This is a post-peer-review, pre-copyedit version of an article published in EUROPEAN JOURNAL OF PUBLIC HEALTH. The final authenticated version is available at European Journal of Public Health, cky165, https://doi.org/10.1093/eurpub/cky165

SOCIOECONOMIC INEQUALITY IN NON-COMMUNICABLE DISEASES IN EUROPE BETWEEN 2004 AND 2015: EVIDENCE FROM THE SHARE SURVEY

Running title: Socioeconomic inequality in non-communicable diseases among European adults

Filippa Bono

Researcher

Dept. of Economics, Business and Statistics (SEAS)

University of Palermo, Viale delle Scienze, Building 13

90128-Palermo, Italy

Email: filippa.bono@unipa.it

Phone: +39 091 23895256

Domenica Matranga (corresponding author)

Associate Professor

Dept. of Sciences for Health Promotion

and Mother and Child Care "G. D'Alessandro"

University of Palermo Via del Vespro, 133

90127 - Palermo, Italy.

Email: domenica.matranga@unipa.it

Phone +39 091 6553604

Fax +39 091 591440

Word count: (main text) 2995

Abstract

Background: The scope of this work was to investigate socioeconomic inequalities among European adults aged 50 or older in chronic diseases and behavioural risk factors for these diseases, namely, smoking habits, obesity and physical inactivity, between 2004 and 2015.

Methods: Data for this study were drawn from the Survey of Health, Ageing and Retirement (SHARE) in Europe, which is a panel database of microdata on health, socioeconomic status and social and family networks of people aged 50 years or older, covering most of the European Union. The predicted number of non-communicable diseases (NCDs) was used to estimate the concentration index and to find the contributions of determinants to socioeconomic inequalities in chronic diseases.

Results: The inequality disfavoured the poor in both years, but the effect was stable from 2004 (C=-0.071) to 2015 (C=-0.081). Inequality was shown to be attributed mostly to physical inactivity and obesity and this contribution increased during the study period. Among socioeconomic status (SES) determinants, education and marital status were the most concentrated in both years, while physical inactivity and obesity were the most concentrated behavioural risk factors in both years.

Conclusions: In order to prevent chronic diseases, health policy should aim not only to improve individual health behaviors in the population, but also to reduce socioeconomic inequality. Our study suggests promoting a healthy lifestyle in the most disadvantaged socioeconomic classes as a strategy to improve the health conditions of the whole population.

Keywords: Health inequality, non-communicable diseases, SHARE wave 6, Concentration index

1. Introduction

In Europe, the main non-communicable diseases (NCDs), including diabetes, cardiovascular diseases, cancer, chronic respiratory diseases and mental disorders, account for an estimated 86% of the deaths and 77% of the disease burden. Of the six WHO regions, the European Region is the most affected by NCDs [1]. It has been shown that at least 80% of all heart disease, stroke and type 2 diabetes and at least one third of cancer cases are avoidable [2]. The WHO NCD global surveillance strategy is based on a multidimensional view of disease determinants including physiological influences, lifestyle influences, environmental influences and social structure [3].

At present, there are about 166 million people aged 60 years and older in Europe, more than double compared to the 1950s', and one out of five is older than 80. People aged 60 or older represent 22% of all Europeans, a proportion which is double compared to the rest of the world [4].

There is abundant literature about the prevalence of NCDs and their determinants, but the large inequalities that exist in health outcomes and in the utilization of health services between the poor and the better-off lead to questions about health inequalities in NCDs and Behavioural Risk Factors (BRFs) for NCDs.

At a global level, there is evidence that NCD rates are higher in economically disadvantaged people than in those with higher socioeconomic status, both within high income-countries [5] and within low- and middle-income countries [6].

