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Eurostat is the Statistical Office of the European Union (EU). Its mission is to provide the EU with high-quality statistical information. To that end, it gathers and analyses data from the National Statistical Institutes (NSIs) across Europe and provides comparable and harmonised data for the EU to use in the definition, implementation and analysis of EU policies. Its statistical products and services are also of great value to Europe's business community, professional organisations, academics, librarians, NGOs, the media and citizens. In the social field, the EU Statistics on Income and Living Conditions (EU-SILC) instrument is the main source for statistics on income, poverty, social exclusion and living conditions.

Over the last years, important progress has been made in relation to EU-SILC. This is the result of the coordinated work of Eurostat and the NSIs, *inter alia* in the context of the EU 'Living Conditions' Working Group and various thematic Task-Forces. Despite these significant achievements, EU-SILC data are still insufficiently analysed and used.

It is in this context that Eurostat launched in 2008 a call for applications with the following aims:

(1) develop methodology for advanced analysis of EU-SILC data;
(2) discuss analytical and methodological papers at an international conference;
(3) produce a number of publications presenting methodological and analytical results.

The 'Network for the Analysis of EU-SILC' (Net-SILC), an ambitious 18-partner Network bringing together expertise from both data producers and data users, was set up as in response to this call. The initial Net-SILC findings were presented at the international conference on 'Comparative EU Statistics on Income and Living Conditions' (Warsaw, 25-26 March 2010), which was organised jointly by Eurostat and the Net-SILC network and hosted by the Central Statistical Office of Poland. A major deliverable from Net-SILC is a book to be published by the EU Publications Office at the end of 2010 and edited by Anthony B. Atkinson (Nuffield College and London School of Economics, United Kingdom) and Eric Marlier (CEPS/INSTEAD Research Institute, Luxembourg).

The present methodological paper is also an outcome from Net-SILC. It has been prepared by Cristina Hernández-Quevedo, Cristina Masseria and Elias Mossialos (LSE Health, London School of Economics and Political Science, United Kingdom). Gara Rojas González was responsible at Eurostat for coordinating the publication of the methodological papers produced by Net-SILC members.

It should be stressed that this methodological paper does not in any way represent the views of Eurostat, the European Commission or the European Union. The authors have contributed in a strictly personal capacity and not as representatives of any Government or official body. Thus they have been free to express their own views and to take full responsibility both for the judgments made about past and current policy and for the recommendations for future policy.

This document is part of Eurostat's *Methodologies and working papers* collection which are technical publications for statistical experts working in a particular field. All publications are downloadable free of charge in PDF format from the Eurostat website (http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/publications/Methodologies_and_working_papers). Furthermore, Eurostat databases are freely available at this address, as are tables with the most frequently used and requested short- and long-term indicators.

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Analysing the socioeconomic determinants of health in Europe: new evidence from EU-SILC

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Abstract: This paper shows an analysis of inequalities in suffering health limitations in daily activity by using the EU-SILC longitudinal data for the waves 2005 to 2007 in 20 European Member States for which data was available. Inequalities in health limitations were measured using the concentration index approach. We complement the analysis with a decomposition analysis of the Concentration Indices in order to disentangle the main contributors of the income-related inequalities in health. We find evidence of income-related inequalities in health for all the countries analysed, although they present a heterogeneous pattern over time. The regression analysis shows that demographic factors such as age and gender pre-determine an individual to report health limitations. Besides, factors such as activity status, education and different indicators of social exclusion are highly associated with perceiving health limitations in daily activity, as showed by the results of the regression analysis as well as the decomposition analysis. The limitations of this study are further discussed in a methodological working paper (Hernández-Quevedo et al, 2010).

Keywords: self-assessed health, health limitations, EU-SILC, inequalities, longitudinal data

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[1] The authors are based in LSE Health, London School of Economics and Political Science (UK). They would like to thank Tony Atkinson, Conchita d'Ambrosio and Eric Marlier for their comments and suggestions. Of course, these persons are not responsible in any way for the present contents. The European Commission bears also no responsibility for the analyses and conclusions, which are solely those of the authors. Address for correspondence: C.Hernandez-Quevedo@lse.ac.uk

1. Introduction

As the European Union continues to expand, disparities in the health of the European population, both within and between countries, are a cause for concern, with an increasing number of countries and international organisations acknowledging the need to reduce inequalities in health. The Commission on Social Determinants of Health has presented a guide of measures to achieve equity in health, where it is recognised the poor health of the poor, the social gradient in health within countries and the existence of health inequities between countries (CSDH WHO, 2008). Reducing health inequalities has been considered one of the measures of health systems performance recommended by the World Health Organisation (WHO, 2000). The World Health Organization and the European Union have played an important role in providing a framework and the principles to encourage action in many countries. Those countries that acknowledge the need of reducing the health gap follow the equity principles and values of the World Health Organisation and as such, they are explicitly concerned with the socioeconomic dimension of health inequalities. However, there is considerable diversity in the public policy goals and targets that aim to address health inequalities across different European countries.

At the European level, there is a commitment of member states to set up national action plans to combat poverty and social exclusion. As a key component to this process, the Atkinson Report (Atkinson *et al*, 2002) set out recommendations for the development of indicators of social inclusion in the European Union. These were developed in response to the 2000 Lisbon European Council meeting's resolution to "*promote a better understanding of social exclusion through continued dialogue and exchanges of information and best practice, on the basis of commonly agreed indicators*". At the special European summit in Lisbon in March 2000, for the first time, social policy was explicitly introduced as a distinct focus of attention for European cooperation. It was agreed that common objectives for eradication of poverty and social exclusion would be adopted, that national policies would be designed to meet these, and that progress would be monitored. As a result of this trend towards European social policy harmonization, cross-country comparative information on social inequalities and exclusion (in terms of health or other dimensions) has gained additional relevance in Europe.

However, the analysis of the socioeconomic determinants of health presents important methodological issues. Several studies have analysed the association between health and socioeconomic status, in particular, health and education (see Grossman, 2000; Smith, 2004); and health and income or wealth (see for example, Smith, 1999, 2004). A positive relationship between health and socioeconomic status is widely documented across many societies and periods

(see for example Smith, 1999; Deaton, 2003). However, the causal mechanisms underlying this relationship are complex and controversial. Socioeconomic status can influence health through the direct influence of material deprivation in the health production function and on the access to health care or of education on the uptake and compliance with medical treatments; while health can influence socioeconomic status through the impact of health shocks on the labour market outcomes, such as unemployment, early retirement (Bound, 1991; Disney *et al*, 2006) and earnings (Contoyannis and Rice, 2001). The WHO Commission on the Social Determinants of Health (2008) concluded that variation in income or health service access could not alone explain the persistence of health inequality and that wider social determinants play an important role. Besides, it has been argued that this association between health and socioeconomic status could be due to "third factors", such as time preference rates, that do not imply any causal relationship (Hernández-Quevedo *et al*, 2008).

2. Literature review

2.1. Cross-country evidence of socioeconomic inequalities in health

Several cross-country studies for European countries have provided evidence of inequalities in health outcomes related to socioeconomic variables, with a focus on whether disparities in health outcomes differ systematically according to socioeconomic variables, such as education or income.

Large education-related inequalities in self-assessed health were observed in Austria, Denmark, England, Italy, the Netherlands, Norway, West Germany, Spain and Sweden, with large differences in magnitude (Kunst *et al*, 2005). Between the 1980s and the 1990s, socioeconomic inequalities in self-assessed health remained, on average, stable for men but slightly increased for women. Increasing inequalities were observed in Italy, the Netherlands and Spain, but this was not seen in Northern countries. The results suggest that Northern countries' welfare states had mechanisms to protect people in lower socioeconomic classes from the health effects of the economic crises in the 1990s. However, large socioeconomic inequalities in reported health status still persist in all the 10 western countries analysed.

Education-related inequalities in common chronic diseases were found in Belgium, Denmark, Finland, France, Great Britain, Italy, the Netherlands and Spain (Dalstra *et al*, 2006). Most diseases showed higher prevalence among people with low educational level; only allergy was more common in the high education group. High inequalities favouring the better-off were observed for stroke, diseases of the nervous system, diabetes and arthritis. No statistically significant inequality was found for cancer, kidney and skin diseases. The size of socioeconomic differences in chronic diseases varied between men and women. For diabetes, hypertension and heart diseases, inequalities were higher among women; while for back and spinal cord disorders, inequality was higher among men. By comparing the working-age and the elderly population groups, on average, education-related inequalities decreased when age increased. The only exceptions were chronic respiratory diseases, headache and migraine. Among the working-age group, cancer was more prevalent in the low educated group but in old age the pattern reversed; among older people cancer appears to affect the better educated.

In a recent study, Eikemo *et al* (2008) try to determine whether the magnitude of educational health inequalities varies between 23 European countries, that have different welfare regimes, classifying countries as Scandinavian, Anglo-Saxon, Bismarckian, Southern and Eastern countries. They use self-reported general health and limiting longstanding illness as indicators of morbidity and

the analysis is based on data from the first and second wave of the European Social Survey for 2002 and 2004. They find that East European countries had the highest prevalence of both health indicators, while South European welfare regimes had the second highest prevalence of poor self-assessed health, and the lowest prevalence of limiting longstanding illness. Ireland and UK had the lowest prevalence for both health indicators and for both sexes. Southern European countries had the largest health inequalities, while countries with Bismarckian welfare regimes tend to have the smallest. Countries with the lowest average years of education, Southern and Eastern European countries, presented the largest overall prevalence rates of ill-health, whilst the Anglo-Saxon countries have the lowest prevalence rates. In terms of educational health inequality, countries in the Scandinavian welfare regime were placed less favourably than those in the Anglo-Saxon and Eastern European regimes. Only Sweden shows relatively small educational-related inequalities in health.

