Health, Wealth, and the Role of Institutions

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1. Introduction

A positive relationship between socio-economic status (SES) and health has been observed over many populations and many time periods.[1] SES can be assessed as occupation, social class, education, income or wealth and the positive relationship still obtains. A major object of investigation has been to quantify the causes of the relationship. Generalizing very broadly, the main flow of causality could be from health to SES. For example, more healthy individuals are likely to be more successful in obtaining schooling; they are likely to have better jobs and advance more rapidly in them, leading them to have higher incomes and greater wealth; and, in the U.S., they are less likely to have large out-of-pocket health care expenses. Were this causal pathway to be quantitatively the dominant causal pathway, public policy to improve health would also indirectly improve economic status.

The main flow of causality could be from SES to health. Mechanisms would include better nutrition and health care services that the greater resources could purchase; better health behaviors such as less smoking that education could induce; and safer, healthier work environments that would accompany a shift to better, less physically demanding occupations. Were this to be the main causal pathway, policy to increase incomes or education, or to improve the structure of occupations would also eventually lead to an improvement in health.

Again generalizing very broadly, a third causal flow could be from unobserved general fitness to both SES and health. Those who are more fit at entry into the workplace are likely to have successful careers and to have fewer health declines. This kind of reasoning could extend to variation in tastes that are fixed early in life. For example, variation in the subjective time rate of discount across people would cause variation in health behaviors, education and saving rates, thus inducing a correlation among those outcomes later in life. In these examples, policy to improve health or increase incomes would only have direct effects on health or incomes, at least from a perspective of a decade or so. However, in the very long run, policy could have indirect effects; but to quantify them it would be necessary to understand how health is transmitted across generations and how SES and tastes of the parents affects health, SES and tastes of their children.

An added complication is that the quantitative importance of the flow of causality is likely to vary across populations. In less developed populations giving people additional economic resources is likely to improve their health via improved nutrition and access to health care services, whereas such effects are probably very small or even zero in developed economies. Within a population, giving economic resources to those who are economically deprived may similarly improve their health but it would not do so for those who are better off. Because of the complexity of the problem and the substantial data requirements, there are no widely agreed-upon estimates of the relative importance of the three broad explanations of the correlation between SES and health.

Our goal in this paper is to find whether variation in institutional structure as measured at the national level could help us understand more about the flow of causality. The Netherlands has an institutional structure which aims to shield, at least in the short run, individuals from the

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[1]See Kitagawa and Hauser (1973), Berkman (1988), Marmot et al. (1991), Feinstein (1993) and Smith (1999)

economic consequences of a decline in health. In the U.S., while there are programs to reduce the severity of the consequences of a decline in heath, the consequences are certainly not eliminated. In the Netherlands access to health care is universal whereas in the U.S. the greater use of health care services is associated with higher income.

We will use data from the American *Health and Retirement Study* (HRS), the *Health and Asset Dynamics Study* (AHEAD), and from the Dutch *CentER Savings Survey* (CSS) to find qualitatively whether the institutional structures have the expected effect on the relationships between SES and health; and quantitatively whether the effects are important.

We will use the panel nature of these data sets in conjunction with the differences in institutional environment to shed light on the positive relationship between health and wealth which exists in both countries. The panel nature of the datasets allows us to address causality issues, whereas the differences in institutional settings make it possible to assess some common explanations for the observed relationship.

In 1992 the HRS surveyed about 12600 persons approximately aged 51-61 and their spouses with subsequent waves in 1994, 1996 and 1998. We use data from these waves. The AHEAD surveyed about 8,200 persons approximately aged 70+ and their spouses in 1993, 1995 and 1998. We will use data from the first two waves. The CSS is an annual panel of about 4000 persons. We use waves 1993 through 1998.

Our main focus will be on the comparison between HRS and CSS because of the greater number of observations and waves. However, we will point out differences between results from HRS and AHEAD because of the institutional differences within the U.S. In the AHEAD population few work so that any effects of health on earnings will be minimal. Health care insurance via Medicare is almost universal in AHEAD which will reduce and possibly even eliminate any effects of out-of-pocket expenditures on wealth that might result from a health event.

Institutional differences should affect some of the following explanations for the observed positive relationship between wealth and health.

- *Out-of-pocket health expenses:* In the Netherlands such expenses are on the order of 1 or 2 percent of total expenditures, with no discernible relation with age (Alessie et al., 1999). In the age range of HRS out-of-pocket expenses are rather skewed: for example, between waves 1 and 2 about 33% had no out-of-pocket expenses whereas 7% had from $1,000 to $5,000 in out-of-pockets expenses and 2% had more than $5,000 (Hill and Mathiowetz, 1998). We find that out-of-pocket health expenses play only a minor role in the observed positive relationship between wealth and health.
- *The role of earnings interruptions*: The U.S. and the Netherlands differ in their income maintenance provisions, and hence earnings interruptions may be expected to have different effects on wealth accumulation in the two countries. In the Netherlands generous income maintenance provisions aim to mitigate any adverse effect of health related earnings interruptions. Consequently, we find that adverse health changes have a significantly negative effect on household income in the U.S. but not in the Netherlands.
- *Differential access to health care*: The Netherlands has essentially a universal health care system. Thus in the Netherlands, such an explanation would be of limited importance. We investigate this issue by estimating equations that explain subsequent health on the basis

of past wealth. The extent to which we find differences in this relationship between the U.S. and the Netherlands can be seen as an indication of the importance of differential access to health care. Our results indicate that conditional on baseline wealth and health, there is a highly significant effect of wealth and income on subsequent health status in the U.S.. In the Netherlands no such relation is found. This lends some credence to this explanation.

- *Mortality risk:* Individuals (or couples) with a higher life expectancy have more reason to save (see e.g., Hurd (1987, 1989, 1998). Hence, we expect healthier individuals to save more, other things being equal. In the Netherlands, however, annuity income is the dominant source of income among the elderly, more so than in the U.S. This should lead to a weaker relationship between health and saving in the Netherlands than in the US.

2. Data description

The Health and Retirement Study is a panel survey of individuals born from 1931 through 1941 and their spouses or partners. At baseline in 1992 the HRS had 12,652 respondents. It was nationally representative of the target cohorts, except for over-samples of blacks, Hispanics and Floridians (Juster and Suzman, 1995). This paper uses data from waves one through four which were fielded in 1992, 1994, 1996 and 1998. The complete HRS sample of individuals that are surveyed at anytime over the four waves is 13,406 persons. To make our sample representative of the cohorts of 1931 through 1941 we only use data on individuals born in those years. The resulting sample has 10045 individuals. Sample sizes in the cross-tabulations of changes across waves below are based on individuals that respond in both waves being analyzed and thus will vary across waves.

Household income is income of an individual and spouse or partner. Its components as measured in the HRS are earnings, assets income, pensions, Social Security, SSI, workers compensation, unemployment, other government income (veterans' benefits, welfare, food stamps). Wealth is financial wealth, business and real estate wealth and housing wealth.

