IMPACT OF SOCIO-ECONOMIC STATUS ON SELF-ASSESSED HEALTH IN DEVELOPING AND DEVELOPED COUNTRIES AND FOR MEN AND WOMEN

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Abstract

There is a shortage of information of key demographic (age and sex) and socioeconomic variables on adult mortality and morbidity in less developed countries (LDCs). We aim to fill part of this gap by focusing on self-assessed or self-defined morbidity and use data collected by the World Health Survey in 21 countries in 2002 and 2003. The countries included in this report are from West and East Europe, Latin America, Africa and Asia. In all countries self-assessed health of women was worse than of men. The percentage in less than good health increased with age in all countries. In most countries there was a significant impact of wealth status and education on self-defined morbidity: the higher the wealth status and the higher the level of education, the lower was the percentage in less than good health. We also expected that in countries characterized by high income inequality there would be a larger impact of wealth status on health than in countries with low inequality. There was limited empirical support in favour of this hypothesis; it was found in a number of countries, but not in others. The results shown here are preliminary: we plan to include more countries and to apply techniques limiting bias in the measurement of self-assessed morbidity.

Introduction

For all countries in the world adult mortality rates are known or good estimates are available (e.g., UN, 2007). There is much less information on adult morbidity. Estimates on a regional basis are available from the Global Burden of Disease project of WHO, but not at the country level. Figures on adult morbidity in a large number of countries have recently become available form the World Health Survey (WHS). Information on morbidity is derived from the respondents of this survey; we are, therefore, dealing here with self-reported or self-defined or self-assessed morbidity or health. Data on self-assessed health were collected in 72 surveys conducted in both less developed and more developed countries.

In this paper we also plan to focus on several aspects of self-reported morbidity including how it relates to age and gender but we will focus in particular on the impact of socio-economic status. Many studies - usually carried out in more

developed countries (MDCs) - have shown that there are negative relationships between socio-economic status (e.g., income, education) and adult mortality (e.g., Wilkinson and Pickett, 2006; Mackenbach et al, 2008). There is much less information on this last topic in less developed countries (LDCs) and the relevance of our project is that it helps to fill part of this gap. We cannot do this for adult mortality as the outcome variable, however, due to lack of data. Instead, we will focus on self-assessed morbidity as the outcome variable in a number of LDCs and MDCs.

Objectives and Hypotheses

The first objective of our project is to derive two health status measures from the available WHS data and to test their validity. This testing of validity is necessary, because the two instruments needs to measure morbidity in a comparable manner in a wide range of settings. The second objective is to determine if and to what extent adult men and women rate their health differently in both LDCs and MDCs. The third objective is to look at differences in self-assessed health by age. The fourth aim is to study the impact of socio-economic status on (adult) self-assessed health in both less and more developed countries. Inequality in health (morbidity) exists in MDCs by income and education. The topic we want to investigate to what extent this inequality also exists in LDCs. We hypothesize that this inequality by socioeconomic status (measured by income and education) is actually larger in LDCs than in MDCs. This is due to the fact that differences in income (income inequality) and education are in many LDCs larger than in MDCs.

Based on a literature review (not included here), we formulate the following hypotheses. The first is that in both MDCs and LDCs women consider themselves to be in less good health than men. The second hypothesis is that self-assessed morbidity will increase by age in all countries, but patterns in increase will differ. We further hypothesize the existence of positive relationships of socio-economic status with self-assessed health in both more and less developed countries: the higher is the socio-economic status, the higher is the percentage in good health. A fourth hypothesis is that the strength of the socio-economic status – self-assessed health relationship varies. The gradient of the socio-economic status – self-assessed health relationship is larger in a number of LDCs with considerable income inequality than in MDCs with relatively low levels of income inequality. A fifth hypothesis is that the impact of education on adult health is (more or less) similar as the one of income on health. A sixth hypothesis is that in both MDCs and LDCs the relationship of socio-economic status with self-assessed health is stronger for men than for women.

Data and Methods

The World Health Survey consists of a number of cross-sectional sample surveys that were carried out in 72 countries in 2002 and 2003 by WHO. The number of

respondents varied in most countries from about 1,000 (in many European countries) to 10,000. The respondents were randomly selected on the basis of a nationally representative sampling frame. Randomly selected households were contacted first; after that one adult person within these households was selected and then interviewed. Each survey contains a number of topics that are covered in a Household and an Individual Questionnaire. In a number of countries a long version of the Individual Questionnaire was used (90 minutes) while in other countries a short version (30 minutes) was used. Extensive pre-testing of the questionnaire took place in the WHO Multi-country Survey on Health and Responsiveness in 2000-2001 and in a pilot study that was carried out in 12 countries in early 2002. In the various phases of implementation of the surveys attention was paid to obtaining high-quality data (e.g., adequate training of interviewers and supervision, calculation of Sample Population Deviation Indices, response rates, rates of missing data and reliability coefficients for test-retest interviews). Details of the methodology are provided in Ustin et al, (2003).