Socioeconomic differences in self-assessed health status are found also in eastern European countries such as Russia, Estonia, Lithuania, Latvia, Hungary, Poland and Czech Republic; and the findings are not dissimilar from those in the EU-15 (Bobak *et al*, 2000). Education and material deprivation are important determinants of health status; people with higher education are less likely to report poor health. Low perceived control in work was also significantly associated with poor health, even after adjusting not only for age and gender but also for education, deprivation and inequality.

Helasoja *et al* (2006) compared time trends from 1994 to 2004 in the pattern and magnitude of educational inequalities in health in Estonia, Latvia, Lithuania and Finland. The results show that the existing educational inequalities in health in three Baltic countries and Finland remained generally stable over time from 1994 to 2004. Also, the overall prevalence of all three health indicators was generally stable, but in the Baltic countries improvement in perceived health was mainly found among the better educated men and women. Diagnosed diseases increased in the Baltic countries, except Lithuania, where diseases decreased among the better-educated women. Symptoms increased among the better-educated Estonian and Finnish women.

Mackenbach *et al* (2005) find that an increase in income is associated with improvements in self-assessed health status at the individual level. Using the five-point scale of the SAH as a continuous outcome, it is found that higher household income is associated with better health conditions for both men and women, particularly in the middle-income range in seven European countries (Belgium, Denmark, England, Finland, France, the Netherlands and Norway). In the highest-income group, the relationship between income and self-assessed health is curvilinear; higher income is associated with less than proportional increases in self-assessed health in all countries analysed. A curvilinear association was found also for the lowest-income group in Belgium, Finland, Norway and the Netherlands, where the relationship reverses in particular among women. However, for these four countries, net instead of gross income

was measured. This result showed that health inequalities are explained mainly by the direct effect of material circumstances and poverty on health status.

Hernández-Quevedo *et al* (2006) found that long-run income inequalities for the eight waves covered by the ECHP (1994 - 2001) in health limitations in daily activity are higher than short-run inequalities in the countries included in the analysis. The short- and long-run inequalities are negative in all countries, implying that health limitations are concentrated in those individuals at the bottom of the income distribution. Larger long-run inequalities (over the eight waves) are observed in Ireland, Spain and Portugal and the lowest, in Germany (only three waves) and Finland. Although in all countries inequality varies widely across waves, only in Germany, Greece, and Spain, was it in absolute terms greater at the beginning of the reference period than at the end. The largest increases in inequalities across the available waves are observed in Austria, Finland, and Luxemburg, while in the UK and Germany, the magnitude of income-related inequalities in health, given by the concentration index, is quite stable (but only 3 waves were available in these two countries). Moreover, in all countries the mobility indices are negative. Therefore, income-related inequalities in ill-health were found larger in the long-run than in the short-run everywhere. Downwardly income-mobile individuals are more likely to suffer any limitation in daily activity due to their health status than upwardly mobile individuals. The largest difference between short and long-run inequalities is in Ireland and Italy, and the lowest in Germany and the UK.

2.2. Evidence on the analysis of the socioeconomic determinants of health

Previous studies that have exploited longitudinal data such as Contoyannis *et al* (2004, 2004a) have concluded that suffering any health limitation in daily activity is a dynamic phenomenon. In particular, Contoyannis *et al* (2004) analyses the relationship between socioeconomic status and self-assessed health, finding a socioeconomic status gradient in health, that is not distorted by the attrition in the data. While some studies find a similar result (for example, Jones and Wildman, 2008) other studies do not find that link (Smith, 2004). In any case, education is found to play an important role improving health, which leads to the concern that a range of variables influence health inequalities.

Olsen and Dahl (2007) examine self-reported health for individuals in 21 European countries using data from the European Social Survey (ESS) conducted in 2003. They find that individual-level characteristics such as age, education, economic satisfaction, social network, unemployment and occupational status are related to the health of the individuals, both for women and men. They also consider country-level characteristics, finding that socioeconomic development, measured as GDP per capita, is strongly associated with better health, after controlling for individual-level characteristics.

Among the 21 countries considered in this study, the eastern European countries are those where individuals report the poorest health.

A European-based study by Hernández-Quevedo *et al* (2008) have analysed the persistence in health limitations for individuals within the member states of the European Union. For that purpose, they exploit the eight waves of the European Community Household Panel (ECHP), focusing on two binary measures of health limitations (suffering any limitation and suffering severe limitation). Non-linear dynamic panel data models are used. The findings show that, although there is heterogeneity in the socioeconomic gradient across countries, educational achievement and job status are identified as the main socioeconomic characteristics that influence the reporting of some kind of limitation in daily activity.

Some previous studies have used the EU-SILC in order to provide some descriptive analysis of unmet need for medical examination (Huber *et al*, 2008) as well as the health status of the immigrant population included in the survey (Ribera *et al*, 2008). However, no study until now has fully exploited the EU-SILC to obtain a cross-country comparison of the determinants of health status and unmet need of health care for the European population. The objectives of this applied study are: firstly, to provide updated evidence on socioeconomic inequalities in health in the EU-15 Member States provided in previous studies that exploited the ECHP together with new evidence on the level of socioeconomic inequalities in health for the new Member States of the enlarged European Union; secondly, an econometric analysis to provide some insight on the association between health limitations and a range of demographic and socioeconomic factors; finally, to perform a decomposition analysis to identify the main contributors to income-related inequalities in health across Europe.

3. EU-SILC data

The EU-SILC (Statistics on Income and Living Conditions) is an instrument aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions, becoming a key tool for policymakers interested in monitoring Lisbon strategy. The instrument is anchored in the European Statistical System (ESS). It replaced the European Community Household Panel (ECHP) from 2005 onwards.

The EU-SILC was launched in 2004 in 13 Member States (Belgium, Denmark, Estonia, Greece, Spain, France, Ireland, Italy, Luxembourg, Austria, Portugal, Finland and Sweden) and in Norway and Iceland. This first release of cross-sectional data mainly refers to the income reference year 2003 with a fieldwork carried out in 2004. The EU-SILC reached its full scale extension to include 25 Member States plus Norway and Iceland in 2005. Bulgaria, Romania, Turkey and Switzerland have launched SILC in 2006.

The instrument aims to provide two types of data: cross-sectional data pertaining to a given time or a certain time period with variables on income, poverty, social exclusion and other living conditions (including three health items), and longitudinal data, pertaining to individual-level changes over time, observed periodically over, typically, a four year period.

However, there are several limitations on the longitudinal design of the EU-SILC: while the ECHP presented 8 waves of data and hence, individuals were followed during this time period, the 4-year rotational format of the EU-SILC implies that the information on individuals' history is reduced to four years. This time framework differs across Member states. In fact, only 13 countries launched the EU-SILC in 2004 and hence, half of the countries provide individual information for less than four years. Besides, the fact that it is a short panel compared to the 8-wave panel offered by the ECHP limits the methodological analysis, as dynamic models in this context will not be reliable. Hence, in this study we have to be cautious claiming causality but association between health and socioeconomic factors. An additional limitation is presented with the EU-SILC compared to the ECHP in terms of the health-related variables available: the number of variables which measure health outcomes are fewer than in the ECHP, and the variables that count for the actual use of the health services in each country are not included at all in the EU-SILC, although some indicators of forgone health care and the main reasons have been included.

3.1. Sample and variables

The data we use in this study are the EU-SILC longitudinal data (Users' database) covering the years 2005, 2006 and 2007. All individuals aged 16 or over in any of these waves are included in our analysis. The sample we use is therefore an "unbalanced panel" and includes all individuals whether they are in only 1 wave, in 2 waves or in all 3 waves considered.

We include 20 countries in our analysis: Austria, Belgium, Cyprus, Czech Republic, Estonia, Spain, Finland, France, Hungary, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Poland, Portugal, Sweden, Slovenia, Slovakia Republic and United Kingdom. The longitudinal data contained in the EU-SILC Users' database do not include information for Bulgaria, Denmark, Germany, Greece, Ireland, Malta and Romania; these countries are therefore not included in our analysis.

The sample sizes for the different countries vary substantially from one country to other. The extreme cases are Italy with 88 529 respondents and Sweden with only 10 800 respondents (see Table A.1 in the appendix for the sample sizes of all the countries included in our analysis).[2]

Health variables

The EU-SILC includes several variables regarding health outcomes. One of the questions is self-perceived health. Individuals are asked: "how is your health in general?", with five possible responses: very good, good, fair, bad and very bad. Only for Finland, and for 2004 and 2005, the scale used during interviews was: good, rather good, average, rather bad and bad. A second health variable included asks the individual: "Do you have any long-standing illness, disability or infirmity?", with two possible answers: yes, no. A third health outcome variable indicates whether the individual suffers any limitation in activities because of health problems for at least the last six months, with three possible answers: "yes, strongly", "yes, limited", and "no, not limited".

For the descriptive analysis, we create a binary indicator of very good, good health, which equals 1 if individuals report either very good or good health, and 0 otherwise. We also consider a binary indicator of having a chronic illness together with a binary indicator of suffering any type of limitation in daily activities (equalling 1 if individuals report being strongly limited or limited – categories 1 and 2 in the original variable).

[2] The sample sizes shown in Table A.1 do not include missing values for the health or socioeconomic variables included in our analysis. We found significant missing data for all the years that we consider in our analysis. Given that the missing data may corrupt the overall picture, the main results presented below are based on exclusion of missing data.

