Be wealthy to stay healthy

An analysis of older Australians using the HILDA survey

Lixin Cai
University of Melbourne

Abstract

Using the Household, Income and Labour Dynamics in Australia (HILDA) survey data, this study examines the effect of wealth on health transitions of older Australians. By focusing on health transitions instead of health status itself, the study avoids potential endogeneity of wealth arising from the reverse effect of health on wealth. Two health indicators are used to define health transitions: self-reported general health status and the existence of long-term health conditions. The results show that, for both health indicators, wealthy people are less likely to experience a transition from good to poor health, suggesting that wealth might have a causal effect on health.

Keywords: health, older population, panel data, wealth

There is a large body of literature on the relationship between socio-economic status (SES) and health, with the general finding that higher SES is associated with better health outcomes (see Adams et al., 2003 and references therein). The association is found to hold for different populations and various measures of health (Goldman, 2001). Although SES is frequently used in the literature, it may refer to different indicators in various studies. Education, income, wealth, occupation and social class are frequently used SES indicators. Since these indicators are closely correlated, some researchers refer simply to SES to skirt the problem of multi-collinearity, but the blending of different indicators limits the scientific value and policy applicability of the research (Fuchs, 2004). This study focuses on the relationship between wealth and health.

Theoretically, the causality between SES and health can go either way. On the one hand, low SES may cause poor health due to malnutrition and/or less access to medical services. Health risk behavior, such as smoking, alcoholism

Journal of Sociology © 2009 The Australian Sociological Association, Volume 45(1): 55–70
DOI:10.1177/1440783308099986 www.sagepublications.com

and drug use, is also more likely to be found among people with low SES than among those with high SES (Stronks et al., 1996). On the other hand, poor health may lead to low SES particularly in terms of income and wealth, because poor health not only means increased medical expenses, but also reduces the ability to work, implying less opportunity to accumulate wealth. Despite the fact that a close association between SES and health has long been observed, the direction of causality remains an open issue that attracts researchers from both social and medical sciences (Deaton, 2002; Frijters et al., 2005; Fuchs, 2004; Meer et al., 2003; Smith, 1999, 2004). From policy-makers' viewpoint, simply knowing the correlation between SES and health is not enough, because policy design aimed at improving general health or narrowing health inequality requires understanding the direction of causality (Deaton, 2002; Frijters et al., 2005).

Medical scientists and researchers in the public health area tend to believe that the pathway is from SES to health (Smith, 1999, 2004). For example, there is a growing research interest in the socio-economic determinants of health in the public health literature, where it is emphasized that the determination of health disparities goes beyond medical treatments and health care services, which are traditionally regarded as the most important determinants of health, to socio-economic factors, such as income, employment status, environment and even income distributions (Marmot and Wilkinson, 1999; Wilkinson and Marmot, 1998). On the other hand, economists seem to be more interested in the effect of health on SES, particularly the effect of health on labour supply and wages (or earnings), with the general finding that people with better health have a higher labour force participation rate and earn higher wages (Cai, 2007; Cai and Kalb, 2006; Grossman and Benham, 1974; Haveman et al., 1994; Lee, 1982; Stern, 1989).[1]

There are a few studies that directly examine the relationship between wealth and health (e.g. Adams et al., 2003; Meer et al., 2003; Smith, 1999, 2004). Using the Panel Study of Income Dynamics (PSID) data, Smith (1999) shows that median household wealth increases with respondents' self-reported health status in the US, and the relationship holds for people at different ages. Using both the PSID and the Health and Retirement Survey (HRS) data, Smith (1999, 2004) finds that adverse health shocks have a negative effect on wealth through reduced labour supply and earnings and increased medical expenditure, suggesting that a causal effect of health on wealth exists. On the other hand, using information on the value of inheritance in the previous five years to instrument changes in wealth, Meer et al. (2003) find that the effect of wealth on health is insignificant. By extending the Granger causality framework to panel data, Adams et al. (2003) directly test for the absence of direct casual paths from wealth to health and vice versa for elderly Americans aged 70 and over. While their results generally reject the hypothesis of no direct causal link from health to wealth, the evidence on the link from wealth to health is mixed. For mortality and for

acute, sudden-onset diseases, the hypothesis of no causal link from wealth to health is accepted, but for incidence of mental problems the null hypothesis is rejected.

While there appears to be no study examining the relationship between wealth and health using Australian data, the association between poverty and health has long been noticed in Australia. For example, in the mid-1970s, the Poverty Commission identified poor health as a condition that greatly increased the risk of poverty (Commission of Inquiry into Poverty, 1975). The Australian Council of Social Service (ACOSS) described poverty as being both a consequence of poor health and a health hazard of its own (ACOSS, 1993; Mitchell, 1993). In a recent study, Saunders (1998) showed that Australians under and at the margin of the poverty line are more likely to experience financial and emotional stress in their lives than better-off Australians. One of the major problems with these Australian studies is that they do not address the direction of causality; rather, they just show that a statistical correlation between poverty and health exists (Saunders, 1998).

