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Health Shocks in China: Are the Poor and Uninsured Less Protected?

by

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Abstract

Health shocks have been shown to have important economic consequences in developed countries. Less is known about how health shocks impact on income, consumption, labor market outcomes, and medical expenditures in middle- and low-income countries. This paper explores these issues in China. In addition to providing new evidence on the general impact of health shocks, we also extend previous work by assessing the extent of risk protection afforded by formal health insurance, and by examining differences in the impact of health shocks between the rich and poor. We find that health shocks are associated with a substantial and significant reduction in income and labor supply. There are indications that the impact on income is less important for the insured, possibly because health insurance coverage is also associated with limited sickness insurance, but the effect is not significant. We also find evidence that negative health shocks are associated with an increase in unearned income for the poor but not the non-poor. This effect is however not strong enough to offset the impact on overall income. The loss in income is a consequence of a reduction in labor supply for the head of household, and we do not find evidence that other household members compensate by increasing their labor supply. Finally, as expected, negative health shocks are associated with a significant increase in out-of-pocket health care expenditures. More surprisingly, there is some evidence that the increase is greater for the insured than the uninsured. The findings suggest that households are exposed to considerable health-related shocks to disposable income, both through loss of income and health expenditures, and that health insurance offers very limited protection.

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I. INTRODUCTION

Serious illness and injury are largely unpredictable events. They can have potentially devastating effects on individuals and households, both through a loss of income and expenditures associated with medical care. Indeed, recent evidence from the US suggests that nearly half of personal bankruptcies are due to medical problems, with both out-of-pocket payments and loss of income being contributing factors (Himmelstein, Warren et al. 2005).

There is a growing literature focusing on the economic consequences of health shocks in developed countries—in terms of income, consumption, wealth, labor market outcomes, and medical expenditures. This literature has found strong evidence that negative health shocks are associated with reductions in income and wealth. For example, Smith (1999) finds that onset of a serious health condition reduces wealth by an average of US$17,000.[1] Stephens (2001) finds that disability of the head of a household is associated with a long-term decline in consumption. One of the conduits through which health shocks impact on consumption is labor supply. Smith (1999) finds a reduction of about 4 hours per week and a 15 percentage point decline in the probability of remaining in the labor force from a severe health event.[2] Using the same data, Levy (2002) also finds a negative impact on labor force participation, but no reduction in hours once participation is controlled for. Large effects of health shocks on labor supply have also been found in German data (Riphahn 1999). Not surprisingly, health shocks have also been shown to have a large impact on medical expenditures (Smith 1999; Wu 2001).

Less is known about the economic consequences of health shocks in middle- and low-income countries.[3] In general, research on risk and risk management in these contexts has demonstrated that households are able to use precautionary savings, informal networks, formal insurance, and other institutions to smooth consumption in the face of idiosyncratic shocks, although insurance tends to be far from perfect (Morduch 1995; Townsend 1995; Dercon 2002). In general, this research has focused on climactic and other idiosyncratic shocks, but there is also a limited literature on the specific issue of health shocks. For example, Gertler and Gruber (2002) provide evidence that households in Indonesia are unable to perfectly insure consumption

[1] See also Levy (2002) and Wu (2001).
[2] For a review of the literature, see Currie and Madrian (1999).
[3] There is of course a sizeable literature on the general relationship between health and economic outcomes in developing countries (Behrman and Deolalikar 1988; Strauss and Thomas 1995; Strauss and Thomas 1998)

against health risks. Similarly Dercon and Krishnan (2000) show that in Ethiopia the consumption risks associated with health shocks are not borne equally by all household members, and Wagstaff (2005) finds evidence that health shocks are associated with a reduction in consumption in Vietnam, in particular for uninsured and better-off households. Health shocks have also been found to reduce labor supply in both Africa and Asia (Pitt and Rosenzweig 1986; Schultz and Tansel 1997), although the impact on productivity and wages is less clear. Gertler and Gruber (2002) find health shocks to reduce labor supply and income in Indonesia, although the effect is not significant for all health shock measures. They also find a significant effect on medical expenditures, although this effect is considerably smaller than the impact on income.

Drawing on work from both developed and developing countries, this paper explores the economic consequences of health shocks in China. It focuses on how changes in self-assessed health of the head of household impact on income, household labor supply and medical expenditures. Although the lack of consumption data does not permit us to test the extent of consumption insurance, we extend previous work by examining whether formal health insurance mitigates the economic consequences of a health shock. This question has received some attention in the context of developed countries. For example, both Smith (1999; 2003) and Levy (2002) find that the impact of health shocks on income and wealth are not significantly different between the insured and uninsured in the US (Smith 1999; Levy 2002). However, they do find evidence that insurance reduces out-of-pocket payments. How do these issues play out in China? How are households affected by health shocks? Are there differences in the impact of health shocks between the rich and poor? Does health insurance protect households against risk? If so, does this protection operate only on the expenditure side or also on the income side? In a country that is currently considering or undertaking major health system reforms, these are important questions to ask and answer.