Although the three measures described before have been analysed in terms of their distribution across countries (see later), for the econometric analysis we have decided to focus only in the binary indicator of suffering health limitations in daily activity. This variable is considered a quasi-objective indicator, which should capture the level of health of individuals more accurately than the self-reported health variable (see for example, Hernández-Quevedo *et al*, 2008).

Explanatory variables

As explanatory variables, we include a set of demographic and socioeconomic variables included in the longitudinal data of the EU-SILC.

As our socioeconomic variable that determines inequalities in health, we use equivalised household disposable income, which is a derived variable already included in the EU-SILC database. In our regression analysis we include the logarithm of this variable (*ln_inc*).

For our regression analysis, we use several demographic variables, such as age and gender. Age was grouped in five categories: less than 35 years old (reference group), between 35 and less than 45, between 45 and less than 60, between 60 and less than 75, and above 75 years old. We also include an indicator of being male, with female being the reference category.

As socioeconomic factors, we include three indicators of highest level of education attained based on the ISCED: primary and lower secondary education, (upper) secondary education and post-secondary non tertiary education and first stage of tertiary education (reference group); moreover, whenever the number of missing values was above 1 000, we included a further category (missing value for education). Several indicators of activity status were also included (unemployed, student or in military service, retired, disabled, housewife, inactive, self-employed, employed part-time, and employed full-time, which is our reference category). Besides, we include several indicators regarding whether the individual make ends meet with great difficulty or with difficulty (*endsmeet_dif*), with some difficulty (*endsmeet_2*), fairly easily (*endsmeet_3*) or either easily or very easily, which is our reference category. We also include whether the individual has the capacity to afford paying for one week annual holiday away from home. We also include three indicators regarding the degree of urbanisation: densely populated area (*urban1*) which is the reference category, intermediate area (*urban2*) and thinly populated area (*urban3*). Besides, two dummies for waves 2006 and 2007 are included, with 2005 being our reference wave. Finally, we include the different regions for each country.

The sample mean of the socioeconomic variables included in the analysis for the 20 countries considered can be seen in detail in Table 1 below.

Table 1: Sample mean of main variables used in the analysis, 2005 - 2007

	BE	CZ	EE	ES	FR	IT	CY	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK
Age <34	0.27	0.29	0.32	0.30	0.23	0.25	0.34	0.31	0.31	0.28	0.31	0.25	0.27	0.33	0.27	0.33	0.24	0.26	0.26	0.27
Age 35-44	0.19	0.16	0.16	0.19	0.18	0.20	0.18	0.17	0.19	0.21	0.16	0.21	0.20	0.16	0.16	0.15	0.19	0.16	0.17	0.25
Age 45-59	0.27	0.27	0.25	0.23	0.29	0.24	0.25	0.25	0.25	0.26	0.27	0.25	0.26	0.28	0.26	0.28	0.24	0.27	0.21	0.24
Age 60-74	0.17	0.20	0.19	0.18	0.20	0.19	0.16	0.18	0.18	0.17	0.18	0.18	0.18	0.15	0.20	0.18	0.21	0.20	0.22	0.16
Age >75	0.10	0.08	0.09	0.10	0.10	0.12	0.06	0.10	0.08	0.08	0.09	0.10	0.09	0.08	0.11	0.06	0.12	0.11	0.14	0.08
Male	0.49	0.46	0.45	0.58	0.47	0.48	0.49	0.45	0.46	0.49	0.46	0.47	0.48	0.47	0.47	0.46	0.45	0.46	0.49	0.45
Primary Education	0.28	0.17	0.24	0.51	0.36	0.50	0.30	0.26	0.26	0.43	0.30	0.33	0.26	0.23	0.63	0.18	0.30	0.31	0.17	0.25
Secondary Education	0.32	0.71	0.43	0.19	0.41	0.31	0.37	0.46	0.31	0.34	0.51	0.35	0.48	0.57	0.13	0.67	0.53	0.41	0.39	0.43
Tertiary Education	0.31	0.12	0.33	0.23	0.21	0.16	0.26	0.27	0.43	0.23	0.18	0.31	0.26	0.17	0.10	0.15	0.17	0.28	0.32	0.32
Education missing	0.08			0.06											0.14				0.12	
unemployed	0.07	0.07	0.04	0.06	0.05	0.05	0.03	0.06	0.05	0.03	0.05	0.02	0.04	0.10	0.06	0.06	0.07	0.06	0.03	0.02
Study/ Military service	0.08	0.07	0.09	0.07	0.09	0.07	0.12	0.08	0.10	0.09	0.09	0.08	0.06	0.10	0.07	0.12	0.08	0.06	0.07	0.05
Retired	0.23	0.26	0.22	0.17	0.27	0.22	0.17	0.24	0.22	0.15	0.25	0.14	0.27	0.21	0.23	0.27	0.36	0.25	0.27	0.19
Disable	0.03	0.04	0.04	0.02	0.04	0.01	0.01	0.02	0.04	0.03	0.09	0.05	0.00	0.08	0.02	0.02	0.00	0.07	0.04	0.04
Housewife	0.07	0.04	0.04	0.11	0.04	0.14	0.09	0.04	0.02	0.17	0.05	0.11	0.09	0.02	0.08	0.00	0.02	0.03	0.00	0.08
Inactive	0.02	0.00	0.00	0.04	0.01	0.05	0.02	0.01	0.01	0.00	0.02	0.05	0.01	0.04	0.02	0.01	0.00	0.00	0.01	0.01
Employed	0.49	0.52	0.56	0.52	0.49	0.45	0.56	0.56	0.55	0.54	0.46	0.55	0.53	0.45	0.53	0.52	0.46	0.53	0.58	0.61
Self-employed	0.05	0.08	0.04	0.09	0.04	0.12	0.08	0.05	0.06	0.04	0.06	0.06	0.06	0.09	0.12	0.05	0.04	0.07	0.06	0.07
Employee	0.43	0.44	0.52	0.43	0.45	0.34	0.48	0.51	0.49	0.50	0.40	0.48	0.47	0.36	0.41	0.47	0.42	0.46	0.52	0.53
Employed part-time	0.11	0.02	0.03	0.04	0.09	0.04	0.03	0.02	0.02	0.09	0.02	0.19	0.09	0.03	0.03	0.02	0.01	0.06	0.12	0.14
Employed full-time	0.33	0.42	0.49	0.39	0.36	0.30	0.45	0.49	0.47	0.41	0.38	0.29	0.38	0.33	0.38	0.46	0.41	0.40	0.40	0.40
Ends meet with difficulty	0.15	0.27	0.14	0.27	0.15	0.34	0.46	0.47	0.28	0.05	0.36	0.14	0.08	0.46	0.37	0.33	0.25	0.08	0.07	0.13
Ends meet with some dif	0.20	0.39	0.30	0.31	0.37	0.40	0.28	0.36	0.49	0.12	0.45	0.15	0.26	0.34	0.39	0.46	0.41	0.19	0.18	0.25
Ends meet fairly easily	0.28	0.23	0.47	0.27	0.32	0.20	0.16	0.14	0.19	0.29	0.15	0.16	0.36	0.14	0.17	0.17	0.20	0.37	0.34	0.38
Ends meet easily	0.37	0.10	0.09	0.14	0.16	0.06	0.10	0.03	0.04	0.53	0.03	0.55	0.30	0.06	0.07	0.04	0.13	0.37	0.40	0.25
Urban1	0.53	0.33	0.49	0.51	0.46	0.43	0.58	0.49	0.43	0.48	0.33		0.36	0.42	0.43	0.24		0.29	0.22	0.76
Urban2	0.43	0.24	0.51	0.20	0.37	0.40	0.12	0.51	0.57	0.33	0.22		0.25	0.13	0.31	0.34		0.18	0.15	0.19
Urban3	0.04	0.43		0.28	0.18	0.17	0.30			0.19	0.45		0.39	0.45	0.26	0.42		0.53	0.63	0.05

	BE	CZ	EE	ES	FR	IT	CY	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK
W05	0.22	0.23	0.24	0.28	0.28	0.27	0.26	0.29	0.24	0.34	0.25	0.33	0.27	0.27	0.27	0.27	0.30	0.27	0.28	0.32
W06	0.38	0.40	0.39	0.38	0.35	0.39	0.38	0.39	0.39	0.35	0.40	0.37	0.39	0.38	0.38	0.38	0.39	0.37	0.38	0.40
W07	0.40	0.37	0.37	0.34	0.37	0.33	0.36	0.32	0.36	0.30	0.35	0.30	0.34	0.34	0.34	0.35	0.31	0.36	0.34	0.28
Reg1	0.09	0.10	0.07	0.13	0.29						0.27		0.42	0.20				0.18		
Reg2	0.59	0.12	0.03	0.50	0.31						0.19		0.21	0.21				0.02		
Reg3	0.32	0.11	0.01	0.11							0.23		0.37	0.18				0.02		
Reg4		0.15	0.05											0.16				0.02		
Reg5		0.16	0.01											0.15				0.03		
Reg6		0.12	0.01															0.07		
Reg7		0.12	0.03															0.04		
Reg8			0.12															0.03		
Reg9			0.06															0.02		
Reg10			0.04															0.07		
Reg11			0.03															0.05		
Reg12			0.16															0.03		
Reg13			0.11															0.05		
Reg14			0.02															0.04		
Reg15			0.18															0.01		
Reg16			0.03															0.08		
Reg17			0.00															0.02		
Reg18			0.00															0.04		
Reg19			0.04															0.08		
Reg20																		0.00		
Reg21				0.11														0.02		
Reg22																		0.02		
NxT	19328	33794	22232	55385	39518	88529	16722	18451	19616	20841	32646	20838	26304	68224	19659	23939	18289	12804	11791	33156

