construction of the two indices were determined by data availability and level of aggregation of information. These two multidimensional phenomena are difficult to quantify, have multiple conditionings and to construct the indicators was necessary to choose the most relevant aspects that reflect in an objective way deprivation and the health of a community. The raw

data were provided by the Department of Statistics and Department of Public Health from Neamt County.

Data on selected items needed to describe in a proper way Neamt County realities are from 2002 from the last Population and Housing Census. The most common elements that are taken into account when socio-economic status and deprivation are discussed refer to the level of education, occupation and income. Based on the available data for the construction of our index, we used the percentage of the population with primary or no education. Another component is the percentage of population working in the primary sector, applied to reflect the occupational status. Information on income level isn't available and therefore we considered unemployment rate to reflect the economic power of the municipalities. To introduce the quality of the housing conditions we added in the final form of the indicator the percentage of houses with water and electricity.

Composite indicators as the ones we used are obtained from the application of specific calculation methods for each territorial unit of analysis.

The method chosen for the construction of the indicators necessary in our analysis was the ranking method. This has the great advantage of taking into account the relative distances between the individual values of the indicators. Selected items used in the final form of the indicator have different importance therefore higher weights are assigned to indices that have a richer information input.

Based on the two indices was decided to identify territorial distribution of socio-economic deprivation and of the general level of health, to highlight poorer areas and those whose populations have a lower level of health.

Maps are indispensable tools especially when a quick identification of the problem areas is desired, allowing the policy makers a better resource allocation and giving them the possibility to establish the most suited measures adapted to local conditions. The authors have chosen to use the Dorling cartogram method, as an innovative approach for medical data representation. Dorling cartograms are maps in which the sizes of the surface units have been distorted in proportion to population dimension and social and environmental characteristics.

To establish the existence of the relationship between population health status and the socio - economic development level we used statistical methods of analysis. In this case correlation and regression have proved their usefulness.

## **2. Results**

### **2.1. Deprivation indicator**

The creation and use of a single indicator to capture in an objective manner deprivation is a tricky task. One number should reflect economic, social or cultural characteristics.

Usually deprivation indicators are applied to small areas, to well defined geographic territories or administrative units to capture aspects of living conditions, living standards and the needs of communities analyzed in terms of services (Bartley, M., Blaine, D., 1994). In other words, the main advantage is that this type of indicators shows the close relationship that exists between deprivation and territory.

When aggregated data at administrative unit are used for their construction, a special attention should be paid to the interpretation of the final results, because not all poor people are living in deprived areas, as otherwise, not all individuals living in deprived areas are necessarily poor (Townsend, P. et al., 1988).

Finding and applying the most relevant forms of deprivation indicators is a subject of wide interest for sociologists and economists. In the past two decades they become highly used in public health, in epidemiological studies, and especially for resource allocation. Geography, through its cartographic methods, has brought its contribution by highlighting territorial disparities and by underlining the connection with locational factors.

Elements that led to the construction of deprivation index applied in this study are:

- Unemployment rate
- Percentage of population working in the primary sector
- Educational attainment – represented by percentage of population with primary education or no education
- Percentage of houses with water supply
- Percentage of houses equipped with electrical installation

After all steps of the ranking method have been taken for each component in order to get the corresponding ranks, the final indicator was obtained by applying a certain weight in the final value on the index:

- Unemployment rate 25 %
- Educational attainment 25 %
- Percentage of houses with water supply 20 %
- Percentage of houses equipped with electrical installation 15 %
- Percentage of population working in the primary sector 15 %

After applying the calculation methodology for every administrative unit, as expected, the best position was obtained by Piatra Neamt, the most important city in the county, followed by Roman, Targu Neamt and Bicz. The best ranked commune is Alexandru cel Bun. This municipality fully benefits from Piatra Neamt influence and proximity, periurbanisation process can be easily identified.

A less common approach for data representation involves the use of Dorling cartograms (Figure 1). The main advantage is that the resulting figures clearly mark areas with problems. Due to strong visual impact that images have, we

applied this technique for deprivation indicator.

