

MEASUREMENT OF HEALTH INEQUALITY

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Abstract

Health inequality is met everywhere in the world, including in countries with a high level of economic development, or those with strong social protection systems. In this paper I analyzed certain methods to measure health inequalities between population groups and also I presented some empirical results regarding health disparities between European Union countries. My research is focussed on three health areas: health status of population, access to health care services and resource allocation and population spending on health care.

Keywords: *disparities, health, inequalities, life expectance, mortality rate*

Introduction

Health inequality should not be accepted anywhere in the world. One of the main reasons why additional social policies in every country should be drafted would be the reduction of disparities between population groups disadvantaged and the rest of the population; the major objective being improving the health of the population throughout the country.

Because health inequalities are not fortuitous, but are heavily influenced by government, communities, and the individual himself, they are not inevitable. Therefore, the improvement of population health and reduction of inequality should be the main core long-term objectives, in terms of social policies at national and international. European Council (June 2008) stressed the importance of eliminating disparities - in terms of population health status - between and among State Members. EU Health Strategy includes measures and actions to reduce the inequalities between people living in different parts of the EU, but also between people of advantaged classes of society and those from disadvantaged groups, by solidarity, social and economic cohesion, the human rights and equal opportunities.

Starting with January 2011, it was initiated the *European Portal for Action on Health Equity* as a tool to promote health equity amongst different socio-economic groups in the European Union. The Portal provides information on policies and interventions to promote health equity within and between the countries of Europe, by targeting the socio-economic determinants of health.

The information presented is the result of collaboration between a wide range of health and social actors in the EU, who came together in the context of a pan-European initiative that aimed to stimulate action for greater health equity. The initiative was established an EU Consortium for Action on the Socio-economic Determinants of Health (SDH).

The 2008 WHO Annual Report highlights the deepening inequality and inefficiency of the health care systems worldwide. Even in developed countries, inequality in health is increasing, a phenomenon generated by the provision of specialized medical services, high tech, but less accessible, to the detriment of concern for providing basic health services and disease prevention among all populations.

Literature review

Increased global inequality has resulted in a different direction of research in the field: one that compares the health of the population between the various political entities, such as between

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countries or regions. Most studies are presented in numerous reports prepared by UN, ILO, OECD and the WHO.

Since 2005, in the European community, a group of experts reviewed the information on policies and practices in public health and supported initiatives to introduce community action programs to reduce existing inequalities. Research Framework Programmes (currently FP7) also provides a major boost to research in this area and share a variety of programs including health program and the Community Programme PROGRESS Social Solidarity labour and employment, financial studies and examples of good practice.

In Romania, there are few research studies on health inequality. The National Institute of Economic Research has included in the annual research programs projects relating to health, living conditions, which were addressed in the context of some aspects of these components of wealth distribution in different population categories, defined by employment status, education, age and sex, household size and type, environment and region of residence, as well as deciles or quintiles. Research on population health status has been conducted in the Institute for Research on Quality of Life and National Institute of Statistics. The economic dimensions of inequality and social polarization in Romania were the main research issues in the social field in the program research of the Institute of National Economy in the frame of Romanian Academy (Molnar, Caragea, 2010).

Measurement of health inequalities

Measuring health inequality is however a very difficult action because the complexity of the health various determinants. Therefore, any result obtained from the evaluation of differences between different individuals, between social groups, communities or societies, in terms of health, should be viewed with some reservations.

In the following section of the paper there are underlined some of the most representative methods measuring inequality in health:

(1) One of the methods measuring inequality of health in the vision of a research team from the World Health Organization (Mäkinen, 2000), examines the inequality of states in developing or in transition, in terms of resource allocation in health sector. Differences between countries were judged on the following indicators: public spending on health care per capita, number of ancillary medical personnel (nurses) and the number of doctors per 100,000 inhabitants.