We selected 21 countries from the WHS database in five regions (4 in West Europe, 4 in Central and East Europe, 5 in Latin America , 4 in Sub-Saharan Africa) and 4 in Asia with roughly similar mortality levels (within these five regions except Asia). However, income inequality, measured with the Gini index (GI) varied between and within in three of the five regions (not in West Europe and in Asia). Values of the Gini index were obtained from the United Nations Development Report 2006 (UNDP, 2006). A low value indicates a relatively low level of income inequality, a high value a relatively high income inequality. Countries were in the four of the five regions chosen in such a way that the rank order of the countries in terms of their Human Development Index (HDI) score was roughly similar (exception was Asia). The HDI rank is a good proxy of levels of development and of mortality in general.

The 4 selected countries in West Europe were: United Kingdom, Germany, Spain and Portugal (all with relatively low GI coefficients). The 4 countries in Central and East Europe were: Hungary and Ukraine (relatively low GI values) and Kazakhstan and Russia (relatively high GI values). The 5 countries in Latin America were: Mexico, Dominican Republic and Uruguay (fairly low GI values) and Brazil and Paraguay (very high GI values). The 4 countries in Africa were: Ghana and Senegal (fairly low GI values) and Namibia and South Africa (very high GI values). The 4 countries in Asia were India (6 states), Bangladesh, Sri Lanka and Vietnam (all with fairly low GI values, but not always at the same HDI level).

A Health Status Index (HSI) and a Self-Rated Health (SRH) measure were used as the outcome variables. The HSI was derived from the WHO Disability Assessment Schedule and a total of 14 questions were used on the ability to carry out a number of routinely performed daily activities dealing with aspects such as mobility, self care, vision and other questions dealing with experiencing pain, bodily discomfort, anxiety and depression. There are 5 response categories

for each of these items ranging from No difficulty (=1) to Extremely Difficult/Impossible (=5). Principal component analysis was used to create an interval level variable derived from the first component. This first component was in all countries by far the most important with an Eigenvalue of 7 and more and explaining 35 to 50% of the variance. The SRH measure is based on a single question: “How do you rate your health? Very good (=1), Good (=2), Moderate (=3), Bad (=4) and Very bad (=5)”. Scores are transformed into an ordinal level variable.

Wealth status was used as a proxy for income and in the Western and Eastern European countries based on ownership of 19 assets (e.g., house, car, computer, telephone, etc.). The list of items used in Latin America, Africa and Asia was somewhat different from used in the European countries. Principal Component Analysis was performed to create an interval level variable. In all countries the first factor was by far the most important with an Eigenvalue of 5 or more that explained between 25 and 30% of the total variance. This variable was used and was then transformed into five quintiles each containing about 20 percent of all cases.

We used two dependent variables namely the HSI and the SRH while the independent variables were age, sex, wealth status and education. The analysis was carried out in the following sequence. First, we studied differences in self-assessed health measured by HSI and SRH for adult males and females 20 years and older (age-adjusted). Next, we looked in detail at the relationship of age with self-assessed health. Next, we determined how income and education were related to the two dependent variables (HSI and SRH) before and after controlling for other variables in particular age and sex.

As techniques of multivariate analysis we used multiple regression analysis (age and health status) and logistic regression analysis (socio-economic status and health status). Logistic regression was chosen because the two health status variables had very skewed distributions. Rate differences, regression coefficients and odds ratios were used to measure the strength of the relationships of the independent variables with health status (Kunst et al, 2004).

Results

Age-adjusted self-defined morbidity by gender

Table 1 shows the age-adjusted percentages in less good health according to HSI and SRH by gender in the 21 countries. Percentages in less good health according to HSI (men and women together) were the highest in Bangladesh, India, Senegal, South Africa, Brazil and Russia and lowest in most West European, two Latin American and two Asian countries. There is to some extent a different rank order of countries when SRH is used as health measure (instead of HSI). The highest rates are found in Ukraine, Russia and Bangladesh and the

lowest in Uruguay, United Kingdom, Germany and Spain. There are, therefore, obvious discrepancies in outcomes between HSI and SRH. For example, according to SRH the percentages in less good health are higher in Ukraine and Russia than in Ghana, South Africa and Namibia and this is rather unexpected. We will elaborate on these discrepancies later.

(Table 1 here)

Another finding is that in all the 21 countries adult women rate their level of health lower than that of the men: a higher percentage of women consider themselves to be in less good health than men. Using HSI for all 21 countries together, the difference is 13.9 percentage points. Using SRH the overall difference by sex is 9.4 percentage points. Differences by sex tend to be lower in 2 of the 4 Western European countries (i.e., United Kingdom, Germany) and in Hungary than in all the other countries (for both HSI and SRH). The largest differences by gender are found in Portugal.

Self-defined morbidity by age

Table 2 shows the relationship of age with HSI and SRH in the 21 countries expressed in the form of regression coefficients. For males 20 years and older in all countries together, the regression coefficient using HSI is 4.81 for males and 4.68 for females. This means that on average for every increase in age by five years, the percentage in less good health increased by nearly 5 percentage points for males and a little less (4.68) for females.