The CentER Savings Survey (CSS) derives from annual interviews with participants in the so-called CentERpanel. The CentERpanel is run by CentERdata, a subsidiary of CentER at Tilburg University. The CentERpanel comprises some 2,000 households. These households have a computer at home, either their own or provided by CentERdata, and the respondents in the CentERpanel answer questions that are downloaded to their computer every weekend. Typically the questions for the CSS are asked in May of each year, but in some years the timing of the CSS has deviated considerably from this. In particular in the first year (1993) technical difficulties delayed the survey to the extent that some parts of the questionnaire were administered in early 1994. As a result some parts of the 1994 questionnaire were not administered at all, including the health questions. Initially, the CSS had two parts: a representative panel of about 2,000 households and a so-called high income panel of about 1,000 households, but in1997 the distinction was abandoned.

The total questionnaire of the CSS is quite long. To reduce respondent burden the questionnaire is split up in five “modules” that are administered in five separate weekends. The modules are: demographics and work; housing and mortgages; health and income; assets and

liabilities; economic psychology.

2.1. Descriptive statistics

Table 2.1 presents for the Dutch data descriptive statistics for a number of variables of interest. The sample is of individuals 20 or older for whom we have self-assessed health status.[2] The average age was 46.6 and the large standard deviation is due to the extended age range. Net wealth was about 372,000 guilders which at an exchange rate of 2:1 would be about $185,000. About 41% of the sample was employed.

Table 2.2 has the corresponding characteristics of the HRS sample. In that the HRS sample is in the age range of 51 to 67 the average age is greater than in the Dutch data and the standard deviation is much smaller. Net wealth is about twice as great, and the standard deviation is very much larger even taking into consideration the greater mean: in the HRS the standard deviation is about four times the mean but it is just 1.4 times the mean in the CSS data. This difference is a reflection of the much more highly skewed wealth distribution in the U.S.[3] Household income in the HRS is about twice as great as in the CSS, and the standard deviation is much larger showing more income inequality in the U.S.[4]

Household size and the level of education are about the same in the two data sets. A notable difference is the rate of employment. The difference is mostly due to the higher rate of labor force participation of women in the U.S.

Table 2.3 has the distributions of self-assessed health in the CSS for the entire age range and for those over 50. Most respondents in the CSS data classify their own health as good or excellent. The health distribution for respondents over 50 is somewhat less good than for the sample as a whole, as could be expected. Table 2.4 has the distribution of self-assessed health in the HRS. What is most obvious is that although both the Dutch and the U.S. data are based on a five-point scale the distributions are very different: at the low end of the scale less than one percent of the CSS respondents reported poor health whereas about eight percent of the HRS respondents gave such a report. The difference is likely due to cultural differences and the interpretation of the words attached to the scales. Under the assumption that the true health of the populations is about the same, which we informally examine below, a CSS response of either

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[2]A comparison of the characteristics of respondents in the total sample and those who answered the health questions shows very little difference. The respondents who answered the health questions are slightly older on average (about one year) and slightly better educated. The respondents who answered the health questions are somewhat less likely to be employed.

[3]The greater skew in the HRS wealth data is particularly notable because of the much greater age range in the CSS: a greater fraction of the skew in the CSS should be due to life-cycle effects.

[4]The comparison is not exact because the CSS income measure is after-tax income whereas the HRS measure is before tax: progressive taxation will reduce the skewness of the income distribution.

poor or not so good (about 5.6% of these older than 50) would signal approximately the same health as an HRS report of poor; a CSS report of fair is about the same as an HRS report of fair; a CSS report of good (about 55% of those over 50) is about the same as HRS reports of either good or very good (about 58%); and excellent is about the same in the two populations.

Tables 2.5 through 2.12 have data on health behaviors and health outcomes in the CSS. Besides giving information about indicators of the health of the population, the tables aim to give informal validation of the CSS subjective health assessments by showing that characteristics which vary with actual health vary in a similar way with self-assessed health.

Table 2.5 shows a rather high rate of long-term illness, about 24% over all ages and 34% among those over 50.[5] The decline in smoking with age reflects higher mortality among smokers, cohort differences in smoking rates and quitting behavior. In epidemiologic data drinking five or more drinks per day is associated with substantially increased morbidity and mortality (Shaper, 1990; Boffetta and Garfinkel, 1990). Thus, the high rates of consuming more than four drinks per day indicate that excessive alcohol consumption is likely to be a significant cause of mortality and morbidity in the Netherlands.

We find a significant relationship between health and smoking status as shown in Table 2.6.[6] About 26% of nonsmokers rate their health to be excellent, but the rate declines to 22% among moderate smokers and just 16% among heavy smokers.

Body mass index (BMI) has roughly a monotonic relationship with health but the variation is not very great (Table 2.7)

The CSS contains a number of questions on the subjective probability of surviving to a target age. For instance, a typical question asked of respondents aged 16 through 65 years is "How big would you say is the chance that you will live to become 75 years or older?", where answers are given on a 0-10 scale. Similar questions are asked of other age groups: respondents between 16 and 70 are asked for the probability of living beyond 80, respondents between 65 and 75 are asked for the probability of living beyond 85, and so forth. Table 2.8 presents the mean subjective probabilities of surviving to the target ages of 75 and 85 (on a 0-10 scale) by health category. The table shows a very strong relationship between self reported health and the subjective survival probabilities.[7] For example, those in poor health report survival chances to age 75 of about four out of ten while those in excellent health say their survival chances on average are almost seven out of ten. Survival chances to age 85 are lower but show the same pattern with respect to health status. These relationships are similar to those found in U.S. data (Hurd and McGarry, 1995)

Table 2.9 shows a clear positive relation between health and education. For example,

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[5]A long-term illness is a positive response to: "Do you suffer from a long-term illness, disease, or handicap or do you suffer from the consequences of an accident?" The HRS has no comparable question.

[6] Neither self assessed health nor self assessed health change exhibits a significant relationship with the consumption of more than four alcoholic drinks per day.

[7] The difference in the mean survival probabilities is highly statistically significant.

among those over 50, 67.7% of those with education less than high school report d good or excellent health compared with about 78% of those who have more than high school. Thus the relationship between SES and health as measured here by education level and by self-assessed health is qualitatively the same as in data from other countries and other age groups.

To show the evolution of self-assessed health in the panel we found the distribution of health status over the same individuals in two adjacent waves, say years *t* and *t+1*, and then averaged the distributions over four waves of the CSS. Table 2.10 shows that as the CSS respondents aged, self-assessed health worsened. For example, in the baseline year 30.9% of respondents over the age of 50 reported their health to be poor, not so good or fair and in the following year 31.8% of the same respondents reported their health to be in those categories. The percentage reporting excellent health declined from 20.2% to 18% on average over one year.