II. DATA, CONTEXT, AND METHODS

Data and descriptive statistics

The analysis is based on the China Health and Nutrition Survey (CHNS).[4] The CHNS is a longitudinal survey that covers nine out of China's 33 province-level divisions.[5] Four counties, stratified by income, were randomly selected in each of the 9 provinces. In addition, the provincial capital and a lower income city were selected when feasible. Within the 36 counties and urban areas, 190 primary sampling units (villages and urban neighbourhoods) were selected randomly. The paper draws on data from four rounds of the CHNS: 1991, 1993, 1997, and 2000.[6] In each year, we focus on the heads of households. The total number of observations for each year is 2,368 (1991), 2,627 (1993), 2,985 (1997), and 2,667 (2000).[7]

The four rounds of the CHNS panel cover a period of dramatic change in China. In this paper we focus on how changes in self-assessed health (SAH) relate to changes in economic outcomes. SAH—sometimes referred to as General Health Status—is based on self-evaluation of health status according to a scale of four or five, typically ranging from 'poor' to 'excellent'. SAH is popular in the empirical literature because it has been shown to be highly correlated with subsequent morbidity and mortality.[8] In the parts of China covered by the CHNS, SAH has worsened gradually over the four rounds of survey (Table 1).[9] In 1991, 27% of heads of households rated their health as fair or poor; by 2000, this had increased to 37%. This worsening is also reflected in the principal health shocks variable used in the paper, SAH_CHANGE, which is simply the change in SAH between periods. Acknowledging the restrictions imposed by using a simple difference in SAH as a health shock measure, we also explore a more flexible form

[4] Details taken from CHNS website http://www.cpc.unc.edu/projects/china.
[5] Guangxi, Guizhou, Heilongjiang (1997 and 2000 only), Henan, Hubei, Hunan, Jiangsu, Liaoning (not 1997), and Shandong.
[6] The first round of the CHNS was implemented in 1989. Data from this round are not used here because some of the variables of interest are not available in the first round, and because of the lack of comparability in other variables.
[7] In the CHNS sampling procedure, all new households formed from sample households who resided in sample areas were added to the sample. In 1997, new communities were added to replace households or communities no longer participating. Moreover, Heilongjiang province replaced Liaoning province. In 2000, newly formed households and replacement households were also added, and Liaoning province returned to the study. Although attrition has been relatively low, the sample size used for the analysis is considerably lower than the total number of households in the sample: 3,616 (1991), 3,441 (1993), 3,875 (1997), and 4,403 (2002). This primarily reflects two factors. First, data were incomplete for some of the variables of interest, in particular self-assessed health. As a result, nearly 20% of observations were dropped. In addition, approximately 10% of the observations had to be dropped because data were only available for one year. A small number of observations were also dropped as outliers in the data.
[8] The use of self-assessed health to study the impact of health shocks also has important limitations. These are discussed in more detail in the method section.
[9] The question about self-reported status in the CHNS is asked relative to 'other people in your age'. As a consequence, changes in SAH should not reflect secular, age-related, changes in health status.

based on four dummy variables (SAH_POS_CH_LGE, SAH_POS_CH_SML, SAH_NEG_CH_SML, SAH_NEG_CH_LGE) that distinguish between large (a jump of two or three SAH ratings) and small (a jump of one SAH rating).[10] These two sets of health shock variables permit us to test whether (i) the impact is a positive health shocks on outcomes is different from a negative health shock; and (ii) a 'large' health shock has an impact that is twice as large as a 'small' health shock. Over the four rounds of the survey, a sizeable and growing share of the sample experience negative health shocks. In 1993, 25% of household heads had experienced a worsening of health status relative to 1991. Only a small percentage of household—2% in 1991—experience what we refer to as a large shock. In 2000, the percentage of household heads that experience a negative shock increased to 32%, while 6% experienced a large negative shock.