At a European level, the literature on socioeconomic inequalities in self-rated health gives evidence of existing differences among countries in the association of income inequality and income-related health gradient [7-8], of socioeconomic status and states of health as a result of contextual differences [9]. Other studies show socioeconomic inequalities in mortality rates

[10-12], and both in mortality and self-rated health [13]. Pasqualini et al. [14] show that chronic disease is influenced by people's circumstances (such as region of residence and parental background) and that the Gini concentration index is a statistically significant explanatory variable. Regarding BRFs for NCDs, socioeconomic inequalities have been shown in overweight/obesity [15], in alcohol related mortality [16], in occupational, leisure-time, and transport related physical activity [17], and in tobacco consumption [18]. The effect of lifestyle on income-related inequality in health and the statistical significance of smoking-related and income-related inequality in self-reported and lifestyle ill-health has been demonstrated [19].

The scope of this paper is to investigate socioeconomic inequalities among European adults aged 50 or older in NCDs and BRFs for NCDs, in particular tobacco consumption, obesity and physical activity, between 2004 and 2015.

2. Methods

2.1. The sample

This paper is based on data of the first and the sixth wave of the SHARE survey [20-21], which is a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks. The fieldwork time of this survey is 2004 for the first wave and 2015 for the sixth wave [22]. The number of European countries involved varies from 12 in 2004 to 21 in 2015, including Israel.

The SHARE target population consists of all persons aged 50 or older at the time of interview whose habitual residence is in the respective country involved in the SHARE survey. The SHARE sample is randomly selected to be nationally representative of the European non-institutionalized population aged 50 or older. The household response rate of the samples supported by the original funding from the European Commission's 5th framework

programme is 63.3 percent. The individual (i.e. within-household) response rate in the first wave varies from a minimum of 73.7% in Spain to a maximum of 93.3% in France. SHARE provides an imputation dataset that solves estimation problems with missing values in sensible variables such as income or related lifestyle variables [23].

For the purposes of the current investigation and in order to address health inequality and inequity, the analysis includes individuals living in ten countries present in both waves (Austria, Germany, France, Switzerland, Belgium, Denmark, Sweden, Spain, Italy, Greece), which yields a study population of 25,016 people in 2004 and 43,916 in 2015.

2.2. Variables

SHARE provides information on a large number of indicators and measures of health. As health outcome, in this analysis we consider the number of chronic diseases diagnosed in the respondent's lifetime. As BRFs for NCDs, we include core behavioural and physiological risk factors for NCDs that meet the criteria for surveillance [3]. Specifically, we include being a current smoker (yes/no), obese (yes/no) and physically inactive (yes/no), while we do not consider drinking habits because of excessive missing data. For the purpose of this study, obese is defined by a body mass index over 30. These risk factors are included for several reasons: they have the greatest impact on NCD mortality and morbidity; there is evidence that their modification is possible and effective in primary prevention; they can be measured with validity while following appropriate ethical standards, and it is possible to obtain data for meaningful comparisons across countries [3]. Demographic and socioeconomic status (SES) variables include gender, age, education, marital status, working status, income and wealth. We measure educational attainment according to ISCED, the international standard classification of education; marital status as a binary variable (couple and not-in-couple); and

the working status through six categories (retired, employed/self-employed, unemployed, permanently sick/disabled, homemaker and other).

Income is obtained as the sum of income from employment, self-employment, pension, regular private transfers, long-term care and capital assets income (interest from bank accounts, bonds, stocks or shares, or mutual funds) at the household level. Wealth is measured as the sum of household income plus total assets (also referred to as net worth). Total assets are the sum value of the primary residence net of mortgage, value of other real estate, owned share of own business, owned cars, and the value of financial assets (bank accounts, government and corporate bonds, stocks, mutual funds, individual retirement accounts, and contractual savings for housing and life insurance policies owned by the household) minus financial liabilities [24].

2.3. Statistical Methods

In this paper, we measure inequality in health using the ill-health concentration index (C) [25], with the number of NCDs as the ill-health indicator (illness is increasing by growing number of NCDs). We ranked adults according to their wealth, we divided the sample into quintiles and calculated the proportion of NCDs within each quintile. The concentration curve is the plot of the cumulative proportion of the number of NCDs (y-axis) against the cumulative proportion of the population ranked by wealth (x-axis), beginning from the least disadvantaged. The ill-health C is defined as twice the area between the concentration curve and the diagonal. When the concentration curve coincides with the diagonal, the ill-health C is zero and everyone enjoys the same health. When the concentration curve lies above the diagonal, there are inequalities to the disadvantage of the poorest people and the C is negative. Conversely, inequalities to the disadvantage of the richest people push the

concentration curve below the diagonal and the C is then more than zero. The further the concentration curve lies from the diagonal, the greater the degree of inequality of health across wealth groups.

