Health Risk Factors among the Older European Populations: Personal and Aggregate Country Effects

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Abstract:

It is now common to use the individual's self-assessed-health-status (SAHS), which expresses her/his holistic 'internal' view, as a measure of health. The use of SAHS is supported by numerous studies that show that SAHS is a better predictor of mortality and morbidity than medical records. The 2011 wave of the rich Survey of Health Aging and Retirement Europe (SHARE) is used for the exploration of the full spectrum of factors behind the health-status in 16 European countries, using 23,800 observations. Special emphasis is given to the *examination of behavioral risk factors (smoking, alcohol consumption and obesity) – both at the individual and country levels.* The main findings are: (i) the estimation of self-assessed-health-status regressions provides clear evidence of the *effects of the three behavioral risk factor on the individual's subjective rating of her/his health status, beyond and above the obvious effects of health conditions (that are also caused by the behavioral risk factors);* (ii) the second, more innovative, finding is related to the effects of country-specific macro variables on the subjective-health of the residents, beyond and above those of the personal characteristics. Adapting the technique presented in Oswald and Wu (2010), country effects derived from the SAHS regression are examined for correlations with a set of objective country macro measures. They include: share of smokers on a daily/regular basis; alcohol consumption (per-capita liters per year); share of obese individuals in the country. It appears that *country-level smoking and obesity affect negatively aggregate country SAHS, while alcohol consumption has no effect*. It is therefore not only 'who you are' that affects the subjective rating of health, but also 'in which country you live'. Overall, our findings indicate that what is true for the individual is also true for the country as a whole: both *individual* and *country-level* (obesity and smoking) risk factors affect subjective-health and the two levels of behavioral risks accumulate and reinforce the subjective-health assessment. This seems to be at odds with the 'Easterlin Paradox' that emphasizes within country individual effects and denies cross-country effects, and suggest the economic cost-effectiveness of preventive obesity and smoking treatment.

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1. Introduction and motivation

In this study we focus on the effects of three behavioral risk factors (smoking, alcohol use, and obesity) on the (self-assessed) health-status of the older populations (age of 50 and over) in European countries. The empirical analysis includes 2 strata that relate to 'how you live' and 'where you live': (i) examination of the effects of the *personal* medical and socio-economic factors on the person's health-status (controlling for country random effects). Special attention will be given to the behavioral risk factors mentioned above; and (ii) an inquiry of the correlates of *aggregate state-level risk factors* and the country's aggregate/average health-status – to what extent are the former affecting the population's health, above and beyond the effects of personal levels? The statistical analysis in this sub-section will follow Oswald and Wu (2010) who used data for the US to examine state-effects (beyond the effects of personal characteristics) on the well-being of American residents. The explanatory variables in their well-being equation included socio-economic characteristics of the sampled individuals, as well as dummy variables for the states of residence of the individuals. The standardized state dummy variables were then confronted with objective measures of US states, suggested in Gabriel and colleagues (2003).[1] It appears that "there is a state-by-state match (r=0.6, p<0.001) between subjective and objective well-being" (page 576). We will borrow the same technique[2] for our study on the effects of country aggregate measures of: smoking, alcohol use, and obesity, on the country-level average health-status-assessments.

Behavioral risk factors are major contributors to health problems and costs. In industrialized countries where morbidity and mortality are primarily related to chronic

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[1] The measures are based on objective state conditions, such as: temperature, wind speed, sunshine, coastal land, precipitation, inland water, public land, national parks, hazardous waste sites, environmental 'greenness', commuting time, violent crime, air-quality, student-teacher ratio, local taxes, local spending on highways and education, and cost of living (see Oswald and Wu, 2010, pp. 577-578).
[2] Country random-effects derived from multilevel regression analysis are used, instead of country fixed-effects (used by Oswald and Wu).

rather than infectious diseases, health behaviors are particularly important. Extensive medical and social research relate to the effects of these risk factors.[3]

(i) Smoking: cigarette smoking is the greatest single cause for illness (mainly: cancers, chronic obstructive pulmonary diseases - COPD, and heart disease) and for premature death. Many smoking-related deaths are not instant deaths. For instance, developing COPD, results in several years of illness of and distressing symptoms before death. Moreover, smoking has major negative *externalities* as well, *affecting other people*: it is harmful for children and babies who live in a home with a smoker. They are more prone to asthma and ear, nose and chest infections, as well as to cot-death. They are also at a risk of developing COPD and cancer as adults, and to become smokers themselves when older. Adults who are exposed for long periods of time to other people smoking, have an increased risk of lung cancer and heart disease. Tobacco smoke is also an irritant that can worsen conditions of people with asthma and with other respiratory problems. Using as an illustration UK and US data, it is reported that about 100,000 people in the UK die each year from smoking-related diseases, and life-expectancy for a long-term smoker is about 10 years less than for a non-smoker (Kenny, 2012). In the United States, about 20 percent of reported deaths are related to tobacco smoking (respective figures for 1990, 2000 and 2005 are: 400 thousand, 435 thousand and 467 thousand. Cawley and Ruhm, 2011, Tables 3.1.1 and 3.1.2). The World Health Organization (WHO) presented in 2009 estimates for mortality and morbidity caused by tobacco use in high-income countries (those with 2004 per-capita incomes in excess of 10,065). The estimated percentage of deaths due to tobacco use is 17.9 and the projected disability-adjusted life years (DALYs) is 10.7 (World Health Organization, 2009, Tables 1and 2).[4]

(ii) Alcohol consumption: Continued use of excessive amounts of alcohol, could lead to medical problems (liver diseases, gastrointestinal tract, cardiovascular and neurological problems), to psychiatric problems (alcohol dependence syndrome,

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[3] There is also a rich literature on the economics of risky behaviors. For recent reviews see: Cook and Moore (2002); Gallet and List (2003); Gallet (2007); Wagenaar, Salois and Komro (2009); Cawley (2010); and the very extensive review of Cawley and Ruhm (2011).

[4] All of these estimates should be treated with considerable caution because the causes of most death cases are multifactorial, making it quite difficult to estimate the independent effect of specific determinants.

suicidal intentions, anxiety and depression), and to social problems (impaired performance at work, relationship problems, violent crimes, accidents, and anti-social behavior). Illustrative data for the UK show that: in 2010/2011 there were 190,900 hospital admissions where the primary diagnosis was attributable to the excessive consumption of alcohol. Alcohol misuse accounted for 1.5 percent of premature deaths in England (in 2010, rising from 8,664 in 2009 to 8,790 in 2010. Rull, 2012). In the United States about 4-5 percent of death cases are believed to be the result of alcohol consumption (Cawley and Ruhm, 2011). WHO reports that in high-income countries 1.6 percent of deaths and 6.7 DALYs are attributed to alcohol consumption (World Health Organization, 2009, Tables 1 and 2). There is however enormous cross-cultural variation in the way the individual behaves when she/he drinks. In some societies (such as the UK, Scandinavia, the United States and Australia), alcohol is associated with violent and anti-social behavior, while in others (such as Mediterranean and some South American cultures) drinking is largely peaceful and harmonious (SIRC, 1998). Moreover, the prevalence of alcohol-related problems is not directly related to the average per-capita consumption. Countries with low consumption (such as Iceland) often register high rates of alcohol-related social and psychiatric problems, while countries with much higher levels of consumption (such as France and Italy) score low on most indices of alcohol-related problems.[5]

(iii) Obesity: obese individuals (with BMI>30; The Body Mass Index (BMI) is a single number that evaluates an individual's weight in relation to height - weight/height^2, weight in kilograms and height in meters), have an increased risk of developing type 2 diabetes, high cholesterol and triglyceride levels, high blood pressure, sleeping apnea, gallstones, cancers (colon, breast and womb), gout, and a fatty liver. Daily life is more difficult for obese persons: they feel tired and with

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[5] Alcohol-related problems are associated with specific cultural factors relating to: beliefs, attitudes, norms and expectations about drinking. Societies with generally positive beliefs and expectations (defined as 'non-temperance', 'wet', 'Mediterranean' or 'integrated' drinking cultures) experience significantly fewer alcohol-related problems. At the other end, negative or inconsistent beliefs and expectations (found mainly in 'temperance', 'dry', 'Nordic', or 'ambivalent' drinking cultures) are associated with more alcohol-related problems (SIRC, 1998 – based on a literature search of over 5000 books, journal articles, conference proceedings, abstracts and reports)

low energy, sweat a lot, experience breathing difficulties, develop skin irritation, have sleeping difficulties, and experience back and joint pain which also affect their mobility. Psychological problems can also be observed: low self-esteem, poor self-image, low confidence, isolation feelings, and even depression. These feelings can affect relationships with family members, friends, and co-workers at the work place. Being obese affects life expectancy. An analysis of almost one million people from around the world (in 2009), showed that a BMI level between 30 and 35 results in a drop of 2-4 years in life expectancy. When the BMI level is between 40 and 45 – life expectancy drops by 8-10 years. The drop is more pronounced for women than for men (Kenny, 2013). In the US, in 2005, obesity is ranked third in the list death risk factors (after smoking and high-blood-pressure. Cawley and Ruhm, 2011, Table 3.1.2). Another study that used US data claims that the annual medical costs (in 2008) for an obese person were $1,429 higher than those of comparable individuals with normal weight. Obesity appears to be more common among (female) low-educated and low-income individuals (Centers for Disease Control and Prevention, 2010). In the WHO (2009) study obesity is also ranked third in the list of leading causes of death in developed countries, responsible for 8.4 percent of deaths and 6.5 DALYs (World Health Organization, 2009, Tables 1 and 2).

Health starts to deteriorate around the age of 50. It is therefore natural to examine the determinants of the health-status using samples from the population aged 50 or above. Moreover, the share of this sub-population is constantly growing in virtually all countries (in European countries: from about 146 million in 2002 to 195 million in 2012, an increase of 16 percent in one decade, see Figure 1 below). Catering to the health needs of this growing sub-population is of great socio-political importance.