In terms of economic outcomes, we focus on income, labor market outcomes, and medical expenditures. The general income variable, PCINC, represents per capita household income at constant prices. As can be seen from Table 2, per capita income has increased steadily over the survey period, fuelled by growth in both earned (EARN_PCINC) and unearned (UNEARN_PCINC) income. For labor market outcomes, we construct two variables, capturing the total number of hours per week on average by the head of household (TOTHRS_HD) and by other household members (TOTHRS_NONHD). We also consider the labor market participation decision (TOTHRS_PARTIC), which captures whether total average hours per week last year was greater than zero. Finally, medical expenditures (OOP) include all health expenditures incurred in the last month, but excludes expenditures reimbursed by insurance. With the exception of unearned income and labor supply by non-head household members, there is a sizeable gradient in the relationship between SAH and the outcome variables considered (Table 4).

In addition to looking at how health shocks impact on economic outcomes in general, we also try to understand whether there are differences in impact between the poor and non-poor, and between the insured and uninsured. The poverty dummy (POOR) is a relative measure of poverty, which indicates whether household income was among the bottom 40% in the sample in

[10] Changes of two and three SAH ratings were grouped because the number of observations with a change in three ratings was very small (<0.5%).

the previous year.[11] For health insurance, three dummy variables are constructed. This includes coverage by the Government Health Insurance scheme (GIS) for government employees, the Labor Health Insurance scheme (LIS) for employees in state-owned enterprises, insurance coverage by the work unit other than state-owned enterprises, the cooperative medical scheme (CMS) in rural areas, and other forms of health insurance. In general, health insurance coverage (HI) has declined over the survey period, from 31% of household heads in 1991 to 24% in 2000. This trend reflects changes in the financing and institutional arrangements for health insurance that started in the early 1980s and that are still ongoing (Liu 2002; Akin, Dow et al. 2004; Liu 2004). The decline in insurance coverage is more marked in the case of urban schemes (URB_HI) than in rural areas, where there has even been a small increase in coverage over the survey period.

Methods

For all the outcomes of interest, the equation of interest is the following equation:[12]

$$(1) \qquad \ln y_{it} = X_{it}\beta + \gamma \Delta h_{it} + \alpha_i + u_{it},$$

where y_{it} is the outcome variable (income, labor supply of head, labor supply of non-head household members, and medical expenditures), X_{it} is a vector of time-variant individual and household characteristics respectively, Δh_{it} is the health shock variable, α_i are individual effects capturing both time-invariant unobserved heterogeneity and a vector of time-invariant individual and household characteristics, and u_{it} is an error term that may include time-variant individual effects.

The challenge in consistently estimating γ arises from three factors. First, there is potential measurement error in the health shock variable (Strauss and Thomas 1998). Perceptions about own health status are likely to be influenced by education, contact with the health systems, and other factors, rendering measurement error in SAH correlated with independent variables of interest. This is in contrast with some more 'objective' measures of health shocks that have been used in the literature, including the emergence of a new serious health condition between waves in panel data (Smith 1999; Wu 2001; Levy 2002), the onset of impairment and disability

[11] We use lagged poverty because current poverty status may be a consequence of a health shock, and is hence endogenous.
[12] This approach is similar to that followed by Smith (1999) and Levy (2002). In contrast, Gertler and Gruber (2002) focus on the *change* in the log outcome. We explored this specification. As discussed further in the results section, the results were similar between the two specifications.

(Haveman and Wolfe 1990; Baldwin, Zeager et al. 1994; Stephens 2001), change in activities of daily living (Gertler and Gruber 2002), change in illness status (Kochar 1995; Townsend 1995; Schultz and Tansel 1997; Riphahn 1999), changes in BMI (Wagstaff 2005), and 'unpredicted' number of days unable to work (Dercon and Krishnan 2000). In this paper, measurement error problems are mitigated by the fact that we focus on *change* in SAH. Time-invariant measurement errors in SAH have hence been eliminated through the construction of the variable. Any remaining measurement error in SAH_CHANGE will tend to bias the coefficient downwards.

Second, the presence of unobserved individual heterogeneity—e.g. preferences or health endowments—may be a determinant of both health and the outcome of interest. This would render OLS estimates biased. We overcome this problem by exploiting the panel dimension of the data to estimate a fixed-effect model. In effect, this entails the inclusion of an individual level dummy which capture both time-invariant unobserved heterogeneity and time-invariant explanatory variables. We assume that there is no time-invariant heterogeneity that is correlated with the health shock variables.