Tables 2.11 and 2.12 show average levels of wealth and income by health status. We observe a monotonic increase in both income and wealth with self assessed health.[8] We also observe that even holding health constant wealth and to a lesser extent income have skewed distributions in that the mean is higher than the median.

Tables 2.13 through 2.16 have data from the HRS about health behaviors and health outcomes. The rate of smoking in the HRS population is about the same as in the Netherlands in the population over the age of 50, but the rate of heavy smoking (more than 20 cigarettes per day) is about five percentage points greater (Table 2.13). The fraction of the population that drinks alcoholic beverages is about the same in the two countries, but the fraction that drinks heavily (more than four drinks per day) is very much greater in the Netherlands: 9.1% versus just 1.2% in the U.S.

Table 2.14 shows the distribution of health status as a function of moderate and heavy smoking. There is very little difference in the two distributions. The main difference is between smokers, whether moderate or heavy, and the entire population. For example, 47% of the population assesses its health to be excellent or very good while 38 to 39% of smokers put their health in those categories. This is in contrast to the Netherlands where there is less (though statistically highly significant) variation in health status by smoking status.

As shown in Table 2.15 BMI is considerably greater in the HRS than in the CSS population (over age of 50): 27.3 versus 25.2, which is almost ten percent greater. Furthermore, there is a much more substantial gradient in BMI as a function of self-assessed health status in the U.S. than in the Netherlands. For example the variation from excellent to poor is 2.6 in the U.S. and 1.9 in the Netherlands. But in that only 0.6% of observations are in the poor category in the Netherlands a better comparison is over the not-so-good to excellent range. In that range BMI in the Netherlands is almost constant as health varies whereas it varies by about 10% in the U.S.

Based on these health behaviors and BMI, it is not obvious whether the health of the CSS population over 50 is better or worse than the health of the HRS population: the HRS population has more heavy smokers and has higher BMI, but the CSS population has considerably more heavy drinkers. Therefore, we will continue to assume that the health of the two samples is about

[8]An F-test shows that the differences in wealth and income across health categories are statistically significant at any reasonable level of significance.

the same, and that the differing distributions of health as measured by self-assessed health is due to question wording and cultural interpretation. The distribution of educational attainment as a function of health status is shown in Table 2.16. The table shows a much stronger relationship between health and education in the HRS than in the CSS data. For example, in the CSS (over 50) about 26% of those in poor or not so good health had more than a high school education compared with about 41% of those in excellent health, for a difference of 15 percentage points. In the HRS the difference is about 38 percentage points between those in poor and those in excellent health.

Table 2.17 has mean and median wealth and income levels as a function of self-assessed health in the HRS. All measures show strong correlations between health and economic status. For example those whose health was excellent had almost eight times the wealth on average as those whose health was poor, and their income was about three times as great. The variation in these economic measures is considerable larger in the U.S. than in the Netherlands: in the over 50 population average wealth among those in excellent health in the Netherlands is just 43% greater than among those in poor or not-so-good health.[9] Average income is just 30% greater.

We conclude our comparison of the cross-section data by observing that although the variation in health by educational status in the two countries is approximately the same, the variation in economic status whether measured by wealth or income is much greater in the U.S. A superficial explanation is that the wealth and income distributions are not as highly skewed in the Netherlands. However, the relatively flat distribution of wealth is, itself, at least partly the result of institutional differences such as public policy.

3. The impact of health on wealth and income, given baseline health

We have established that in both the U.S. data and the Dutch data there is a strong positive cross-section association between health and indicators of socio-economic status. In this section we study the relationship between health and SES where now we restrict the measurement of SES to income and wealth. We condition on baseline health and SES to control for unobserved individual effects that may affect both health and SES.

The Netherlands

Our first objective is to find if health changes are associated with changes in income or wealth. At least in principle we would expect to find such an association because a health deterioration could result in earnings interruptions causing income to decline. A fall in income would require the expenditure of assets to maintain consumption, and assets could be depleted further should there be out-of-pocket medical expenditures.

Our method is to compare in the panel the change in average wealth and in average income as a function of the change in health status. Thus we will find the change in wealth and

[9]This comparison is based on the assumption that the underlying health of the two populations is similar and, as stated earlier, poor and not-so-good health in the Netherlands is equivalent to poor health in the U.S.

income among those whose health remained the same in two adjacent waves; the change in wealth and income among those whose health improved; and the change among those whose health worsened. In the Netherlands as shown in Table 3.1 there is no relationship between health changes and income changes as evaluated by changes in averages or percentage changes. Although the table is based on respondents of all ages, we find similar results if we limit the sample to respondents over 50 as shown in the Appendix. There is a rather weak relationship between health changes and wealth changes (Table 3.2): average wealth increased by 10.7% among those whose health improved and by 8.7% among those whose health worsened. In actual amounts the change in wealth was rather similar across the health change groups.

The CSS does not contain information on out-of-pocket health care costs. Using consumer expenditure data, Alessie et al. (1999) have found that in the Netherlands such expenses are in the order of 1 or 2 percent of total expenditures, with no discernible relation with age. Thus it appears unlikely that out-of-pocket costs can have a big impact on wealth.

U.S.

Table 3.3 shows that those whose health improved had the largest increase in income over two years, about $3100, and the largest percentage increase in income, about 7%. Having constant health is associated with smaller increases in income and having a decline in health is associated with even smaller increases. This is in contrast with the Netherlands where we found no relationship between health change and income change.

Table 3.4 shows average panel changes in wealth and the number of observations. Thus on average wealth increased by 12.8% over a typical two-year period. The table shows that those whose health improved had the largest percentage increase in wealth over two years: 15.5%. Having a decline in health rather than constant health is associated with a much smaller 8.7% increase in wealth, or about $18 thousand.[10] These are all nominal changes averaged over the three HRS transitions. Although the pattern of change in the Netherlands data is about the same as in the U.S. data, the differential magnitudes are greater in the U.S. For example, in the U.S. having an improvement in health rather than a decline is associated with eight percentage points greater wealth gain whereas the difference is two percentage points per year in the Netherlands.[11]

In AHEAD as shown in appendix table 3.4a there is no relationship between health change and wealth change.

To investigate whether the differential wealth change by health status could be due to out-

[10]Smith (1999) obtained qualitative similar results on wealth change, but no quantitative comparison is possible because of differences in definitions.

[11]The change in the U.S. is over two years but over just one year in the Netherlands. It is not clear how to make an adjustment for the difference in the period of measurement. For example, if the wealth change were due to one-shot health care expenditures associated with the decline in health, no difference would be required. If due to a permanent income loss, the rates for the Netherlands should be doubled.

of-pocket health care costs, we found out-of-pocket health care costs between waves 2 and 3 by health status in waves 2 and 3 respectively.[12] Those who remained in excellent health had out-of pocket health care costs of about $1500 (Table 3.5). The diagonal elements show costs associated with constant health status, and we see that costs increase with worsening health, reaching about $2800 among those whose health was poor in both waves 2 and 3. We find that transitions to worse health states are usually associated with higher costs and transitions to better health states with lower costs. The exception is the transition from poor to excellent or very good health. Apparently such transitions are associated with recovery from an important health shock, which required substantial out-of-pocket expenses.