The very rich data base of the Survey of Health Aging and Retirement Europe (SHARE) is an ideal data set for the exploration of the full spectrum of factors behind the health-status. It is a multidisciplinary and cross-national panel data set of micro data on health, socio-economic status and social and family networks, of more than 45,000 individuals aged 50 or over. They are a balanced representation of the various regions in Europe, ranging from Scandinavian countries (Denmark and Sweden), through Central Europe

(Austria, France, Germany, Switzerland, Belgium and the Netherlands), through Eastern Europe (The Czech Republic, Poland, Hungary, Slovenia and Estonia) to the Mediterranean (Spain, Portugal and Italy).

Figure 1: Size of population aged 50 and over, Europe, 2002-2012
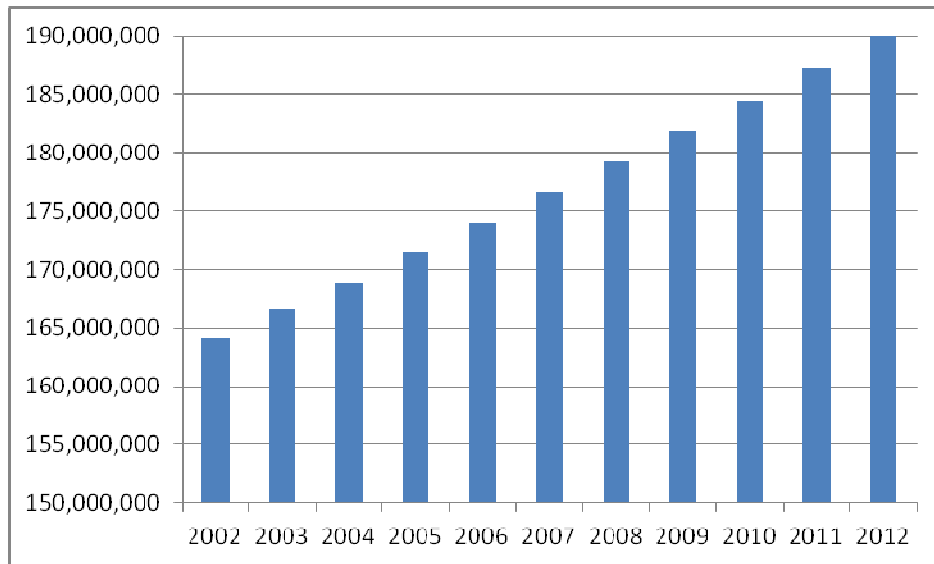
Source: Eurostat (2013)

For the health-status measure we are using the respondent's Self-Assessed-Health-Status (SAHS). Following the use of the assessed/subjective well-being as a measure of quality of life, it also became common to use the individual's assessment of her/his health-status as a health measure. The structure of the subjective-health (or 'self-assessed-health-status'- SAHS) question is similar to the question on well-being. Respondents are frequently asked to assess their health by rating their overall health on a scale with 4-10 categories, ranging from 'very poor' to 'excellent', or some variant. In the SHARE questionnaire the question is: "On a scale from 1 to 5, where '1' describes the worst imaginable condition and '5' describes the best imaginable condition, how do you rate your health in general?" [6] A person's own understanding of her/his health is the 'internal' view of health, as opposed to 'external' views that are based on observations of doctors or pathologists (Sen, 2002).

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[6] In the most recent 2011 wave of SHARE, which will be used for the empirical analysis, only 5 categories are presented (1 -to- 5). Some of the previous waves included also a question with 11 categories (0-10).

The 'self-assessed-health-status' has increasingly become a common measure of health in empirical research (e.g., Deaton and Paxson, 1998; Kennedy et al., 1998; Smith, 1999). The belief that the individual is the best evaluator of her/his health status was supported by findings of numerous studies, which indicate that self-ratings of health are good predictors of mortality and morbidity even more than medical records. The first clear demonstration came with Mossey and Shapiro's (1982) analysis of the Manitoba longitudinal Study, which showed that elderly Canadians' self-ratings of health were better predictors of seven-year survival than their medical records or their self-reports of medical conditions. Idler and Benyamini (1997) quote evidence from no less than 27 studies documenting that a respondent's global health rating is a powerful predictor of subsequent individual mortality. Benyamini and Idler (1999) identified 19 additional studies that were published during the period 1995 to 1998. Some of the more recent studies in the same line are: Ferraro and Kelley-Moore (2001); Wang at al. (2001); van Doorslaer and Gerdtham (2003); Nagarajan and Pushpanjali (2008); Parissis et al. (2009) and Cesari et al. (2009). Up-to-2008, over 200 studies reported robust relationships between self-assessments-of-heath with mortality and morbidity (Mora et al., 2008). The respondents in these sample surveys are heterogeneous in terms of: country of residence, socio-economic status, race, ethnicity, education, preventive practices, and health conditions – indicating the universality of the phenomenon.[7]

Our two-layer empirical analysis will help answer two questions: (i) are individuals aware of the harmful effects of their individual behavioral risk factors? If positive, these factors should affect significantly the individual's self-assessment of her/his health-status. As personal medical information (diseases, medical symptoms etc.) is also included in our regression analysis, the effects of the individual's risk-factors relate to the extra dis-utilities, above and beyond the direct medical impairment; (ii) are country differences in average SAHSs (controlled for differences in individual medical and socio-economic characteristics) significantly correlated with aggregate country-levels of the three risk factors? If positive, it follows that negative externalities affect residents and lead to lower subjective health-status scores. The most notable example is of negative externalities is

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[7] Our data set does not include data on mortality, and can therefore not contribute to the exploration of the relationship between SAHS measures and mortality.

'passive smoking' - exposure to smoking of others (e.g., passive smoking caused nearly 50,000 deaths each year – between 2000 and 2004 - among adults in the United States; Centers for Disease Control and Prevention, 2008; it is extremely harmful to children and babies, Kenny, 2012). Other negative side-effects and externalities of the three risk factors include: work absenteeism and low productivity, social effects, excessive health and welfare payments. Exploration of the correlations between country macro measures (in particular, country levels of smoking; alcohol consumption; and obesity) and the aggregate/average country SAHSs, further improves our understanding of what affects health self-assessments. Deaton (2008) looked at the 'satisfaction with health' versus a set of objective aggregate country measures of health (in particular, life expectancy and country expenditures on health) and found that they are uncorrelated across 132 countries. We focus on country measures of behavioral risk factors and also employ a different statistical analysis.

The 'external' view of health has come under considerable criticism, particularly from anthropological perspectives, for taking a distanced and less sensitive view of illness and health (Kleinman, 1988, 1995). Accordingly, it has been argued that public health decisions are quite often poorly responsive to the patient's own understanding of suffering and healing. The reason is that public policy reacts to medical components of health and illness, while individuals have adopted an expanded more complex and holistic definition of health that encompasses more than *simple medical considerations.* A better understanding of the effects of the risk-factors on the individual's subjective-health, including their origin (whether individual or societal) can contribute to the introduction of more efficient public-health policies and strategies (such as preventive health policies) that might reduce the prevalence of the three risky behaviors. This, in turn, could lead to an increase in life expectancy and in quality of life, and a decrease in costs of health and welfare.

The outline of the paper is the following: The second section describes the SHARE data set and the variables used for the statistical analysis, in particular the health risk factors. Section 3 presents the empirical analysis of the determinants of SAHS, the country coefficients and their correlations with a set of country-specific variables (with special focus on country-level risk factors), and Section 4 summarizes and concludes.

2. The SHARE (Survey of **H**ealth, **A**ging and **R**etirement in **E**urope**) data base, and variables used for the econometric analysis**

2.1 *The data base*

SHARE is a unique, innovative, carefully designed, multidisciplinary and cross-national panel data base of micro data on health, socio-economic background, and social and family networks. It includes more than 45,000 individuals aged 50 or over. SHARE is coordinated centrally at the Mannheim Research Institute for the Economics of Aging, with substantial central tasks in Italy and the Netherlands. It is a collaborative effort of more than 150 researchers world-wide, organized in multidisciplinary national teams and cross-national working groups. A scientific monitoring board and a network of advisors help to maintain and improve the project's scientific standards. The main funding comes from the European Commission (5th, 6th and 7th framework programs). For this study we will use the most recent fourth wave, conducted in 2010-2011, with the participation of 16 European countries, ranging from Scandinavian countries (Denmark and Sweden), through Central Europe (Austria, France, Germany, Switzerland, Belgium and The Netherlands), through Eastern Europe (the Czech Republic, Hungary, Poland, Slovenia and Estonia) and to the Mediterranean (Spain, Portugal and Italy). Rigorous procedural guidelines and programs ensure a harmonized cross-national design.

Data collected include health variables (e.g. self-reported health, health conditions, physical and cognitive functioning, behavioral risk factors, use of health-care facilities); bio-markers (e.g. grip strength, body-mass index, peak flow); psychological variables (e.g. psychological health, well-being, life satisfaction); economic variables (e.g. current work activity, job characteristics, opportunities to work past retirement age, sources and composition of current income, wealth and consumption, health insurance, housing, education); and social support variables (e.g. marital variables, assistance within families, transfers of income and assets, social networks, volunteer activities, religious activities).

Daniel McFadden concluded that "*SHARE has become a world-class example of research infrastructure*".

2.2 *Variables used for the econometric analysis: definitions, rational for use, and descriptive statistics*

Appendix Table A.1 presents descriptive statistics of the research variables.

The *dependent variable* is the individual's subjective self-assessment of her/his health status that has 5 categories and is based on the question: "On a scale from 1 to 5, where '1' describes the worst imaginable condition and '5' describes the best imaginable condition, how do you rate your health in general?" The average SAHS score for the whole sample is 2.83.