A final estimation problem arises if health is simultaneously determined with labor supply, productivity, income, and health inputs. In this framework (Grossman 1972), flows or changes in health over time reflect investment in health, depreciation of health stock, as well as unexpected shocks. As a result, innovations in the outcome equation feed back to health through the impact of the outcome, say higher income or labor supply, on health investments. The result is a correlation between the error term, u_{it} and Δh_{it}. The simultaneity problem may be particularly severe with SAH, which, to a greater extent than more objective measures like activity limitations or onset of specific conditions, includes psychological dimensions.[13] These problems have led attempts to instrument for SAH in empirical analysis of the relationship between health and economic outcomes, but it has often proven difficult to find convincing instruments and exclusion restrictions.[14] Our strategy for dealing with the potential simultaneity of health shocks

[13] Although feed-back mechanisms may be stronger, the general nature of SAH as a measure of health status is also one of its strengths. The use of more specific health measures based on physical functionings or particular diagnoses as proxies for general health status can be problematic because their relationship with economic outcomes may be weak. Moreover, the impact of 'objective' measures of health limitations on economic outcomes may vary with sex, occupation, and other factors (Baldwin, Zeager et al. 1994), creating problems that are similar to the measurement error issues that arise with SAH. For a general discussion, see Currie and Madrian (1999).

[14] For example, Disney, Emmerson, et al. (2003) use activity limitations and individual characteristics, following an approach proposed by Bound (1999). Contoyannis and Rice (2001) use different instrumental variable estimators to study the impact of

is to consider a specification where 'large' health shocks—which are more likely to represent exogenous shocks—enter as separate dummy variables from 'small' shocks. This is admittedly an imperfect identification strategy. However, as pointed out by Bound (1991), the bias arising from the endogeneity of SAH will at least tend to be offset by any downward bias related to measurement errors in SAH.

In addition to the basic model (1), we also estimate models where the health shock variable(s) is interacted with an insurance or poverty dummy, i.e.

$$(2) \qquad \ln y_{it} = X_{it}\beta + \gamma \Delta h_{it} + \phi I_i \Delta h_{it} + \alpha_i + u_{it}.$$

This permits us to test whether the economic consequences of health shocks are different for the insured and uninsured, and for the poor and non-poor.

III. **RESULTS**

Specification

Results are reported in Table 5 - Table 13. Columns (A) and (B) presents the results for two different specifications, as well as tests of the hypotheses that (i) the impact of a negative health shock is different from a positive health shock, and (ii) that the coefficients on 'large' shocks are twice those of 'small' shocks. For all the outcome variables, we cannot reject the hypothesis that the absolute value of the coefficient on a negative health change is the same as the coefficient on positive health change. Similarly, including change in SAH as dummy variables for large and small changes, we cannot reject the hypothesis that the coefficients on large changes (positive or negative) are twice those of small changes for any of the outcomes.[15] It hence seems that there is little reason to use the more flexible specification, and for the purpose of looking at poverty and insurance interaction, we restrict attention to the simple health change variable (columns (C) to (E)).

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health on wages, but find limited impact on the estimated coefficients on health. Other studies have used prices of health inputs (e.g. travel time to health care provider) or community level characteristics. The effectiveness of this approach is often limited by a lack of variation or low correlation between instruments and health status.

[15] The same conclusions holds if we focus on *change* in log outcome, with the exception of out-of-pocket medical expenditures, where the impact of a positive health shock is significantly higher than that of a negative health shock.

Health shocks and income

Health shocks are associated with significant changes in income (Table 5). The coefficient on SAH_CHANGE suggests that a worsening of SAH by one rating reduces income by 6.2%, and a worsening by two ratings by 12.4%. The poverty interaction is not significant. There is however weak evidence that the insured individuals, in particular the urban insured, are protected against income shocks, but the effect is not significant. Although the Government and Labor Insurance Schemes do not include any direct sickness benefits, this finding is plausible as many of the government and SOE employees who are covered by these schemes tend to enjoy limited sickness insurance as a separate benefit.

We also look separately at earned and unearned income. As expected, the overall effect of health shocks on income is operating primarily through *earned* income (Table 6). As is the case with total income, poverty and insurance interactions are not significant. In the case of *unearned* income, health shocks do not have an overall effect. The poverty interaction is however significant and positive, such that the total effect of health shocks on unearned income is positive for the poor.[16] We also explored whether health shocks had any impact on specific components of unearned income. We do not find any significant effects for the sample as a whole. However, when we include the poverty interaction, we find a positive and significant effect on in-kind transfers from family and friends (Table 10).[17] This suggests that the poor benefit from some protection against income shocks associated with adverse health events. However, transfers from family and friends comprise only a small share of income (9.4% of total unearned income), and the impact of health shocks on overall income remains negative (Table 11).