Table 3.6 summarizes the results of table 3.5. Those whose health improved had slightly lower health costs than those whose health was constant. Out-of-pocket costs were highest among those whose health worsened, but the differences in terms of dollars are not substantial.

We conclude from these results that the pattern of income change between the waves and out-of-pocket expenditures for health care are consistent with the larger change in wealth that we observed in the U.S.: in the Netherlands income change was not related to health change but both income change and health expenditures were related to health change in the U.S. However, the magnitudes of the differences are not great enough to explain the differences in wealth change. For example, in the U.S. among those whose health was constant income increased by about $2.2 thousand and out-of-pocket costs were $1.8 thousand. The net effect of these changes is the sum of them or $0.4 thousand. Among those whose health worsened, the net effect was −$0.9 thousand. From these differences we would predict that the wealth of those whose health was constant would have increased by $1.3 thousand more than the wealth of those whose health worsened, but the actual difference in wealth gain was $21 thousand as shown in Table 3.4. Therefore, at least over the time periods of the HRS and CSS panels, the direct effects of health changes on income and health care expenditures cannot explain the observed differences in wealth change.

4. The impact of wealth and income on health transitions

Our informal model of the effects of income and wealth on health is that conditioning on health these resources will purchase better health care services and other amenities which will tend to prevent declines in health or even improvements in health. We will quantify these effects via ordered logit estimation of the rate of health transition from one wave to another.

United States

We use data from HRS waves 1, 2, 3, and 4, and so we observe three transitions, which we treat as independent transitions. Ages range from 51-61 in wave 1 to 57-67 in wave 4. Three categories of health are defined: excellent/very good; good; fair/poor. Baseline health is

[12] Data limitations prevent a meaningful calculation of out-of-pocket health care costs for the wave 1 to wave 2 transition.

controlled by separate logit estimations for each of the three health categories. Thus the estimations are hazards or transitions from health status at wave *t* to health status at wave *t+1*. To allow for nonlinearities in the response to income or wealth we define nine income-wealth categories: for each of income and wealth we distinguish low, medium, and high where low is the lowest quartile, medium is either the second or third quartile, and high is the highest quartile. The nine income-wealth categories are the interactions between the income and wealth categories.

Table 4.1 gives the estimated effects on the transition from excellent/very good health to either good health or fair/poor health. A positive coefficient increases the chances of maintaining excellent or very good health or, in the event of a transition, that the transition will be to good health rather than to fair or poor health. For example, those with low income and medium wealth have a higher probability of remaining in the top category than those with low income and low wealth, and their odds of remaining in the top category relative to the second are 50.7% higher. All the income and wealth variables have strong effects in that all increase substantially the odds of remaining in excellent or very good health and all are highly significant. The pattern of coefficients does reveal some nonlinearities: an increase in wealth at all income levels increases the odds of remaining in the top health category; but an increase in income only increases the odds when wealth is low or medium, not when wealth is high.

Age reduces the probability of remaining in the top category but the effects are weak compared with the effects of income or wealth. For example, an increase in age of 10 years is equivalent to about half of the smallest income/wealth effects, that of medium income and low wealth. Having health very good rather than excellent in the baseline reduces substantially the odds of remaining in the top category. The variables for waves 2 and 3 show that wave 2 had a lower transition rate out of the top category relative to wave 1 whereas wave 3 had a higher rate.

In Table 4.2 the baseline category is good health. A positive coefficient increases the probability of a transition to better health or reduces the probability of a transition to worse health. As before, the economic variables have strong effects: Being in the low/medium income-wealth category increases the odds of transiting to the top health category by 44.7% relative to someone in the low/low category. The economic effects, however, are nonlinear: large effects are only associated with increases in income or wealth when either income or wealth is at a low level. For example, when income is high, the odds of better health increase from 1.37 to 2.60 when wealth increases from low to medium, but the odds do not increase further when wealth increases to high.

In Table 4.3, the baseline category is fair or poor. Someone with higher income or wealth will have a higher probability of transiting to better health. As before, however, the effects are nonlinear: increases in wealth have effects either in the lowest income category or when wealth increases from the lowest to the medium category. Similarly increases in income have effects when wealth is low or when income increases from the lowest to the medium category. If health is fair rather than poor the probability of an improvement in health is substantially greater.

The results from AHEAD (see the Appendix, Tables 4.1a through 4.3a) are qualitatively similar to these from the HRS: among those with better health at baseline (excellent, very good, or good) income and wealth have significant positive effects on the transitions to better health (or the likelihood of maintaining health). However, the effects are substantially attenuated from

those based on HRS. Furthermore, among those whose health is fair or poor at baseline neither income nor wealth has any effect whatsoever. An overall summary of the difference can be found from the average of the odds ratios over all the income and wealth interactions. In AHEAD the odds of improving or maintaining health are about 100% greater among those not in the lowest income-wealth quartile compared with those who are in the lowest income-wealth cell. In HRS the odds are about 260% greater.

The Netherlands

Because the U.S. data only pertain to respondents aged approximately 51-67 and the Dutch data cover the complete age range, we control for age in two ways. First, we present results for the Netherlands both for the whole sample and, in the Appendix, for the subsample of respondents over 50. Secondly, we normalize income and wealth by age in the following manner. First we run ten quantile (decile) regressions of income and wealth on a polynomial in age and a number of wave dummies. The outcomes are used to allocate each income (or wealth level) to one of 10 deciles of a distribution that is specific to the particular age of the respondent in the year of observation. Such a normalization is important since both income and wealth exhibit significant relationships with age and calendar time. The normalization by decile based on age and wave dummy purges observed changes from these age effects as well as from secular trends in income or wealth over time.

Table 4.4 is analogous to Table 4.1 above. Data are from CSS waves 1, 2, 3, 4, 5, and 6 (1993-1998). It should be noted here that for 1994 there is no information on health status, as mentioned in Section 2 above. Thus for 1993 we take the transition to 1995 rather than to 1994 as a data point, so effectively we have four transitions. As for the U.S. three categories of health are defined: excellent/ good; fair; not so good/poor. The 9 income-wealth categories are defined in exactly the same way as for the U.S. We also present a variant where we adjust for age by considering age-specific quantiles of income and wealth. Thus in the age corrected variant the income-wealth categories are defined on the basis of the location of household income or wealth in their age specific distribution.

In addition, since we are considering a much wider age range in the Netherlands than in the HRS, age is entered as a third degree polynomial rather than linearly. Where appropriate we will discuss the results for the subsample of respondents over 50 which are presented in the Appendix.