Figure 2 plots the distribution (in percentages) of responses to the SAHS question, for the whole sample, and also for Denmark and Poland (presentation of distributions for all 16 countries results in a cluttered diagram). As is evident from the graph, there are substantial differences between Denmark and Poland in the subjective-health evaluations. For instance: The modal value is "Good" for the whole sample (37 percent chose this value). The modal value for Poland is lower: "Fair" (36 percent marked this value as their SAHS), while the modal value in Denmark is "Very good" (chosen by 35 percent). Another example: against a European average of about 6 percent who report having a "Excellent" health-status, in Denmark the parallel figure is almost 20 percent, while in Poland only a mere of less than 1 percent mark their health-status as excellent (0.77 percent). The country differences might stem from objective differences in health conditions, from country-specific macro variables (e.g., risky behaviors within the population, per-capita GDP, income inequality, country expenditures on health and welfare), and also from cultural and language differences.

Figure 2: Distribution (percentages) of responses to SAHS question, SHARE 2011
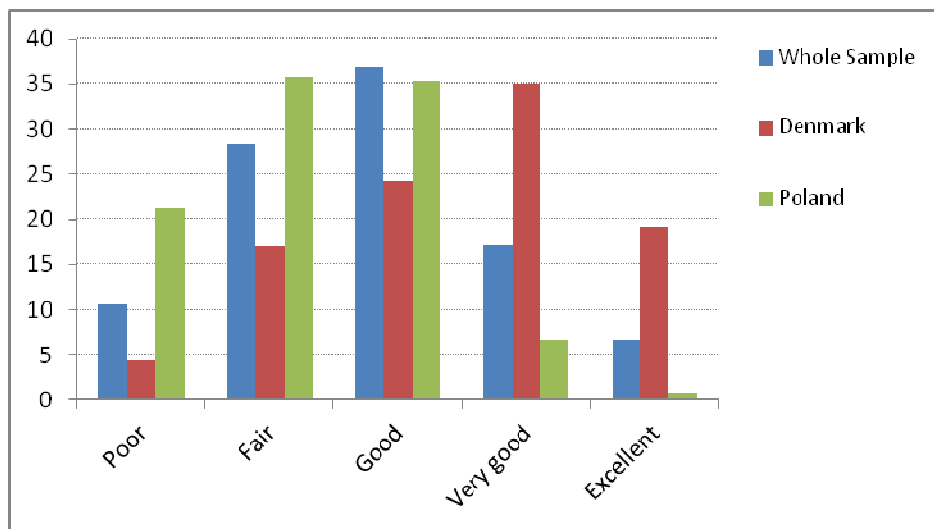
The independent variables include: Socio-demographic variables (gender, age, education, marital status, number of children in household, parents alive, pension); medically based health (drug use, diagnoses of medical problems, use of medical services, health symptoms, and quality of eyesight); functional capacity, cognitive functioning and behavioral risks (smoking, alcohol use, and obesity). Our focus in this study is on the effect of risky behaviors. Obviously, in order to arrive at *net effects of smoking, alcohol use and obesity*, all other variables potentially affecting SAHS need to be controlled for.

(i) Socio-demographic variables

Gender: Gender is introduced using a dummy variable that is set to 1 for male respondents. In our sample 49.3 percent are males. Research indicates that at older age women experience more health-related problems and functional limitations than men (e.g., Murtagh and Hubert, 2004). This could lead to lower levels of SAHS.[8]

Age dummies: For age we use four dummy variables, relating to the age groups of: 61-to-70; 71- to-80; 81-to-90; 91 and over; with the reference group being age of 50-to-60. In our sample 27.2 percent are at the age of 50-60; 38.2 percent belong to the age group of 61-70; and 24.7, 9.2 and 0.7 percent belong to each of the groups of 71-80, 81-90, and

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[8] A meta-analysis on gender differences in psychological well-being, including 300 empirical studies, showed that gender differences were small but were greater in more recent cohorts (Pinquart and Sorensen, 2001). As health is a major component of well-being, we can also speculate that a similar pattern will be found for health.

over 90, respectively. Against the rich literature of age effects on well-being, the literature on age effects on SAHS is scarce. Deaton (2008) looked at correlates of health (and of well-being) in 132 countries (using data of the 2006 Gallup World Polls), distinguishing between rich countries and poor ones. He found that in rich countries it is people in their 50^s, not in their 60s or 70s, who report the least satisfaction with their health. The explanation he offered was that this group experienced health problems for the *first* time, suggesting that it is not poor health that is hard to tolerate, but the first indications of morbidity/mortality. On the other hand, in the poor countries, and in particular in Africa where morbidity has been a constant companion throughout life, health satisfaction declines rapidly with age. As our data set covers European developed countries, if Deaton's speculation about a minimum point in SAHS at the 50s (in developed countries) is correct, we should expect the lowest level of SAHS (ceteris paribus) at the age group of 50-60 (our reference group).

Education: Education is introduced by a dummy variable that equals 1 if the respondent has at least 13 years of schooling (31.8 of respondents belong to this group). Grossman and Kaestner (1997) find support a positive relation between health and education.[9]

Family: Marital status, number of children in household and living parents: For 'marital status' we use 2 dummy variables: married (74.1 percent of the sample) and widowed (12.3 percent), with the reference group including: divorced, separated and single respondents (13.6 percent). There is evidence that married people are healthier (both physically and psychologically) (Kiecolt-Glaser and Newton, 2001; Ross et al., 1990), and report better subjective-health than unmarried people (Stack and Eshleman, 1998; Ren, 1997).[10]

The number of children in the household is included as one of the explanatory variables, since children might serve as a social security net for their older parents, extending help in terms of care-giving and emotional/social support (Zunzunegui et al., 2001). As our sample includes respondents aged 50 and above, the children have most probably left the

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[9] This finding is in line with a positive correlation between education and happiness. For instance: Blanchflower and Oswald (2004) show that education plays a positive role in enhancing happiness, even when income is controlled for.

[10] In the same vein, it is well established that marriage is positively related to happiness (Blanchflower and Oswald, 2004; Frey and Stutzer, 2002).

parents' house. Indeed, the average number of children in the sample is very low (0.01, with a modal value of 0).

Respondents' parents who are alive (18.5 percent have a living mother and 6.9 percent have a living father) might request help from their elderly children, but on the other hand, could also extend emotional support and affection that might affect the SAHS. Also, living parents could be a proxy of good genetics. To the best of our knowledge, living mother/father has not been included in past research on SAHS.

Wealth: public pensions. Wealth is introduced by a dummy variable that relates to public old age pensions received by the individual. It was coded as 1 if he receives such pensions. A percentage of 55.1 of the respondents have this type of pension. In the literature, reduced income is associated with poorer health (Crossley and Kennedy, 2002; Smith et al., 1994). We control for health conditions and still hypothesize that being wealthy leads to higher SAHSs.[11]

(ii) Medically based health

Drug use: A continuous variable that is the number of different drugs that the respondent takes at least once a week (e.g., drugs for high-cholesterol, high blood-pressure, health diseases, asthma, diabetes, osteoporosis, chronic bronchitis, joint pain, other pains, sleep problems, anxiety or depression, stomach burns). The average number of drugs is 1.65, ranging between from 0 to 11.

Medical diagnosis of health problems: A set of dummy variables that relate to diseases that the individual was diagnosed with. They include: heart diseases (13.1 percent of respondents); hypertension (39.4 percent); vascular diseases (3.8 percent); diabetes (12.9 percent); lung diseases (7 percent); arthritis (24.4 percent); osteoporosis (1.4 percent); and cancer (4.8 percent).

Health symptoms: A continuous variable that is the sum of different symptoms that the individual suffered from during the last 6 months (e.g., sleeping problems, falling down,

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[11] SHARE includes data also on employment status (employed, unemployed, retired, homemaker). The employment status is not included in the regression analysis because there might be a problem of direction of causality: is employment leading to higher measures of SAHS, or are the individuals who are healthier (and thus report higher levels of SAHS) those who are employed? In the sample used for the empirical analysis, 27.3 percent of our elderly respondents are still employed.

persistent cough, fatigue, swollen leg, dizziness). The average is 1.7 symptoms ranging between 0 to11.

Medical consultation: A continuous variable that is the response to the question: "During the last 12 months, about how many times in total have you seen or talked to a medical doctor about your health. Please exclude dentist visits and hospital stays, but include emergency rooms and outpatient clinic visits". The average is 6.9, ranging between 0 and 98.

Hospitalization: A dummy variable that equals 1 if the respondent answered positively the question: "During the last 12 months, have you been in hospital overnight? Please consider stays in medical, surgical, psychiatric or any other specialized wards." 16.3 percent of the sample reported that they were hospitalized during the last year.

Eyesight: A continuous variable ranging from 1 (poor) to 5 (excellent). It is the average of 2 variables related to eyesight that are the responses to the question: "Your distance/reading eyesight is: poor (1)…excellent (5)". The Cronbach Alpha between these two variables is 0.72, suggesting that the arithmetic average is a good approximation. The average is 3.4.

(iii) Behavioral risks

Smoking: Two dummy variables represent this behavioral risk. The first that equals 1 if the individual answered positively the question: "Do you smoke at the present time?" 24.6 percent of the sample reported that they are smoking at present. The second dummy equals 1 if individual ever smoked daily but now does not. 17.7 percent of the respondents smoked in the past and stopped smoking. This variable was added as smoking has an accumulating effect that does not fade away when the individual stops smoking.

Alcohol use: The survey includes the following questions related to alcohol use: "During the last 3 months, how often have you drunk any alcoholic beverages, like beer, wine, spirits or cocktails?" The seven options range from 'not at all' to 'almost every day'. Three dummies have been created: the first one equals 1 if individual consumes alcohol 3 or 4 days per week (7.9 percent of the sample), the second equals 1 if the individual

consumes alcohol 5 or 6 days per week (3.2 percent) and the last one equals 1 if the respondent consumes alcohol almost every day (22.8 percent).