Using the longitudinal nature of the Household, Income and Labour Dynamics in Australia (HILDA) survey, this article examines the effect of wealth on health transitions of older Australians. By focusing on health transitions instead of health status itself, the study avoids the potential endogeneity of wealth arising from the reverse effect. The results show that wealthy people are indeed less likely than the poor to experience a transition from healthy to unhealthy, suggesting that wealth might have a causal effect on health.

The article is organized as follows. The next section discusses the method used to identify the causal effect of wealth on health. The following section describes the data source and defines the health variable. The next section presents empirical results and, finally, there is a concluding section.

Method

In assessing the effect of wealth on health, the potential reverse effect of health on wealth poses an endogeneity problem. In particular, if health has a positive effect on wealth, as suggested by many studies (e.g. Adams et al., 2003; Smith, 1999, 2004), the effect of wealth on health would be overestimated in a model that uses cross-sectional data and treats wealth as an exogenous variable. Simultaneous equation models and instrumental variable methods can be utilized to account for the endogeneity of wealth, but both approaches require valid instrumental variables that have to be closely correlated with wealth but do not directly affect health. In survey data that are not designed specifically for studying the relationship between wealth (or SES in general) and health, valid instruments are usually not available.[2] This study takes an alternative approach to circumventing the reverse effect

problem. That is, instead of looking at the relationship between wealth and health at one point in time, this study examines the effect of wealth in a base year on the transition of health in subsequent years.[3] Essentially, this approach uses the difference in timing of event occurrence to avoid the reverse effect of health on wealth and thus may identify the potential causal effect of wealth on health.[4] If wealth indeed protects health, we would expect that, everything else being equal, people who are wealthy now are more likely than the poor to stay healthy in the future.

Although in principle health transitions in both directions (i.e. from healthy to unhealthy and vice versa) can be analysed, this study focuses on transitions from healthy to unhealthy, because the large majority of the population examined were healthy in the base year. In addition, a transition from unhealthy to healthy may take longer than the time period that is available in the data. However, due to the exclusion from the analysis of people who were unhealthy in the base year, the results presented in the study should be viewed as 'conditional' (upon being healthy in the base year) and may not be generalized to the entire older population.

Since the focus of the study is on whether a health transition occurs, the dependent variable is a binary variable. The natural model for binary dependent variables is probit models.[5] The generic model to be estimated is,

$$(1)\ \text{Prob}(y_{it} = 0,\ t>0 \mid y_{i0} = 1) = f(W_{i0}, X_i) + \varepsilon_i\ ,$$

where y_{it} refers to health status at time t, taking value 1 if healthy or 0 if unhealthy; W_{i0} is reported wealth in the base year; X_i is a vector of other covariates; ε_i is a random error term. In our empirical analysis, wealth enters the model as a set of dummies as defined by quintile. Essentially, equation (1) states that the probability of an individual i experiencing the transition from healthy to unhealthy between the base year and subsequent years is a function of the person's wealth in the base year (W_{i0}), some observed factors (X_i) and unobservable factors (ε_i).

Although the approach taken in this study avoids the endogeneity of health arising from the reverse effect, the effect of wealth could still be biased if the unobserved determinants of both wealth and health transitions are correlated. Addressing the correlated unobserved determinant problem requires valid instrumental variables that directly affect wealth but do not affect health transitions. Such instrumental variables are not available in the HILDA data. However, while it is reasonable to believe that the unobserved determinants of wealth are correlated with the unobserved determinants of health status, it is unlikely that the unobserved determinants of wealth are systematically associated with the unobserved determinants of health changes in a particular time period. As such, the bias arising from correlated unobserved determinants is expected to be small, if there is any at all.

Buckley et al. (2004) use a similar approach to examining the effect of income on health transitions of older Canadians. For the purpose of examining the effect of economic resources on health, wealth may be a measure superior to income because income in a single year may not adequately measure the financial resources available to an individual over the lifetime in which decisions affecting health are made (Smith and Kington, 1997). Moreover, if economic status does have an effect on health, it would be more in the nature of a cumulative effect rather than one based on annual income in any given year; in this sense, wealth is a better measure than income because wealth comes closer to reflecting an individual's previous income history (Buckley et al., 2004).

Data and the health variable

The data used in the article draw upon the HILDA survey, waves 2 to 4. The survey is a national household panel survey with a focus on issues relating to families, income, employment and well-being. Details of this survey are documented in Wooden et al. (2002). The first wave interviews were conducted between August and December 2001. The reason for using the HILDA from the second wave, which is thus defined as the base year in this study, is that only in the second wave was information on wealth collected through a special module of questionnaires. Wealth is the variable on which this study focuses. In this study wealth refers to household net worth (i.e. household total assets minus total debt), which represents the total economic recourses under the command of the household.