In contrast to the U.S. results, neither income nor wealth has a significant effect on the probability of remaining in the highest health category. The only variables that are strongly significant are age and good health. The effect of age is to reduce monotonically the odds ratio of remaining in excellent health: by the age of 80 the odds are just 40% of the odds at age 50.

Table 4.5 has the results when the baseline category is fair health. A positive coefficient increases the probability that someone will transit to better health, and lowers the probability of transiting to lower health. The income and wealth categorical variables are now jointly significant. The estimates of their coefficients suggest a tendency of higher wealth or higher income to contribute to a higher probability of transiting to better health. Age has a very significant effect, reducing monotonically the odds of transiting to better health or of remaining

in fair health: the odds of an 80 year-old are about 60% of the odds of a 50 year-old.

In Table 4.6, the baseline category is not so good or poor and a positive coefficient indicates a higher probability of transiting to a higher health status. The estimated coefficients on the variables representing income and wealth are not significant. If health is not so good rather than poor the probability of transiting to a better health state is increased. Increasing age reduces the probability: the odds are about half at age 80 as at age 50.

To summarize the results in this section: there are very significant effects of income and wealth interactions on the probability of improving health or not decreasing it in the U.S. In the Netherlands these effects appear hardly present. The U.S. samples are bigger than in the Netherlands and partly this may explain why more significant results are found in the U.S. than in the Netherlands. However, the magnitudes of the coefficients in the Dutch data are small and there is no consistent pattern suggesting an overall persistent effect of income or wealth. Furthermore, apart from the health category not so good or poor (n=315), the number of observations in the Dutch sample appears to be big enough to expect significant results if a true relation between income and wealth and health changes did exist in the population.

5. Concluding remarks

Although in a cross section both the U.S. and the Netherlands exhibit clear positive relationships between SES and health, in the Netherlands changes in health and SES show very little relation. This finding would suggest that in the Netherlands the positive association between SES and health could be the result of individual unobserved heterogeneity which affects both SES and health. The heterogeneity could take the form of a latent variable such as fitness or initial conditions. Although we cannot address this issue here, we believe it should be the object of future research. A second explanation has to do with the time lag between the onset of a health event and its effect on income: although there are short- to medium-run income maintenance programs in the Netherlands, over many years it is likely that income would slowly differ from what it would have been had there been no health shock. To investigate this hypothesis we probably need longer panels and a different type of statistical mode.

In the U.S. the positive relation between SES and health in cross section also shows up in an analysis of changes. However, at least in some of the panel analyses the quantitative importance of the positive relationship does not seem to be large enough to explain the cross-sectional variation. Consider first the effect of health change on income and wealth change. In the panel those with a decline in health have low income and wealth change, so that in future cross-sections people with worsened health will have less income and wealth. However, the change in income and wealth in the panel cannot explain the very large cross-section income and wealth variation as health varies. In principle the large cross-section variation in income could explain the wealth variation especially if the income differences are applied over long time periods. As an extreme example the cross-section difference in income between those in poor health and those in excellent health is about $50 thousand and the wealth differences are about $350 thousand (Table 2.17). If the entire income difference were saved the wealth difference could be accounted for in about seven years. Even under this scenario, however, we would still have to explain the large cross-section variation in income.

The observed effect of income and wealth on health transitions that we observed in the panel may be able to explain the cross-section relationships. For example, suppose initially that everyone in a population was in excellent health. According to our results those with low levels of income and wealth would have an elevated probability of transiting to worse health, but their incomes and wealth would relatively not be affected. Once in a worse health status they would tend to remain in that status. Over a number of years the population would be sorted so that better health would be associated with higher income and wealth. An objective of future research will be to find if this hypothesis can quantitatively explain the cross-section relationships.

Although we observed large effects of income and wealth on the health transition probabilities in the US, we have no plausible explanation for their size. Health care costs do not seem to be large enough, but in future research we will study variation in out-of-pocket costs and wealth change as a function of health care insurance coverage. To the extent that health care coverage plays an important role (e.g. for the medicare population) this would help explaining the difference in outcome with The Netherlands, which has essentially universal coverage. A second explanation is that underlying fitness causes both better health transitions and higher income and wealth via labor market success. In future research we will investigate this hypothesis by studying more measures of fitness and health status such as performance measures and cognitive scores.

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Table 2.1: Descriptive statistics: the Netherlands

	Mean	Standard deviation
Age	46.6	13.8
Household size	2.9	1.3
Assets (thousand guilders)	372.0	415.5
Liabilities (thousand guilders)	109.5	142.5
Net wealth (thousand guilders)	262.5	366.0
Household income (thousand guilders)*	55.8	37.9
Education less than high school (fraction)	0.34	
High school	0.27	
More than high school	0.39	
Employed	0.41	

Number of observations 18489. The exchange rate was approximately two guilders per dollar.
*After-tax spendable income

Table 2.2: Descriptive statistics: HRS

	Mean	Standard deviation
Age	58.3	3.8
Household size	2.8	1.7
Assets (thousand $)	292.9	905.7
Liabilities (thousand $)	43.1	415.7
Net wealth (thousand $)	254.7	1023.6
Household income (thousand $)	50.7	126.6
Education less than high school (fraction)	0.26	
High school	0.38	
More than high school	0.36	
Employed	0.60	

Based on HRS waves 1-4 pooled. Number of observations 35281

Table 2.3: Distribution of self-assessed health, The Netherlands

	All ages		age>50	
	frequency	percentage	frequency	percentage
Poor	89	0.5	38	0.6
Not so good	554	3.0	334	5.0
Fair	2841	15.4	1404	20.9
Good	10588	57.3	3699	55.0

Table 2.3: Distribution of self-assessed health, The Netherlands

Excellent	4417	23.9	1249	18.6

Table 2.4: Distribution of self-assessed health status: HRS

Poor	8.2
Fair	16.1
Good	29.1
Very good	28.9
Excellent	17.7
All	100.0

Based on HRS waves 1-4 pooled. Number of observations 31,281

Table 2.5: Health behavior, The Netherlands

	All ages		age>50	
	frequency	percentage	frequency	percentage
Suffers from long term illness	4366	23.6	2313	34.4
Smokes	6026	32.6	1691	25.2
Smokes, but less than 20 per day	4029	21.8	1137	16.9
Smokes more than 20 per day	1997	10.8	554	8.2
Has more than 4 alc. drinks a day	1462	7.9	612	9.1

Table 2.6: Health and smoking , The Netherlands:
Distribution of health status

	All ages			Age > 50		
	amount smokes			amount smokes		
	not at all	less than 20	20 or more	not at all	less than 20	20 or more
Poor	0.4	0.5	0.6	0.6	0.4	0.7
Not so good	3.0	2.6	3.6	5.0	4.6	5.1
Fair	14.8	15.1	19.3	20.7	21.8	20.4