Obesity: Two dummy variables have been defined in relation with the Body Mass Index (BMI, based on weight and height). A dummy variable that is equal to 1 if the BMI is between 30-40 (20.1 percent of the sample) and a second dummy that is equal to 1 if the BMI is over 40 (0.9 percent).

These three behavioral risk factors affect SAHS via the effect on diseases and medical symptoms (e.g., lung diseases, cancer, hypertension, stroke, respiratory and heart diseases, diabetes – Centers for Disease Control and Prevention, various publications), and also via accumulated *psychological and social effects* that are not expressed by clear medical indicators, resulting in significant effects even when a large battery of medical indicators is controlled for. While it is clear that smoking and obesity lead to health deterioration, the effect of alcohol use is less evident. Excessive alcohol drinking could lead to deteriorated functioning of the liver, kidneys and other organs. But if, on the other hand, we combine the suggestions that alcohol drinking improves happiness, and that the mental state of "happiness" improves health[12], then a positive correlation between alcohol use and SAHS could also be evidenced. It was indeed found that moderate alcohol use improves the health-status. Thun et al., (1997) conclude that "In the middle-aged and elderly population, moderate alcohol consumption slightly *reduced* overall mortality" (page 1705).

(iv) Functional Capacity Indices

ADL: This index relates to limitations with basic Activities of Daily Living (ADL). Six activities are included: dressing (including putting on shoes and socks), walking across room, bathing or showering, eating (such as cutting up food), getting in and out of bed, and using the toilet (including getting up or down). We use the individual's answer to

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[12] Several studies are claiming that the mental state of 'happiness' improves health: it is conducive to physical health and to the immune system (Rytt and Singer, 2003; Rozenkranz et. al., 2003). Moreover, happy people are more likely to recover from major injuries (Layard, 2005), and when a person has a joyful experience - the body chemistry improves, along with a decrease in blood pressure and heart rate (Davidson et al., 2000; Rytt and Singer, 2003).

these questions for the construction of a linear index, using the principal components analysis.

IADL: This index describes the number of limitations with Instrumental Activities of Daily Living (IADL) reported by each individual. Seven activities are included: using a map to figure out how to get around in a new place, preparing a hot meal, shopping for groceries, making telephone calls, taking medications, doing work around the house or garden and managing money (such as paying bills). We use the respondent's answers to these questions to construct a linear index using the analysis of principal components.

An increased level of each of these two indices (ADL, IADL) means an increase of limitations with basic and instrumental activities of daily living, respectively.

(v) Cognitive abilities

Identifying animals: The test used for the measurement of cognitive skills is the count of animals that the individual listed in 60 seconds, in response to the question: "I would like you to name as many different animals as you can think of. You have one minute to do this." The average was 19.9 ranging from 0 to 100.

Our sample is composed of individuals from the following 16 European countries: Austria (8 percent of the sample), Germany (5.4 percent), Sweden (6.4 percent), The Netherlands (7.1 percent), Spain (5.6 percent), Italy (8.6 percent), France (11.9 percent), Denmark (7 percent), Switzerland (5.4 percent), Belgium (9.7 percent), The Czech Republic (11.6 percent), Poland (5.9 percent), Hungary (1.8 percent), Portugal (1.6 percent), Slovenia (0.7 percent) and Estonia (3.3).

We also experimented with the inclusion of country-specific measures, in addition to country random-effects.[13] In particular we used: percentage of the population aged 15 years and over who report smoking regularly/daily; annual per-capita consumption of alcohol (liters); share of obese individuals; life expectancy and the Gini index. Other

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[13] Both country random-effects and country macros can be used when Multilevel Regression Analysis is employed. See Section 3 for details and for definitions and sources of the macros.

macros were not included due to their high correlation with life expectancy (e.g., Human Development Index, per-capita GDP, expenditures on health).

The SHARE survey includes a battery of questions on employment, on mental/psychological health (*Looks back with happiness, Life has often a meaning*, *Does often the things that she/he wants*) and questions related to social ties and networks (*Voluntary work*, *Social ties*, *Major trust in people*, *Attendance of church activities).* This information was not included in the regression analysis to avoid biases related to simultaneity.

3. Econometric analysis and findings

The econometric analysis has 2 layers: (i) estimation of a SAHS equation, using the explanatory variables described above (Section 2.2); and (ii) based on the regression results: derivation of country effects (that reflect country average SAHSs) and estimation of correlations between the country SAHSs and macro country measures (focusing on country-specific risk factors and also life expectancy and the Gini index). Significant correlation between country coefficients (netted out of the individual effects on SAHS) and country macro measures indicates that country characteristics affect the residents' SAHS above and beyond the individual characteristics. While the investigation of SAHS determinants is reported in many studies, the second stage is novel. This study is following Oswald and Wu (2010) who studied the correlation between SWB of American individuals and the characteristics of their States of residence. We will extend their technique to study country-average subjective-health versus country-level health/development measures, with special focus on country behavioral risk factors. We are using Multilevel Regression Analysis and not standard OLS regression that was employed by Oswald and Wu.

3.1 *Descriptive statistics of risky behaviors, by country*
Figures 3-5 present country measures of smoking (Figure 3), alcohol consumption (Figure 4), and obesity (Figure 5) based on OECD data (OECD, 2013) and on estimates

derived from two waves of SHARE (2007 and 2011[14]). The definitions used by the OECD are similar to the definitions we employ for the SHARE data (obese - BMI>30, and smoking on a daily/regular basis), facilitating comparability between the two measures. However for alcohol consumption the OECD looks at a per-capita annual consumption of alcohol (liters) while this information is not included in SHARE. We therefore present (in Figure 4) only the SHARE 2007 and 2011 country estimates (percentage of individuals who consume alcohol at least 5 days a week). It should also be emphasized that the OECD data relate to the whole population, for obesity, and the population aged 15 and over for smoking. The SHARE data covers only the elderly (aged 50 and over). It follows that the measures are not fully comparable. However, on the other hand, these differences facilitate a comparison between the elderly and the larger populations.

Figure 3: Percentage of individuals who smoke daily, by country
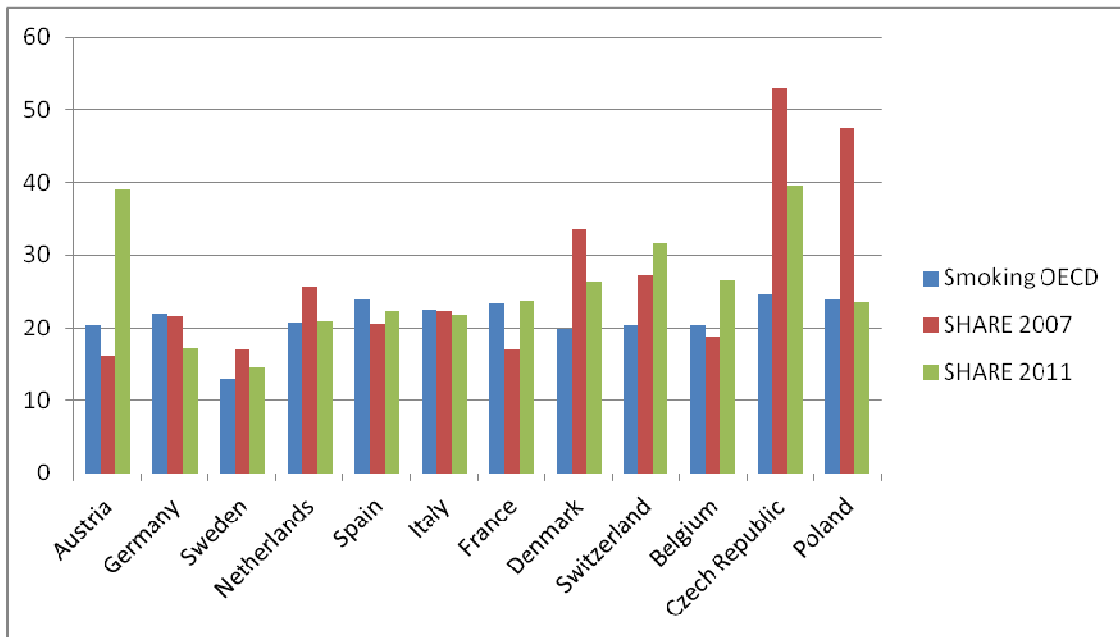
The OECD estimates (for around 2011, ranging between 13.1 percent in Sweden, to 24.6 percent in the Czech Republic) are in some countries lower than the SHARE estimates and in others higher – reflecting the fact that smoking is not more common amongst the older population. Changes over time are also not uniform: There are quite dramatic

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[14] The estimates are for the countries that are included in both samples of 2007 and 2011 (12 countries).

decreases in some countries (the Czech Republic, Poland and Denmark), and increases in others (Austria, Belgium, France, and Switzerland).