Following the approach used by Hosseinpoor et al [26], in a first phase a negative binomial regression (NB) model is estimated to predict the number of NCDs with regards to a set of covariates, including socio-economic determinants and BRFs; in a second phase, the C index and the decomposition of inequality in NCDs in linear scores are estimated. The C index is calculated on the basis of predicted number of NCDs in order to obtain a continuous response variable, which allows the fulfilment of assumptions for linear decomposition. In order to assess the goodness of fit of NB model, the LR test for dispersion parameter is performed. The C can be decomposed in the sum of the covariates' contributions and a residual component, which reflects the inequality in NCDs that cannot be explained by systematic variations across wealth groups in the covariates. To calculate the relative contribution of each determinant, we multiply the concentration index of each determinant C_k by its contribution weight and divide it by the overall C [27]. Overall inequality can be decomposed as the sum of justified inequality (arising from standardizing variables, that are beyond the control of policy makers, i.e. age and gender), unjustified inequality or inequity (arising from control variables such as socioeconomic health determinants for instance) and residual inequality. The inequity index is calculated as the overall minus the justifiable inequality. This difference corresponds to the concentration index for the indirectly standardized values of gender and age [28].

To capture changes in inequalities between 2004 and 2015, we apply the Oaxaca-type decomposition as suggested in [29]. We denote with η_{kt} the relative variation of NCDs divided by the relative variation of the *k*th determinant at time t (estimated elasticity). The elasticity measures the sensitivity of health with respect to the corresponding determinant

[28]. The Oaxaca-type decomposition allows us to measure to what extent changes in inequalities in NCDs are due to changes in inequality in their determinants ($\Delta C \cdot \eta$) rather than to changes in their elasticities ($\Delta \eta \cdot \eta$) [29].

To show the robustness of our analysis, we analysed the sub-population aged 65 years or older, for which we expected a minor disparity of illness compared to people 50 years or older. In addition, we performed a sensitivity analysis to investigate the effects of omitting obesity and education on the inequality decomposition. We expected a great impact because only including the complete set of core risk factors can give the best model to describe inequalities in NCDs.

We performed statistical descriptive and regression analysis using STATA/SE 14.2, while we analysed health inequality and inequity using ADEPT 5.4, freely available at http://web.worldbank.org .

3. Results

The mean age of the sample is 64.4 in 2004 and 67.8 in 2015, and the standard deviation is almost unchanged during the period (10.5). In both years, women represent slightly more than half of the sample and nearly two-thirds of the sample live in a couple. The proportion of retired people is over 50% in both years and the number of subjects who claim to have only one chronic illness prevails. In this period, the proportion of obese people increases in all countries, except for Spain and Italy. In almost all countries the percentage of smokers is below 50%, except for Sweden and Denmark. Finally, the proportion of physically inactive people generally increases, with the most active population in Switzerland and Sweden and the least active population in Italy (Table 1).

The average income decreases in the period (-13.6%) while the average wealth increases (+12.8%). Per capita mean annual household income deteriorates in all countries except for Switzerland and Belgium. Per capita mean net worth ameliorates in Austria, Germany, Sweden, Denmark, Switzerland and Belgium, while it worsens in Italy, France and Greece (data not shown in tables).

Among people aged 50 or older, the number of chronic diseases is significantly associated with all SES determinants and all BRFs, except for marital status, which is not statistically significant in 2015. Living in Spain, Denmark and Belgium in 2004 and living in Sweden and Switzerland in 2015 does not affect the number of NCDs of respondents (Table 2). NB models for 2004 and 2015 fit data well ($p<0.001$), as it is also confirmed by the comparison between observed and predicted number of NCDs by gender and age (Table S1 in supplement material).