(2) A recent health inequality measurement method (Doorslaer and O'Donnell, 2008) is based on the computation of the composite index accounting the cumulative action of determinants of health. The value of this approach is that the index is based on analysis of level and trends of health inequalities and the method can also explain the causes of inequality in health. Concentration index is calculated as the aggregate amount of the contribution of health determinants (demographic, social and economic factors). Wagstaff et al. (2003) demonstrate that the concentration index of health can be written as the sum of the contribution of factors, such as demographics, education, region, etc., to income-related health inequality, where each contribution is the product of the elasticity of health with respect to the factor and the concentration index of the factor. That is, the concentration index can be written as:

$$C = \sum_k (\beta_k \bar{x}_k / \mu) C_k + GC_\varepsilon / \mu \quad (1)$$

where: μ - is the mean of the health measure y , \bar{x}_k - is the mean of k^{th} factor, β_k - is its coefficient from least squares regression of health on all factors, C_k - is the concentration index for the k^{th} factor and GC_ε - is the generalized concentration index for the error term of the regression:

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon \quad (2)$$

(3) Measuring health status inequality is based on the life expectancy distribution, by age. This approach seeks to answer several questions, for example, "it may be perfect equality between individuals when the same number of years they live," or when they enjoy the same level of health status? "

In the next section, it is described the method for measuring health inequalities for a population with individuals born in T. We want to see if, at time T + t there are differences in terms of their health status. In other words, individuals who compose the population have the same level of health when they reached the age of t? In circumstances where there is perfect equality, we make the two conditions are necessary and sufficient:

- All individuals have the same healthy life expectancy;
- All individuals are subject to the same risks in terms of health status (incidence of illness and likelihood of improvement is considered equal for all individuals).

Healthy life expectancy is a function that can be written as:

$$S(x) = p(x) \cdot \sum_j p_{jx} \cdot w_{jx} \quad (3)$$

where:

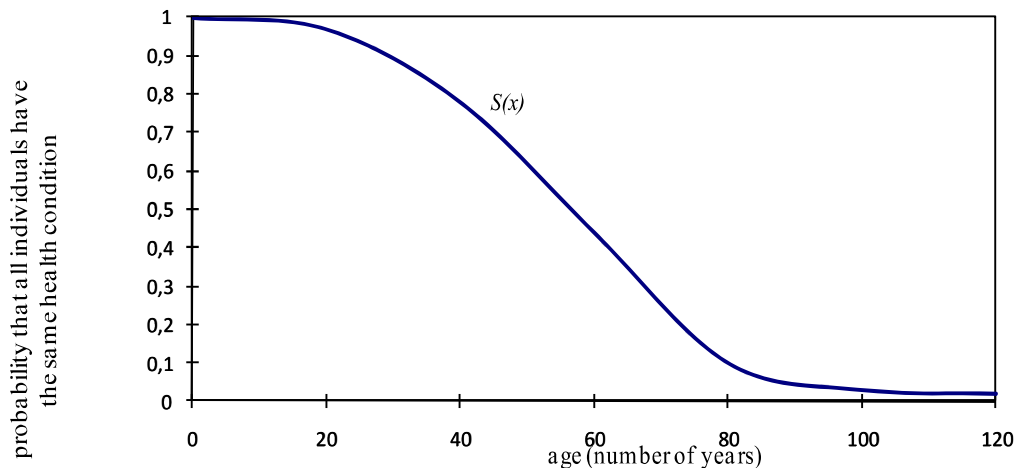
$S(x)$ - is the healthy life expectancy at age x ,

$p(x)$ - is the probability of being alive at age x , $p_{jx}(x)$ - probability to have health status level j at age x and

$w_{jx}(x)$ - is the severity of disease at age x , attributed to the health status level j (severity is measured on a scale where 0 corresponds to death and 1 is equivalent to full health).