Figure 4: Percentage of consumers of alcohol at least 5 days a week, by country
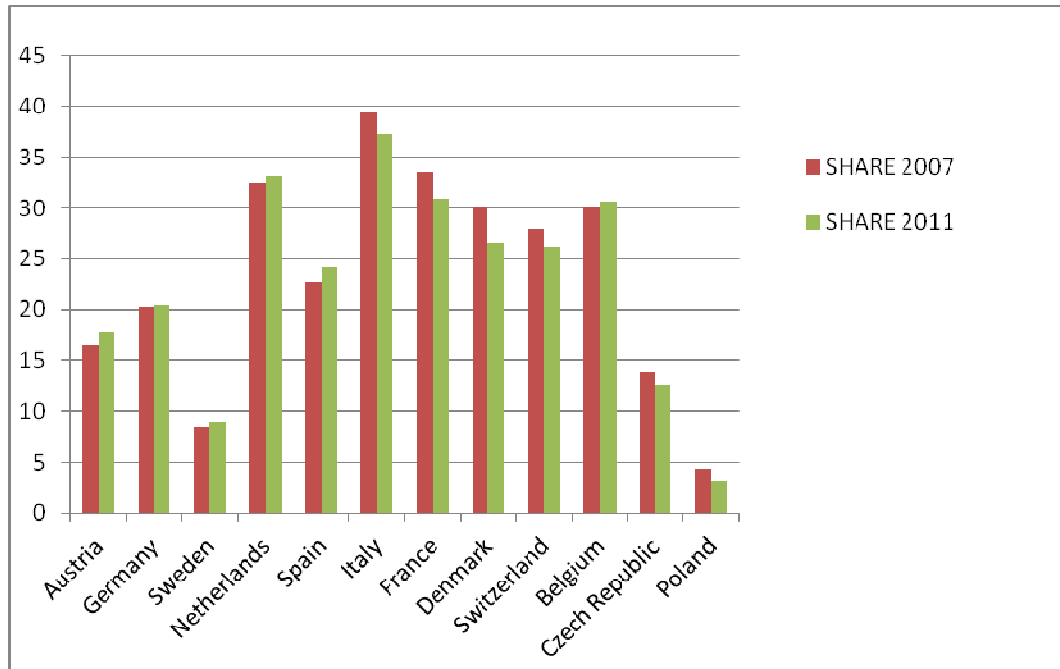
The percentage of individuals who consume alcohol al least 5 days a week is highest in Italy, and ranges between about 5 percent to close to 40 percent. It increased mildly in Austria, Germany, Sweden, The Netherland, Spain and Belgium, and decreased slightly in the other countries of the sample.

Figure 5: Percentage of obese individuals (BMI>30), by country
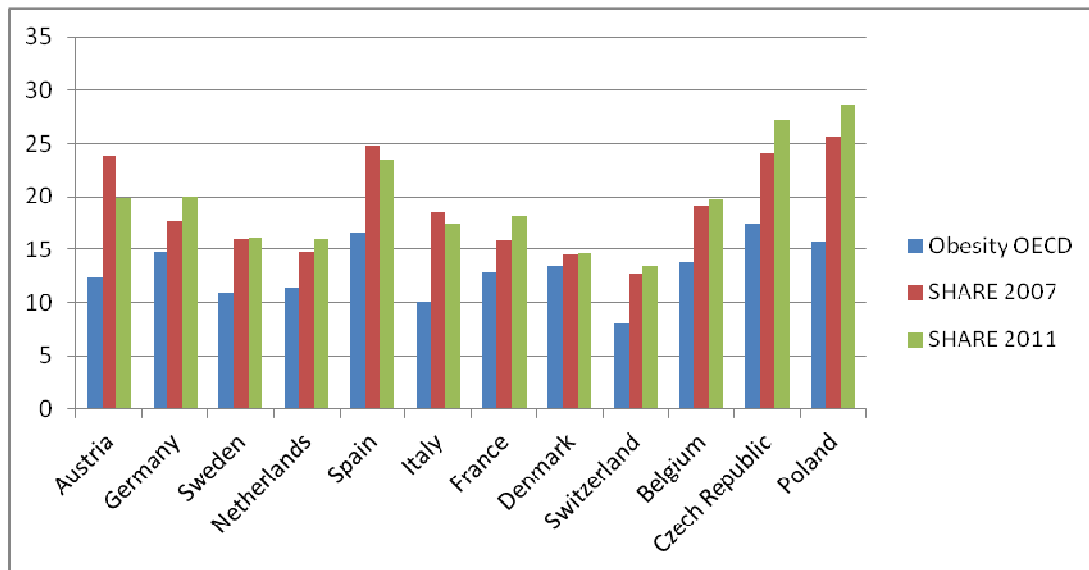
As is evident from Figure 5, in all the countries included in our study, the OECD measures (for around 2011, ranging between 8.1 percent in Switzerland to 17.4 percent in the Czech Republic) are significantly lower than the sample averages that are restricted to individuals aged 50 and over. This observation could indicate that obesity is more common in elder ages. A comparison of the estimates of 2007 and 2011 shows a trend of increase in seven out of the 12 countries (Poland ranks first with 28 percent in 2011), stability in two countries and decrease in five.

3.2 SAHS regression equation: Determinants of subjective-health

The clustered nature of our data (samples of respondents in 16 countries) leads to the choice of Multilevel Regression Analysis as the preferred econometric technique. In addition, this method allows for the inclusion of both contextual-country variables and country random-effects (Table 4). Experimenting with Ordered Logit[15], Ordinary Least Squares[16], Probit-Adapted OLS (POLS, see van Praag and Ferrer-i-Carbonell, 2008)

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[15] Since reported subjective-health is intrinsically ordinal (with 5 values of 1-5), the natural way to estimate a SAHS equation is by using Ordered Logit or Ordered Probit. However - as discussed in Ferrer-i-Carbonell and Frijters (2004), in Frey and Stutzer (2002), and in van Praag et al., (2010) – when the dependent variable relates to satisfaction scores, the use of a linear model instead of an Ordered Logit model, does not change the basic results. The simpler OLS method allows coefficients to be read off as cardinal subjective-health scores.

[16] Oswald and Wu (2010), in their Science paper, justify the use of OLS even when their dependent variable is a 4-category variable.

resulted in minor changes in terms of sign, magnitude, and significance of coefficients (can be provided from authors upon request).

The dependent variable is the respondent's subjective assessment of her/his health-status, ranging from '1' (worst imaginable condition) to '5' (best imaginable condition).

Of special interest are the effects of the country, which measure the contribution of the country of residence to the subjective-health of its residents, beyond the effects of all other personal explanatory variables that are included in the regression analysis. Once multilevel regression is employed, country effects can be predicted and these values can then be used for the ranking of the 16 countries from highest to lowest, in terms of a country-specific component of SAHS.

Table 1 presents the multilevel regression results.

Table 1: Determinants of SAHS, multilevel regression, SHARE 2011

Variables	Coefficients (z-statistics)
(i) Socio-demographic personal characteristics	
Male	-0.077 (-6.766)***
Age (years)	
50-60	Ref.
61-70	0.016 (1.017)
71-80	-0.023 (-1.147)
81-90	-0.040 (-1.576)
over 90	0.082 (1.180)
Education	
More than 12 years of schooling	0.110 (9.243)***
Marital status	
Single/Divorced/Separated	Ref.
Married	0.028 (1.825)*
Widowed	0.015 (0.701)
Number of children in household	0.037 (0.902)
Living parents	
Mother	0.063 (4.222)***
Father	0.074 (3.406)***
Old age pension	0.035 (2.472)**
(ii) Medically based health	
Drug use (number of drugs)	-0.081 (-16.805)***
Health conditions – diagnosed with	
Heart problems	-0.139 (-8.249)***
Hypertension	-0.025 (-2.063)**
Cerebral vascular disease	-0.157 (-5.656)***
Diabetes	-0.114 (-6.798)***

Variables	Coefficients (z-statistics)
Chronic lung disease	-0.171 (-8.123)***
Arthritis	-0.200 (-15.022)***
Osteoporosis	-0.062 (-1.396)
Cancer	-0.356 (-14.583)***
Number of medical symptoms	-0.127 (-31.153)***
Medical consultation (number)	-0.013 (-20.654)***
Hospitalization (dummy)	-0.182 (-12.349)***
Quality of eyesight (range of 1-5)	0.163 (28.058)***
(iii) Behavioral risks	
Smoking	
Smoked in the past, not now	**-0.016 (-0.942)**
Smokes now	**-0.120 (-8.766)*** **
Alcohol consumption	
3 or 4 days a week	**0.063 (3.212)*** **
5 or 6 days a week	**0.109 (3.665)*** **
7 days a week	**0.031 (2.317)** **
Obesity	
BMI between 30-40	**-0.098 (-7.323)*** **
BMI higher than 40	**-0.126 (-2.285)** **
(iv) Functional Capacity Indices	
ADL	-0.033 (-6.983)***
IADL	-0.019 (-3.959)***
(v) Cognitive abilities	
Number of remembered animals	0.011 (14.333)***
Sample Size	23,805
R^2	0.44

* significant at 0.10; ** significant at 0.05; ***significant at 0.01

Notes: Country random-effects are included;

R^2 for two-level models, is the proportional reduction in the estimated total residual variance, comparing the null model without covariates with the model of interest (Snijders and Bosker, 1999)

The pattern that emerges from Table 1 is clear: while health conditions (obviously) play a significant role in the individual's subjective-health-assessment, our core individual behavioral risk factors also have significant net effects on SAHS, above and beyond their association with diseases and medical symptoms (that are controlled of). *Current smoking has a significant negative effect* (similar in magnitude to the effect of being diagnosed with Diabetes or having heart problems). However, past smoking is not considered by the respondents as a health risk factor. *Obesity too has a significant negative effect*: obesity is represented by two dummies that relate to the level of obesity (BMI 30-40, and BMI> 40). The effect of extreme obesity (>40) is considered as similar in size to the effect of

smoking, while levels of BMI between 30 and 40 have a somewhat lower effect. Interestingly, *consumption of alcohol affects positively and significantly subjective-health.* The positive effect of alcohol consumption has an inverted U-shape, with a maximum at the level of consuming alcohol 5-6 days a week.

Turning to the other determinants of SAHS, first to the set of medical conditions: suffering from diseases and bad health conditions lower the subjective assessment of health. Diagnosed with Cancer leads to an average drop of about 0.36 (on a scale of 1-5), while suffering from other major diseases (heart, cerebral vascular, diabetes, arthritis, and chronic lung disease) leads to a drop of around 0.03 - 0.20. Other indications of poor health conditions (use of drugs, hospitalization, medical consultations, medical symptoms) also lead to significant drops in the self-assessment-of-health, whereas better eye sight has a pronounced positive effect on SAHS (a change of 1 unit in the measure of eyesight that ranges between 1 and 5, leads to a change of 0.16 in SAHS). Lack of functional capacity (ADL and IADL) has a negative effect, while better cognitive skills increase SAHS.