(Table 2 here)

Table 2 shows that there is variation in the strength of the relationship of age with health in the 21 countries. It tends to be small in 1 of the 4 West European countries (United Kingdom) and in 4 of the 5 Latin American countries and in Bangladesh with regression coefficients varying from 2.5 to 3.7 (HSI measure used) (for both males and females). Differences by age are particular large in Sri Lanka, Vietnam and the 3 East European countries with regression coefficients between 6 and 7.

Patterns of increase vary by country. In the five countries just mentioned (with large regression coefficients) the percentage in less good health was very small (from 10 to 20 percent) in the age group 20-24 years old and it increased to very high (between 90 and 100 percent) for the group 80 years and older. Bangladesh is an example of a country with a different pattern: the percentage in less good health was in general very high (see Table 1) and it has fairly low regression coefficients. The reason for this is that the percentage in less good health was already high at young ages (about 60 percent in age groups 20 to 40) and was high in the older age groups (close to 100 percent in age groups 80 years and older). The United Kingdom is an example of still another pattern: it also has

rather low regression coefficients but the percentage in less good health is low at younger ages (about 20% in the age group 20-24) and it increases with age, but at a much slower rate than in, for example, Bangladesh (until about 60 percent in the age groups 60 years and older).

Comparison of self-defined morbidity with life expectancy

We now compare the percentages in less good health (using both HSI and SRH) by gender with life expectancies at birth by gender for all countries together (unweighted) (Table 3). Very clear differences can be seen here. In all the 21 countries life expectancy at birth was higher for males than for females (in 2000-2005) while in all these same countries the overall percentage in less good health (for both HSI and SRH)(age-adjusted) was higher for women than for men (20 years and older). Table 3 shows, for example that for all 21 countries together the difference in life expectancy by gender was about 6 years in favour of women while the difference in less good health (using HSI) was about 14 percentage points in favour or men.

(Table 3 here)

We also looked at differences in perceived heal by gender in the various age categories in the 21 countries. In most countries the differences between males and females are largest in middle age (age groups between 50 and 65) (HSI measure used).

Validity of the two self-defined morbidity measures

We also compared the two self-defined morbidity measures with life expectancy in each of the 21 countries. We want to know in particular to what extent there is a correlation in the rank order of the morbidity measures (HSI and SRH) in the 21 countries with the rank order of the mortality measure. The result can be found in Table 4. The correlation of the rank order of HSI and life expectancy for males and females is high (0.813 for males, 0.800 for females and 0.828 for both sexes). In other words, the correspondence in the rank order between the HSI measure and life expectancy is high. The largest discrepancies between HSI and life expectancy are found in three countries: Portugal and Brazil (a much higher percentage in less good health according to HSI than according to life expectancy) and Ghana (a much smaller percentage in less good health according to HSI than according to life expectancy).

(Table 4 here)

Table 4 also shows that there is low correspondence between the rank orders of SRH and life expectancy (correlation coefficients of 0.291 for males, 0.381 for females and 0.396 for the total). This means that the SRH measure is a much worse predictor of the mortality level in a population than is the HSI measure.

There are in particular six countries that deviate very much in the rank orders of SRH and life expectancy namely Ghana, South Africa and Namibia (they have, on average, much better health according to SRH than according to life expectancy) and Portugal, Ukraine and Vietnam (they have on average much worse health according to SRH than the mortality levels indicate).

Use will be made of these findings when describing the findings on the impact of two socioeconomic variables on the self-defined morbidity variables (HSI and SRH) to be presented in the next sections. We will exclude findings dealing with the HSI and SRH variables as the dependent variables in those cases in which there is reason to have doubts about the validity of these measurements. This is the case for those countries that have low correlations of the HSI and SRH variables with life expectancy.

We also noticed a pattern in the discrepancies in ranking of the SRH measure and the life expectancy measure by region (data not shown here). All four African countries scored much higher on the SRH measure than on life expectancy. In other words, the respondents in these countries believed themselves to be in better health than the levels of life expectancy would suggest. The opposite pattern was noticed in several of the 4 Central and East European countries (especially Ukraine and Russia). The respondents in these countries were of the opinion that they were in general in worse health than the level of life expectancy would indicate

Another aspect of validity is the correlation of the rank orders of the HSI and SRH variables. This is also shown in Table 4. In general the correlations are moderate (0.439 for males, 0.521 for females and 0.542 for both genders). This is an indication that HSI measures different aspects of self-defined health than SRH. Actually the correspondence is fairly high in most of the 21 countries, but there are, however, 3 countries in particular with low correspondence in the rank orders of HSI and SRH. These countries are Vietnam, Ukraine and South Africa (for both men and women). Vietnam and Ukraine score low on HSI (they have relative small percentages in bad health), but very high on SRH (they have relative high percentages in bad health). In South Africa we see the opposite pattern: this country scores high on HSI (high percentages in bad health for men and women) and low on SRH (small percentages in bad health).