Source: EU-SILC Users' database (UDB). The 2005 – 2007 sample considered here includes all individuals available in the longitudinal version of the UDB for waves 2005, 2006 and/or 2007
Note: AT (Austria), BE (Belgium), CY (Cyprus), CZ (Czech Republic), EE (Estonia), ES (Spain), FI (Finland), FR (France), HU (Hungary), IT (Italy), LT (Lithuania), LU (Luxembourg), LV (Latvia), NL (Netherlands), PL (Poland) PT (Portugal), SE (Sweden), SI (Slovenia), SK (Slovakia), UK (United Kingdom)

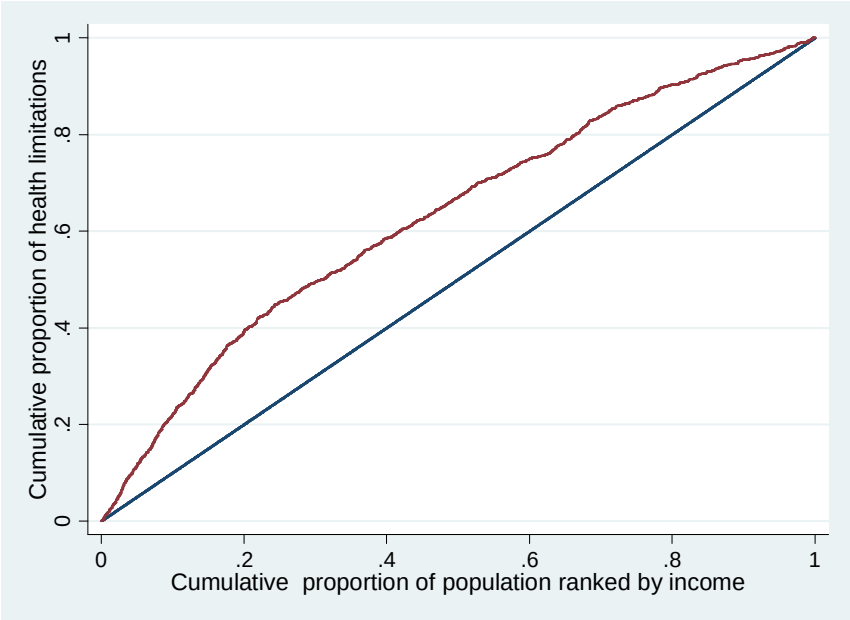
4. Methods

4.1. Measuring inequality in health outcomes

Methods based on concentration curves and concentration indices have been extensively used for measuring inequalities and inequities (Wagstaff and van Doorslaer, 2000). The health concentration curve (CC) and concentration index (CI) provide measures of relative income-related health inequality (Wagstaff, Van Doorslaer and Paci, 1989). Wagstaff, Paci and van Doorslaer (1991) have reviewed and compared the properties of the concentration curves and indices with alternative measures of health inequality. They argue that the main advantages are that: they capture the socioeconomic dimension of health inequalities, they use information from the whole income distribution rather than just the extremes, they give the possibility of visual representation through the concentration curve, and finally, they allow checks of dominance relationships.

The concentration index (CI) is derived from the concentration curve (CC). This is illustrated in Figure 1 for a measure of ill-health. The sample of interest is ranked by socioeconomic status. If income is used as the relevant ranking variable, the horizontal axis begins with the poorest individual and progresses through the income distribution up to the richest individual. This relative income rank is then plotted against the cumulative proportion of illness on the vertical axis. This assumes that a cardinal measure of illness is available, that can be compared and aggregated across individuals. The 45-degree line shows the line of perfect equality, along which the population shares of illness are proportional to income, such that the poorest 20% of individuals experience 20% of the illness in the population. “Pro-poor” inequality is illustrated by the concave curve in the figure which corresponds to the concentration curve. In the example shown, the poorest 20% of income earners experience more than 20% of illnesses. Therefore, the CC plots the cumulative percentage of health against the cumulative percentage of the population ranked from the poorest to the richest (if income is the socioeconomic variable of interest). The size of inequality can be summarised by the health concentration index, which is given by twice the area between the concentration curve and the 45-degree line. CI mathematically is defined solely in terms of the covariance between the health variable and the fractional rank of the socioeconomic variable chosen (two times the covariance between health and the fractional rank of the socioeconomic variable divided by the mean value of health), and not by the variance of the latter (Kakwani *et al*, 1997; O’Donnell *et al*, 2008).

Figure 1: Concentration curve for an indicator of health limitations compared to the 45-degree line (diagonal) of perfect equality – The example of Cyprus in 2007



Source: See Table 1

There are various ways of expressing the CI algebraically. The one that is mostly used in the literature for its convenience is:

$$C = \frac{2}{\mu}\sum_{i=1}^{N}(h_i - \mu)\left(R_i - \frac{1}{2}\right) = \frac{2}{\mu}\mathrm{cov}(h_i, R_i) \qquad (1)$$

This shows that the value of the concentration index is equal to the covariance between individual health (h_i) and the individual's relative rank (R_i), scaled by the mean of health in the population (μ). Then the whole expression is multiplied by 2, to ensure the concentration index ranges between -1 and +1. Hence, the CI mathematically is defined solely in terms of the covariance between the health variable and the fractional rank of the socioeconomic variable chosen (two times the covariance between health and the fractional rank of the socioeconomic variable divided by the mean value of health), and not by the variance of the latter (Kakwani *et al*, 1997; O'Donnell *et al*, 2008). Equation (1) indicates that the CI is a measure of the degree of association between an individual's level of health and their relative position in the income distribution. It is important to highlight that a value of CI = 0 does not mean absence of inequality, but an absence of the socioeconomic gradient in the distribution, this is, an absence of inequality associated to the socioeconomic characteristics.

The concentration index is considered an appropriate measure of socioeconomic-related inequalities in health when health is measured on a ratio

scale with non-negative values. However, measurement of inequalities is usually based on self-reported data, and it is not possible to obtain a concentration index from categorical data. In this study, we use a dichotomous variable, which has been seen as a partial solution to this issue (O'Donnell *et al,* 2007). However, there are other problems that arise with this solution when calculating CIs, as argued by Wagstaff (2005) and that Erreygers (2009) intends to correct for. This is further discussed under a methodological note (Hernández-Quevedo *et al*, 2010).

4.2. Econometric analysis of the socioeconomic determinants of health

To analyse the socioeconomic characteristics of individuals that are associated with health, we estimate a pooled probit model in order to explore the relationship between socioeconomic status and health. For our measure of health limitations we specify a binary response model in the following way:

$$h_{it}^{*} = \alpha + \beta x_{it} + \varepsilon_{it}, \; i = 1,...,N; \; t = 1,...,T \qquad (2)$$

where h_{it}^{*} represents a latent variable of the observed level of health limitations and *x* is a vector of the demographic and socioeconomic factors considered in the analysis.

In our data, the latent outcome h_{it}^{*} is not observed. Instead, we observe a binary indicator of the category in which the latent indicator falls (h_{it}). The observation mechanism is:

$$h_{it} = 1, \text{ if } h_{it}^{*} > 0,$$
$$h_{it} = 0, \text{ otherwise} \qquad (3)$$

We apply an estimator appropriate for binary responses such as the probit specification, in this case, a pooled model, which assumes that the error term ε_{it} is distributed as N (0,1). Note that while the pooled models do not explicitly take account of the panel nature of the dataset, the estimator is a consistent estimator of the parameters of interest. We use a robust estimator of the covariance matrix that allows for clustering within individuals. The pooled estimator does not require the regressors to be strictly exogenous and can accommodate predetermined variables (see, for example, Wooldridge, 2002). This makes the estimator more robust in comparison to a random effects specification, where strict exogeneity is assumed.

The concentration index approach enables to decompose the contribution of need and non need variables as well as of the error component to overall

inequality in health (Wagstaff *et al*, 2003; O'Donnell *et al*, 2008). However, if the demand for health care is modelled using non linear estimation techniques, the decomposition method is not easily applicable (O'Donnel *et al*, 2008; Jones *et al,* 2007). A sensitivity analysis was performed comparing linear and non linear estimates of health limitations in daily activities using the 2007 data. Since the linear results did not diverge from the non-linear results, the former coefficients were used for calculating the contribution of each variable to total inequality. The contribution of each variable to total inequality is the product of three factors (divided by the mean value of the dependent variable): the relative weight of such variable (measured by its mean); its income distribution (Gini coefficient for income itself and the concentration index for all other variables); and the marginal effect on the health model (linear regression coefficient). For example, if people with primary education are poorer than the rest of the population (negative income concentration index) and more likely to report limitations in daily activities (positive marginal effect), their contribution to total inequality will be negative. On the contrary, if they are less likely to report limitations (negative marginal effect), the contribution will be positive. The sum of the contribution of all the variables adds up to the total inequalities in health.

Wagstaff *et al* (2003) show that the concentration index for *h*, expressed as *C*, can be written as follows:

$$C = \sum_k (\beta_k \bar{x}_k / \mu) C_k + GC_\varepsilon / \mu, \qquad (4)$$

Where μ is the mean of *h*, $\bar{x}_k$ is the mean of x_k, C_k is the concentration index for x_k, and GC_ε is the generalised concentration index for the error term ε. In fact, C is equal to a weighted sum of the CIs estimated with respect to the *k* regressors, where the weight for x_k is the elasticity of h with respect to x_k. The residual component captured by the last term reflects the income-related inequality in health that is not explained by systematic variations in the regressors with respect to income, which should approach zero for a well-specified model. Hence, the concentration index of our health variable can be decomposed in two components. Firstly, there is a deterministic part that equals the weighted sum of the concentration indices of the *k* regressors, where each regressor x_k is weighted by the elasticity of *h* for this regressor and evaluated at the sample mean. The second part is the residual, which reflects the inequality in health that cannot be explained by the systematic variation across income groups in the x_k.