As for the socio-economic personal variables: men have lower average valuations of SAHS than women. Murtang and Hubert (2004) claimed that at older age, women experience more health-related problems and functional limitations than men, leading to lower valuations of SAHS. However, as we control for a large set of health-related problems, this argument is not valid anymore. *Could be* that men are more hypochondriac than women and/or more ignorant on disease/health issues, leading to more pessimistic reports on their health status.

More educated individuals (those with more than 12 years of schooling) tend to report higher SAHS levels. In line with the speculation that ignorance (of men) leads to lower reports of SAHS, highly educated individuals have the knowledge how to better control diseases, and therefore feel healthier. Age does not affect subjective-health scores.[17]

As expected, individuals with a public pension feel healthier (significant at a 10 percent significance level). Wealth adds an element of protection and confidence that a need to deal with health problems will not be confounded by financial restrictions. Married

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[17] Some studies that looked at aged respondents (cited in the sub-section of variables' description) found a minimum point at the age of 50-60. Our data does not support this finding.

individuals report higher scores of SAHS (compared all other marital-statuses), but the effect is relatively small and only marginally significant.

Interestingly, living parents add significantly to the valuation of subjective-health (however, the effects are quite small). One explanation for this finding can be related to genetics – parents of individuals who are at the age of 50 and over, must be at least in their late 70s. This is an indication of high life expectancy that might affect health valuations of their offspring. Another option is that parents provide affection and support (although they also demand help) that affects SAHS.

3.3 Country effects: Correlations between subjective country-effects and country-specific objective macro measures

Once multilevel regression analysis is employed (Table 1), the effects of the countries of residence on subjective-health (beyond the effects of all other variables included in the regression) can be predicted. Table 2 presents the country effects on SAHS obtained from Table 1 regression (column 2), along with the raw (not controlled for characteristics of individuals) average SAHS of the 16 countries included in our sample (column 1). Ranks are presented in parentheses. Figure 6 is a graphical presentation of the rankings of the 2 measures (presented in Table 2).

As is obvious from Table 2 and Figure 6, the overall ranking pattern changes when personal characteristics are controlled for.

After controlling for personal characteristics (column 2) it is found that first ranks Denmark, second Switzerland, and third Belgium. Last ranks Estonia.

Table 2: Country averages of SAHS – raw versus controlled for personal characteristics

Country	Raw country SAHSs (rank)	Country effects on SAHS (rank)
Austria	2.97 (5)	0.15 (4)
Germany	2.72 (10)	-0.12 (12)
Sweden	3.20 (3)	0.13 (5)
The Netherlands	3.05 (4)	0.08 (7)
Spain	2.53 (12)	-0.05 (9)
Italy	2.73 (9)	0.09 (6)
France	2.80 (7)	0.01 (8)

Denmark	3.46 (1)	0.35 (1)
Switzerland	3.32 (2)	0.29 (2)
Belgium	2.95 (6)	0.19 (3)
The Czech Republic	2.63 (11)	-0.08 (11)
Poland	2.30 (15)	-0.18 (14)
Hungary	2.32 (14)	-0.17 (13)
Portugal	2.36 (13)	-0.21 (15)
Slovenia	2.76 (8)	-0.07 (10)
Estonia	2.15 (16)	-0.44 (16)

Figure 6: Ranks of country effects versus ranks of average country raw SAHSs
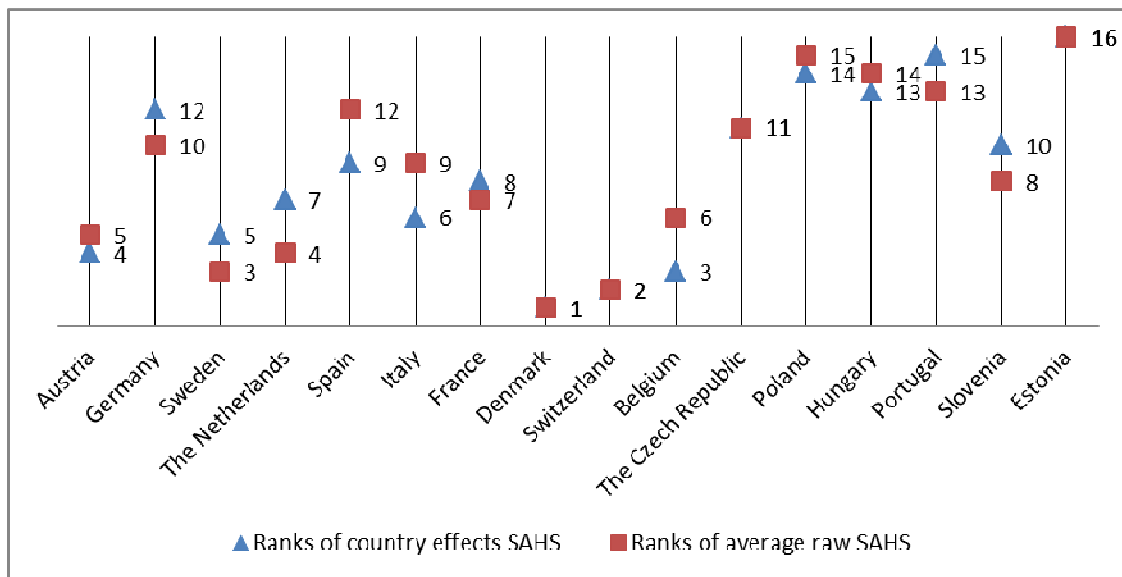
Denmark and Switzerland remain at the top of rankings and so does Estonia that ranks last in both schemes. The ranks do not change also for The Czech Republic. Germany, Sweden, The Netherlands, France, Portugal and Slovenia drop to lower places when controlled country effects are considered. Some other countries move up, when personal characteristics are accounted for (Austria, Spain, Italy, Belgium, Poland and Hungary).

A more interesting novel question that this paper attempts to address is: whether objective country-specific macro characteristics are affecting significantly the country populations' subjective-health-assessments. As the focus of this study is on country-level behavioral risk factors, we are exploring *whether the country's level of smoking/alcohol-use/obesity is also contributing to SAHS* (beyond the effects of personal levels of the residents)?

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The country effects of the 16 countries included in our sample (see Table 2) are plotted against the country macro health risk measures, namely: percentage of the population, aged 15 and over, who smoke on a daily basis; alcohol consumption, measured by annual sales of pure alcohol in liters per-capita (by individuals aged 15 years and over); and the country percentage of obese individuals (BMI>30). Pearson correlations are calculated and tested for significance (twisting Oswald and Wu, 2010, to the health arena and relating to countries instead of US states).

(A) *Smoking*

Country percentages of the population aged 15 years old or over who report that they are daily smokers (OECD, 2013 – see Appendix Table A.2) are compared with country SAHS effects. As Figure 7 indicates, they are negatively correlated. The Pearson coefficient is -0.5156 and it is significant at 5% (p-value=0.0409).

**Figure 7: Country-level smoking versus country effects, 2011**
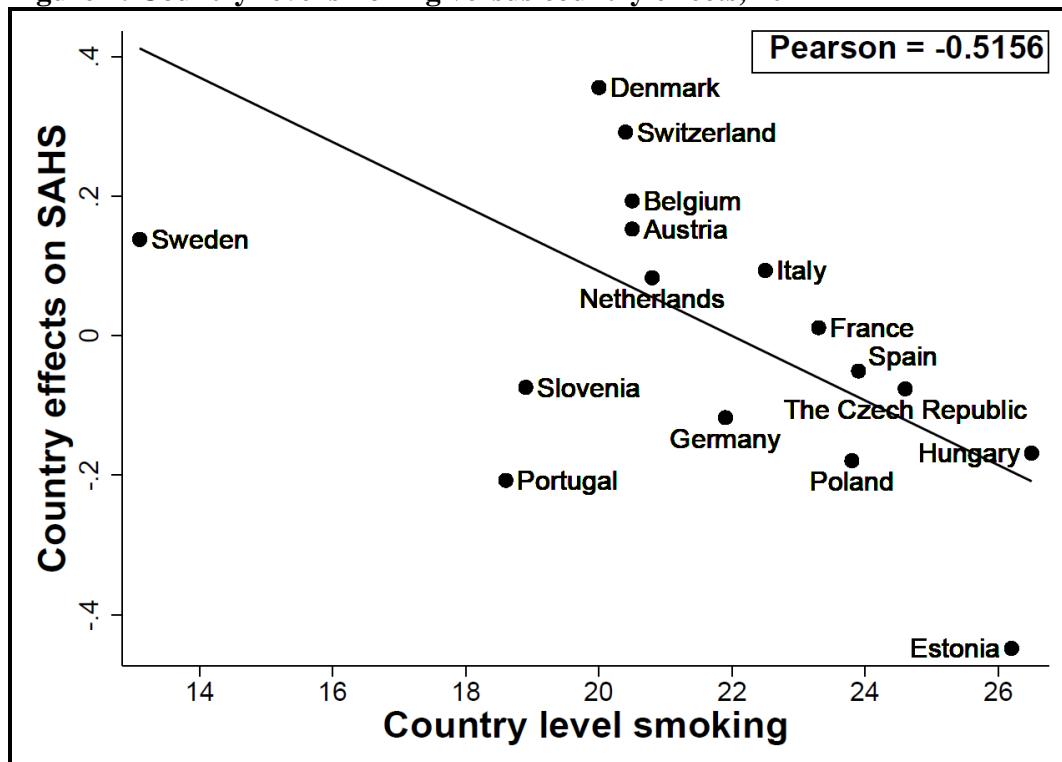
Source: OECD (2013) and Table 2