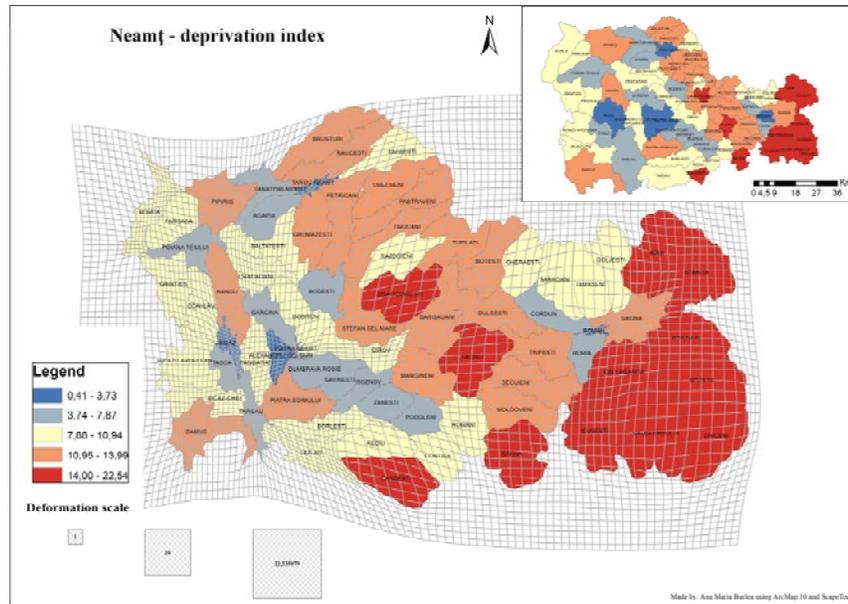


Fig. 1 Deprivation indicator – Dorling method of representation (Burlea, 2012)

Deprived areas are oversized and the joint class of the poor communes from the eastern part of the county is clearly highlighted. The western half, with a higher degree of socio - economic development, is undersized.

It can be noticed an east – west segmentation of the district. The mountain municipalities are better rated with a low level of deprivation. On the opposite side are the communes from the lower part of the county, the worst ranked municipalities are grouped in a compact area.

The differences are considerable, the most deprived commune – Valea Ursului, has a six time higher value of deprivation index compared with the most developed municipality. The situation reflects the reality, as all municipalities included within the most deprived class have the worst values of intermediate indicators. Over 45% of the people living in Valea Ursului, Oniceni and Mărgineni have only primary education. Less than one percent of the households from Stanița and Ion Creanga are connected to the water supply. In Valea Ursului is found the highest percentage of people working in the primary sector - 93%.

All these data are sufficient to render an image on the county territorialisation based on socio – economic development level. On one hand there are the communes from the lower part, with a clearly agricultural profile, with poor households and most of the times without basic utilities and a population with a low level of education. The second category includes the municipalities in the vicinity of cities, many of them showing clear features of periurbanisation, as well the ones from the mountains. In the last case, the exploitation of the main resource – wood, along with the potential of the natural landscape (many communes have a strong tourism profile) contributed to the development of these settlements.

## **2.2. Health indicator**

To capture the population health status in every administrative - territorial unit we included in the final form of the indicator several indices: mortality rate, infant mortality rate, aging index, demographic dependency ratio of the elderly population and the ratio between mortality rate and the percentage population over 65 years - as indirect method for assessing life expectancy at birth. Weight attached to each component was:

- mortality rate and infant mortality rate 25 %;
- the ratio between the mortality rate and the percentage population over 65 years 20 %;
- aging index and demographic dependency ratio of the elderly population 15 %.

We assigned the most important weights to mortality rate and infant mortality rate, as the evolution of these two indicators is closely linked to the socio - economic development level of a community. Progresses in living standards are often reflected by lower levels of the two indices.

Infant mortality is considered an element that surprises in a refined manner changes within a society (Reidpath, DD, Allotey, P., 2003).

The general level of education, quality and access to medical health care, the environment, even ethnic characteristics of a population are fundamental factors underlying mechanisms that are influencing the transformation of these indicators.

Because information on life expectancy is not available at commune level, we used as reference the relationship between mortality and the percentage of the population over 65 years. In this way differences can be observed between municipalities with a favourable report - caused by a lower number of deaths and a more significant proportion of the elderly population, which is generally associated with high mortality rates and those characterized by the opposite situation, with unfavourable report. This discrepancy may be associated with a different level of health status.