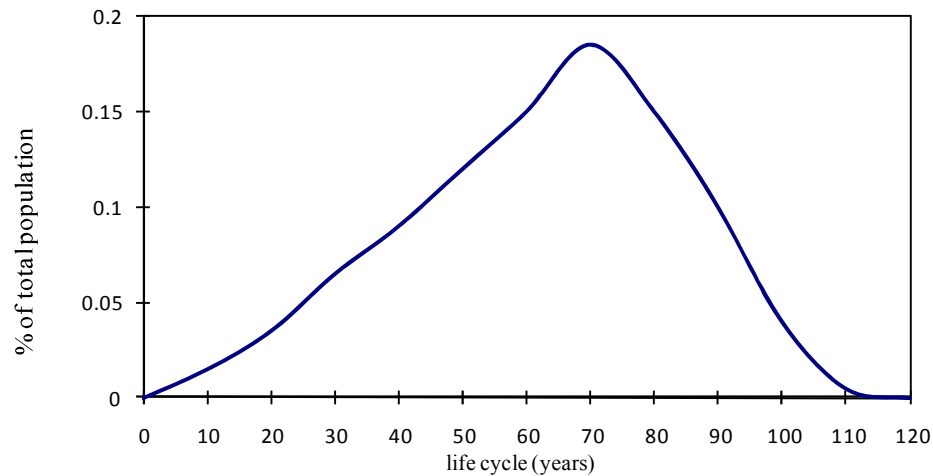
Figure 1a illustrates the healthy life expectancy by age and Figure 1b represents the distribution of healthy life expectancy for a population subject to the same risks in terms of health.

Figure 1a



In Figure 1a, healthy life expectancy - equal for all individuals - is given by the area under the curve $S(x)$.

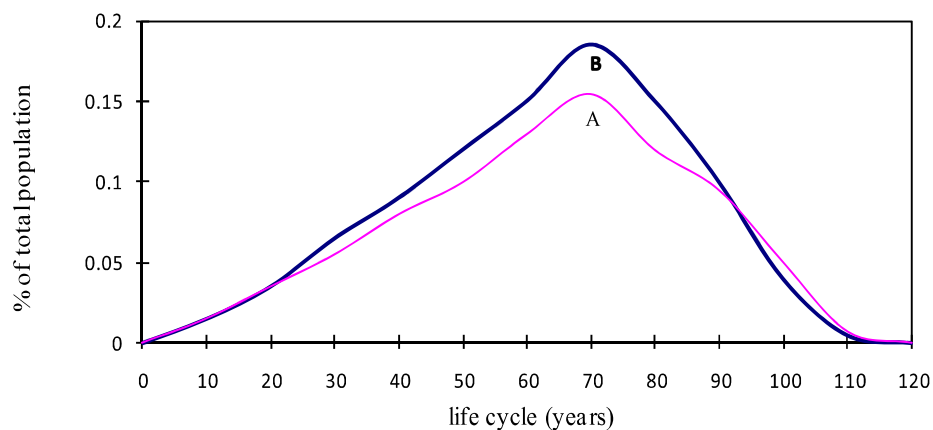
Figure 1b



Each of the individual has the same healthy life expectancy, but do not have equal chances to maintain its good health throughout life. For example, at age 20 years old, the probability of having a good health is 93%. In other words, at this age, because of natural causes (the misfortune), 7 of 100 individuals have a state of full health. Inequality in health should be analyzed, but in terms of risk factors that can damage the health of individuals. For example, if some individuals of the population are subject to risks related to socio-economic conditions in which they live, what is the likelihood that they will have good health for 20 years? Or, on an equal risk, varies as the probability of having a good health according to age?

Consider two populations A and B, characterized by different risk profiles in terms of maintaining good health of individuals who compose them, throughout life. In Figure 3 we can see that there are differences in the likelihood that individuals who constitute the population has to have the same healthy life expectancy compared to the population component B, due to risk factors that can not be avoided.

Figure 2



(4) Other method used to measure inequality in health has to calculate an index of inequality, according to the relation:

$$I(\alpha, \beta) = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|^\alpha}{2n^2 \mu^\beta} \quad (4)$$

where:

y_i, y_j - is the health status of individual i , respectively j , μ - is the mean of population and n - is the number of population. α and β are parameters, which may have the following values: $\alpha=1$ and $\beta=0$ or $\beta=1$, respectively $\alpha=2$ and $\beta=0$ or $\beta=1$.