(B) *Alcohol consumption*

Country annual consumption of alcohol (in liters, per person aged 15 years old and over - OECD, 2013 – see Appendix Table A2) is compared with country SAHS effects. As

figure 8 shows, they are negatively correlated (Pearson coefficient = -0.3541) but the correlation is not significant (p=0.1784). While personal consumption of alcohol was found to have a *positive* significant effect on SAHS, it appears that country-level measures are not related significantly to country average SAHSs. Most probably, due to historical/cultural differences related to alcohol consumption (for an extensive discussion see SIRC, 1998)

Figure 8: Country-level alcohol consumption versus country effects, 2011
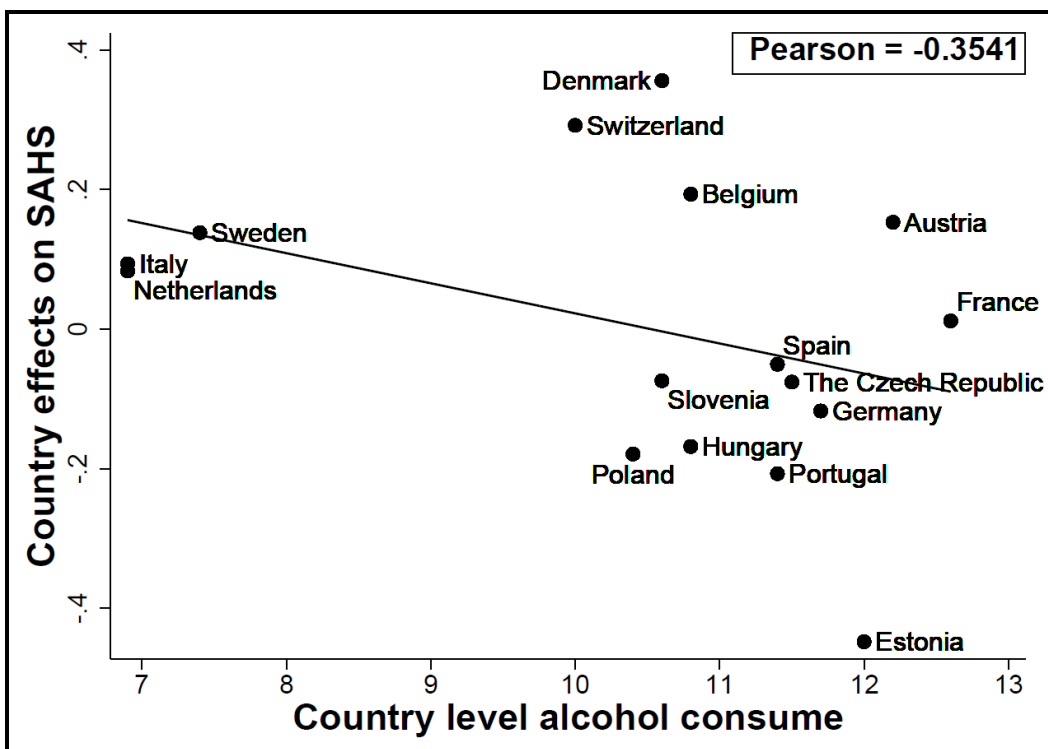
Source: OECD (2013) and Table 2

(C) *Obesity*

Obesity is defined as a BMI over 30. OECD (2013) provides data of the percentage of obese individuals by country (see Appendix Table A.2). As Figure 9 indicates, percentage of obese residents within the population is negatively correlated with SAHS effects. The Pearson coefficient is -0.7081 and it is highly significant (p-value=0.0021). The correlation between country-level obesity and average aggregate SHASs is stronger than

the respective correlation with country-level smoking (0.7081 and 0.5156, respectively), indicating the more dominant negative externalities of obesity.

Figure 9: Country-level obesity (BMI>30) versus country effects, 2011
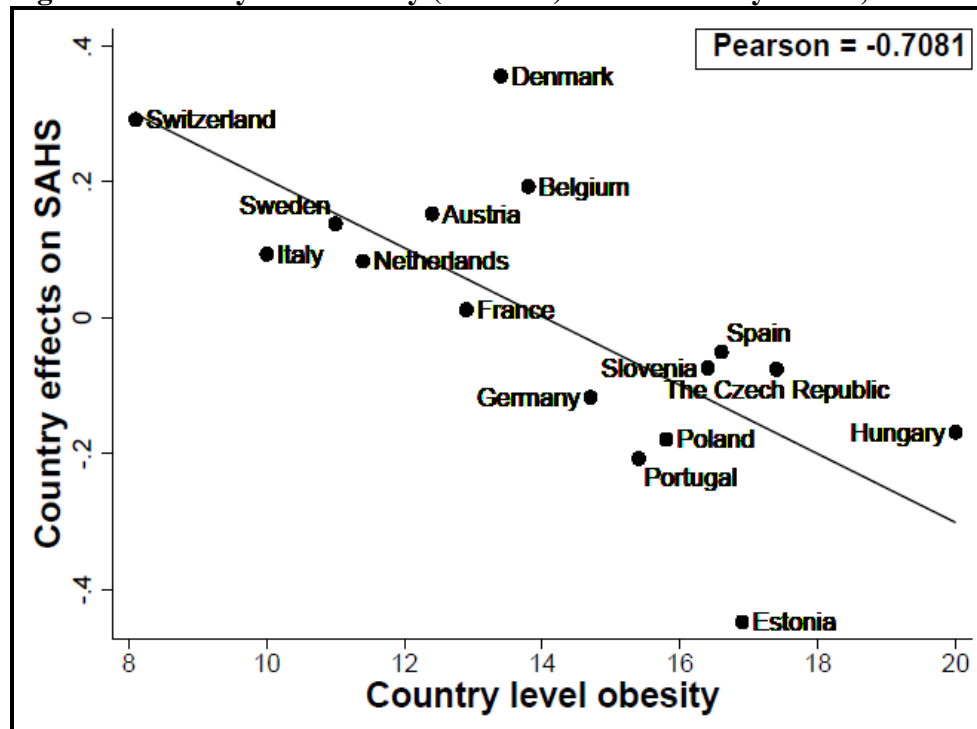
Source: OECD (2013) and Table 2

It should be noted that a correlation coefficient of about 0.6 (in absolute value) is unusual by standards of behavioral science. It is high by the cut-offs suggested by Cohen's (1988) rules-of-thumb, which argued that in human data an correlation coefficient value over 0.5 should be seen as large association, and 0.3 as a medium one. A coefficient of 0.6 is the same degree of correlation as, for example, has been found for people's own life-satisfaction readings, taken 2 weeks apart (that is, using the same well-being question, asked of the same person).

In this study we focus on the effects of personal and societal behavioral risk factors. Obviously, correlates of aggregate SAHSs and other macro measures can also be investigated. In particular, correlates with diverse economic development measures. Garcia-Muñoz et al. (2013) look into the effects of development measures and aggregate net SAHSs, and find significant positive correlations with: per-capita GDP; the Human

Development Index (HDI); life expectancy at birth; per-capita expenditures on health; and expenditures on education, as percentage of GDP.[18]

An alternative examination of the effects of country-level measures on SAHS, could be performed by adding to the regression presented in Table 1, country measures of risk factors and other macros. Due to high correlations between some of the country measures, and in order to avoid multicollinearity only five country-level variables have been added: percentage of obese individuals, percentage of smokers, per-capita liters of annual alcohol consumption, life expectancy at birth and the Gini Index. Regression results are presented in Table 4. The results reconfirm the observation that both individual characteristics and country-level measures affect SAHSs. Country-level obesity has a significant effect (p=0.010), country-level alcohol consumption and smoking do not affect aggregate SAHSs.[19] Income inequality (measured by the Gini index has a negative effect on SAHS, while life-expectancy has a positive effect (significant at the 10 percent significance-level).

Table 4: Determinants of SAHS, multilevel regression, with country-specific aggregate measures, SHARE 2011

Variables	Coefficients (z-statistics)
(i) Socio-demographic personal variables	
Male	-0.076 (-6.714)***
Age (years)	
50-60 Ref.	
61-70 0.016 (1.033)	
71-80 -0.023 (-1.150)	
81-90 -0.041 (-1.592)	
more than 90 0.081 (1.177)	
Education	
More than 12 years of schooling 0.111 (9.282)***	
Marital status	
Single/Divorced/Separated Ref.	
Married 0.028 (1.843)*	

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[18] The sample in that study is somewhat different. However, replication of the examinations of all the above development measures leads to significant positive correlations in our sample too. Results can be provided by the authors upon request.

[19] Could be the insignificant effect of smoking is related to the high correlation between country-levels of obesity and smoking (a correlation coefficient of 0.5496 in our sample).