The next two indices used were chosen to capture the demographic profile of territorial units analyzed, with a focus on the degree of population aging. This global phenomenon that characterizes population dynamics reflects the social, economic, demographic and political transformations. A large number of elderly people require adaptation of the labour market, of the health care system and of insurance policies. Changes caused in the structure of the major age groups, in particular by increasing longevity, involves the adaptation of health services to a medical profile characterized by high incidence of chronic diseases.

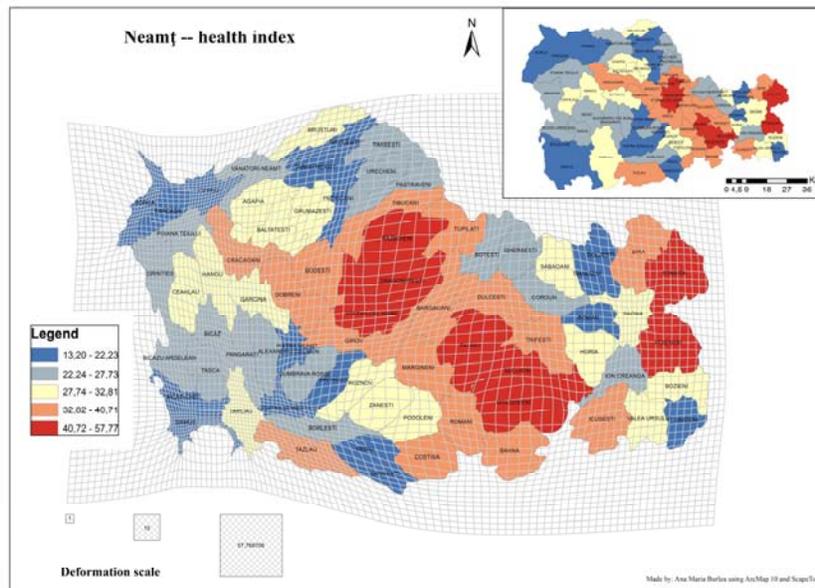


Fig. 2 Health indicator – Dorling method of representation (Burlea,2012)

The general picture, at territorial administrative unit, of the population health status in Neamț County is shown in figure 2 and, as in deprivation case, an east – west division can be identified. Communes from Moldova Subcarpathians stand out as having a precarious health, compared with those from the mountains. This seems to confirm the old belief that people living in the mountains, have a better health status.

The best value of the health indicator belongs to commune Tămășeni. The situation is explained by the good values of partial indices. This municipality presents the lowest mortality rate, the lowest degree of population aging and low demographic dependency index.

The class which includes municipalities with a very good health status is dominated by the communes from the higher area of the county. Of all urban municipalities Piatra Neamt is the best placed city and is ranked on the third position. Along it only Roman and Târgu Neamț managed to fall into the first category.

Figure no. 2 shows the distribution of health status at territorial – administrative level. The visual impact is much stronger, areas with a poorer health status are oversized, and those with a favourable situation are reduced. East - West division is underlined here by compressing villages from the mountains and the exaggeration of those from the east.

### 2.3. Statistic analysis

Deprivation and health indicators were constructed to test the hypothesis according to which the socio - economic development level leaves its mark on the general health status of a community, in our case Neamt county population.

The first step to be followed when we want to see the existence of an association between two variables is their graphic representation in the form of a scatter plot.

The first analytical step was the construction of a scatter plot (figure no. 3) between deprivation index and health index, to see whether or not there is a relationship between the two.