In addition to the data collected through personal interviews, each person who completed a personal interview was also given a self-completion questionnaire to be returned on completion by mail or handed back to the interviewer at a subsequent visit to the household. Information relating to individuals' health was collected in both the personal interviews and self-completion questionnaires. In the personal interviews, individuals were asked whether they had a health condition, impairment or disability that restricted everyday activity and had lasted or was likely to last for six months or more. In the self-completion questionnaire, the Short Form 36 (SF-36) health-status questions were asked. The SF-36 is a measure of general health and well-being, and produces scores for eight dimensions of health (Ware et al., 2000). The first question in the SF-36 is the standard self-reported health-status question: '*In general, would you say that your health is excellent, very good, good, fair or poor?*' This self-reported health status and the existence of health conditions are the two health indicators that are used to define health transitions in this study.[6] For the purpose of defining health transitions, five-level self-reported health status is transformed into a dichotomous variable, with good health referring to the original top three health levels (i.e. good, very good and excellent health), and

poor health referring to the bottom two levels (i.e. poor and fair health). Attrition arising from death can be identified in the data. Since death is most likely the consequence of poor health, the few cases of death were recoded as poor health or having health conditions.

The two health indicators are used as complementary measures of health in this study because each of them has advantages and disadvantages over the other. For example, self-reported health is often thought prone to reporting error (Bound, 1991), however, as a summary measure of health, it has been widely used in empirical research. There is also a large body of literature showing that self-reported health is a good measure of health in the sense that it is a strong and independent predictor of mortality and morbidity (Connelly et al., 1989; Idler and Kasl, 1995; Lundberg and Manderbacka, 1996; McCallum et al., 1994; Okun et al., 1984). On the other hand, people's responses to the health condition questions may be less subjective due to the way the question is asked (i.e. using showcard examples).[7] But specific health conditions cover prevalence without providing information on severity of health problems. In addition, poor health may not necessarily manifest itself in the form of health conditions. For example, a person without any health condition may not be as healthy as a person with certain conditions (see Table 1). In this sense health conditions may provide a narrower measure of individuals' health than the self-reported health measure.

The population analysed in this study includes individuals who were 50 years or over as in the second wave. When the transition of health is analysed, the sample is further restricted to those who reported as healthy in the second wave (i.e. the base year). We focus on the older population because their health is more likely to change than that of younger people. Men and women are examined separately.

Table 1 cross-tabulates the two measures of health for individuals aged 50 years or over using the second wave HILDA. Clearly the two measures are closely correlated: the vast majority of those in good health have no health condition; the vast majority of those in poor health indeed have health conditions. However, there are discrepancies between the two measures. For example, more than 20 percent of those in poor health have no health condition and 20 percent of those in good health have a health condition. This discrepancy may reflect reporting errors, or arise from the fact that the two measures represent different dimensions of health.

For the health condition measure, 'healthy' refers to 'having no health condition'; for the self-reported health measure, 'healthy' refers to 'being in good health'. A health transition from healthy to unhealthy is then defined to occur if a person was found to be in poor health or to have a health condition in wave 3 or 4, given that the person had no health condition or was in good health in wave 2 (i.e. the base year).

Table 1: Cross-tabulation of self-reported health and health conditions

	Health conditions (%)		
Self-reported health status	*No*	*Yes*	*No.obs.*
Male			
Good	77.65	22.35	1356
Poor	22.97	77.03	566
Female			
Good	79.97	20.03	1558
Poor	25.86	74.14	580

Empirical results

The empirical results are presented in two subsections. The first subsection takes a descriptive approach to showing the association between wealth and health (and health transitions) without controlling for confounding factors. The second subsection reports the estimation results of the health transition model, which controls confounding factors and attempts to identify the casual effect of wealth on health.

Descriptive analysis

Using the second wave HILDA data, Table 2 shows the proportion by wealth quintile of people aged 50 years or over who had health conditions or were in poor health. The gradient of health in wealth is obvious for both health measures: the higher the wealth level, the lower the probability of having health conditions or being in poor health. For example, while close to 60 percent of males in the first 20 percent of wealth distribution had health conditions, less than a quarter of those males in the top 20 percent of wealth distribution had health conditions. A similar pattern holds for females and the self-reported health measure. The table also shows the test statistics (χ^2) on the hypothesis that wealth and health are independent. The statistics strongly reject the hypothesis for all cases.

