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Abstract

Using the Household, Income and Labour Dynamics in Australia (HILDA) survey data, this study examines the effect of wealth, as measured by net worth, 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.

1. Introduction

This study uses the Household, Income and Labour Dynamics in Australia (HILDA) survey data to examine the effect of wealth, as measured as net worth, 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.

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, as measured by net worth, 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 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 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 (Smith, 1999, 2004; Fuchs, 2004; Meer et al., 2003; Deaton, 2002; Frijters et al., 2005). From policy-makers' viewpoint, knowing the correlation between SES and health are not good enough because policy design aimed at improving general health or narrowing health inequality requires understanding the direction of causality (Frijters et al., 2005; Deaton, 2002).

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 (Wilkinson and Marmot, 1998; Marmot and Wilkinson, 1999). 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 and Kalb, 2006; Cai, 2007; Stern, 1989; Haveman, 1994; Lee, 1982; Grossman and Benham, 1974).[1]

There are a few studies that directly examine the relationship between wealth and health (e.g. Smith, 1999, 2004; Meer et al., 2003; Adams et al., 2003). 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

[1] However, it should be acknowledged that in his pioneered work on health production theory, Grossman, an economist, noted the causal effect of SES on health (1972). By 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.

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 showed 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 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 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 paper is organized as follows. Section 2 discusses the method used to identify the causal effect of wealth on health. Section 3 describes the data source and defines the health variable. Section 4 presents empirical results and Section 5 concludes.

2. 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. Smith, 1999, 2004; Adams et al., 2003), 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 a point of 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 analyzed, 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 time than that available in the data. However, due to the exclusion of people who were unhealthy in the base year from the analysis, 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) $\Pr ob(y_{it} = 0,\ t>0 \mid y_{i0} = 1) = f(W_{i0}, X_i) + \varepsilon_i$,

[2] For studies that use an instrumental variable approach to examining the effect of income or wealth on health, see Ettner (1996), Lindahl (2002), 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 (i.e. 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 did experiment with duration models that provided qualitatively similar results to probit models.

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 health 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 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, even if there is any.

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).

3. Data and variables

The data used in the paper draw upon the Household, Income and Labour Dynamics in Australia (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 wellbeing. Details of this survey are documented in Wooden, Freidin and Watson (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, which represents the total economic recourses under the command of the household. The measurement of net worth in HILDA is not straightforward. We calculated household net worth as household total assets minus household total debt. Household total assets are the sum of financial assets, as hold in the forms of equity investment, cash investment, trust accounts, bank accounts, redeemable insurance policies and superannuation, and non-financial assets, including home and other properties, collectible, business and vehicles. Similarly, household debt is the sum of property debt, business debt, credit card debt, HECS debt and other debt.

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 wellbeing, 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

[6] Buckley et al. (2004) only examine the transition of self-reported health.

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 (Idler and Kasl, 1995; McCallum et al., 1994; Connelly et al., 1989; Okun et al., 1984; Lundberg and Manderbacka, 1996). 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 analyzed in this study includes individuals who were 50 years or over as in the second wave. When the transition of health is analyzed, the sample is further restricted to those who reported healthy in the second wave (i.e. the base year). I focus on older population because their health is more likely to change than 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, above 20 per cent of those in poor health have no health condition and 20 per cent of those in good health have a health

[7] When the health condition questions are 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.

condition. This discrepancy may reflect reporting errors or arise from the fact that the two measures represent different dimensions of health.

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

Self-reported health status	Health conditions (%)		No.obs.
	No	Yes	
	Male		
Good	77.65	22.35	1,356
Poor	22.97	77.03	566
	Female		
Good	79.97	20.03	1,558
Poor	25.86	74.14	580

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).

4. 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.

4.1 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 per cent of males in the first 20 per cent of wealth distribution had health conditions, less than a quarter of those males in the top 20 per cent 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 2: Proportion having health conditions or in poor health by wealth quintile (%)

Wealth quintile	With health conditions		In poor health	
	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
$\chi^2(4)$	124.02***	121.80***	114.23***	117.10***
No. obs.	2,192	2,436	1,922	2,138

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 to experience the transition. The χ^2 test statistics indicate that wealth and the probability of experiencing the transition are not independent.

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

Wealth quintile	Health condition transition		Self-reported health transition	
	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
$\chi^2(4)$	31.33***	57.82***	40.35***	38.99***
No. obs.	1,149	1,372	1,111	1,301

4.2 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 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 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 variable on change in marital status, all other control variables take the values as in wave 2.

Table 4 presents the estimation results. 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 quantile to other wealth quantiles.[11]

At the bottom of Table 4 we report χ^2 statistics that jointly test the significance of all the four wealth quantile 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 health conditions) among those in the second and third wealth quantiles is 14 percentage points lower than the probability of those in the bottom wealth quantile;

[8] The estimation results indeed show that in general ages have a significant effect on the transitions of health (see Table 4).
[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.

those in the fourth and fifth wealth quantiles are about 17 percentage points lower than those in the bottom wealth quantile. 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 quantiles are more likely to experience the transition than those in the top two quantiles.