All results are weighted and the models are estimated using STATA 9.0

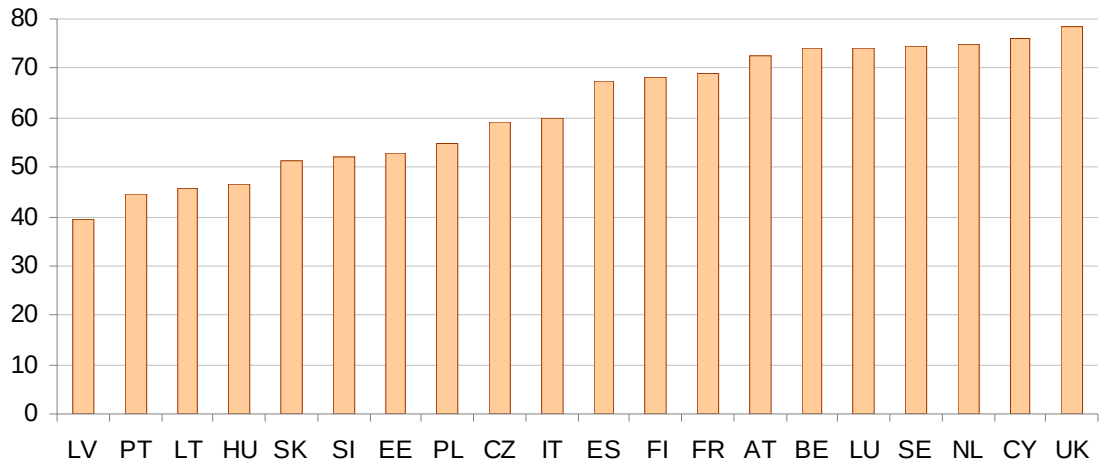
5. Results

5.1. Descriptive analysis

Figures 2, 3 and 4 show the distribution of the different health indicators across the 20 countries considered, ranking countries according to the different health outcomes. The actual percentages are detailed in Table A.1 in the Appendix.

With respect to those individuals perceiving their health as the two top categories available in the questionnaire, these are, very good or good SAH, we can see that the highest percentage corresponds to the UK (79%), followed by Cyprus (76%), the Netherlands and Sweden (75%), while the lowest percentages correspond to Latvia (39%), Portugal (44%) and Lithuania (46%).

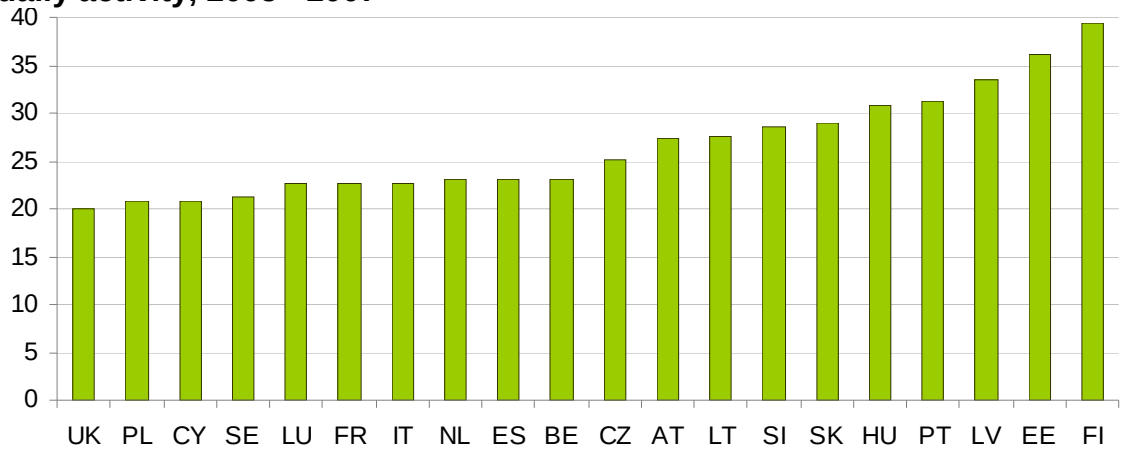
Figure 2: Percentage of individuals reporting very good or good self-assessed health, 2005 - 2007



Source: See Table 1
Notes: See Table 1/ Countries sorted according to the indicator value

In terms of the percentage of individuals reporting suffering any health limitation in their daily activity, the highest corresponds to Finland (39%), Estonia (36%), and Latvia (34%), while the lowest ones correspond to the UK (20%), Poland, Cyprus, and Sweden (all three with 21%).

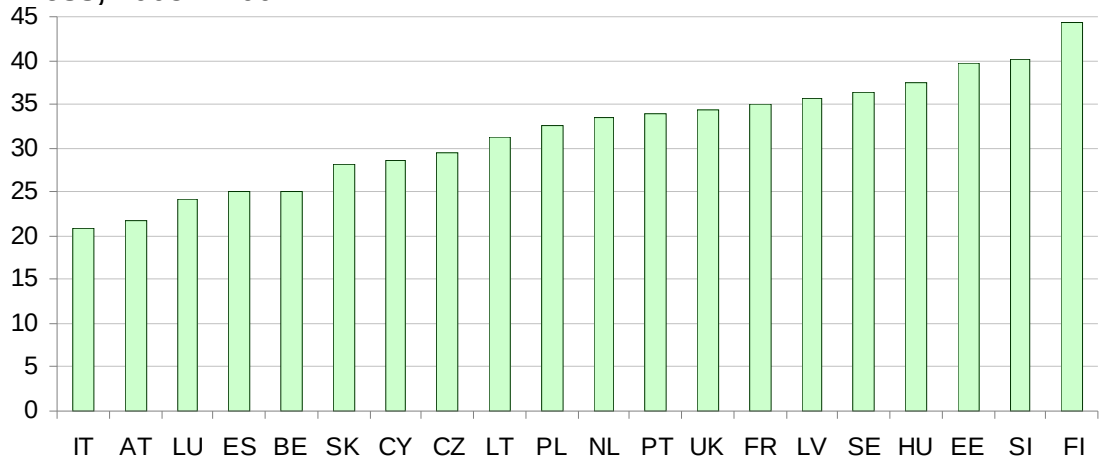
Figure 3: Percentage of individuals reporting any health limitations in their daily activity, 2005 - 2007



Source: See Table 1
Notes: See Figure 2

Regarding the percentage of individuals reporting having a long-lasting illness, the highest percentage corresponds to Finland (44%), followed by Slovenia (40%) and Estonia (40%), while the lowest corresponds to Italy (21%), followed by Austria (22%) and Luxembourg (24%).

Figure 4: Percentage of individuals reporting a long-standing chronic illness, 2005 – 2007



Source: See Table 1
Notes: See Figure 2

5.2. Evidence on socioeconomic inequalities in health outcomes

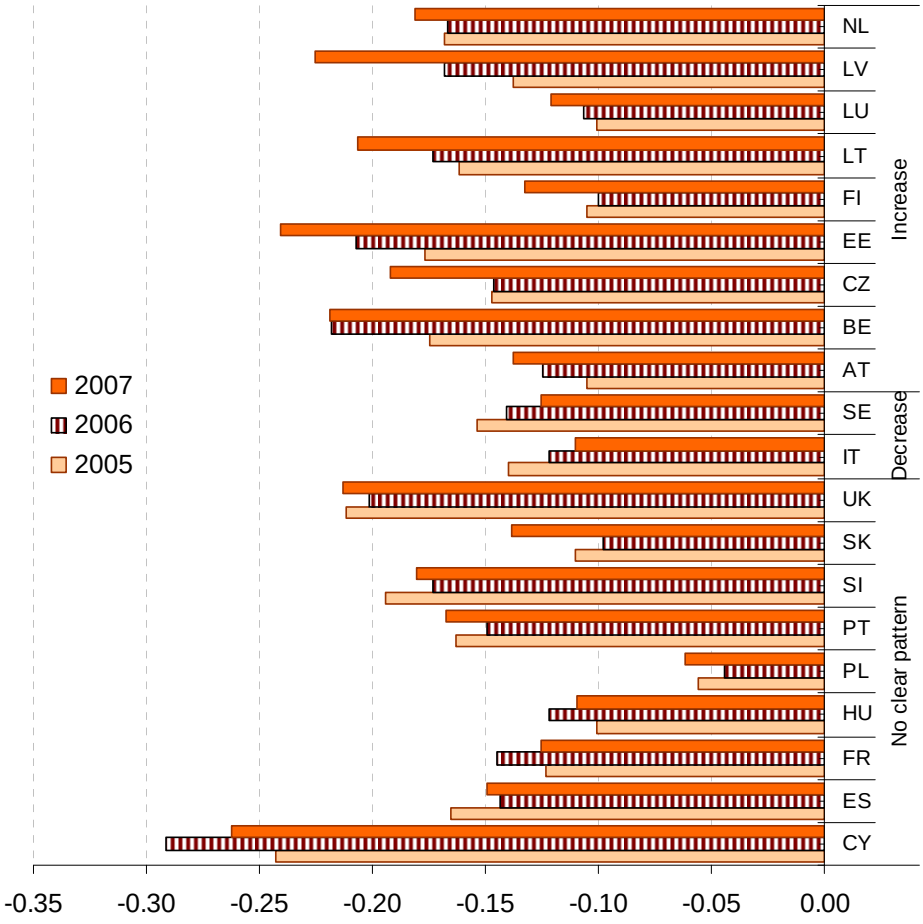
Income-related inequalities in health limitations have been measured for the 20 countries considered and for the three waves included in our analysis, in order to see the trend on inequalities in health limitations across time and hence, exploiting the longitudinal format of the data. The Concentration Indices

calculated here are short-term CIs for each of the waves. Results can be seen in absolute terms in Figure 5 below. Complete results are shown in Table A.2.