Table 3 restricts the sample to those who had no health condition or were in good health in the second wave and shows the proportion found to have a health condition or to be in poor health in wave 3 or 4 (i.e. experienced a transition from healthy to unhealthy). From the table a negative association between wealth and the probability of experiencing health transitions appears: the wealthier an individual is, the less likely they are to experience the transition. The χ^2 test statistics indicate that wealth and the probability of experiencing the transition are not independent.

Table 2: Proportion having health conditions or in poor health by wealth quintile (%)

	With health conditions		*In poor health*	
Wealth quintile	*Male*	*Female*	*Male*	*Female*
1st	57.86	53.48	45.80	42.99
2nd	44.98	36.76	38.38	29.84
3rd	38.04	38.81	28.53	30.79
4th	31.05	30.60	19.29	19.63
5th	24.20	20.74	16.28	12.59
All	39.23	36.08	29.45	27.13
χ^2 (4)	124.02***	121.80***	114.23***	117.10***
No. obs.	2192	2436	1922	2138

Table 3: Wealth and health transitions among those with no health condition or in good health in the second wave (%)

	Health condition transition		*Self-reported health transition*	
Wealth quintile	*Male*	*Female*	*Male*	*Female*
1st	50.7	49.61	32.06	25.3
2nd	36.75	44.16	19.23	23.02
3rd	34.19	33.09	14.16	19.76
4th	29.44	24.56	16.18	12.09
5th	28.09	26.12	10.13	8.24
All	35.60	35.13	18.09	17.37
χ^2 (4)	31.33***	57.82***	40.35***	38.99***
No. obs.	1149	1372	1111	1301

Estimation results of health transition models

The negative association between wealth and health transitions found in Table 3 could be caused by confounding factors, such as age. For example, the incidence rate of many long-term health conditions, such as arthritis, diabetes and circulatory conditions, increases with age (ABS, 2006).[8] On the other hand, for older people wealth may decrease with age due to dissaving after retirement. The regression model, as described in equation (1), helps control for confounding effects and identifies the independent effect of wealth. The control variables used in the model include six age dummies, four education dummies, four variables on health risk behaviour, a variable on change in marital status, and a variable on living areas.[9] These variables

Table 4: The MME estimates for the wealth effect from health transition models

	Health condition transition		*Self-reported health transition*	
	Male	*Female*	*Male*	*Female*
Wealth quintile[(b)]				
1st	omitted			
2nd	–0.1406***	–0.0381	–0.1016***	–0.0314
	(0.0447)[(a)]	*(0.0429)*	*(0.0392)*	*(0.0376)*
3rd	–0.1379***	–0.1442***	–0.1192***	–0.0522
	(0.0459)	*(0.0411)*	*(0.0368)*	*(0.0369)*
4th	–0.1658***	–0.2055***	–0.0802**	–0.1301***
	(0.0461)	*(0.0393)*	*(0.0398)*	*(0.0307)*
5th	–0.1701***	–0.1697***	–0.1455***	–0.1695***
	(0.0477)	*(0.0416)*	*(0.0359)*	*(0.0269)*
Log-likelihood	–688.55	–801.31	–477.74	–564.61
Pseudo *R*-squared	0.0702	0.0748	0.0842	0.0478
Joint test on the significance of the wealth dummies				
χ^2 (4)	16.27	33.05	14.82	31.42
p-value	0.0027	0.0000	0.0051	0.0000
No. obs.	1136	1341	1108	1293

Note: (a) Standard errors in parenthesis. (b) Control variables include age, education, health risk behavior, become non-married, living in an urban area, number of children and number of adults in a household. ***, **, * indicates the estimate is significant at 1%, 5% and 10% respectively.

are standard variables in health determination equations. The change in marital status variable indicates whether a person became non-married since wave 2. The inclusion of this variable is based on the assumption that losing a partner at an older age might have a detrimental effect on health (Buckley et al., 2004). In addition, a variable on the number of adults and a variable on the number of children in the family are also included to control for the effect of family size.[10] Except for the variable on change in marital status, all other control variables take the values as in wave 2.

Table 4 presents the estimation results for the wealth variables. Estimates for other control variables are reported in the appendix Table A2. For ease of interpretation, we report the mean marginal effect (MME) estimates, which show the average change in the probability of experiencing a health transition when moving from the bottom wealth quintile to other wealth quintiles.[11]

At the bottom of Table 4 we report χ^2 statistics that jointly test the significance of all the four wealth quintile dummies. The test results indicate that the effect of wealth on health transitions is statistically significant for both health indicators and for both males and females. That is, overall, wealth is found to have a significant effect on the transition of health from

healthy to unhealthy. For males, those in the bottom wealth quintile are more likely than those in other wealth quintiles to experience the health transition using both health indictors. For example, other thing being equal, the probability of experiencing a health condition transition (i.e. from no health condition to having a health condition) among those in the second and third wealth quintiles is 14 percentage points lower than the probability of those in the bottom wealth quintile; those in the fourth and fifth wealth quintiles are about 17 percentage points lower than those in the bottom wealth quintile. The effect of wealth on the transition of self-reported health appears to be slightly smaller than the effect on the health condition transition. For female health condition transitions, those in the bottom two wealth quintiles are more likely to experience the transition than those in the top three quintiles; for female self-reported health transitions, those in the bottom three wealth quintiles are more likely to experience the transition than those in the top two quintiles.