The inequality in the number of NCDs disfavours the poor in both years, but the effect is stable from 2004 (C=-0.071, 95%CI=[-0.075; -0.067]) to 2015 (C=-0.081, 95%CI=[-0.086; -0.077]). Conversely, the inequity at the disadvantage of the poor increases in the study period

(I_{2004}=-0.045, 95%CI=[-0.047; -0.042] and I_{2015}=-0.070, 95%CI=[-0.073; -0.067]). Significant concentration increases are found in Austria, Germany, and Switzerland and decreases in Italy and Denmark (Table 3 and Figure 1 in supplement material online).

Inequality can be mostly attributed to physical inactivity and obesity and their contribution increases in 2015 compared to 2004 (Co_{2004}=-0.007 and Co_{2015}=-0.010). Inequalities in all determinants disfavor the poor in both years. Among SES determinants, the most concentrated in both years are education (C_{2004}=0.055 and C_{2015} =-0.059) and marital status (C_{2004} =-0.055 and C_{2015} =-0.045). Among BRFs, the most concentrated are physical inactivity in both years (C_{2004} =-0.224 and C_{2015} =-0.227) and obesity (C_{2004} =-0.124 and C_{2015} =-0.114). The sub-population aged 65 years or older showed lower levels of disparity (C_{2004}=-0.053, 95%CI=[-0.057; -0.049] and C_{2015}=-0.077, 95%CI=[-0.081; -0.074]) compared with those found for the full study population. The contributions to inequality were stable for both obesity (Co_{2004}=-0.002 and Co_{2015} =-0.008) and physical inactivity (Co_{2004}=-0.007 and Co_{2015} =-0.010). Furthermore, our model was sensitive to the omission of obesity, with important changes of both concentration indices and contributions of smoking (0.043 in 2015 and 0.10 in 2004, after removing obesity). Omitting education caused no substantive changes in the contributions of other determinants, while only the concentration index of working status changed substantially (-0.27 in 2015 and -0.068 in 2004, after removing education).

Results of the Oaxaca decomposition are remarkable only for changes in inequalities in obesity, for which changes in inequalities ($\Delta C \cdot \eta$ =-0.108) appear to be more important than changes in elasticity ($\Delta\eta \cdot C$=0.009)(Table 4).

4. Discussion

Many studies showed that NCD rates are higher in socioeconomically disadvantaged people than in groups with a higher socioeconomic position, but little is known about income and

education inequalities in NCDs. One finding of this study is that NCDs are unequally distributed to the disadvantage of poor people and that this inequality can be related to differences in education and wealth more than income. People further down the social strata have less access to NCD care and treatment, especially to primary care, which can effectively reduce the exposure to some important risk factors and prevent advanced stage disease and complications [30]. We found that inequality in NCDs increases among European adults, aged 50 or older, living in richer countries (Austria, Germany, Sweden and Switzerland), while it decreases for those living in lower income countries (Greece, Italy, Spain). After standardizing by age and gender, the inequity analysis confirms this change for all countries except for Spain. Differences in within-country patterns depend on the stage of economic development and especially on social, economic and health policies [5]. The economic recession has hit living standards deeply, affecting the consumption behavior related to basic needs [31] and determining low-quality health care and less funds allocated for disease prevention for the whole population. However, results about the impact of the current economic recession on health equity are still inconsistent because changes in health inequality can be explained by the role of welfare state policies and by changes in the socioeconomic profile of the groups under comparison in times of crisis [32].

We found education to be the main determinant of both the average number of NCDs and of socioeconomic inequalities in NCDs. European countries with higher welfare spending have lower educational inequalities in health [33]. More educated individuals have superior information acquisition skills, which increase the likelihood that they recognise and report symptoms of disease, and are quicker in accessing healthcare services for prompt treatment [34].

Another important result of our study relates to the role of wealth more than income to analyse inequality in NCDs, in line with another study about Mediterranean adults aged 50 or

older [35]. In fact, income and wealth are positively related but income reflects a flow of resources which are available over a period, while wealth reflects the accumulation of resources over the life span of a person. Among adults aged 50 or older, income variability is far less than wealth variability, so wealth allows a more accurate measurement of SES differences in health and healthcare utilization in this population. Other studies also showed that wealth is a significant predictor of the use of health care services, especially those based heavily on service users' own payments [24].