According to the results, all the estimated CI's are statistically significant at a 5% significance level. Besides, all CI's for health limitations are negative and different from 0. This means that not only is there evidence of income-related inequalities in health limitations in the three waves, but that health limitations are disproportionally concentrated among the worse-off. This result is consistent with previous studies at EU-15 level, which found significant income-related inequalities in health limitations across the EU-15 Member States concentrated in the poorest individuals of each society (Hernández-Quevedo *et al*, 2006).

The magnitude of the concentration index reflects both the strength of the relationship and the degree of variability in the health variable. For the latest data available, namely 2007, we can see that the highest levels of income-related inequalities in health limitations exist in Cyprus, Estonia, and Latvia while the lowest correspond to Poland, Hungary and Italy.

Figure 5: Concentration Indices for health limitations in absolute terms for waves 2005, 2006 and 2007



Source: See Table 1
Note: See Table 1

Moreover, for several countries there was a clear trend on socioeconomic inequalities in health limitations through time (Figure 5). For Latvia, Luxembourg, Lithuania, Estonia, Belgium and Austria, there is a clear increase on income-related inequalities in health limitations across time, while for Italy and Sweden there is a clear decreasing trend for socioeconomic inequalities in health limitations from wave 2005 to wave 2007.

If we compare income-related inequalities in health limitations between 2005 and 2007 for those countries without a clear pattern, we can see that overall inequalities increased everywhere with the exception of Spain and Slovenia.

5.3. Evidence on the socioeconomic determinants of health outcomes

The results of the probit model show that there are several expected results common to all the countries analysed. We can see a positive gradient for age, with individuals suffering more health limitations as they get older. For those countries where being male is statistically significant, the general relationship with health limitations is negative, so men are less likely to report any health limitations compared to women, the exception being Austria and Poland, where male are more likely to report health limitations than women. In the case of highest level of education achieved, it is possible to see a gradient in Austria, Estonia, Finland, and the Netherlands, where individuals are less likely to report health limitations as they attain higher levels of education. For most of the countries, having primary level of education is associated with suffering health limitations in daily activity. Moreover, for the countries (Belgium, Spain, Poland, Portugal and Sweden) in which we included a further category for missing education value, the dummy was always positive and statistically significant, implying that people with missing value were more likely to report limitations in daily activities. Regarding activity status, being unemployed, retired, disable, housewife or inactive is positively associated with suffering health limitations while students or those under military training are less likely to report health limitations. For some countries, self-employed individuals are more likely to report health limitations than those who are employee. This is the case for Estonia, Hungary, Lithuania, Latvia, Poland and Portugal. Those employed part-time are also more likely to report health limitations than those working full-time. In terms of the ability of individuals to make ends meet, in general it is possible to see a gradient, with individuals more likely to report health limitations as they make ends meet with any difficulty. Besides, being able to afford a holiday is negatively related with reporting health limitations in all the countries. Finally, it is possible to see that the income variable is not statistically significant for some of the countries, which is consistent with previous results shown at European level obtained from the ECHP dataset (see for example, Hernández-Quevedo *et al*, 2008). Also we can see different sign in the association between income and health limitations, where these estimates are

statistically significant. While for Austria, Cyprus and Slovenia, individuals are less likely to report health limitations as they have more income, this is not the case for Czech Republic and Lithuania, where the more income available, the more likely is the individual to report health limitations, all other factors remaining constant[3].

[3] In general, the results derived from the econometric analysis are consistent with those found earlier using the ECHP dataset (see for example, Hernández-Quevedo *et al*, 2008). However, it is not possible to compare results directly, as the methodology used differs across studies.

Table 2: Pooled probit estimates for health limitations, marginal effects, 2005 - 2007