Health shocks and labor supply

It is reasonable to expect that the negative impact of a health shock on per capita income is at least in part related to a reduction in labor supply. The analysis bears this out, considering both total hours worked (Table 8), where the results suggest a reduction in hours of 5% for a

[16] The same conclusions hold when we focus on *change* in earned and unearned income.
[17] We also find a positive interaction dummy for another two components of unearned income (poverty and welfare funds, and other sources), but the combined effect (coefficient on SAH_CHANGE plus the interaction dummy) is not significant in both cases.

worsening of one SAH rating, and the participation decision (Table 9).[18] The interaction effects with poverty and health insurance status are positive, but not significant. We also explore whether there is any evidence that other household members compensate by increasing their labor supply in the face of an adverse health shock, but find no evidence that this is the case.[19]

Health shocks and out-of-pocket expenditure

Finally, we find, strong evidence that health shocks are associated with changes in out-of-pocket medical expenditures (Table 12), suggesting that a change in SAH of one rating results in a change in medical expenditures of 9% on average. We find a negative and significant coefficient on the poverty interaction. This indicates that health shocks have a smaller, but still significant, impact on medical expenditures for the poor. Of course, the flipside of this finding is that the poor are likely to obtain less health care when they experience a health shock, with potentially adverse consequences for health. In contrast, the health insurance interaction is positive, although not significant, and only for urban health insurance.[20]

IV. **CONCLUSIONS**

Health shocks are ubiquitous events in both developed and developing countries. Although there is a sizeable literature on the economic consequences of health shocks in developed countries, the evidence is scarce for developing and middle-income countries. Even less is known about whether shocks impact differently on different types of households—e.g. depending on insurance status or level of income.

This paper has provided new evidence on the economic consequences of health shocks in China. The results indicate that negative health shocks—defined as a worsening of self-assessed health—have a significant and sometimes large impact on income, labor supply, and medical

[18] We undertook the same analysis looking at hours worked in primary occupation rather than total hours. The results are consistent, and findings from the regressions of primary occupation hours are not reported here.
[19] Results are not reported, but are available from the authors upon request.
[20] When we focus on *change* in log medical expenditures, the urban health insurance interaction is positive and significant (Table 13). This indicates that the rate of change in medical expenditure is not only higher when an individual experiences a negative health shock, but that the rate of change is significantly higher for the urban insured. Keeping in mind that the medical expenditure variable refers to out-of-pocket expenditures rather than total medical expenditures (i.e. expenditures covered by insurance are excluded), this finding is somewhat surprising. It suggests that having health insurance (at least urban insurance) increases rather than reduces out-of-pocket, presumably because the insured use both more and more sophisticated health services than the insured.

expenditures. There are indications that the impact on income is less important for the insured, but the effect is not significant. We also find evidence that negative health shocks are associated with an increase in unearned income for the poor but not the non-poor. This effect, which seems to be due to in-kind transfers from friends and family rather than formal safety net schemes, is however not strong enough to offset the impact on overall income. The loss in income is a consequence of a reduction in labor supply for the head of household, and we do not find evidence that other household members compensate by increasing their labor supply. Finally, as expected, negative health shocks are associated with a significant increase in out-of-pocket health care expenditures. This increase is smaller for the poor. More surprisingly, there is also some evidence that it is greater for the insured than the uninsured.

These findings provide new evidence on health shocks and their economic consequences, but are also of relevance to current policy issues in China and elsewhere. First, the paper also makes it clear that health insurance does not necessarily reduce expected out-of-pocket health care expenditures. Indeed, the results suggest that the opposite may be true. This undoubtedly reflects the fact that the insured receive more and better health care. What is surprising is that this increase in the quantity and quality of care is so great that it more than offsets the lower cost of care for the insured. The findings beg the question of whether health insurance at least provides protection against very high (catastrophic) health expenditures. In a context of heavy reliance on fee-for-service payment of providers, strong financial incentives for individual providers, and weak mechanisms of quality control, the findings also raise concern about whether some of the increase in spending associated with health shocks reflects the provision of unnecessary care.

Second, the results suggest that a large negative health shock reduces income by 12.4% and increases medical expenditures by 17.6% on average. Both these effects serve to reduce disposable income. However, considering that medical expenditures are only a small share of income, the effect on income is considerably more important. Hence, while health insurance and safety net schemes that assist with health care expenditures have an important role to play in protecting households against catastrophic health expenditures, households remain vulnerable in the absence of some form of sickness insurance. This suggests that the current health reform agenda, which emphasizes protection against high health expenditures, may be incomplete.