Another interesting result from Table 4 is that the effect does not appear to be linear. For example, for males the largest difference of the probability of experiencing the 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 of the

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 quantile				
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)*
Age group				
50-54	omitted			
55-59	0.0918**	0.0625*	0.0154	-0.0003
	(0.0407)	*(0.0369)*	*(0.0305)*	*(0.0294)*
60-64	0.1443***	0.0940**	0.0543	0.0298
	(0.0463)	*(0.0429)*	*(0.0363)*	*(0.0349)*
65-69	0.1793***	0.1497***	0.0880**	0.0121
	(0.0508)	*(0.0459)*	*(0.0415)*	*(0.0357)*
70-74	0.1892***	0.2383***	0.1263***	0.0740*
	(0.0527)	*(0.0511)*	*(0.0473)*	*(0.0429)*
75-79	0.3405***	0.3093***	0.1998***	0.0725
	(0.0661)	*(0.0609)*	*(0.0677)*	*(0.0509)*
80 +	0.4064***	0.3481***	0.1918**	0.0176
	(0.0892)	*(0.0725)*	*(0.0780)*	*(0.0538)*
Education				
Less year 11	omitted			
Year 11 or 12	0.0146	-0.0022	-0.0327	0.0014
	(0.0493)	*(0.0380)*	*(0.0416)*	*(0.0327)*
Certificate	0.0008	-0.0372	0.0289	-0.0542*
	(0.0372)	*(0.0422)*	*(0.0335)*	*(0.0317)*
Diploma	0.0460	0.0033	-0.1124***	0.0423
	(0.0514)	*(0.0495)*	*(0.0320)*	*(0.0464)*
Degree	-0.0625	-0.0599	-0.0003	0.0095
	(0.0433)	*(0.0393)*	*(0.0377)*	*(0.0346)*

(Continued)

Table 4: Continued

	Health condition transition		Self-reported health transition	
	Male	Female	Male	Female
Health risk behavior				
Current smoker	0.0369	-0.0148	0.0613	0.0432
	(0.0439)	*(0.0425)*	*(0.0379)*	*(0.0397)*
Ex-smoker	0.0824***	0.0299	0.0163	0.0319
	(0.0306)	*(0.0295)*	*(0.0253)*	*(0.0245)*
Heavy drinker	0.0628	-0.0450	0.0266	0.1027
	(0.0613)	*(0.1654)*	*(0.0505)*	*(0.1712)*
Lack of physical activity	0.0869*	0.0423	0.0449	0.0517
	(0.0463)	*(0.0408)*	*(0.0385)*	*(0.0373)*
Become non-married	0.0107	-0.0294	0.1226	0.0380
	(0.1007)	*(0.0786)*	*(0.0949)*	*(0.0642)*
Live in urban area	0.0099	-0.0131	-0.0501**	0.0014
	(0.0287)	*(0.0259)*	*(0.0237)*	*(0.0215)*
No. adults	0.0423**	0.0304*	-0.0051	0.0187
	(0.0182)	*(0.0168)*	*(0.0158)*	*(0.0142)*
No. children	-0.0343	-0.0536	0.0424	-0.0113
	(0.0358)	*(0.0611)*	*(0.0275)*	*(0.0484)*
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				
$\chi^2(4)$	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. ***, **, * indicates the estimate is significant at 1%, 5% and 10% respectively.

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 quantile appear not to have a lower probability of experiencing the transition, compared to those in the fourth wealth quantile.

The second panel shows the estimates for the age variables and clearly age matters (except for female self-reported health transitions). The results indicate that the older an individual is, the more likely for the person to experience the transition from healthy to unhealthy. The effects of age are stronger in the transition of health conditions than in the transition of self-reported health in terms of the statistical significance and the magnitude of the MME estimates.

For the education variables, some of them have unexpected signs, but overall they are not significant. There might be some explanations for such seemingly surprising results. First, the education variables are highly correlated with wealth and health risk behavior. Controlling for these confounding variables reduces the effect of education. For example, when wealth variables were left out from the model, the degree dummy was generally found negative and significant. Second, the samples analyzed include older people and it is often found that the effect of education on health is weaker for older people than for younger ones (House et al., 1994; Lynch 2003; Cutler and Lleras-Muney, 2006). Third, the protective effect of education on health may take time to manifest and the time span examined in this study (i.e. three years) may be too short for such effects to work through.

All health risk behavior variables have expected signs except for the heavy drinker variable in female health condition transitions, but most of the estimates are not significant, which might be again due to the short period examined. The become-non-married variable in general has an expected sign, but insignificant in any cases. The urban variable is insignificant as well. When significant, the number of adult variable has an expected sign, and the variable on the number of children is not significant anywhere.

5. Conclusion

Using the Household, Income and Labour Dynamics in Australia (HILDA) survey data, this study 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 analyzed (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 to one's health, than their wealthy counterparts. Second, people who are poor in wealth may also live an environment that is physically and/or socially disadvantaged, such as poor housing conditions, unfriendly neighborhood and/or lack of 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 less resource may get 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 (Willianson and Fast, 1998a,b), 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 social hierarchy and wealthy people experience less chronic stress because they have greater freedom to make decisions (Even, 2002; Deaton, 2003; Leigh and Jencks, 2007). 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 socioeconomic factors and psychological and emotional processes that in turn affect health. However, the current data do not provide adequate information to test these hypotheses.

[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.

Appendix

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

Variables[(a)]	Health condition transitions		Self-reported health transition	
	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.

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