Wealth status and self-defined health

We now turn to the topic of the impact of socio-economic status on self-assessed health. This is done by means of logistic regression analysis whereby the percentages in less good health (for both HSI and SRH) are the dependent variables and age, wealth status and education are the independent variables. Age is only used here as a control variable since we are interested in the relationship of the two socioeconomic variables with perceived health after controlling for age. An example of the impact of the two socioeconomic variables

on health is provided in Table 5 referring to one particular country namely Spain. We see here, for example, that the odds for adult males in the poorest 20% of being in less good health were more than twice as high (2.2) than for adult males in the richest 20% (the reference category with a value of 1). We also see that the odds for being in less good health gradually increase with wealth status with odds ratios of 1.0, 1.0, 1.2, 1.5 and 2.2. The impact is statistically significant in the poorest 40% of the male population (1.5 compared to 1 and 2.2 compared to 1). A stronger impact can be observed of wealth status on health (both HSI and SRH) for adult women than for adult men (e.g., using HSI an odds ratios of 2.7 for women who belonged to the poorest 20% compared to 2.2 for men who belonged to the poorest 20%. Table 5 also shows in Spain a considerable impact of education on health and a stronger impact for women than for men.

(Table 5 here)

The next table shows the impact of wealth status on self-assessed health in 19 of the 21 countries expressed in the form of odds ratios calculated by means of logistic regression analysis (Table 6). In this table we only show the odds in the poorest 20% compared with the odds in the richest 20% (which is the reference category with an odds value of 1). Looking, for example at Spain we see here the same odds ratios for the poorest 20% as shown in Table 5. Our strategy is to make use of HSI measure as much as possible, but we will also add the results dealing with SRH measure. The strength of the association of wealth status with the two morbidity measures should be of the same magnitude. In a number of cases values, have not been shown (indicated by: n.u.= not used); they were deleted because they had the largest discrepancies in values between percentages in less good health (HSI and SRH) and life expectancy (described earlier with respect to Table 4).

(Table 6 here)

Results are described first for males and females together (columns showing Totals). In three Western European countries the odds of being in less good health (using both HSI and SRH) for the poorest 20% are between 2.3-4.0 times higher than the odds of being in less good health in the richest 20% (the reference category = 1). The odds ratios for the poorest 20% are on average somewhat lower in three Eastern European countries than in Western countries. Four of the five Latin American countries have also on average lower odds ratios for the poorest 20% than in Western Europe. The exception is Brazil with has a high odds ratio for the poorest 20% (SRH measure: 3.7). South Africa and Namibia have high odds ratios for the poorest 20% (HSI measure: 4.6 and 3.0) while Senegal is characterized by no differences between the poorest and richest 20% (HSI measure: 1.0 and SRH measure: 0.9). The four Asian countries have odds ratios of being in less good health that vary for the poorest 20% from substantial (HSI measure: 2.7) to small (SRH measure: 1.3) compared to the richest 20%.

The odds ratios of the HSI and SRH measures of Table 6 should be roughly similar. They are of the same magnitude in most countries. There are, however, four exceptions: the largest discrepancies exist in Germany (e.g., HSI measure: 2.5 versus SRH measure: 4.0) and there are also deviations from the expected pattern in Hungary, Russia and Bangladesh. The overall odds ratios in all 19 countries together of being in less good health of the poorest 20% is on average twice as high as that of the richest 20% (HISI measure: 2.0, SRH measure: 2.2) (unweighted).

Table 6 also shows the differences in the wealth status-health status relationship for adult males and females separately. In six countries the impact is larger for women than for men (Germany, Spain, Brazil, Uruguay, South Africa and Namibia) while in nine countries the impact is larger for men than for women (Kazakhstan, Ukraine, Russia, Mexico, Uruguay, India, Bangladesh, Sri Lanka and Vietnam). In the remaining countries there is either no difference between men and women (Senegal) or the evidence is contradictory (United Kingdom, Hungary and Paraguay).

Wealth status and self-defined morbidity by level of income inequality

Preliminary findings on variation of the strength of the wealth status – self-defined morbidity relationship by the level of income inequality in a country (measured with the Gini Index) can also be derived from Table 6. In several comparisons we did find support for the hypothesis, formulated earlier, that the strength of this relationship varies with the Gini Index (and after controlling for the level of mortality in general). For instance, the impact of wealth status on morbidity was larger in Brazil (with a very high GI) than in Mexico (with a lower GI) (SRH measure: 3.7 in Brazil versus 1.5 in Mexico). The impact was also larger in Brazil than in the Dominican Republic (SRH measure: 3.7 in Brazil versus 1.3 in Dominican Republic). The impact was larger in South Africa (with a high GI) than in Senegal (with a low GI) (HSI measure: 4.6 in South Africa versus 1.0 in Senegal). The impact was also larger in Namibia than in Senegal (HSI measure: 3.0 in Namibia versus 1.0 in Senegal). However, in other comparisons we did not find evidence supporting our hypothesis mentioned above. It is not so that the strength of the relationships of wealth status and morbidity was larger in Kazakhstan and Russia (with higher GI values) than in Hungary and Ukraine (with lower GI values). Likewise, the impact of wealth status was only slightly higher in Paraguay (higher GI value) than in Uruguay (lower GI value).