Table 2.6: Health and smoking , The Netherlands:
Distribution of health status

Good	56.0	59.7	60.3	54.2	56.5	59.8
Excellent	25.7	22.0	16.1	19.5	16.7	14.1
All	100.0	100.0	100.0	100.0	100.0	100.0

Table 2.7: Average Body-mass Index and health status: The Netherlands, age 51 or over

Poor	26.7
Not so good	25.2
Fair	25.6
Good	25.2
Excellent	24.8
All	25.2

Table 2.8: Average subjective survival probabilities, The Netherlands

	Target age 75		Target age 85	
	Observations	mean	Observations	mean
Poor	29	4.0	30	2.9
Not so good	184	5.4	207	4.1
Fair	994	6.1	1104	4.8
Good	4493	6.8	4760	5.6
Excellent	1865	7.5	1939	6.3
Total	7565	6.9	8040	5.6

Table 2.9: Distribution of health status by educational attainment: The Netherlands

	All ages	*Age>50*

	Less than high school	High school	More than high school	Less than high school	High school	More than high school
Poor	.7	.4	.4	.8	.3	.4
Not so good	3.9	3.0	2.2	6.2	4.7	3.7
Fair	19.9	14.5	12.1	25.3	18.3	17.5
Good	55.0	57.8	58.8	52.1	57.0	57.0
Excellent	20.5	24.4	26.5	15.6	19.6	21.3
All	100.0	100.0	100.0	100.0	100.0	100.0

Table 2.10: Distribution of health status (cumulative percentages). Same respondents in consecutive years. The Netherlands

	All ages		Age greater than 50	
	year t	year t+1	year t	year t+1
Poor	0.4	0.5	0.5	0.6
Not so good	3.3	3.6	5	5.3
Fair	18.8	19.3	25.4	25.9
Good	75.4	78.2	79.8	82
Excellent	100	100	100	100

Table 2.11: Average wealth by health status (thousands of guilders) , The Netherlands

	All ages		age>50	
	Mean	Median	Mean	Median
Poor	171.5	61.5	230.5	63.0
Not so good	231.0	152.5	273.0	197.0
Fair	244.0	161.0	300.5	203.0
Good	259.0	177.0	343.5	252.5
Excellent	288.5	196.5	384.0	296.5

Table 2.12: Average after-tax household income by health status (thousands of guilders) The Netherlands

	All ages		age>50	
	Mean	Median	Mean	Median
Poor	45.4	37.5	42.6	32.9
Not so good	49.1	42.3	47.4	41.6
Fair	52.2	45.6	52.9	44.6
Good	55.8	50.7	56.8	51.0
Excellent	59.3	54.0	61.1	55.9

Table 2.13: Health behaviors (percent), HRS

Smokes	24.6
Smokes more than 20 per day	13.2
Drinks	54.2
Drinks more than four per day	1.2

Table 2.14: Distribution of health status: smoking. HRS

	Nonsmokers	smokes 1 to 19	smokes 20 or more
Poor	0.07	0.11	0.12
Fair	0.15	0.20	0.19
Good	0.29	0.30	0.30
Very good	0.30	0.25	0.26
Excellent	0.19	0.14	0.12

Table 2.15: Health status and BMI. HRS

Poor	28.4
Fair	28.6
Good	27.8
Very good	26.7
Excellent	25.8
All	27.3

Table 2.16. Distribution of health status by educational attainment: HRS

	Less than high school	High school	More than high school
Poor	17.7	6.4	3.3
Fair	26.9	15.5	8.8
Good	30.1	31.0	26.4
Very good	17.2	30.7	35.5
Excellent	8.2	16.4	26.0
All	100.0	100.0	100.0

Table 2.17: Health, wealth and income, HRS

		Wealth (thousands)		Income (thousands)	
	Percent distribution	Mean	Median	Mean	Median
Poor	8.2	57.1	20.1	20.6	12.2
Fair	16.1	140.7	50.3	32.1	21.8
Good	29.1	210.9	102.3	45.7	34.0
Very good	28.9	325.7	157.5	60.3	44.4
Excellent	17.7	405.5	192.0	74.1	50.9

Table 3.1: Average income change by health transition, The Netherlands

	obs.	mean	percentage change
Health improved	1340	-1000	-1.7
Health constant	6964	1400	2.5
Health worsened	1655	1500	2.6
All	9959	1100	1.9

Table 3.2: Average wealth change (thousands of guilders) by health transition, The Netherlands

	obs.	mean	percentage change
Health improved	1193	27.0	10.7
Health constant	6176	27.5	10.6
Health worsened	1473	22.0	8.7
All	8842	26.5	10.3

Table 3.3: Average income change by health transition, U.S.

	Observations	dollar change	percentage change
Health improved	4876	3082	7.1
Health constant	12906	2191	4.2
Health worsened	9630	1346	2.7
All	24712	2131	4.3

Table 3.4: Average wealth change (thousands) by health transition, U.S.

	Observations	level change	percentage change
Health improved	4876	34.3	15.5
Health constant	12906	39.4	14.5
Health worsened	9630	18.4	7.5
All	24712	32.5	12.8

Table 3.5: Out-of-pocket health care costs associated with health transitions, U.S.

	Wave 3 health status				
Wave 2 health status	Excellent	very good	good	fair	poor
Excellent	1503	1779	2450	1269	2195
Very good	1716	1659	1867	2464	4006
Good	1457	1782	1716	2401	2891
Fair	1758	1366	2165	2120	3004
Poor	2943	2575	1534	1650	2790
All	1570	1702	1868	2128	2904

Table 3.6: Average out-of-pocket health care costs by health transition, U.S.

	number	costs
Health improved	1897	1777.7
Health constant	4283	1793.4
Health worsened	1879	2179.4
All	8059	1879.7

Table 4.1: Logistic estimation: Health excellent or very good at baseline, U.S.
N = 12243

		Parameter	P-value	Odds ratio
Intercept 1		1.623	0.000	.
Intercept 2		3.670	0.000	.
Income	Wealth			
Low	Medium	0.410	0.000	1.507
Low	High	1.226	0.000	3.408
Medium	Low	0.344	0.001	1.410
Medium	Medium	0.781	0.000	2.184
Medium	High	1.192	0.000	3.293
High	Low	0.847	0.000	2.332
High	Medium	1.102	0.000	3.010
High	High	1.394	0.000	4.033
Age		-0.014	0.041	0.986
Health very good		-0.979	0.000	0.376
Wave 2		0.219	0.000	1.245
Wave 3		-0.253	0.000	0.777

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.
Average probabilities in succeeding wave: Health excellent or very good: 0.737; health good: 0.215; health fair or poor: 0.0482

Table 4.2: Logistic estimation: Health good at baseline, U.S.
N = 6901

		Parameter	P-value	Odds ratio
Intercept 1		-2.508	0.000	.
Intercept 2		-0.136	0.753	.
Income	Wealth			
Low	Medium	0.370	0.000	1.447
Low	High	0.810	0.000	2.247
Medium	Low	0.356	0.000	1.427
Medium	Medium	0.613	0.000	1.845
Medium	High	0.820	0.000	2.270
High	Low	0.811	0.001	2.249
High	Medium	0.883	0.000	2.417
High	High	0.981	0.000	2.667
Age		0.018	0.019	1.018
Wave 2		0.117	0.041	1.124
Wave 3		-0.524	0.000	0.592

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.