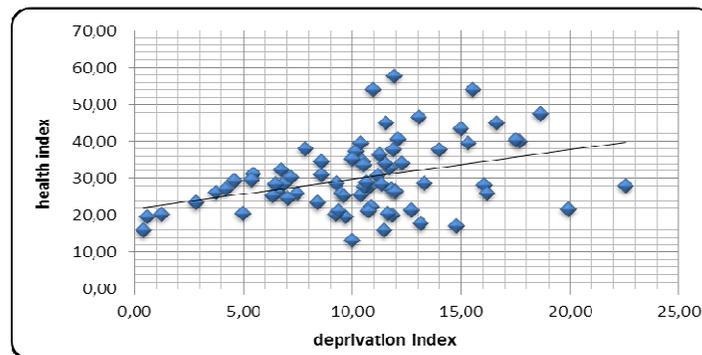


Fig. 3 Scatter plot deprivation index – health index (Burlea, 2012)  
Data sources Neamt County Statistics Department

In the next stage we analyzed the relationship between the two variables. The results showed a correlation coefficient between the dependent variable (health index) and the predictor of 0.65, indicating a positive relationship between the two. In other words, a high value of the deprivation index is accompanied by a high

value of health index. A higher value of this indicator will show for a community a worse health condition.

It should be noted that the model used explains 42% of variation in the dependent variable. In other words, 42% of the variation in health indicator is explained by deprivation index

Model Summary

Model	R	R <sup>2</sup>	Adjusted R Square	Std. Error of the Estimate
1	,651 <sup>a</sup>	,424	,417	9,876545109301720E0

a. Predictors: (Constant), deprivation indicator

We have to mention two particular situations, due to the positions of communes Valea Ursului and Moldoveni. Although in the final standings of socio-economic deprivation the first mentioned obtained the highest value, indicating the lowest level of development, the health score is more favourable. The situation is explained by the fact that Valea Ursului has a young population and average values of mortality.

The second example – commune Moldoveni - has the worst value of health index, although deprivation index placed it in the class of the least deprived territorial administrative units. In this case, population aging phenomenon (this municipality has the highest percentage of elderly population) is the main explanation for the high level of mortality and the high values of the demographic dependency ratio.

Since the results confirmed the study hypothesis, in the next step we wanted to determine which elements of the deprivation index have a larger impact on health. In the second model the correlation coefficient for the joint influence of the five elements used to reflect the socioeconomic status of a community, was 0.49. In this case, partial indicators explained 24% of health indicator variation.

Model Summary

Model	R	R <sup>2</sup>	Adjusted R Square	Std. Error of the Estimate
1	,493 <sup>a</sup>	,243	,187	8,457638501391921E0

a. Predictors: (Constant), Electricity, unempl%, education, water, primsect %

As shown in the correlation matrix as well as in the multiple regression, the strongest influence is exerted by unemployment rate and the percentage of households that are connected to the water supply.

## Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	91,849	43,733		2,100	,039
education	,178	,450	,051	,396	,693
unempl%	-,549	,225	-,403	-2,445	,017
primsect %	-,156	,101	-,379	-1,550	,126
water	-,201	,081	-,421	-2,477	,016
electricity	-,466	,410	-,167	-1,135	,260

a. Dependent variable: health indicator

## Correlation matrix

		Health index	education	unempl %	primsect %	water	Electricity
Health index	Pearson Correlation	1	,317**	-,355**	,344**	-,393**	-,300**
	Sig. (2-tailed)		,006	,002	,003	,001	,009
	N	74	74	74	74	74	74
education	Pearson Correlation	,317**	1	-,363**	,477**	-,444**	-,510**
	Sig. (2-tailed)	,006		,001	,000	,000	,000
	N	74	74	74	74	74	74
unempl%	Pearson Correlation	-,355**	-,363**	1	-,705**	,356**	,307**
	Sig. (2-tailed)	,002	,001		,000	,002	,008
	N	74	74	74	74	74	74
primsect%	Pearson Correlation	,344**	,477**	-,705**	1	-,740**	-,621**
	Sig. (2-tailed)	,003	,000	,000		,000	,000
	N	74	74	74	74	74	74
water	Pearson Correlation	-,393**	-,444**	,356**	-,740**	1	,519**
	Sig. (2-tailed)	,001	,000	,002	,000		,000
	N	74	74	74	74	74	74
Electricity	Pearson Correlation	-,300**	-,510**	,307**	-,621**	,519**	1
	Sig. (2-tailed)	,009	,000	,008	,000	,000	
	N	74	74	74	74	74	74

\*\*. Correlation is significant at 0.01 level

Regarding the relationship between the dependent variable and independent variables is not surprising that between health status and percentage of population with primary education and percentage of people working in the primary sector is a positive correlation. If a community will have a large number of members with low

levels of education and a large number of active population employed in primary sector activities, the greater the chances are that health level to be lower.