To explain the number of NCDs among European adults aged 50 or older, the effect of physical inactivity and obesity was found to have increased between 2004 and 2015, while the effect of smoking status remained stable. Our study confirms the findings of a previous piece of research on European adults aged 50 or higher [36], where being overweight or obese was the most prevalent BRF in men and physical inactivity in women.

Our study showed that obesity, physical activity and education are the main contributors to socioeconomic inequalities in NCDs and that obesity and physical activity are the most unequally distributed to the disadvantage of poor people. This is in line with the positive association between body mass index and education in low-income countries and the inverse association in high-income countries [37].

An interesting review [5] reports that the changes of risk factor inequalities over time in the same community or country have varied by risk factor and study. Nonetheless, except for some risk factors for which inequalities decrease in some studies, socioeconomic gradients in risk factors have persisted or even increased, irrespective of whether overall risk factors increased or decreased. The existence of socioeconomic gradients for weight status and sedentariness has been established also for single countries [35, 38-40].

One limitation of our study concerns the use of imputed data, which was due to numerous missing data in some variables, mainly economic and financial. Some countries had a high

rate of missing values or were not included in both waves, so we restricted our analysis to only ten countries. In addition, information about the drinking habits of the people interviewed was not reliable, so this very important risk factor for NCDs was excluded from the analysis.

The detection and control of physiological factors and preventive actions against physiological and behavioural risk factors remain the essential preventive strategy to counteract NCDs. Our study suggests strengthening prevention in the most disadvantaged socioeconomic classes in order to contain healthcare expenditure for adults aged 50 or older, by improving their living conditions and overall health.

Acknowledgements

Both authors contributed equally to the concept and design of the study, and to the acquisition, analysis and interpretation of data. Both authors performed critical revision for important intellectual content and approved the version to be published. DM acts as the overall guarantor of this paper.

Both authors are grateful to two anonymous referees for their constructive and helpful comments. This paper uses data from release 6 of SHARE 2004 and SHARE 2015. The SHARE data collection has been primarily funded by the European Commission through the 5th framework programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life). Additional funding came from the US National Institute on Ageing (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01 and OGHA 04-064). Data collection in Austria (through the Austrian Science Foundation, FWF), Belgium (through the Belgian Science Policy Office) and Switzerland (through BBW/OFES/UFES) was nationally funded. The SHARE data collection in Israel was funded by the US National Institute on Aging (R21 AG025169), by the German–Israeli Foundation for Scientific Research and Development (GIF), and by the National Insurance Institute of Israel. Further support by the European Commission through the 6th framework programme (projects SHARE-I3, RII-CT-2006-062193, and COMPARE, CIT5-CT-2005-028857) is gratefully acknowledged. For methodological details see (Börsch-Supan, A. and H. Jürges (Eds.) (2005). The Survey of Health, Ageing and Retirement in Europe – Methodology. Mannheim: Mannheim Research Institute for the Economics of Aging (MEA)).

Conflicts of interests

The authors affirm that they have no conflicts of interest, including non-financial, and that they have not received funds for conducting this research.

Key points

1. The study showed the existence of socioeconomic inequalities in chronic diseases among European adults aged 50 or older
2. Socioeconomic inequality was stable between 2004 and 2015 and disfavoured poor people
3. Policy makers should counteract concentrations of physical inactivity and obesity and promote an equal distribution of education in order to prevent widespread chronic diseases.

References

[1] World Health Organization. Non communicable diseases country profiles. 2014. Retrieved from http://www.who.int/nmh/publications/ncd-profiles-2014/en/ Accessed 14 March 2017.

[2] World Health Organization. Health 2020: a European policy framework and strategy for the 21st century. Copenhagen: WHO Regional Office for Europe. 2013. Retrieved from http://www.euro.who.int/en/publications/policy-documents/health-2020.-a-european-policy-framework-and-strategy-for-the-21st-century-2013. Accessed 14 March 2017.