By replacing the parameter values α and β , following formulas are obtained:

$$I(\alpha = 1, \beta = 0) = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|}{2n^2} \quad (5a)$$

$$I(\alpha = 1, \beta = 1) = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|}{2n^2 \mu} \quad (5b)$$

$$I(\alpha = 2, \beta = 0) = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|^2}{2n^2} \quad (5c)$$

$$I(\alpha = 2, \beta = 1) = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|^2}{2n^2 \mu} \quad (5d)$$

If $\alpha=1$, $\beta=1$, than $I(\alpha, \beta)$ is Gini coefficient often used to measure income distribution inequality.

Results

Analysis data was provided by national health interview surveys (according to European Health Interview Survey methodology), conducted in all Member States. The overall objective of this statistical research has been developing, implementing and achieving population health interview survey on a statistical sample of households to provide information and to describe the health status of the population that are not available from other data sources. In Romania, the investigation was prepared in accordance with the European methodology (European Health Interview Survey), the results being representative at national and regional level.

Perceived health status - is the subjective assessment of the individual's declared health status.

According to EU survey methodology concepts and definitions for the health status of the population, the indicator was calculated based on the choices of answer to the question: "In general,

how would you assess your health?" Very good, good, satisfactory, bad or very bad. For children, health status has been assessed by a parent.

On average, there are relatively small differences between the EU and Romania, in terms of population structure, in terms of the perceived health condition: very good, good, satisfactory, poor, very poor. Most people believe that their health is good (45.5% in the EU, respectively 43.7% in Romania). People who think that they have a very good health are more prevalent in Romania (25.7%) compared with the EU average (22.4%). The people who said they had a very poor health in Romania are 1.8%, very close to the value calculated for the EU-27, 1.9%.

Among European countries there are large variations in the structure of the population by health condition perceived of population. The highest weights of the population with good health status are observed in the Mediterranean countries (Greece and Cyprus 52.2%, 49.5%). On the opposite side are Portugal and Hungary, countries where the percentage of population with a very poor state of health is very high (5.3% and 4.9%). Also, the Baltic Countries are characterized by low values of the rate of people with good health (Latvia, 4.7%, Lithuania and Estonia 6.7%, 7.4%).

Disparities between Member States of the EU-27 - in terms of life expectancy at birth - are very high (7.8 years for the female population, i.e. 12.9 years for male population in 2008). Causes of these differences involve a wide range of factors, from the biological and behavioural socio-economic ones. The lowest life expectancy – for males - is 66.3 years in Lithuania, and the highest is recorded in Sweden (79.2 years). For women, the lowest life expectancy at birth has Bulgaria (77.1 years) and the upper, France (84.9 years). Life expectancy is greatly influenced by infant mortality, very high in countries with low economic development. Also, these countries are characterized by the highest life expectancy spreads to the EU average (e.g., the Baltic Countries: Lithuania and Latvia, but also the latest EU State Members: Bulgaria and Romania). On the opposite side are the rich countries, where values are above the European average.

Economic disparities between EU countries are also reflected in health, through the financing of health systems. Also, funding mechanisms are different from one country to another, especially by specific social protection systems. An indicator that includes all sources of financing health care, developed the methodology of the System of Health Accounts - EUROSTAT / OECD / WHO, is the total health care spending established by aggregating the national expenditure from all public or private funding sources (governmental budgets, the budgets of health insurance funds, health expenditure of private non-profit organizations, and household expenditure for health care). Among EU State Members there are great differences in the level of health care costs, coupled with economic development. For example, in 2008, total health care expenditure, per capita, have a value of more than 16 times higher in Luxembourg than in Bulgaria. Also, significant variations in spending on health care per capita, there are between three blocks of countries, based grouping by the time their integration into European structures. Most of financial resources are allocated to health care by the older EU State Members. Also, we can see between them significant amounts of health care expenditure in the Nordic Countries (Denmark, Sweden, Netherlands), characterized by strong social protection systems, including health protection.