Variables	Coefficients (z-statistics)
Widowed	0.015 (0.723)
Number of children in household	0.037 (0.914)
Living parents	
Mother	0.063 (4.217)***
Father	0.074 (3.407)***
Old age pension	0.033 (2.380)**
(ii) Medically based health	
Drug use (number of drugs)	-0.081 (-16.768)***
Health conditions – diagnosed with	
Heart problems	-0.140 (-8.286)***
Hypertension	-0.025 (-2.064)**
Cerebral vascular disease	-0.158 (-5.672)***
Diabetes	-0.114 (-6.785)***
Chronic lung disease	-0.171 (-8.133)***
Arthritis	-0.199 (-14.932)***
Osteoporosis	-0.064 (-1.444)
Cancer	-0.356 (-14.607)***
Number of medical symptoms	-0.127 (-31.173)***
Medical consultation (number)	-0.013 (-20.641)***
Hospitalization (dummy)	-0.182 (-12.372)***
Quality of eyesight (range of 1-5)	0.163 (27.985)***
(iii) Behavioral risks	
Smoking	
Smoked in the past but not currently	**-0.016 (-0.944)**
Smokes now	**-0.120 (-8.785)***
Alcohol use	
3 or 4 days a week	**0.063 (3.202)***
5 or 6 days a week	**0.108 (3.648)***
7 days a week	**0.032 (2.374)**
Obesity	
BMI between 30-40	**-0.098 (-7.337)***
BMI higher than 40	**-0.126 (-2.286)**
(iv) Functional Capacity Indices	
ADL	-0.033 (-6.980)***
IADL	-0.019 (-3.972)***
(v) Cognitive abilities	
Number of remembered animals	0.011 (14.195)***
(vi) Country measures	
Percentage of obese individuals	**- 0.036 (-2.559)**
Percentage of smokers	**0.010 (0.980)**
Per-capita liters of annual alcohol consumption	**-0.008 (-0.511)**
Life expectancy	**0.032 (1.791)***
The Gini Index	**-3.791 (-4.481)***
Sample Size	23,805

Variables	Coefficients (z-statistics)
R^2	0.46

* significant at 0.10; ** significant at 0.05; ***significant at 0.01

Notes: Country random-effects are included;

R^2 for two-level models, is the proportional reduction in the estimated total residual variance, comparing the null model without covariates with the model of interest (Snijders and Bosker, 1999)

4. Concluding remarks

Our empirical study is based on data for about 23,800 respondents from 16 European countries and employs numerous variables from the SHARE data base.

The core conclusions that are derived from the 2 parts of the statistical analysis are the following:

(i)   The estimation of self-assessed-health-status regression provides clear evidence of the *effects of behavioral risk factors (smoking, alcohol consumption and obesity) on the individual's subjective rating of her/his health status, beyond and above the obvious effects of health conditions (that are also caused by the behavioral risk factors)*. The second, more innovative, finding is related to the effects of country-specific macro variables on the subjective-health of the residents, beyond and above those of the personal characteristics. It is therefore not only 'who you are' that affects the subjective rating of health, but also 'in which country you live'. Country-specific aggregate SAHSs are derived, using Multilevel Regression Analysis. These country effects are then examined for correlations with objective country health-risk macro measures. They include: share of smokers on a daily/regular basis; alcohol consumption (per-capita liters per year); share of obese individuals in the country. It appears that country-level smoking and obesity affect negatively aggregate country SAHS, while alcohol consumption has no effect. To the best of our knowledge, such an investigation in the domain of health is novel.

(ii)   *Preventive-health schemes* that will reduce the share of smokers and of obese individuals will lead to an increase in individual SAHSs and consequently will reduce health-care expenditures. As obesity has a stronger effect on SAHS

(Figure 9 and Table 4), the benefits of preventive treatment are most probably more pronounced in the case of obesity. A recent study by the European Centre for International Political Economy (ECIPE, Erixon et al., 2014) estimates that European countries can make huge savings in future health-care expenditures related to obesity if they use effective life-style weight-management programs to treat obesity today: If governments would spend existing and future obesity treatment expenditures on cost-effective preventive programs (employed today), the UK and Spain would be able to reduce health-care expenditures related to obesity in 2030 by 10 and 12 percent (respectively). Germany could save around 6 percent, while Sweden could save as much as 55 percent of future health-care expenditures related to obesity.

(iii)   The evidence that country-level risk factors (and other country measures, see Garcia-Muñoz et al., 2013) do affect subjective-health, can be related also to the heated debate between the supporters and the opponents of the so-called *'Easterlin Paradox'* extending it from the domain of well-being into the domain of health. Easterlin concluded: "*what is true for the individual is not true for society as a whole*" (Easterlin, 1973, page 4, italics in the original), suggesting that wealthy people tend to be happier than poor people in the *same country*, but that there is no such relationship *across countries*, or *over time.* Layard (1980) and Graham and Pettinato (2001) presented evidence that supported the 'Easterlin Paradox'[20], while other studies (e.g., Deaton, 2008; Stevenson and Wolfers[21], 2008; and Sacks, Stevenson and Wolfers, 2010)

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[20] Layard was even more succinct and concluded: "a basic finding of happiness surveys is that, though richer societies are not happier than poorer ones, within any society happiness and riches go together" (page 737). Graham and Pettinato (2001) examined data for a sample of 17 developing economies in Latin America and arrived at a similar result: No clear relationship between gross national product and happiness. In an attempt to explain the paradox, researchers used models emphasizing reference-dependent preferences, relative income, and satiation point models (see for instance: Veenhover, 1991; Diener et al., 1993; and Clark, Frijters and Shields, 2008 for a review paper).

[21] Using the 2006 Gallup World Poll that was conducted in 132 countries, Deaton arrived at a clear-cut conclusion that average life satisfaction is strongly related to per-capita national income. Moreover, unlike most previous findings, he found that the effect holds across the full range of international incomes, and it is even slightly stronger among rich countries. Stevenson and Wolfers (2008) were even more succinct. Based on a statistical analysis of several rich data bases, they conclude that "*Across the world's population, variation in income explains a sizable proportion of the variation in subjective well-being. There appears*

challenged it. Overall, our findings (twisted from the well-being to the health domain) indicate that what is true for the individual, is also true for the country as a whole: both *individual* and *country-level* (smoking and obesity) risk factors affect subjective-health and the two levels of risk accumulate and reinforce the subjective-health assessment.[22] Also, better economic development measures of a country lead to higher valuations of the subjective-health of its residents (everything else being equal). This seems to be at odds with the 'Easterlin Paradox' that emphasizes within country individual effects and denies cross-country effects.

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to be a very strong relationship between subjective well-being and income, which holds for both rich and poor countries" (page 2). There is an extensive literature of criticisms of the 'Easterlin Paradox', as well as the replies. A review of this literature is obviously beyond the scope of this paper.

[22] Also, more favorable economic development measures of a country lead to higher valuations of the subjective-health of its residents (everything else being equal).

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APPENDIX

Table A.1: Sample characteristics

Dependent Variable. SAHS (range of 1-5)	2.83(1.06)
(i) Socio-demographic personal variables	
Male (%)	49.32
Age in years (%)	
50-60	27.24
61-70	38.18
71-80	24.70
81-90	9.25
more than 90	0.68
Education	
More than 12 years of schooling (%)	31.77
Marital status (%)	
Married	74.12
Widowed	12.34
Number of children in household	0.01 (0.13)
Living parents (%)	
Mother	18.51
Father	6.89
Old age pension (%)	55.06
(ii) Medically based health	
Drug use (number of drugs)	1.65 (1.64)
Health conditions – diagnosed with..(%)	
Heart problems	13.13
Hypertension	39.44
Cerebral vascular disease	3.81
Diabetes	12.93
Chronic lung disease	7.04
Arthritis	24.43
Osteoporosis	1.43
Cancer	4.79
Number of medical symptoms	1.70 (1.71)
Medical consultation (number per year)	6.89 (9.37)
Hospitalization (%)	16.35
Quality of eyesight (range of 1-5)	3.37 (0.98)

(iii) Behavioral risks (%)
 Smoking

Smoked in the pat but not currently	**17.72**
Smokes now	**24.60**

 Alcohol consumption (%)

3 or 4 days a week	**7.92**
5 or 6 days a week	**3.17**
7 days a week	**22.77**

 Obesity (%)

BMI between 30-40	**20.08**
BMI higher than 40	**0.89**

(iv) Functional Capacity Indices (standardized)

ADL	-0.12 (1.49)
IADL	-0.17 (1.52)

(v) Cognitive abilities

Number of remembered animals	19.88 (7.52)

(vi) Country shares in the sample (%)

Austria	8.01
Germany	5.45
Sweden	6.37
The Netherlands	7.08
Spain	5.58
Italy	8.63
France	11.90
Denmark	6.96
Switzerland	5.43
Belgium	9.70
The Czech Republic	11.56
Poland	5.94
Hungary	1.80
Portugal	1.59
Slovenia	0.71
Estonia	3.29
Sample Size	23,805

Standard deviations in parentheses

Table A.2: Country-specific macro characteristics, OECD (2013)

Country	Smoking[23]	Alcohol consump.[24]	Obesity[25]	Life expectancy[26]	Gini Index[27]
Austria	20.5	12.2	12.4	81.1	0.26
Germany	21.9	11.7	14.7	80.8	0.30
Sweden	13.1	7.4	11.0	81.9	0.26
The Netherlands	20.8	6.9	11.4	81.3	0.29
Spain	23.9	11.4	16.6	82.4	0.32
Italy	22.5	6.9	10.0	82.7	0.34
France	23.3	12.6	12.9	82.2	0.29
Denmark	20.0	10.6	13.4	79.9	0.25
Switzerland	20.4	10.0	8.1	82.8	0.30
Belgium	20.5	10.8	13.8	80.5	0.26
The Czech Republic	24.6	11.5	17.4	78.0	0.26
Poland	23.8	10.4	15.8	76.9	0.31
Hungary	26.5	10.8	20.0	75.0	0.27
Portugal	18.6	11.4	15.4	80.8	0.35
Slovenia	18.9	10.6	16.4	80.1	0.24
Estonia	26.2	12.0	16.9	76.3	0.32

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[23] Percentage of the population, aged 15 and over, who smoke on a daily basis.

[24] Alcohol consumption, measured by annual sales of pure alcohol in liters per-capita (by individuals aged 15 years and over).

[25] Country percentage of obese individuals (BMI>30).

[26] Life expectancy at birth is defined as the average number of years that a newborn is expected to live, assuming that current mortality rates will not change.

[27] The Gini Index measures the extent to which the distribution of income (or, in some cases, consumption expenditures) among individuals or households within an economy, deviates from a perfectly equal distribution. A Gini Index of 0 represents perfect equality and 1 represents perfect inequality.