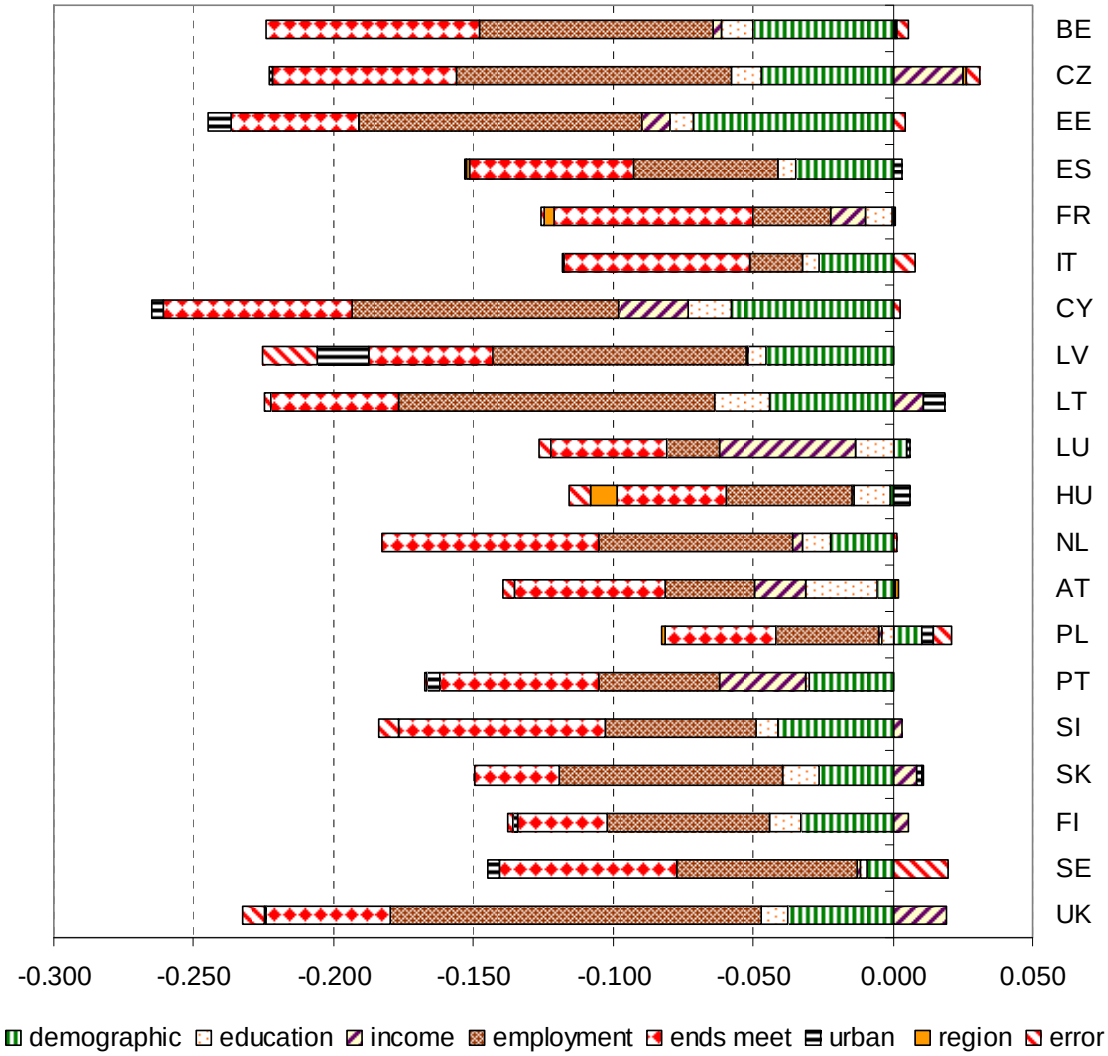
	AT	BE	CY	CZ	EE	ES	FI	FR	HU	IT	LT	LU	LV	NL	PL	PT	SE	SI	SK	UK
Ln income	**-0.03**	0.00	**-0.01**	**0.04**	0.00	0.00	0.00	*-0.01*	0.00	0.00	**0.00**	-0.02	*0.00*	0.00	0.00	0.00	0.00	**-0.02**	*0.02*	0.00
Age35-44	**0.11**	**0.07**	**0.11**	**0.09**	**0.05**	**0.06**	**0.05**	**0.07**	**0.11**	**0.10**	**0.05**	**0.08**	**0.10**	**0.05**	**0.05**	**0.12**	**0.05**	**0.04**	**0.12**	**0.06**
Age45-59	**0.28**	**0.14**	**0.21**	**0.18**	**0.24**	**0.12**	**0.13**	**0.17**	**0.23**	**0.19**	**0.16**	**0.17**	**0.23**	**0.11**	**0.11**	**0.29**	**0.11**	**0.14**	**0.23**	**0.14**
Age60-74	**0.30**	**0.18**	**0.30**	**0.22**	**0.40**	**0.19**	**0.18**	**0.20**	**0.27**	**0.35**	**0.25**	**0.29**	**0.28**	**0.13**	**0.20**	**0.38**	**0.10**	**0.16**	**0.26**	**0.21**
Age>75	**0.51**	**0.35**	**0.43**	**0.47**	**0.53**	**0.35**	**0.36**	**0.44**	**0.43**	**0.60**	**0.40**	**0.46**	**0.43**	**0.33**	**0.40**	**0.49**	**0.12**	**0.28**	**0.45**	**0.33**
Male	**0.02**	**-0.02**	0.00	0.01	0.01	**-0.04**	**-0.05**	0.01	-0.01	**-0.02**	*-0.02*	-0.01	**-0.04**	**-0.05**	**0.01**	**-0.06**	-0.01	0.02	0.00	-0.01
Primary	**0.11**	**0.04**	**0.04**	**0.06**	**0.11**	**0.03**	**0.06**	**0.03**	**0.06**	-0.01	**0.06**	**0.04**	**0.05**	**0.04**	*0.01*	**0.07**	0.03	**0.03**	**0.06**	0.01
Secondary	**0.04**	0.01	-0.02	0.01	**0.04**	-0.01	**0.05**	0.00	0.01	**-0.04**	0.02	0.00	0.01	**0.03**	*-0.01*	0.01	0.01	0.00	0.00	0.00
Ed missing		**0.07**				**0.07**									**0.07**	**0.16**	**0.07**			
unemployed	**0.16**	**0.10**	**0.09**	**0.18**	**0.06**	**0.05**	0.03	**0.10**	**0.07**	**0.04**	**0.14**	**0.18**	**0.11**	**0.17**	0.01	**0.13**	**0.08**	**0.15**	**0.08**	**0.09**
Student mil	**-0.04**	**-0.06**	**-0.05**	-0.02	**-0.08**	**-0.05**	**-0.13**	**-0.04**	**-0.05**	0.00	**-0.08**	*-0.04*	*-0.04*	0.03	**0.22**	-0.02	-0.02	0.03	-0.02	0.00
Retired	**0.22**	**0.14**	**0.19**	**0.19**	**0.23**	**0.13**	**0.15**	**0.16**	**0.32**	**0.10**	**0.28**	**0.06**	**0.28**	**0.11**	**0.68**	**0.26**	**0.15**	**0.17**	**0.35**	**0.17**
disable	**0.66**	**0.71**	**0.77**	**0.74**	**0.67**	**0.65**	**0.44**	**0.42**	**0.67**	**0.68**	**0.71**	**0.49**	**0.61**	**0.66**	**0.08**	**0.68**	**0.60**	**0.62**	**0.66**	**0.78**
housewife	**0.07**	**0.07**	**0.10**	0.00	*-0.04*	**0.08**	*-0.07*	**0.09**	0.00	**0.06**	*0.06*	0.02	0.04	**0.12**	**0.21**	**0.15**	0.12	**0.11**	**0.14**	**0.08**
inactive	**0.19**	**0.13**	**0.23**	**0.18**		**0.19**	-0.09	**0.35**	**0.23**	**0.16**	0.04	**0.25**	**0.27**	**0.14**	**0.05**	**0.37**	**0.18**	**0.22**	**0.10**	**0.14**
Self employed	0.00	-0.02	0.02	0.01	**0.11**	0.00	0.02	-0.02	**0.04**	0.01	**0.09**	0.01	**0.09**	0.02	**0.09**	**0.08**	0.00	0.01	0.01	0.02
Empl partime	0.01	**0.04**	**0.08**	**0.24**	**0.10**	**0.03**	0.03	**0.05**	**0.16**	**0.06**	**0.08**	**0.05**	**0.10**	**0.04**	**0.08**	**0.10**	**0.15**	**0.28**	**0.21**	**0.02**
Endsmeet dif	**0.18**	**0.13**	**0.10**	**0.12**	**0.13**	**0.11**	**0.24**	**0.15**	**0.15**	**0.14**	**0.15**	**0.13**	**0.09**	**0.12**	**0.04**	**0.08**	**0.21**	**0.17**	**0.15**	**0.09**
Endsmeet 2	**0.13**	**0.07**	**0.07**	**0.06**	0.02	**0.06**	**0.13**	**0.07**	**0.09**	**0.08**	**0.08**	**0.12**	0.03	**0.08**	**0.03**	*0.04*	**0.09**	**0.08**	**0.09**	**0.06**
Endsmeet 3	**0.07**	**0.03**	**0.03**	0.02	-0.01	**0.03**	**0.05**	**0.03**	0.03	**0.04**	0.04	**0.05**	-0.04	**0.05**	**-0.02**	0.02	**0.05**	**0.04**	0.02	**0.02**
Afford holiday	**-0.05**	**-0.07**	**-0.05**	**-0.06**	**-0.08**	**-0.06**	-0.03	**-0.05**	**-0.06**	**-0.06**	**-0.06**	0.00	**-0.05**	**-0.09**	**0.08**	**-0.09**	**-0.07**	**-0.05**	*-0.01*	**-0.06**
w06	0.00	0.00	**-0.06**	-0.01	**-0.04**	0.01	-0.01	*0.01*	**-0.05**	**0.04**	**-0.03**	0.01	**0.03**	0.01	**0.11**	**-0.02**	**-0.02**	-0.01	**0.02**	0.00
w07	-0.01	-0.01	**-0.05**	**-0.06**	**-0.04**	**0.02**	**-0.04**	**0.02**	**-0.05**	**0.07**	**-0.04**	0.00	0.01	0.00	0.00	**-0.02**	-0.01	0.11	0.01	*-0.01*
urban2	*0.02*	0.00	0.00	0.01	**0.12**	0.00	0.01	-0.01	0.01	**-0.01**	**-0.04**	-0.01	**0.04**		**-0.02**	**0.05**	0.00		0.00	0.00
urban3	-0.01	0.01	**0.03**	**0.02**		-0.01	0.02	0.00	**-0.05**	*0.01*		*0.03*			0.01	-0.01	0.02		0.00	*-0.02*
Reg2	-0.01	**0.03**		**-0.05**		0.00	**-0.05**	**0.05**	**0.04**											
Reg3	**0.03**	0.03		**-0.06**		**-0.08**	-0.04	**0.06**	**0.08**											
Reg4				-0.03		**-0.04**	**-0.07**	**0.05**												

	AT	BE	CY	CZ	EE	ES	FI	FR	HU	IT	LT	LU	LV	NL	PL	PT	SE	SI	SK	UK
Reg5				*-0.03*		*-0.03*		*0.03*												
Reg6				**-0.05**		*-0.03*		*0.04*												
Reg7				*-0.03*		-0.02		0.03												
Reg8				**-0.05**		**-0.09**		**0.04**												
Reg9						**-0.04**		*0.03*												
Reg10						**-0.05**		0.01												
Reg11						**-0.07**		**0.04**												
Reg12						**-0.04**		**0.06**												
Reg13						**-0.04**		0.02												
Reg14						*-0.03*		0.00												
Reg15						**-0.05**		**0.05**												
Reg16						**-0.06**		0.02												
Reg17						**-0.05**		**0.07**												
Reg18						-0.01		**0.04**												
Reg19						**-0.04**		0.04												
Reg 20								-0.02												
Reg 21								**0.03**												
Reg 22								**-0.15**												
N	26301	19310	16722	33794	22187	55336	12801	39478	32621	88307	19615	20821	18397	20774	68193	19659	11770	18287	23925	31521
Pseudo-R^2	0.22	0.20	0.24	0.24	0.30	0.18	0.14	0.19	0.32	0.24	0.29	0.14	0.22	0.20	0.30	0.27	0.15	0.14	0.27	0.22
Log-L	-12106	-8338	-6540	-14491	-10137	-24413	-7343	-17220	-13615	-35829	-8201	-9535	-9151	-9017	-24459	-8879	-5154	-9428	-10555	-12339

Source: See Table 1
Note: See Table 1

To further understand the contribution of the different factors to inequalities, we have decomposed the overall level of inequality in health limitations but only for the 2007 model. Figure 6 shows that most of the pro-poor inequality is explained by social exclusion factors (capacity of making ends meet and of being able to afford at least one week holiday per week). Indeed the sum of these social exclusion components contributes to 64% of total inequality in Poland, 60% in Italy, and 57% in France (see Table A.3 in Appendix for contributions in percentage of total inequality). The countries with the lowest level of social exclusion component contributions are Estonia (19%), Latvia (20%) and the UK (21%). Employment status also plays a major role in explaining pro-poor inequity in health limitations. In the UK, the total employment contribution is 62%, in Poland is 59%, and in Slovakia is 58%. Only in Italy and Luxemburg does employment explains less than 20% of total inequality. Overall, the negative contribution of employment is caused by retired and disabled people that are poorer than the rest of the population but more likely to report limitations in health. The contribution of education, although always negative, is statistically significant only in a few countries (above 10% only in Austria with 18%, Hungary 12%, Luxemburg 11%), being less than that 5% in Estonia, Spain, Latvia, Portugal, Sweden and the UK. The income contribution is positive in most of the countries with the exception of Czech Republic, Finland, Lithuania, Slovenia, Slovakia and the UK. The country with the highest level of income contribution to total inequality is Luxemburg (40%), while in some countries it is approximately 0% (Hungary, Italy, Spain, and Latvia). Moving to the demographic variables (age and gender) their contribution is mostly positive, except in Luxemburg and Poland; and it varies from as high as 30% of total inequality in Estonia to as low as 0.3% in France. The contribution of urban and regions is not very significant in the majority of the countries. The highest level of urban contribution to inequality was in Latvia (8%), and for regions it was in Hungary (9%).

Figure 6: Decomposition results for the 2007 health model



Source: See Table 1

Note: See Table 1

Reading note: In Italy, the main contributors to the pro-poor income-related inequalities in health limitations in 2007 are: level of income inequalities in the capacity of individuals to make ends meet (60%)., income-related inequalities in the employment status of individuals (17%), income-related inequalities in education level (6%), income-related inequalities in demographic factors such as age and gender (24%) and unobserved characteristics (7%). Compared to other countries, income inequalities do not contribute significantly to income-related inequalities in health limitations in Italy

Given the large contribution of social exclusion variables, we performed a sensitivity analysis, running the model without such variables and recalculating the contribution of the various factors. The effect was overall an increase in the contribution of employment and income as well as of the error term (see results in appendix, Table A.3).