Another interesting result from Table 4 is that the effect does not appear to be linear. For example, for males the largest difference in the probability of experiencing a transition occurs between those in the bottom and those in the second wealth quintiles, no matter which health indicator is used. Also, for males the difference in probability appears not to be statistically different among those in the top four wealth quintiles. For female health condition transitions, those in the top wealth quintile appear not to have a lower probability of experiencing the transition, compared to those in the fourth wealth quintile.

Conclusion

Using the HILDA survey data, this article examines the effect of wealth on health transitions. By focusing on health transitions instead of health status itself, the study avoids the potential endogeneity of wealth arising from the reverse effect of health on wealth, and thus attempts to estimate the causal effect of wealth on health. The results show that for the two health indicators analysed (i.e. the universal self-reported health status and the existence of long-term health conditions), wealth is found to have a significant effect. That is, compared with those at the bottom of the wealth distribution, wealthier people are less likely to experience a transition from healthy to unhealthy, suggesting that wealth might indeed have a causal effect on health.

There are several possible explanations for the causal effect of wealth on health. First, wealth is a measure of economic resources. Although in a developed country such as Australia absolute poverty and thus malnutrition may not be an issue, people with less economic resource may eat more low-quality food, such as fast food that has high levels of fat and sugar and thus is not good for one's health, than their wealthy counterparts. Second, people who are poor may also live in an environment that is physically and/or

socially disadvantaged, in poor housing conditions, an unfriendly neighborhood and/or lacking a social network and social support. There is evidence that poor-quality housing and neighborhood environment have a detrimental effect on health (Stafford and McCarthy, 2006). Third, people with fewer resources may receive less health services than wealthy people, even in a country where there is a universal health care system such as Australia. This is because: (a) the private costs of accessing the health care system (e.g. transportation) and some elements of care (e.g. prescription drugs) are not covered by the system (Williamson and Fast, 1998a, 1998b) and (b) in Australia wealthy people are more likely to have private health insurance that provides more prompt illness treatments. In addition, new health care technologies can generate a gradient of health in wealth, even when none previously existed because the costs associated with new health care technologies are normally high, and wealthy people are more likely to access new technologies than the poor (Deaton, 2002). Fourth, wealth may act as a marker for social status or position within the social hierarchy, and wealthy people experience less chronic stress because they have greater freedom to make decisions (Deaton, 2003). It has long been argued that stress increases susceptibility to diseases because repeated exposure to stress may compromise the immune system (McEwen, 1998; Marmot, 2005).[12] Therefore, the effect of wealth on health not only operates through material deprivation, wealth also affects other socio-economic factors and psychological and emotional processes that, in turn, affect health.

While the current data do not provide adequate information to test these hypotheses, the very existence of the effect of wealth on health transitions suggests that more help in terms of economic and health service provisions to those who are poor in wealth might be beneficial to the health of those at the bottom of the wealth distribution. However, current government policy seems to have been going in the opposite direction by shifting health care financing to the private sector and household incomes through user-fees such as co-payments. In addition, assistance to private health insurance favours the rich. For example, about half of the private health insurance rebate subsidy goes to the top 20 percent of taxpayers, and nearly three-quarters goes to the top 40 percent (Schrader, 2004). This is also inconsistent with the policy implications arising from the findings in this study.

This study has other limitations in addition to those mentioned above, such as that, because wealth information is only available in one wave, we cannot examine how changes in wealth affect health. One may argue that the long-run effect of wealth on health should be larger than that reported in this study, but again, due to data limitations we cannot estimate the wealth effect for a longer time period. Nevertheless, this study contributes to our understanding of the relationship between wealth and health, an area that has not been extensively studied and thus requires more strategic research as called for in Baum (2005).

Acknowledgement

I thank Elizabeth Savage and the participants of the 28th Australian Conference for Health Economists for useful comments.The article uses the data in the confidentialized unit record file from the Department of Families, Community Services and Indigenous Affairs (FaCSIA) Household, Income and Labour Dynamics in Australia (HILDA) Survey, which is managed by the Melbourne Institute of Applied Economic and Social Research. The findings and views reported in the article, however, are those of the author and should not be attributed to either the FaCSIA or the Melbourne Institute.