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Table 1: Health shock variables

VARIABLE	Description	1991	1993	1997	2000	All years			
		Mean	Mean	Mean	Mean	Mean	sd	Min.	Max.
SAH=1 (EXCELLENT)	Self-assessed health (SAH) reported by head of household	0.128	0.120	0.137	0.133	0.130	0.336	0.000	1.000
SAH=2 (GOOD)		0.602	0.606	0.592	0.505	0.576	0.494	0.000	1.000
SAH=3 (FAIR)		0.237	0.234	0.230	0.307	0.252	0.434	0.000	1.000
SAH=4 (POOR)		0.033	0.040	0.041	0.055	0.042	0.201	0.000	1.000
SAH_CHANGE	Difference between SAH in current period and SAH in last period. A positive value corresponds to a worsening of health status		0.002	0.030	0.133	0.060	0.875	-3.000	3.000
SAH_POS_CH_LGE	Dummy variable for whether head of household has experienced an improvement of more than one rating in SAH		0.029	0.038	0.029	0.032	0.175	0.000	1.000
SAH_POS_CH_SML	Dummy variable for whether head of household has experienced an improvement of one rating in SAH		0.220	0.206	0.191	0.205	0.404	0.000	1.000
SAH_NEG_CH_SML	Dummy variable for whether head of household has experienced a worsening of one rating in SAH		0.229	0.226	0.261	0.240	0.427	0.000	1.000
SAH_NEG_CH_LGE	Dummy variable for whether head of household has experienced a worsening of more than one rating in SAH		0.025	0.043	0.060	0.044	0.204	0.000	1.000

n = 2,719 (1991), 2,715 (1993), 3,089 (1997), 2,798 (2000)

Note: No data available for 1991 for the variables that are constructed using lagged SAH

Table 2: Dependent variables

VARIABLE	1991	1993	1997	2000	All years				Description
	Mean	Mean	Mean	Mean	Mean	sd	Min.	Max.	
PCINC	1,154.30	1,353.86	1,432.97	1,880.03	1,457.23	1,889.63	0.00	69,259.55	Total household income from all sources divided by number of household members (1989 prices)
natural log	6.54	6.53	6.62	6.74	6.61	1.67	0.00	11.15	
Δ natural log	-	-0.01	0.01	0.03	0.01	0.72	-4.36	4.77	
EARN_PCINC	1,034.17	1,166.00	1,212.45	1,553.79	1,249.88	1,840.37	0.00	68,413.88	Total income from salaries, business income, agriculture, fishing, and handicrafts, asset rentals, and other minor items, divided by number of householdm embers (1989 prices)
natural log	6.31	6.16	6.01	6.07	6.13	2.18	0.00	11.13	
Δ natural log	-	-0.10	-0.07	-0.01	-0.05	0.84	-4.30	4.54	
UNEARN_PCINC	157.18	187.86	220.53	326.24	225.81	575.75	0.00	10,120.39	Total income from pensions, welfare payments, transfers from friends and family, gifts from the workplace, and other sources (1989 prices)
natural log	2.30	2.39	2.64	2.57	2.49	2.79	0.00	9.22	
Δ natural log	-	0.04	0.08	0.02	0.05	1.08	-3.95	3.97	
TOTHRS_HD	38.05	31.27	28.51	24.20	30.40	24.70	0.00	138.00	Average number of hours worked by head of household per week during last year, including primary and secondary employment and home production
natural log	3.16	2.78	2.68	2.35	2.74	1.56	0.00	4.93	
Δ natural log	-	-0.36	-0.24	-0.41	-0.34	1.66	-6.40	6.56	
TOTHRS_PARTIC	62.87	50.98	45.68	38.55	49.32	48.93	0.00	476.00	Dummy variable for whether the head of household is working (TOTHRS_HD > 0)
TOTHRS_NONHD	3.59	3.22	3.06	2.67	3.13	1.65	0.00	6.17	Total hours worked by non-head household members per week on average during the last year
natural log	-	-0.38	-0.25	-0.41	-0.35	1.73	-6.73	6.07	
Δ natural log	0.87	0.80	0.79	0.72	0.79	0.41	0.00	1.00	
OOP	5.65	5.59	9.53	7.40	7.12	85.65	0.00	2,774.77	Total health care expenditures during last month, net of any reimbursement from health insurance (1989 prices)
natural log	0.19	0.11	0.18	0.19	0.17	0.82	0.00	7.93	
Δ natural log	-	-0.04	0.01	0.01	-0.01	0.38	-3.76	3.71	

n = 2,719 (1991), 2,715 (1993), 3,089 (1997), 2,798 (2000)