Education and self-defined health

Table 7 shows the impact of education on self-assessed health in 19 countries. The 7 countries in West and East Europe are only roughly comparable with those of the other 12 countries, because we could only use three levels of education in the former and five levels in the latter. We will focus first on the impact of

education on morbidity for men and women together (the Total columns). Table 7 shows that in most countries the odds of being in less good health for adults with a low level of education (less than primary or no schooling) were on average twice as high as those with a high level of education (university or higher). There are, however, exceptions. Odds ratios are smaller than the average in Russia, Dominican Republic and Senegal while odds ratios are higher than the average in Brazil, South Africa and Sri Lanka.

(Table 7 here)

In 7 countries the impact of education on self-defined health is larger for men than for women while in 8 the opposite can be observed. Clear examples of the former are Brazil and Sri Lanka and of the latter Hungary, South Africa and Namibia.

Discussion

WHS proved to be an important source of information on one aspect of adult health in MDCs and LDCs namely prevalence of self-assessed morbidity. Valuable information was also obtained on sedveral of its determinants.

Comparison in outcome of the two self-defined morbidity measures

Two measures were used to determine self-assessed morbidity: Health Status Index and Self Reported Health. We were able to show that in particular the external validity of the first measure (HSI) was satisfactory. It had a much larger correlation with life expectancy (at birth) than the SRH measure.

An intriguing result was the discrepancy in the overall (age-adjusted) percentages in less good health between HSI and life expectancy and between SRH and life expectancy in two regions. The contrast is particularly large between, on one hand, the African countries and, on the other hand, the Central and East European countries. There is a tendency for respondents in all four African countries to consider themselves to be in better health according to the SRH than according to the level of life expectancy. In other words, they consider themselves to be in better health than the mortality figures indicate. Exactly the opposite pattern is observed in the four Central and East European countries; these respondents believe that their state of health is worse (according to SRH) than the level of life expectancy in these countries suggests. Roughly similar differences in the ranking of health status between Africa and East Europe exist when comparing scores of SRH with HSI (data not shown here).

There may be cultural reasons that could explain the differences in perception of health between the African and the Central and East European countries. There is evidence from a qualitative study conducted in Russia that living in that country is considered to be very stressful (Pietila and Rytkonen) and that this stress may

influence how people define and evaluate their health. The same may apply to the other countries in that region. In African countries there may be a pattern of denial of the seriousness of health problems or the respondents in these countries may be more optimistic than the mortality figures warrant. An indication that this could be the case is the pattern of denial on the existence of HIV/AIDS and related diseases that has been observed in South Africa and perhaps in other countries as well.

Self-defined morbidity by gender and age

There were considerable differences in self-assessed health in adult men and women. This is in accordance with the second hypothesis formulated earlier. In all 21 countries women considered themselves on average to be in worse health than men (a larger percent of women said they were in less good health than men). This has already been found in several other studies conducted in MDCs (see, e.g., Kunst et al, 1995; Kunst et al., 2004), but we showed that this also the case in LDCs. There was some evidence to suggest that differences in health between men and women were smaller in MDCs than in LDCs, but there were also exceptions. Further analysis is necessary before this can be confirmed.

We also found a strong positive relationship of age with self-assessed morbidity in all 21 countries. This supports the third hypothesis. We also showed, however, that there were considerable differences in the gradients of age with morbidity. Regression coefficients derived from logistic regression analysis were used to determine the gradients of age with self-defined morbidity. Strictly speaking, we should have used odds ratios derived from logistic regression analysis since the dependent variables were dichotomous. Results of logistic regression were very similar to those achieved with multiple regression analysis (data not shown here) and we prefer to show the regression coefficients.

Impact of wealth status on self-defined morbidity

We also found in most MDCs and LDCs an impact of socio-economic status (measured by wealth status) on self-assessed health: the lower the wealth status, the higher the odds of being in less good health. This was found for both HSI and SRH measures. There is, therefore, empirical support for the fourth hypothesis formulated in the beginning of this paper. We are of the opinion that the validity of the HSI measure is higher and for this reason we focus on the HSI measure and rely on SRH as a supplementary measure. The results on West European countries are roughly in accordance with those found in earlier studies (see e.g., Kunst et al. 1995; Mackenbach et al, 2008) while the findings on several East European countries and LDCs are new. There is considerable variation in the wealth status – self-assessed morbidity relationships in LDCs. In three countries (Brazil, South Africa and Namibia) these associations are stronger than in West European countries. The strength of the associations was roughly similar in four Asian countries as in the West European countries. There

were also several countries with no or a weak association between wealth status and morbidity namely Kazakhstan, Ukraine, Dominican Republic, Paraguay and Uruguay; associations in these countries were either non existent or low for the HSI measure and/or the SRH measure.

The fifth hypotheses presented in the beginning of this paper states that differences in morbidity by wealth status are larger in countries that are characterized by high income inequality (Gini index) than in countries with low income inequality. We found limited evidence in support for this hypothesis, but not more than this. In a number of LDCs the relation of wealth status with morbidity is indeed larger than in others (after controlling for age). The larger than average differences in less good health by wealth status in several LDCs (e.g., Brazil, South Africa and Namibia) could be due to the large income inequality in these countries. This also fits with other results from three LDCs characterized by low income inequality in which there was no or a small impact of wealth status on health status (Mexico, Dominican Republic, Senegal). On the other hand, there was hardly any difference in differentials in morbidity by wealth status in Paraguay and Uruguay even though income inequality was higher in Paraguay than in Uruguay.