The reverse situation - negative correlation - is given by indicators that reflect the level of housing utilities. A high percentage of households connected to water supply systems and electricity indicates a greater comfort of living and a higher quality of life, and is generally accompanied by a good state of health.

### **3. Discussion**

An important dimension of medical events is the place where they occur and where the persons who registered the medical event live.

Geographical variation in health is a matter of public interest, with the natural environment seen as a possible factor. Usually, the most convincing explanation for geographical variation in health status is provided by the socioeconomic characteristics of an area (Ricketts, Th. C., 2002). People living in the poorest areas have in general a poorer health status.

A problem that occurs when one wants to analyze geographic variations relates to the scale of analysis. Depending on the unit (analysis) chosen the results will vary. If the area of interest is higher, the results will be distributed across multiple classes. On the other hand, choosing units too small most often offer a limited number of events. That raises questions of confidentiality and statistical significance. Another aspect to be considered relates to the level of aggregation of the needed data: is the information / data on the study population health indicators or indices of socio-economic available for the level of analysis?

The concept of "rural" is influenced by a number of characteristics, such as cultural differences, employment model or geographic isolation. Some rural communities are likely to have similarities with urban areas. Population density, land use or isolation can be extremely important factors.

Cadum et al. suggest that when working with aggregated data, deprivation indicators applied must reflect "environmental component" that underlies social differences. That is considered to be a substitute for unknown individual characteristics.

A special attention when measuring inequalities should be given to methods of building indicators. As well different approaches of analysis and different methods can produce different results that may suggest different causes.

There is no single indicator that summarizes or describes in an undisputed way the socioeconomic status of an individual or a community. Studies (Winkleby, MA, 1992, Kunst, A. et al., 1995) have pointed out that different socio – economic indicators influence health and mortality rate. Also, many researches that aimed to evaluate how socioeconomic status leaves its mark on different areas of the same country, showed that, although the effect is the same, the impact of each indicator

vary, depending largely on the context in which the study takes place (Sousa, A. et al., 2010).

Deprivation emphasizes the characteristics of a group (more precisely, the people living in a particular geographical area) by measuring the similarities and dissimilarities of individuals forming the group. Similarities are reflected not only by material characteristics, but also by the social and cultural specific features.

A gap between east - west in terms of deprivation was identified in the analyzed area. The mountain communes are rated with a low level of deprivation. A different situation is the one of the hillside municipalities, here the last ones ranked forming a joint class.

The same scenario and the same image can also be found when looking at the population health status in Neamt County. The indicator highlighted, once again, the east - west dividing. Communes from Moldova Subcarpathians stand out as having a precarious health, compared with those from the mountains. This seems to confirm the old belief that people living in the mountains, have a better health status.

Any study that has as primary aim the analysis of population health status is not complete without consideration of health system resources, its quality, availability and accessibility.

The general level of education, the quality and the access to health care, the environment, including ethnic characteristics of a population are fundamental factors underlying mechanisms that influence the transformation of these indicators. The level of economic development and the transformation experienced by a society are often reflected in the coverage with health services, in the changes in the number of medical personnel and in the quality and availability of material resources.

The vicious circle poor health - socio- economic deprivation - poor access to health services is actually a reality that characterizes the communes in the county, reality that cannot be neglected and which requires local attention. Overcoming barriers imposed by accessibility and availability of health care system resources is imperative when the improving of the population health status is to be obtained.

### **Conclusions**

Deciphering the socio-economic inequalities in health requires a comprehensive approach. Identification and recognition are not sufficient. They must be associated with methods applied to quantify the amplitude of differences. Furthermore they must provide clues on the mechanisms by which the development level of a community leaves its mark on the health of its members.

In this context, studies with rigorous methodology are required for assessing health and its determinants at the population level. The insight into the health of a

population or community is particularly important for:

- determining health needs and identifying problems,
- establishing the interventions type (to the individual, to society),
- identifying consumer behavior regarding health care (offer)
- determination of the structure and architecture of hospitals, health centers, diagnostic and treatment centers
- planning and resource allocation.

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