Appendix

Table A1: Summary statistics of the samples used for health transition models

	Health condition transitions		*Self-reported health transition*	
Variables[(a)]	*Males*	*Females*	*Males*	*Females*
Transition (=1)	35.71	34.8	17.96	17.18
Age group				
50–54	26.21	24.44	24.73	23.30
55–59	21.37	21.98	19.95	22.21
60–64	16.36	15.28	17.42	15.87
65–69	13.28	13.79	15.16	13.70
70–74	13.10	12.00	12.82	12.54
75–79	6.60	7.60	5.87	7.74
80 +	3.08	4.92	4.06	4.64
Education				
Less year 11	31.13	50.97	30.78	50.70
Year 11 or 12	11.87	14.75	10.83	14.47
Certificate	27.35	11.40	26.71	11.69
Diploma	10.99	8.12	12.18	8.05
Degree	18.65	14.75	19.49	15.09
Smoker	61.74	40.24	63.00	41.02
Heavy drinker	5.72	0.52	5.60	0.46
Lack of physical activity	10.64	10.95	10.11	9.91
Become non-married	1.93	2.46	1.90	2.94
Urban	59.45	59.24	56.77	58.44
No. of adults	2.26	2.03	2.24	1.99
No. of children	0.11	0.04	0.11	0.04
No. obs.	1136	1341	1108	1293

Note: (a) Except for the no. of adults and no. of children variables, the values of all other variables are in percentage.

Table A2: The MME estimates for other control variables

	Transition of health conditions				*Transition of self-reported health*			
	Male		*Female*		*Male*		*Female*	
	MME	*S.e.*	*MME*	*S.e.*	*MME*	*S.e.*	*MME*	*S.e.*
Age group								
50–54	omitted							
55–59	0.0918**	0.0407	0.0625*	0.0369	0.0154	0.0305	–0.0003	0.0294
60–64	0.1443***	0.0463	0.0940**	0.0429	0.0543	0.0363	0.0298	0.0349
65–69	0.1793***	0.0508	0.1497***	0.0459	0.0880**	0.0415	0.0121	0.0357
70–74	0.1892***	0.0527	0.2383***	0.0511	0.1263***	0.0473	0.0740*	0.0429
75–79	0.3405***	0.0661	0.3093***	0.0609	0.1998***	0.0677	0.0725	0.0509
80 +	0.4064***	0.0892	0.3481***	0.0725	0.1918**	0.0780	0.0176	0.0538
Education								
Less year 11	omitted							
Year 11 or 12	0.0146	0.0493	–0.0022	0.0380	–0.0327	0.0416	0.0014	0.0327
Certificate	0.0008	0.0372	–0.0372	0.0422	0.0289	0.0335	–0.0542*	0.0317
Diploma	0.0460	0.0514	0.0033	0.0495	–0.1124***	0.0320	0.0423	0.0464
Degree	–0.0625	0.0433	–0.0599	0.0393	–0.0003	0.0377	0.0095	0.0346
Health risk behavior								
Current smoker	0.0369	0.0439	–0.0148	0.0425	0.0613	0.0379	0.0432	0.0397
Ex-smoker	0.0824***	0.0306	0.0299	0.0295	0.0163	0.0253	0.0319	0.0245
Heavy drinker	0.0628	0.0613	–0.0450	0.1654	0.0266	0.0505	0.1027	0.1712
Lack of physical activity	0.0869*	0.0463	0.0423	0.0408	0.0449	0.0385	0.0517	0.0373
Become non-married	0.0107	0.1007	–0.0294	0.0786	0.1226	0.0949	0.0380	0.0642
Urban	0.0099	0.0287	–0.0131	0.0259	–0.0501**	0.0237	0.0014	0.0215
No. adults	0.0423**	0.0182	0.0304*	0.0168	–0.0051	0.0158	0.0187	0.0142
No. children	–0.0343	0.0358	–0.0536	0.0611	0.0424	0.0275	–0.0113	0.0484