In Romania, the financing of the health system continues to be used in an inappropriate and inefficient. Despite an increase in total health expenditure during the last decade, the financing of the health system in Romania remains low in a European context, especially taking into account the long period of chronic underfunding and lack of investment in health.

Conclusions

Over the last 50 years, there have been impressive social economic and health improvements in this country. People from every class and region are healthier and living longer than ever before. Unfortunately, not everyone is able to share the benefits of these improvements. It is essential that everyone is empowered and encouraged to do so.

Health inequalities are unacceptable. They start early in life and persist not only into old age but subsequent generations. Tackling health inequalities is a top priority for this Government, and it is focused on narrowing the health gap between disadvantaged groups, communities and the rest of the country, and on improving health overall.

Since the twenty-first century, inequality in health has become a constant concern of the social policies of the European community. Empirical studies show that the incidence and prevalence of most diseases is higher in poorer countries, but also in developed countries among people with low education and / or low income, their life expectancy is significantly less. Concerns about reducing inequalities between different socio-economic groups have led to the development of various methods of measurement. In terms of measuring inequality in health, the major problem is to choose the most relevant indicators to reflect the differences between two or more population groups.

The empirical analysis conducted in this study reflects the fact that there are differences between EU State Members in all three directions. In Romania, life expectancy, although is growing, is one of the lowest values in the European Union. Indicator value is the most influenced by infant mortality that is still very high, due to weak and under funded national health system.

Concluding remarks: inequalities are pervasive throughout the world. They are apparent in all developed countries, including ones with highly developed welfare systems such as Norway and Netherlands. Health inequalities can be found in many aspects of health; for example, poor people not only live less long than rich, but also have more years of poor health. Access to health is also uneven.

References

- Doorslaer, E., O'Donnell, O.: Measurement and Explanation of Inequality in Health and Health Care in Low-Income Settings, World Institute for Development Economics Research, Discussion Paper No. 04 (2008)
- Gakidou EE, King G.: Measuring total health inequality: Adding individual variation to group-level differences. *International Journal for Equity in Health*, 1(3) (2002)
- Groffen, D. A. I., Bosma, H., van den Akker, M., Kempen, G. I. J. M., van Eijk, J. Th. M.: Material deprivation and health-related dysfunction in older Dutch people: findings from the SMILE study. *Eur J Public Health* 18: 258-263 (2008)
- Mackenbach, J.P., Kunst, and A.E.: Measuring the magnitude of socioeconomic inequalities in health: an overview of available measures illustrated with two examples from Europe. *Soc Sci Med*, 44:757-771 (1997)
- Makinen, M., Waters, H., Rauch, M., Almagambetova, N., Bitran, R., Gilson, and L.: Inequalities in health care use and expenditures: empirical data from eight developing countries and countries in transition. *Bulletin of the World Health Organization*, 78(1):55-65 (2000)
- Makinen, M., Waters, H.: Inequalities in health care use and expenditure: empirical data for eight developing countries and countries in transition, *Bulletin of World Health Organizations*, 78(1) (2000)
- Molnar, M., Caragea, N.: Economic Dimensions of Inequality and Social Polarization in Romania, Programul Fundamental al Academiei Române (2010)
- Shanmuganathan, S., Claster, W.: Statistical methods in analyzing health inequalities among the world citizens, 18th World IMACS / MODSIM Congress, Australia (2009)
- National Institute of Statistics: Health status of Romanian population. (INS, Bucharest 2008)
- Strategic Review of Health Inequalities in England - Fair Society, Healthy Lives, Published by The Marmot Review (2010)
- Commission on Social Determinants of Health CSDH Final Report: Closing the gap in a generation: Health equity through action on the social determinants of health. Geneva: World Health Organization (2009).