Note: 365 observations dropped for earned and unearned income

Table 3: Independent variables

VARIABLE	Description	1991	1993	1997	2000	All years			
		Mean	Mean	Mean	Mean	Mean	sd	Min.	Max.
AGE01	Average age of household members on Jan. 1, 2001	58.5	58.1	55.0	53.2	56.1	14.8	25.0	100.0
AGE01_SQ	Average age squared	3,653.2	3,593.7	3,237.3	3,019.2	3,369.5	1,764.6	625.0	10,000.0
AGE01_CUB	Average age cubed	242,348.6	235,770.7	202,769.9	181,611.1	215,026.4	167,564.1	15,625.0	1,000,000.0
HHSIZE	Number of household members	2.97	4.04	3.78	3.61	3.61	1.44	1.00	12.00
HHSIZE_SQ	Number of household members squared	10.41	18.46	16.23	15.07	15.09	12.18	1.00	144.00
HHSIZE_CUB	Number of household members cubed	42.43	93.73	77.56	70.88	71.42	93.19	1.00	1,728.00
POOR	Per capita household income is among bottom 40% of sample in last period	-	0.40	0.44	0.39	0.41	0.49	0.00	1.00
HI	Head of household is covered by either urban or rural health insurance	0.31	0.28	0.27	0.24	0.28	0.45	0.00	1.00
URB_HI	Head of household is covered by 'public insurance' or 'workers insurance', or by other type of insurance and resident in urban area	0.26	0.25	0.18	0.17	0.21	0.41	0.00	1.00
RUR_HI	Head of household is covered by 'cooperative medical insurance' or 'work unit insurance', or by other type of insurance and resident in rural area.	0.05	0.04	0.10	0.07	0.06	0.25	0.00	1.00

n = 2,719 (1991), 2,715 (1993), 3,089 (1997), 2,798 (2000)

Table 4: SAH and economic outcomes

		PCINC	EARN_ PCINC	UNEARN_ PCINC	TOTHRS_ HD	TOTHRS_ NONHD	OOP
1991							
	Excellent	1,231.80	1,096.97	104.79	40.54	55.05	2.11
	Good	1,195.81	1,070.29	163.90	39.21	63.60	1.18
	Fair	1,045.31	940.60	172.25	35.70	64.13	4.16
	Poor	879.47	758.60	149.02	24.04	70.81	111.50
1993							
	Excellent	1,533.70	1,375.07	158.62	33.90	46.13	0.27
	Good	1,349.62	1,182.45	167.17	33.10	51.36	1.59
	Fair	1,343.04	1,102.14	240.91	27.11	51.95	9.34
	Poor	947.17	669.00	278.17	20.02	53.83	59.69
1997							
	Excellent	1,697.79	1,562.29	135.50	30.85	41.15	0.34
	Good	1,430.50	1,232.77	197.72	30.04	47.19	1.89
	Fair	1,338.99	1,036.18	302.81	25.11	45.89	14.55
	Poor	1,110.94	739.09	371.85	17.70	37.61	123.00
2000							
	Excellent	1,834.89	1,628.66	206.22	30.42	41.54	0.29
	Good	1,984.00	1,713.84	270.16	25.64	39.35	2.79
	Fair	1,716.46	1,281.93	434.52	20.78	36.65	12.47
	Poor	1,946.70	1,418.51	528.19	14.88	34.65	38.73

n = 2,719 (1991), 2,715 (1993), 3,089 (1997), 2,798 (2000)

Table 5: Results for log per capita total income

VARIABLE	*log per capita income*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**-0.062**		**-0.071**	**-0.085**	**-0.085**
	-2.450		**-1.980**	**-2.860**	**-2.860**
SAH_POS_CH_LGE		-0.029			
		-0.180			
SAH_POS_CH_SML		0.051			
		0.760			
SAH_NEG_CH_SML		-0.096			
		-1.520			
SAH_NEG_CH_LGE		-0.191			
		-1.430			
POOR X SAH_CHANGE			0.019		
			0.330		
HI X SAH_CHANGE				0.096	
				1.480	
URB_HI X SAH_CHANGE					0.101
					1.340
RUR_HI X SAH_CHANGE					0.084
					0.810
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	-0.072				
	-0.816				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.131			
		-0.694			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.002			
		0.009			
SAH_CHANGE + POOR X SAH_CHANGE			-0.052		
			-1.297		
SAH_CHANGE + HI X SAH_CHANGE				0.011	
				0.195	
SAH_CHANGE + URB_HI X SAH_CHANGE					0.017
					0.245
SAH_CHANGE + RUR_HI X SAH_CHANGE					-0.001
					-0.009
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 6: Results for log per capita earned income