The evidence in Central and East European countries is also not in accordance with the fifth hypothesis. In these regions we did not find support for the hypothesis that health differentials by wealth status were larger in countries with high income inequality (Russia and Kazakhstan) than in two countries with low-income quality (Hungary and Ukraine). It is true that differences were larger in Russia than in Ukraine, but the opposite of what was expected was found in Hungary and Kazakhstan. In addition there is the problem that results using the HSI measure do not always match those of the SRH measure; in both Hungary and Russia the odds ratios of being in less good health for the poorest versus the richest 20 percent according are substantially higher for the SRH than for the HSI measure.

Impact of education on self-defined morbidity

We also provided data on the impact of education on self-assessed adult morbidity. Results are roughly similar to those on the impact of wealth status on morbidity. We encountered several problems when making these comparisons; they will be described next.

Limitations and plans for the future

In this paper we reported preliminary results; further analysis needs to take place along the lines mentioned next. We also plan to extend the analysis to more than the 21 covered in this report. There are also several limitations that need to be pointed out.

A problem inherent in the type of research described here is the lack of comparability between countries due to differences in quality of the data in the 21 surveys. We described earlier the efforts that were made to obtain information of high quality. One cannot rule out the possibility that differences between countries were influenced by sampling and non-sampling errors. Among the latter we need to mention the lack of precision of the instruments that were used. This pertains to the morbidity measures used, but also to measurement of wealth status. Lack of accuracy in one or both instruments could explain why, for instance, the odds ratios of being in less good health for the poorest versus the richest 20 percent differ when using the HSI measure instead of the SRH measure (in Germany, Hungary, Russia and Bangladesh). A frequently occurring problem in LDCs is also the lack of accuracy on the age of the respondents especially of older persons. This could explain why there is much variation among countries in the size of the association of age with the two morbidity measures.

A limitation of the comparisons that were made among the various countries on the topic of the relationship of wealth status with health status is that some of the indicators to measure wealth status were different in MDCs from those used in LDCs. Further research is needed to find out to what extent this limits the comparisons that were made.

A limitation on the comparisons of education with health status is the variation in educational composition in the 21 countries. Further research needs to be done to deal with this topic adequately. One possibility is to calculate and make use of the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) measures (Kunst et al., 2004).

Another limitation of the approach to measure health status through questions dealing with self-rated or self-assessed health is that judgments on health by respondents are not only made on the basis of actual health conditions, but are also influenced by norms and expectations about health. For this reason we plan to do more research on the reliability and validity of both the HSI and SRH indices that we used. In addition, we plan to apply two new techniques to adjust for the biases of the two health status measures. One is the anchored vignette approach (see e.g., Salomon et al, 2004) and the other is the use of a disease-weighted self-rated health measure (Mackenbach et al., 2008).

Still another limitation of our research is that for most of the participating WHS countries information is only available on self-assessed health and not on adult mortality. However, for some WHS countries data on adult mortality were collected with a module containing questions on survivorship of siblings. We plan to analyze data on this topic for those LDCS in which the module was used.

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Table 1 Two age-adjusted self-asessed health measures (% in in less good health), pop. 20 yrs +

21 COUNTRIES	Health Status Index % in less good health (sc.9-10)				Self Rated Health % in less good health (mod.,bad, very bad)				N
	Male	Female	Diff M/F	Total	Male	Female	Diff M/F	Total	
UNITED KINGD.	37.8	44.6	6.8	42.1	27.0	30.7	3.7	29.3	1,153
GERMANY	35.4	40.1	4.7	38.3	27.4	29.0	1.6	28.5	1,215
SPAIN	26.4	38.1	11.7	33.3	22.5	30.0	7.5	26.9	6,243
PORTUGAL	31.7	54.9	23.2	46.1	41.2	57.9	16.7	51.8	997
HUNGARY	35.8	43.7	7.9	40.5	39.6	43.0	3.4	41.7	1,379
KAZAKHSTAN	43.9	59.1	15.2	53.9	45.5	59.0	13.5	54.4	4,430
UKRAINE	42.2	59.2	17.0	53.3	61.1	72.6	11.5	68.7	2,755
RUSSIA	51.1	62.6	11.5	58.4	53.0	64.1	11.1	60.1	4,318
MEXICO	29.7	41.7	12.0	36.6	31.8	40.4	8.6	36.8	36,756
BRAZIL	48.5	67.5	19.0	59.2	41.4	54.1	12.7	48.6	4,755
DOMINICAN REP.	33.3	55.1	21.8	45.0	37.1	53.6	16.5	45.9	4,306
PARAGUAY	42.7	64.2	21.5	54.3	27.5	36.5	9.0	32.4	4,828
URUGUAY	29.9	42.1	12.2	36.2	15.4	23.3	7.9	19.4	2,902
GHANA	41.6	56.8	15.2	50.0	25.7	33.8	8.1	30.2	3,727
SOUTH AFRICA	51.8	65.3	13.5	58.9	28.5	38.5	10.0	33.8	2,195
SENEGAL	56.0	72.1	16.1	63.8	40.5	51.4	10.9	45.7	2,632
NAMIBIA	47.8	58.9	11.1	54.6	27.4	37.7	10.3	33.6	3,738
INDIA (6 ST.)	52.8	67.9	15.1	60.6	41.0	49.7	8.7	45.5	9,252
BANGLADESH	69.0	84.0	15.0	76.3	56.1	62.6	6.5	59.5	5,232
SRI LANKA	38.3	48.8	10.5	43.9	27.2	33.2	6.0	30.4	6,393
VIETNAM	33.5	43.7	10.2	39.2	47.5	59.9	12.4	54.4	3,312
Average	41.9	55.7	13.9	49.7	36.4	45.8	9.4	41.8	