In the remaining section of the paper, we will present an econometrical analysis of unmet need. However, it is worth noticing that unmet need was considered as such only when an individual reported reasons related either to costs or availability. Whenever any of the other possible reasons (for example, fear, wait to get better, etc.) was reported, we hypothesised that the individual did not have unmet needs.

6. Discussion

This paper includes an analysis of an indicator of suffering health limitations in daily activity for 20 European Member States. For that purpose, the EU-SILC data has been exploited, in particular, the longitudinal data available for these countries for three waves (from 2005 to 2007) of the EU-SILC database. In order to measure inequalities in health limitations, the concentration index is used. Besides, we include a regression analysis where pooled probit models are used to disentangle the associations between perceiving health limitations in daily activity and different demographic and socioeconomic factors included in the database. There is evidence of income-related inequalities in health for all the countries analysed, although they present a heterogeneous pattern over time. The regression analysis and decomposition approach show that, although demographic factors such as age and gender are important factors and contribute to the pro-poor inequalities in most countries, social exclusion factors such as the ability to make ends meets and to afford a week holiday at year, together with activity status, education and income are highly associated with perceiving health limitations in daily activity.

The European Union has paid increasing attention to health inequalities. At the European Councils in Lisbon and in Nice (2000), the Member States of the European Union took a major initiative by making the fight against poverty and social exclusion as one of the central elements in the modernisation of the European social model. This initiative was made possible on the basis of Articles 136 and 137 of the Amsterdam Treaty. The Lisbon strategy acknowledges the importance of poverty reduction and elimination of social exclusion as mechanisms necessary for the European Union to become the most competitive and knowledge-based economy. A set of common objectives to be pursued by the Member States were established: to facilitate participation in employment and access by all to resources, rights, goods and services; to prevent the risks of exclusion; to help the most vulnerable, and to mobilize all relevant bodies. However, we can see from our results that income-related inequalities in health exist at the European Union, although the pattern is heterogeneous: while for some countries income related inequalities in health have dropped importantly from 2005 to 2007, for most of the countries analysed, inequalities remain, although with a similar trend over time.

The creation of the Commission on Social Determinants (WHO, 2008) recognises the poor health of the poor, the social gradient in health within countries and the existence of health inequities between countries and this is linked to the results of a combination of poor social policies and programmes, unfair economic arrangements and bad politics. It is concluded by the Commission that action on the social determinants of health must involve the whole of government, civil society and local communities, business and

international agencies. In fact, policies and programmes should include all key sectors of society not just the health sector. Three broad sets of recommendations are suggested to close the gap in health inequities. These are: improving daily living conditions, this is, housing, early child development, health care and social protection; tackling the unequal distribution of resources; and finally, measuring and understanding the problem.

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Appendix

Table A.1: Distribution of health outcomes (%), 2005 - 2007

	BE	CZ	EE	ES	FR	IT	CY	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK
sah1	0.28	0.19	0.07	0.17	0.24	0.13	0.46	0.03	0.07	0.31	0.14	0.21	0.37	0.15	0.06	0.14	0.23	0.41	0.34	0.36
sah2	0.46	0.40	0.46	0.50	0.45	0.47	0.29	0.36	0.39	0.43	0.32	0.54	0.35	0.40	0.38	0.38	0.29	0.27	0.41	0.43
sah3	0.18	0.28	0.32	0.21	0.22	0.30	0.15	0.40	0.37	0.19	0.32	0.20	0.20	0.28	0.34	0.30	0.30	0.21	0.19	0.16
sah4	0.07	0.11	0.13	0.10	0.08	0.08	0.07	0.15	0.14	0.06	0.17	0.05	0.06	0.15	0.16	0.14	0.13	0.08	0.05	0.05
sah5	0.02	0.02	0.03	0.02	0.01	0.02	0.02	0.05	0.03	0.01	0.05	0.01	0.01	0.03	0.05	0.04	0.05	0.03	0.01	0.01
limit1	0.08	0.06	0.11	0.09	0.06	0.07	0.09	0.10	0.09	0.06	0.14	0.09	0.09	0.05	0.13	0.10	0.11	0.13	0.09	0.08
limit2	0.15	0.19	0.25	0.14	0.17	0.16	0.12	0.23	0.18	0.16	0.17	0.14	0.18	0.15	0.18	0.19	0.18	0.27	0.13	0.12
limit3	0.77	0.75	0.64	0.77	0.77	0.77	0.79	0.66	0.73	0.77	0.69	0.77	0.73	0.79	0.69	0.72	0.71	0.61	0.79	0.80
Chronic	0.25	0.29	0.40	0.25	0.35	0.21	0.29	0.36	0.31	0.24	0.37	0.33	0.22	0.33	0.34	0.40	0.28	0.44	0.36	0.34

Source: See Table 1

Note: See Table 1

Table A.2 CI for health limitations for waves 2005, 2006 and 2007

	2005	2006	2007
BE	-0.17	-0.22	-0.22
CZ	-0.15	-0.15	-0.19
EE	-0.18	-0.21	-0.24
ES	-0.16	-0.14	-0.15
FR	-0.12	-0.14	-0.13
IT	-0.14	-0.12	-0.11
CY	-0.24	-0.29	-0.26
LV	-0.14	-0.17	-0.23
LT	-0.16	-0.17	-0.21
LU	-0.10	-0.11	-0.12
HU	-0.10	-0.12	-0.11
NL	-0.17	-0.17	-0.18
AT	-0.11	-0.12	-0.14
PL	-0.06	-0.04	-0.06
PT	-0.16	-0.15	-0.17
SI	-0.19	-0.17	-0.18
SK	-0.11	-0.10	-0.14
FI	-0.10	-0.10	-0.13
SE	-0.15	-0.14	-0.13
UK	-0.21	-0.20	-0.21

Source: See Table 1

Note: See Table 1

Table A.3: Decomposition for full model and restricted model, % of total inequality, 2007

	BE	CZ	EE	ES	FR	IT	CY	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK
Full model																				
Demographic	23	25	30	23	0	24	22	20	21	-4	1	12	4	-17	18	23	19	25	8	18
Education	5	6	3	4	8	6	6	3	10	11	12	6	18	6	1	5	10	9	1	4
Income	1	-13	4	0	10	0	10	0	-5	40	0	2	14	2	18	-2	-6	-4	1	-9
Employment	38	51	42	34	22	17	36	40	55	16	41	38	23	59	26	30	58	44	52	62
Social factors	35	34	19	39	57	60	26	20	22	34	36	43	40	64	34	41	22	24	51	21
Urban	0	1	4	-2	-1	1	2	8	-4	-1	-6	0	-1	-7	3	0	-1	2	3	0
Regions	0	-1	0	1	3	0	0	0	0	0	9	0	-1	2	0	0	0	0	0	0
Error	-2	-2	-2	0	1	-7	-1	9	1	4	7	-1	3	-10	0	4	-1	1	-16	4
Restricted model																				
Demographic	22	24	30	22	1	24	21	20	22	-4	1	9	4	-17	16	21	19	23	3	16
Education	8	9	5	11	11	13	7	5	12	14	20	10	22	15	5	12	12	9	3	6
Income	8	10	8	3	55	5	34	3	-2	68	12	30	43	22	34	30	9	15	6	7
Employment	44	53	46	36	23	20	35	43	58	16	43	44	26	62	25	31	59	47	66	64
Urban	0	1	3	-2	-1	1	2	8	-3	0	-6		-1	-4	2		-1	2	3	0
Regions	2	-1		4	4	7					9		-1	2				0		
Error	15	4	7	26	7	30	1	20	14	6	22	7	8	20	18	6	2	4	19	7

	BE	CZ	EE	ES	FR	IT	CY	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK
Full model																				
Demographic	23	25	30	23	0	24	22	20	21	-4	1	12	4	-17	18	23	19	25	8	18
Education	5	6	3	4	8	6	6	3	10	11	12	6	18	6	1	5	10	9	1	4
Income	1	-13	4	0	10	0	10	0	-5	40	0	2	14	2	18	-2	-6	-4	1	-9
Employment	38	51	42	34	22	17	36	40	55	16	41	38	23	59	26	30	58	44	52	62
Social factors	35	34	19	39	57	60	26	20	22	34	36	43	40	64	34	41	22	24	51	21
Urban	0	1	4	-2	-1	1	2	8	-4	-1	-6	0	-1	-7	3	0	-1	2	3	0
Regions	0	-1	0	1	3	0	0	0	0	0	9	0	-1	2	0	0	0	0	0	0
Error	-2	-2	-2	0	1	-7	-1	9	1	4	7	-1	3	-10	0	4	-1	1	-16	4
Restricted model																				
Demographic	22	24	30	22	1	24	21	20	22	-4	1	9	4	-17	16	21	19	23	3	16
Education	8	9	5	11	11	13	7	5	12	14	20	10	22	15	5	12	12	9	3	6
Income	8	10	8	3	55	5	34	3	-2	68	12	30	43	22	34	30	9	15	6	7
Employment	44	53	46	36	23	20	35	43	58	16	43	44	26	62	25	31	59	47	66	64
Urban	0	1	3	-2	-1	1	2	8	-3	0	-6		-1	-4	2		-1	2	3	0
Regions	2	-1		4	4	7					9		-1	2				0		
Error	15	4	7	26	7	30	1	20	14	6	22	7	8	20	18	6	2	4	19	7

Source: See Table 1

Note: See Table 1

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