Table 4.2: Logistic estimation: Health good at baseline, U.S.
N = 6901

Average probabilities in succeeding wave: Health excellent or very good: 0.265; health good: 0.520; health fair or poor: 0.215

Table 4.3: Logistic estimation: Health fair or poor at baseline, U.S.
N = 5385

		Parameter	P-value	Odds ratio
Intercept 1		-4.460	0.000	.
Intercept 2		-2.716	0.000	.
Income	Wealth			
Low	Medium	0.326	0.003	1.385
Low	High	0.842	0.001	2.322
Medium	Low	0.357	0.001	1.429
Medium	Medium	0.509	0.000	1.664
Medium	High	0.607	0.000	1.835
High	Low	0.317	0.432	1.373
High	Medium	0.956	0.000	2.602
High	High	0.899	0.000	2.458
Age		0.006	0.562	1.006
Health fair		1.355	0.000	3.877
Wave 2		0.113	0.147	1.119
Wave 3		-0.403	0.000	0.668

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.
Average probabilities in succeeding wave: Health excellent or very good: 0.063; health good: 0.197; health fair or poor: 0.741

Table 4.4: Logistic estimation: Health excellent or good at baseline, The Netherlands
N = 7740

		No age correction			Age corrected		
		Parameter	P-value	Odds ratio	Parameter	P-value	Odds ratio
Intercept 1		-10.8			-10.8		
Intercept 2		-8.18			-8.17		
Income	Wealth						
Low	Medium	.115	.605	1.12	-.053	.771	.95
Low	High	-.151	.563	.86	.208	.456	1.23
Medium	Low	.115	.613	1.12	.011	.952	1.01
Medium	Medium	.136	.868	1.15	.201	.184	1.22
Medium	High	.356	.064	1.43	.296	.129	1.34
High	Low	-.112	.707	.89	-.109	.687	.90
High	Medium	.105	.564	1.11	.336	.067	1.40
High	High	.279	.146	1.32	.174	.342	1.19
Age		-.254	.004		-.259	.003	
Age squared		.005	.004		.005	.003	
Age cubed		-.00003	.002		-.00003	.001	
Health good		-1.81	.000	.16	-1.81	.000	.16
Wave 3		-.114	.321	.89	-.103	.368	.90
Wave 4		-.024	.840	.98	-.010	.930	.99
Wave 5		.027	.839	1.03	.039	.286	1.04

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile. In both specifications, wave dummies are not jointly significant, but age parameters are. The income-wealth interaction dummies are insignificant in both specifications.

Table 4.5: Logistic estimation: Health fair at baseline, The Netherlands
N = 1493

		No age correction			Age corrected		
		Parameter	P-value	Odds ratio	Parameter	P-value	Odds ratio
Intercept 1		-6.27			-5.96		
Intercept 2		-3.11			-2.44		
Income	Wealth						
Low	Medium	-.321	.120	.73	-.240	.228	.79
Low	High	-.251	.422	.78	.451	.171	1.57
Medium	Low	-.122	.553	.88	.214	.266	1.24
Medium	Medium	.345	.039	1.41	.375	.024	1.45
Medium	High	.225	.290	1.25	.322	.141	1.38
High	Low	.475	.246	1.61	.248	.520	1.28
High	Medium	.313	.160	1.37	.428	.052	1.53
High	High	.193	.382	1.21	.480	.039	1.62
Age		-.156	.164		-.125	.264	
Age squared		.002	.257		.002	.367	

Table 4.5: Logistic estimation: Health fair at baseline, The Netherlands
N = 1493

Age cubed	-.00001	.279		-.00001	.360	
Wave 3	-.315	.027	.73	-.299	.036	.74
Wave 4	-.563	.000	.57	-.521	.000	.59
Wave 5	-.529	.001	.59	-.526	.001	.59

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile. In both specifications, wave dummies are jointly highly significant (p=.0004, and p=.0009 respectively) and so are age parameters and the income wealth dummies (p=.0084, and p=.0147)

Table 4.6: Logistic estimation: Health not so good or poor at baseline, The Netherlands
N = 315

		No age correction			Age corrected		
		Parameter	P-value	Odds ratio	Parameter	P-value	Odds ratio
Intercept 1		-15.5			-15.4		
Intercept 2		-12.9			-12.9		
Income	Wealth						
Low	Medium	-.333	.431	.72	-.411	.348	.66
Low	High	-.406	.529	.67	.311	.644	1.36
Medium	Low	-.187	.677	.83	.448	.286	1.57
Medium	Medium	-.048	.899	.95	-.010	.976	.99
Medium	High	.334	.442	1.40	.351	.495	1.42
High	Low	.479	.535	1.61	.572	.433	1.77
High	Medium	-.054	.915	.95	-.061	.895	.94
High	High	-.489	.356	.61	-.218	.705	.80
Age		-.843	.010		-.857	.009	
Age squared		.013	.032		.014	.029	
Age cubed		-.0001	.067		-.0001	.060	
Health not so good		2.486	.000	12.0	2.571	.000	13.1
Wave 3		-.599	.056	.55	-.605	.052	.55
Wave 4		-.218	.502	.80	-.276	.397	.76
Wave 5		-.319	.395	.73	-.416	.263	.66

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile. In both specifications, wave dummies are not jointly significant, but age parameters are. The income-wealth interaction dummies are insignificant in both specifications.

Appendix: Results for AHEAD and for 51+ in the Netherlands.

Below we present empirical results for the AHEAD sample and the subsample of the CSS of respondents who are at least 51 years of age. To facilitate comparison with the results presented in Sections 3 and 4 we use the same numbering as in these section but add an "a". For instance, Table 3.1a corresponds to Table 3.1 in the main text.

Among respondents 51 years and older in the Netherlands there is no systematic relationship between health changes and income changes (Table 3.1a).

Table 3.1a (51+): Average income change by health transition, the Netherlands

	Observations	Level change (guilders)	percentage change
Health improved	563	-3900	-6.7
Health constant	3041	2000	3.4
Health worsened	674	-1000	-1.8
All	4278	700	1.3

Table 3.2a shows a monotonic relationships between health changes and wealth changes both in levels and in fractional change. The magnitude is somewhat greater than in Table 3.2. The differences in wealth change, however, are not statistically significant even at the 10% level.