Notes

1 However, it should be acknowledged that in his pioneering work on health production theory, Grossman, an economist, noted the causal effect of SES on health (1972). According to Grossman's theory, health is a form of human capital that can be maintained or improved through investment. Because health investment depends on both time and economic resources, health capital is affected by individuals' SES.
2 For studies that use an instrumental variable approach to examining the effect of income or wealth on health, see Ettner (1996), Lindahl (2005), Meer et al. (2003) and Frijters et al. (2005). However, the validity of the instruments used by these studies is open to debate (Frijters et al., 2005).
3 In the data used by this study information on wealth was only collected in the second wave survey. As a result, the effect of changes in wealth on health cannot be examined using the data.
4 The underlying assumptions for such an approach to work are that causal action takes time (Adams et al., 2003), individuals do not foresee the changes in health and, even if they foresee health changes, they do not adjust their wealth holding accordingly.
5 An alternative model is duration models that estimate the probability that an event occurs (e.g. a health change in our case), given that the event has not occurred. One advantage of duration model is that time varying variables can be easily incorporated into the model. However, because the time period is short in our data (three years) and the wealth variable was only collected in the second wave survey, implying that wealth can only be used as a time-invariant variable, we decided to use probit models, which also provide an easy way for interpreting results. We carried out an experiment with duration models that provided qualitatively similar results to probit models.
6 Buckley et al. (2004) only examine transitions in self-reported health.
7 When the health condition questions were asked, HILDA respondents were shown a card listing specific examples of the conditions, including severe sight problems, hearing problems, speech problems, blackouts, limited use of arms or fingers, etc.
8 The estimation results indeed show that, in general, age has a significant effect on the transitions of health (see Appendix Table A2).
9 Summary statistics of the variables can be found in the Appendix Table A1.
10 Family size affects the availability of wealth. Instead of adjusting wealth using some equivalence scales, we directly control for family size, because there is not a unique equivalent scale and it is not clear which equivalence scale is more appropriate.
11 The coefficient estimates can be obtained upon request.
12 Stress may also lead to health risk behaviour, such as smoking and heavy drinking, but these factors have been controlled for in the model.

References

Adams, P., M.D. Hurd, D. McFadden, A. Merrill and T. Ribeiro (2003) 'Healthy, Weathy, and Wise? Tests for Direct Causal Paths between Health and Socioeconomic Status', *Journal of Econometrics* 112: 3–56.

ABS (Australian Bureau of Statistics) (2006) *Changes in Health: A Snapshot, 2004–5* (Cat. No. 4834.0.55.001). Canberra: ABS.

ACOSS (1993) 'Poverty Is a Health Hazard', *ACOSS Research Paper No. 7*. Sydney: Australian Council of Social Service.

Baum, F. (2005) 'Wealth and Health: The Need for More Strategic Public Health Research', *Journal of Epidemiology and Community Health* 59: 542–5.

Bound, J. (1991) 'Self-reported Versus Objective Measures of Health in Retirement Models', *Journal of Human Resources* 26(1): 106–38.
Buckley, N.J., F.T. Denton, A.L. Robb and B.G. Spencer (2004) 'The Transition from Good to Poor Health: An Econometric Study of the Older Population', *Journal of Health Economics* 23: 1013–34.
Cai, L. (2007) 'Effects of Health on Wages of Australian Men', Melbourne Institute Working Paper Series 02/07, University of Melbourne.
Cai, L. and G. Kalb (2006) 'Health Status and Labour Force Participation: Evidence from Australia', *Health Economics* 15: 241–61.
Commission of Inquiry into Poverty (1975) *First Main Report: Poverty in Australia*. Canberra: Australian Government Publishing Service.
Connelly, J.E., J.T. Philbrick, R.G. Smith, D.L. Kaiser and A. Wymer (1989) 'Health Perceptions of Primary Care Patients and the Influence on Health Care Utilisation', *Medical Care* 27: S99–S109.
Deaton, A. (2002) 'Policy Implications of the Gradient of Health and Wealth', *Health Affairs* 21(2): 13–30.
Deaton, A. (2003) 'Health, Inequality, and Economic Development', *Journal of Economic Literature* 61: 113–58.
Ettner, S. (1996) 'New Evidence on the Relationship between Income and Health', *Journal of Health Economics* 15: 67–85.
Frijters, P., M.A. Shields and J.P. Haisken-DeNew (2005) 'The Effect of Income on Health: Evidence from a Large-scale Natural Experiment', *Journal of Health Economics* 24: 997–1017.
Fuchs, V.R. (2004) 'Reflections on the Socio-economic Correlates of Health', *Journal of Health Economics* 23: 653–61.
Goldman, N. (2001) 'Social Inequalities in Health: Disentangling the Underlying Mechanisms', in M. Weinstein and A. Hermalin (eds) *Population, Health and Aging: Strengthening the Dialogue between Epidemiology and Demography*, *Annals of the New York Academy of Sciences* 954: 118–39.
Grossman, M. (1972) 'On the Concept of Health Capital and the Demand for Health', *Journal of Political Economy* 80: 223–55.
Grossman, M. and L. Benham (1974) 'Health, Hours and Wages', pp. 205–33 in M. Perlman (eds) *The Economics of Health and Medical Care*. London: Macmillan.
Haveman, R., B. Wolfe, B. Kreider and M. Stone (1994) 'Market Work, Wages, and Men's Health', *Journal of Health Economics* 13: 163–82.
Idler, E.L. and S.V. Kasl (1995) 'Self-ratings of Health: Do They Also Predict Change in Functional Ability?', *Journal of Gerontology* 50B: 344–53.
Lee, L. (1982) 'Health and Wages: A Simultaneous Equation Model with Multiple Discrete Indicators', *International Economic Review* 23: 199–221.
Lindahl, M. (2005) 'Estimating the Effect of Income on Health and Mortality Using Lottery Prizes as Exogenous Source of Variation of Income', *Journal of Human Resources* 40(1): 144–68.
Lundberg, O. and K. Manderbacka (1996) 'Assessing Reliability of a Measure of Self-rated Health', *Scandinavian Journal of Social Medicine* 24 (3): 218–24.
Marmot, M. (2005) *The Status Syndrome: How Social Standing Affects Our Health and Longevity*. New York: Times Books.
Marmot, M. and R.G. Wilkinson (1999) *Social Determinants of Health*. Oxford: Oxford University Press.
McCallum, J., B. Shadbolt and D. Wang (1994) 'Self-rated Health and Survival: A 7-year Follow-up Study of Australian Elderly', *American Journal of Public Health* 847: 1100–5.
McEwen, B.S. (1998) 'Protective and Damaging Effects of Stress Mediators', *New England Journal of Medicine* 15: 171–9.