[3] World Health Organization. The WHO STEPwise approach to Surveillance of noncommunicable diseases (STEPS). Retrieved from http://www.who.int/ncd_surveillance. Accessed 23 January 2018.

[4] United Nations.Word Population Aging 2013. 2013. Retrieved from http://www.un.org/en/development/desa/population/publications/ageing/WorldPopulationAgeing2013.shtml. Accessed 23 January 2018.

[5] Di Cesare M, Khang YH, Asaria P, Blakel T, Cowan MJ, Farzadfar F, et al. Inequalities in non-communicable diseases and effective response. Lancet. 2013; 381: 585–97.

[6] Hosseinpoor AR, Bergen N, Kunst A, Harper S, Guthold R, Rekve D, et al. Socioeconomic inequalities in risk factors for non communicable diseases in low-income and middle-income countries: results from the World Health Survey. BMC Public Health. 2012; 12: 912.

[7] Chauvel L, Leist AK. Socioeconomic hierarchy and health gradient in Europe: the role of income inequality and of social origins. Int J Equity Health. 2015; 14: 132.

[8] Jutz R. The role of income inequality and social policies on income-related health inequalities in Europe. Int J Equity Health. 2015; 14: 117.

[9] Alvarez-Galvez J. Discovering complex interrelationships between socioeconomic status and health in Europe: A case study applying Bayesian Networks. Soc Sci Res. 2016; 56: 133-43.

[10] Huisman M, Read S, Towriss CA, Deeg DJ, Grundy E. Socioeconomic inequalities in mortality rates in old age in the World Health Organization Europe region. Epidemiol Rev. 2013; 35: 84-97.

[11] Borrell C, Marí-Dell'olmo M, Palència L, Gotsens M, Burström BO, Domínguez-Berjón F et al. Socioeconomic inequalities in mortality in 16 European cities. Scand J Public Health. 2014; 42(3): 245-54.

[12] Hu Y, van Lenthe FJ, Mackenbach JP. Income inequality, life expectancy and cause-specific mortality in 43 European countries, 1987-2008: a fixed effects study. Eur J Epidemiol. 2015; 30(8): 615-25.

[13] Mackenbach JP, Stirbu I, Roskam AJ, Maartje M, Schaap MM, Menvielle G, Leinsalu M, et al. Socioeconomic inequalities in health in 22 European countries. New Engl J Med. 2008; 358: 2468–81.

[14] Pasqualini M, Lanari D, Minelli L, Pieroni L, Salmasi L. Health and income inequalities in Europe: What is the role of circumstances?. Econ Hum Biol. 2017; 26: 164–173.

[15] Giskes K, Avendano M, Brug J, Kunst AE. A systematic review of studies on socioeconomic inequalities in dietary intakes associated with weight gain and overweight/obesity conducted among European adults. Obes Rev. 2010; 11(6): 413-29.

[16] Mackenbach JP, Kulhánová I, Bopp M, Borrell C, Deboosere P, Kovács K, et al. Inequalities in Alcohol-Related Mortality in 17 European Countries: A Retrospective Analysis of Mortality Registers. PLoS Med. 2015; 12(12): e1001909.

[17] Beenackers MA, Kamphuis CB, Giskes K, Brug J, Kunst AE, Burdorf A, et al. Socioeconomic inequalities in occupational, leisure-time, and transport related physical activity among European adults: a systematic review. Int J Behav Nutr and Phys Act. 2012; 9: 116.

[18] Kulik MC, Hoffmann R, Judge K, Looman C, Menvielle G, Kulhánová I, et al. Smoking and the potential for reduction of inequalities in mortality in Europe. Eur J Epidemiol. 2013; 28(12): 959-71.

[19] Mukong A K, Walbeek C, Van and Ross H. Lifestyle and Income-related Inequality in Health in South Africa. Int J Equity Health. 2017; 16(1):103.

[20] Börsch-Supan, A. Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 1. Release version: 6.1.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w1.610. 2018.