Table 2 Impact of age on self-defined health (% in less good health)(2 health status measures) expressed as regression coefficients, population. 20 yrs +, (linear regression anslysis)

21 COUNTRIES	Health Status Index % in less good health (sc.9-10)		Self Rated Health % in less good health	
	Male	Female	Male	Female
UNITED KINGD.	2.95	3.73	2.29	2.39
GERMANY	5.23	5.52	4.90	4.90
SPAIN	4.85	6.21	4.90	5.77
PORTUGAL	5.27	6.23	7.08	6.60
HUNGARY	4.21	4.37	5.39	5.61
KAZAKHSTAN	6.72	6.06	6.57	5.96
UKRAINE	6.01	5.25	5.44	4.62
RUSSIA	6.24	5.43	6.66	5.50
MEXICO	5.22	5.09	3.95	3.67
BRAZIL	3.28	2.59	4.67	3.47
DOMINICAN REP.	3.51	3.53	4.60	3.58
PARAGUAY	2.74	2.93	3.15	2.27
URUGUAY	3.17	3.49	2.63	3.05
GHANA	6.54	5.63	4.66	5.51
SOUTH AFRICA	3.38	4.52	5.16	5.45
SENEGAL	4.17	2.83	4.45	4.25
NAMIBIA	5.66	4.96	4.20	4.86
INDIA (6 ST.)	4.86	4.15	4.28	4.69
BANGLADESH	3.49	2.48	3.40	3.29
SRI LANKA	6.75	6.83	6.37	6.10
VIETNAM	6.67	6.50	5.82	5.41
Aver per country	4.81	4.68	4.79	4.62

Table 3 Average % in less good health (derived from 2 measures: HSI and SRH) compared with average life expectancy at birth in these countries (2000-2005), 21 countries, population 20 years +				
		Male	Female	Total
% in less good health	Health Status Index (HSI)	41.9%	55.7%	49.7%
	Self Rated Health (SRH)	36.4%	45.8%	41.8%
Life Expect	at Birth (years)	65.6	71.6	68.6

Table 4 Correlation of rank orders of self-defined health (% in less good health) (2 measures: HSI and SRH) and life expectancy at birth and correlation of the two health measures (HSI and SRH), 21 countries, population 20 years +				
		Male	Female	Total
Correlation coefficient	HSI and Life Exp	0.813	0.800	0.828
	SRH and Life Exp	0.291	0.381	0.396
	HSI and SRH	0.439	0.521	0.542

Table 5 Impact of wealth status and education on self-defined health (% in less good health) (2 measures) expressed as odds ratios (Ref Cat: =1, richest 20% and university educ), age-adjusted, in Spain, pop. 25 years+, (logistic regression analysis)

SPAIN

WEALTH STATUS

	Health Status Index Odds ratios; % in less good health						Self Rated Health Odds ratios; % in less good health					
	Male			Female			Male			Female		
	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI
Poorest 20%	2.2*	(1.6	3.1	2.7*	(2.0	3.6	2.4*	(1.7	3.3	3.0*	(2.2	4.0
20%	1.5*	1.1	2.1	1.9*	1.5	2.5	1.7*	1.3	2.4	2.4*	1.8	3.2
20%	1.2	0.9	1.6	1.6*	1.3	2.1	1.7*	1.3	2.4	1.9*	1.5	2.5
20%	1.0	0.7	1.3)	1.4*	1.1	1.8)	1.1	0.8	1.5)	1.5*	1.1	1.9)
Richest 20%	1.0			1.0			1.0			1.0		

EDUCATION

	Health Status Index Odds ratios; % in less good health						Self Rated Health Odds ratios; % in less good health					
	Male			Female			Male			Female		
	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI	O.R.	Lower CI	Upper CI
< Primary	3.2*	(2.1	4.7	4.1*	(3.0	5.7	3.6*	(2.4	5.4	7.0*	(4.9	10
Primary	2.4*	1.6	3.4	2.2*	1.7	3.0	2.9*	2.0	4.2	4.1*	2.9	5.8
< Secondary	1.4	1.0	1.9	1.5*	1.1	1.9	1.6*	1.1	2.4	3.2*	2.3	4.4
Secondary	1.5*	1.0	2.1)	1.2	0.9	1.6)	1.2	0.8	1.9)	1.7*	1.7	2.5)
University+	1.0			1.0			1.0			1.0		