Meer, J., D. Miller and H. Rosen (2003) 'Exploring the Health–Wealth Nexus', *Journal of Health Economics* 22: 713–30.
Mitchell, M. (1993) 'Poverty Is a Health Hazard: Address to the Behavioral Medicine Conference', *ACOSS Paper No. 62*. Sydney: Australian Council of Social Service.
Okun, M.A., W.A. Stock, M.J. Haring and R.A. Witter (1984) 'Health and Subjective Well-being: A Meta-analysis', *International Journal of Aging and Human Development* 192: 111–32.
Saunders, P. (1998) 'Poverty and Health: Exploring the Links between Financial Stress and Emotional Stress in Australia', *Australian and New Zealand Journal of Public Health* 22(1): 11–16.
Schrader, T. (2004) 'Poverty and Health in Australia', *New Doctor* 80: 17–19.
Smith, J. (1999) 'Healthy Bodies and Thick Wallets: The Dual Relation between Health and Economic Status', *Journal of Economic Perspectives* 13: 146–66.
Smith, J. (2004) 'Unraveling the SES Health Connection', *Institute for Fiscal Studies Working Paper 04/02*. London: Institute for Fiscal Studies.
Smith, J. and R. Kington (1997) 'Race, Socioeconomic Status and Health in Late Life', pp. 106–62 in L. Martin and B. Soldo (eds) *Racial and Ethnic Differences in the Health of Older Americans*. Washington, DC: National Academy Press.
Stafford, M. and M. McCarthy (2006) 'Neighbourhoods, Housing, and Health', pp. 297–317 in M. Marmot and R.G. Wilkinson (eds) *Social Determinants of Health*. Oxford: Oxford University Press.
Stern, S. (1989) 'Measuring the Effect of Disability on Labour Force Participation', *Journal of Human Resources* 24: 361–95.
Stronks, K., H. Van de Mheen, C. Looman and J.P. Mackenbach (1996) 'Behavioral and Structural Factors in the Explanation of Socio-economic Inequalities in Health: An Empirical Analysis', *Sociology of Health and Illness* 18: 653–74.
Ware, J., K. Snow, M. Kosinski and B. Gandek (2000) *SF-36 Health Survey: Manual and Interpretation Guide*. Lincoln, RI: Quality Metric Incorporated.
Wilkinson R. and M. Marmot (1998) *Social Determinants of Health: The Solid Facts*. Copenhagen: World Health Organization.
Williamson, D.L. and J.E. Fast (1998a) 'Poverty and Medically Necessary Treatment Services: When Public Policy Compromises Accessibility', *Canadian Journal of Public Health* 89(2): 120–4.
Williamson, D.L. and J.E. Fast (1998b) 'Poverty Status, Health Behaviours and Health: Implications for Social Assistance and Health Care Policy', *Canadian Public Policy* 24: 1–25.
Wooden, M., S. Freidin and N. Watson (2002) 'The Household, Income and Labour Dynamics in Australia (HILDA) Survey: Wave 1', *Australian Economic Review* 35(3): 339–48.

Biographical note

Lixin Cai is a Senior Research Fellow at the Melbourne Institute of Applied Economic and Social Research of the University of Melbourne. He was awarded a PhD in economics from the Australian National University in 2003. His research interests include micro-simulation modelling of the effect of tax and transfers on labour supply, the relationship between health and labour market activity and outcomes, the relationship between socio-economic status and health, and the dynamics of income support recipients in Australia. *Address*: Melbourne Institute of Applied Economic and Social Research, Alan Gilbert Building, University of Melbourne, Parkville VIC 3010, Australia.
[email: cail@unimelb.edu.au]