Table 3.2a (51+): Average wealth change by health transition, the Netherlands

	observations	level change (guilders)	percentage change
Health improved	523	32000	10.1
Health constant	2796	26000	8.0
Health worsened	626	20000	6.5
All	3945	26000	8.1

In AHEAD there is no relationship between changes in health and changes in wealth (Table 3.4a). This is in distinction to HRS where those in worsening health had the smallest percentage increase in income.

Table 3.4a (AHEAD) Change in average wealth

Health change	Observations	Thousands of dollars	percent
Better	899	36.3	18.4
Same	6230	46.0	20.0
Worse	3821	42.4	22.0

Table 3.4a (AHEAD) Change in average wealth

All	10950	44.0	20.5

In AHEAD the likelihood of remaining in excellent or very good health increases in wealth, but not in income (Table 4.1a). For example when wealth is in the medium category, the odds ratio changes from 1.32 to 1.52 to 1.38 as income increases from the lowest to the highest category. These differences are not statistically significant. Even though some of the parameters are significant, the odds ratios in the HRS are about 50% greater.

Table 4.1a (AHEAD). Logistic estimation: Health excellent or very good at baseline
N = 3850

		Parameter	P-value	Odds ratio
Intercept 1		3.4147	0.0001	.
Intercept 2		5.0132	0.0001	.
Income	Wealth			
Low	Medium	0.2766	0.0745	1.319
Low	High	1.2839	0.0005	3.611
Medium	Low	0.2171	0.1740	1.242
Medium	Medium	0.4155	0.0009	1.515
Medium	High	0.5963	0.0001	1.815
High	Low	0.2649	0.4388	1.303
High	Medium	0.3202	0.0334	1.377
High	High	0.7725	0.0001	2.165
Age		-0.0340	0.0001	0.967
Health very good		-0.9886	0.0001	0.372
Wave 2		-0.4094	0.0001	0.664

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.
Average probabilities in succeeding wave: Health excellent or very good: 0.582; health good: 0.281; health fair or poor: 0.138

Among those in good health two of the coefficients on the income-wealth variables are significant at the 5% level (Table 4.2a), but the effects are considerably smaller than in the HRS. For example the largest odds ratio here is 1.49 whereas in the HRS it is 2.67.

Table 4.2a (AHEAD). Logistic estimation: Health good at baseline

N = 3444

		Parameter	P-value	Odds ratio
Intercept 1		0.0445	0.9267	.
Intercept 2		2.0406	0.0001	.
Income	Wealth			
Low	Medium	-0.00516	0.9709	0.995
Low	High	0.2027	0.5004	1.225
Medium	Low	0.00187	0.9897	1.002
Medium	Medium	0.2898	0.0091	1.336
Medium	High	0.2038	0.1502	1.226
High	Low	-0.1777	0.6414	0.837
High	Medium	0.2720	0.0637	1.313
High	High	0.3987	0.0014	1.490
Age		-0.0169	0.0045	0.983
Wave 2		-0.4110	0.0001	0.663

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.
Average probabilities in succeeding wave: Health excellent or very good: 0.228; health good: 0.449; health fair or poor: 0.323

Among those in fair or poor health in AHEAD there are no significant coefficients on the income-wealth variables and no overall pattern (Table 4.3a)

Table 4.3a. (AHEAD). Logistic estimation: Health fair or poor at baseline
N = 3650

		Parameter	P-value	Odds ratio
Intercept 1		-4.1279	0.0001	.
Intercept 2		-2.5724	0.0001	.
Income	Wealth			
Low	Medium	-0.0381	0.7869	0.963
Low	High	0.2603	0.4796	1.297
Medium	Low	-0.1420	0.3010	0.868
Medium	Medium	-0.0874	0.4314	0.916
Medium	High	0.0302	0.8595	1.031
High	Low	-0.1400	0.8347	0.869
High	Medium	-0.1025	0.5499	0.903
High	High	-0.0305	0.8400	0.970
Age		0.0127	0.0653	1.013
Health fair		1.0121	0.0001	2.751
Wave 2		-0.4042	0.0001	0.667

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile.
Average probabilities in succeeding wave: Health excellent or very good: 0.071; health good:

Table 4.3a. (AHEAD). Logistic estimation: Health fair or poor at baseline
N = 3650

0.188; health fair or poor: 0.741

Table 4.4a shows that for respondents over 50 SES has no significant effect on the probability of staying in the highest health category. The only variables that are strongly significant are age and health good. The odds of maintaining excellent or good health decrease with age.

Table 4.4a: Logistic estimation: Health excellent or good at baseline, The Netherlands
N = 2864

		Parameter	P-value	Odds ratio
Intercept 1		40.1		
Intercept 2		42.8		
Income	Wealth			
Low	Medium	-.238	.372	0.79
Low	High	.402	.397	1.50
Medium	Low	-.051	.849	0.95
Medium	Medium	.125	.590	1.13
Medium	High	.336	.249	1.40
High	Low	-.209	.666	0.81
High	Medium	.399	.177	1.49
High	High	.086	.755	1.09
Age		2.14	.066	
Age squared		-.032	.072	
Age cubed		.00015	.085	
Health good		-2.00	.000	.14
Wave 3		.139	.425	1.15
Wave 4		.264	.145	1.30
Wave 5		.353	.081	1.42

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile. In both specifications, wave dummies are not jointly significant, but age parameters are. The income-wealth interaction dummies are no significant

In Table 4.5a, the baseline category is health fair. A positive coefficient increases the probability that someone will transit to better health (and lowers the probability of transiting to lower health). The income-wealth dummies are jointly significant at the 10% level. The estimates of the dummy coefficients suggest a tendency of higher wealth or higher income to contribute to a higher probability of transiting to better health, as was found for the complete sample. Age again has a very significant effect.

Table 4.5a: Logistic estimation: Health fair at baseline, the Netherlands
N = 811

		Parameter	P-value	Odds ratio
Intercept 1		-18.0		
Intercept 2		-14.7		
Income	Wealth			
Low	Medium	-.284	.303	0 .75
Low	High	.569	.156	1.77
Medium	Low	.102	.714	1.11
Medium	Medium	.526	.029	1.69
Medium	High	.464	.142	1.59
High	Low	.039	.941	1.04
High	Medium	.249	.417	1.28
High	High	.532	.089	1.70
Age		-.704	.510	
Age squared		.011	.494	
Age cubed		-.00006	.461	
Wave 3		-.385	.055	0.68
Wave 4		-.548	.008	0.58
Wave 5		-.534	.014	0.59

Notes: For income and wealth: low is lowest quartile; medium is second or third quartile; high is highest quartile. Wave dummies are jointly significant as are age parameters. The income-wealth dummies are not significant at the 5% level (p=0.09)

When we attempted to replicate Table 4.6 for the age category 51+, no convergence of the ML logit program was attained, indicating identification problems due to the small sample size (196).