Table 6 Impact of wealth status (5 classes) on self-defined health (% in less good health)(2 health measures) expressed as odds ratios (poorest 20% vs richest 20%), age-adjusted, pop. 25 yrs + ,(logistic regression analysis)

21 COUNTRIES	Health Status Index Odds ratio Poorest 20% vs Richest 20%(=1)			Self Rated Health Odds ratio Poorest 20% vs Richest 20%(=1)		
	Male	Female	Total	Male	Female	Total
UNITED KINGD.*	2.4*	2.3*	2.3*	1.6	2.8*	2.3*
GERMANY**	2.2*	2.8*	2.5*	3.6*	4.4*	4.0*
SPAIN	2.2*	2.7*	2.5*	2.4*	3.0*	2.7*
PORTUGAL	n.u.	n.u.	n.u.	n.u.	n.u.	n.u.
HUNGARY**	2.0*	1.3	1.6*	2.4*	3.0*	2.6*
KAZAKHSTAN	1.3	0.8	1.0	2.2*	1.0	1.6*
UKRAINE	1.8*	1.0	1.3	n.u.	n.u.	n.u.
RUSSIA	1.6*	1.4	1.5*	3.1*	2.2*	2.6*
MEXICO	1.8*	1.4*	1.6*	1.6*	1.5*	1.5*
BRAZIL	n.u.	n.u.	n.u.	3.5*	4.0*	3.7*
DOMINICAN REP.	1.0	0.8	0.9	1.6*	1.1	1.3*
PARAGUAY**	1.2	1.4*	1.3	2.0*	1.9*	1.9*
URUGUAY	1.0	1.5*	1.3	1.7*	1.7*	1.7*
GHANA	n.u.	n.u.	n.u.	n.u.	n.u.	n.u.
SOUTH AFRICA	3.8*	5.8*	4.6*	n.u.	n.u.	n.u.
SENEGAL	1.2	0.8	1.0	1.1	0.7	0.9
NAMIBIA	2.7*	3.2*	3.0*	n.u.	n.u.	n.u.
INDIA (6 ST.)	2.5*	1.9*	2.2*	1.9*	1.5*	1.7*
BANGLADESH	2.7*	1.7*	2.2*	1.4*	1.2	1.3*
SRI LANKA	2.7*	1.8*	2.2*	2.5*	2.5*	2.5*
VIETNAM	3.5*	2.3*	2.7*	n.u.	n.u.	n.u.
Average per country	2.1	1.9	2.0	2.2	2.2	2.2

n.u.= not used

Table 7 Impact of education (3 or 5 classes) on self-defined health (% in less good health)(2 health measures) expressed as odds ratios (lowest level of education vs highest level), age-adjusted, population 25 yrs + ,(logistic regression analysis)

21 COUNTRIES	Health Status Index Odds ratio Lowest vs Highest Level (=1)			Self Rated Health Odds ratio Lowest vs Highest Level (=1)		
	Male	Female	Total	Male	Female	Total
EDUCATION: 3 CAT.						
UNITED KINGD	1.8*	1.2	1.4*	1.7*	1.4	1.5*
GERMANY	1.6	1.7	1.7*	1.9*	2.1*	2.0*
SPAIN	1.9*	1.9*	1.9*	2.3*	3.9*	3.1*
PORTUGAL	n.u.	n.u.	n.u.	n.u.	n.u.	n.u.
HUNGARY	1.6	1.9*	1.8*	2.6*	3.9*	3.4*
KAZAKHSTAN	1.7	1.2	1.5	2.5*	1.0	1.6*
UKRAINE	3.1*	1.5	2.0*	n.u.	n.u.	n.u.
RUSSIA	1.1	1.0	1.0	1.3	1.2	1.2
EDUCATION: 5 CAT.						
MEXICO *	2.6*	1.6*	1.9*	1.7*	1.7*	1.7*
BRAZIL	n.u.	n.u.	n.u.	9.6*	8.2*	8.7*
DOMINICAN REP.	0.6	0.7	0.7	1.9*	1.0	1.3
PARAGUAY	1.3	2.4*	1.9*	4.4*	3.1*	3.5*
URUGUAY	1.3	1.5	1.5	1.6	3.8*	2.9*
GHANA	n.u.	n.u.	n.u.	n.u.	n.u.	n.u.
SOUTH AFRICA	2.6*	5.2*	3.6*	n.u.	n.u.	n.u.
SENEGAL	1.0	1.2	1.1	0.9	1.5	1.0
NAMIBIA	1.5	4.8*	2.9*	n.u.	n.u.	n.u.
INDIA (6 ST.)	3.1*	3.8*	3.4*	2.0*	2.0*	2.0*
BANGLADESH	2.2*	2.5*	2.2*	1.7*	2.4*	1.8*
SRI LANKA	4.4*	3.2*	3.8*	4.3*	4.0*	4.1*
VIETNAM	4.5*	1.6	2.2*	n.u.	n.u.	n.u.
Average per country	2.1	2.2	2.1	2.7	2.7	2.7