[21] Börsch-Supan, A. Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6. Release version: 6.1.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w6.610. 2018

[22] Börsch-Supan A, Brandt M, Hunkler C, Kneip T, Korbmacher J, Malter F, et al. Data resource profile: The survey of health, ageing and retirement in Europe (SHARE). Int J Epidemiol. 2013; 42(4): 992–1001.

[23] De Luca G, Celidoni M, and Trevisan E. Item nonresponse and imputation strategies in SHARE Wave 5, IN Malter F, and Börsch-Supan A. (ed.), SHARE Wave 5: Innovations & Methodology, Munich: MEA, Max Planck Institute for Social Law and Social Policy 2015.

[24] Allin S, Masseria C, Mossialos E. Measuring socioeconomic differences in use of health care services by wealth versus by income. Am J Public Health. 2009; 99(10): 1849-1855.

[25] Wagstaff A, Peci P, van Doorslaer E. On the measurement of inequalities in health. Soc Sci Med. 1991; 33: 545-557.

[26] Hosseinpoor AR, van Doorslaer E, Speybroeck N, Naghavi M, Mohammad K, Majdzadeh R, Delavar B, Jamshidi H, Vega J. Decomposing socioeconomic inequality in infant mortality in Iran. Int J Epidemiol. 2006; 35: 1211-1219.

[27] Speybroeck N, Konings P, Lynch J, Harper S, Berkvens D, Lorant V, et al. Decomposing socioeconomic health inequalities. Int J Public Health. 2010; 55: 347–351.

[28] Wagstaff A, Bilger M, Sajaia Z, Lokshin M. Health Equity and Financial Protection (English). Washington, DC : World Bank Group. 2011. Retrieved from http://documents.worldbank.org/curated/en/962191468151159187/Health-Equity-and-Financial-Protection

[29] Van Doorslaer E, Koolman X. Explaining the differences in income-related health inequalities across European countries. Health Econ. 2004; 13: 609-628.

[30] World Health Organization 2003 Social determinants of health. The solid facts. 2nd Edition. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf

[31] Bono F, Cracolici MF, Cuffaro MA. Hierarchical Model for Analysing Consumption Patterns in Italy Before and During the Great Recession. Soc Indic Res. 2017; 134: 421–436.

[32] Bacigalupe A, Escolar-Pujolar A. The impact of economic crises on social inequalities in health: what do we know so far? Int J Equity Health. 2014;13:52. doi: 10.1186/1475-9276-13-52.

[33] Dahl E, van der Wel KA. Educational inequalities in health in European Wealfare states: a social expenditure approach. Soc Sci Med. 2013; 81: 60-9.

[34] Bago d'Uva T, Lindeboom M, O'Donnell O, van Doorslaer E. Education-related Inequity in Health Care with Heterogeneous Reporting of Health. J R Stat Soc Ser A Stat Soc. 2011; 174(3): 639–664.

[35] Tsimbos C. An assessment of socio-economic inequalities in health among elderly in Greece, Italy and Spain. Int J Public Health. 2010; 55(1): 5-15.

[36] Linardakis M, Papadaki A, Smpokos E, Micheli K, Vozikaki M, Philalithis A. Association of Behavioral Risk Factors for Chronic Diseases With Physical and Mental Health in European Adults Aged 50 Years or Older, 2004–2005. Prev Chronic Dis. 2015; 12: 150134.

[37] Pampel FC, Denney JT, Krueger PM. Obesity, SES, and economic development: a test of the reversal hypothesis. Soc Sci Med. 2012; 74: 1073–81.

[38] Matranga D, Tabacchi G, Cangialosi D. Sedentariness and weight status related to SES and family characteristics in Italian adults: exploring geographic variability through multilevel models. 2018; 46(5): 548-556.

[39] Ding D, Do A, Schmidt HM, Bauman AE. A Widening Gap? Changes in Multiple Lifestyle Risk Behaviours by Socioeconomic Status in New South Wales, Australia, 2002–2012. PLoS One. 2015; 10(8): e0135338.

[40] Lebel A, Kestens Y, Clary C, Bisset S, Subramanian SV. Geographic Variability in the Association between Socioeconomic Status and BMI in the USA and Canada. PLoS One. 2014; 9(6): e99158.