VARIABLE	*log per capita earned income*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**-0.100**		**-0.084**	**-0.107**	**-0.107**
	-3.190		**-1.910**	**-2.950**	**-2.950**
SAH_POS_CH_LGE		-0.147			
		-0.770			
SAH_POS_CH_SML		0.059			
		0.710			
SAH_NEG_CH_SML		-0.137			
		-1.760			
SAH_NEG_CH_LGE		-0.482			
		-2.950			
POOR X SAH_CHANGE			-0.036		
			-0.520		
HI X SAH_CHANGE				0.033	
				0.410	
URB_HI X SAH_CHANGE					0.031
					0.340
RUR_HI X SAH_CHANGE					0.036
					0.280
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	-0.175				
	-1.607				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.265			
		-1.137			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		-0.207			
		-1.011			
SAH_CHANGE + POOR X SAH_CHANGE			**-0.119**		
			-2.418		
SAH_CHANGE + HI X SAH_CHANGE				-0.075	
				-1.089	
SAH_CHANGE + URB_HI X SAH_CHANGE					-0.076
					-0.905
SAH_CHANGE + RUR_HI X SAH_CHANGE					-0.072
					-0.600
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 7: Results for log per capita unearned income

VARIABLE	*log per capita unearned income*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	0.031		-0.031	0.037	0.036
	0.850		-0.610	0.880	0.860
SAH_POS_CH_LGE		0.102			
		0.460			
SAH_POS_CH_SML		0.002			
		0.020			
SAH_NEG_CH_SML		0.001			
		0.010			
SAH_NEG_CH_LGE		**0.341**			
		1.800			
POOR X SAH_CHANGE			**0.139**		
			1.740		
HI X SAH_CHANGE				-0.027	
				-0.290	
URB_HI X SAH_CHANGE					-0.072
					-0.670
RUR_HI X SAH_CHANGE					0.067
					0.450
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	0.108				
	0.856				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		0.097			
		0.361			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.339			
		1.428			
SAH_CHANGE + POOR X SAH_CHANGE			**0.108**		
			1.891		
SAH_CHANGE + HI X SAH_CHANGE				0.010	
				0.131	
SAH_CHANGE + URB_HI X SAH_CHANGE					-0.036
					-0.366
SAH_CHANGE + RUR_HI X SAH_CHANGE					0.103
					0.745
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 8: Results for log total hours worked by head of household

VARIABLE	*log total hours worked by household head*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**-0.056**		**-0.075**	**-0.065**	**-0.064**
	-2.790		**-2.640**	**-2.760**	**-2.750**
SAH_POS_CH_LGE		-0.015			
		-0.130			
SAH_POS_CH_SML		0.015			
		0.280			
SAH_NEG_CH_SML		**-0.100**			
		-2.000			
SAH_NEG_CH_LGE		-0.196			
		-1.860			
POOR X SAH_CHANGE			0.041		
			0.930		
HI X SAH_CHANGE				0.037	
				0.720	
URB_HI X SAH_CHANGE					0.058
					0.980
RUR_HI X SAH_CHANGE					-0.009
					-0.110
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	-0.096				
	-1.364				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.045			
		-0.303			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.005			
		0.038			
SAH_CHANGE + POOR X SAH_CHANGE			-0.033		
			-1.049		
SAH_CHANGE + HI X SAH_CHANGE				-0.028	
				-0.638	
SAH_CHANGE + URB_HI X SAH_CHANGE					-0.006
					-0.110
SAH_CHANGE + RUR_HI X SAH_CHANGE					-0.073
					-0.949
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 9: Results for logit of labor market participation

VARIABLE	*labor market participation by head (total hours > 0)*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**-0.150**		**-0.210**	**-0.190**	**-0.190**
	-2.710		**-2.610**	**-3.000**	**-3.000**
SAH_POS_CH_LGE		-0.189			
		-0.600			
SAH_POS_CH_SML		0.059			
		0.430			
SAH_NEG_CH_SML		-0.317			
		-2.360			
SAH_NEG_CH_LGE		**-0.464**			
		-1.570			
POOR X SAH_CHANGE			0.122		
			1.030		
HI X SAH_CHANGE				0.196	
				1.320	
URB_HI X SAH_CHANGE					0.231
					1.290
RUR_HI X SAH_CHANGE					0.137
					0.600
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	-0.299				
	-1.624				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.308			
		-0.786			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.170			
		0.466			
SAH_CHANGE + POOR X SAH_CHANGE			-0.087		
			-1.067		
SAH_CHANGE + HI X SAH_CHANGE				0.006	
				0.046	
SAH_CHANGE + URB_HI X SAH_CHANGE					0.040
					0.246
SAH_CHANGE + RUR_HI X SAH_CHANGE					-0.054
					-0.247
N	1,726	1,726	1,726	1,726	1,726

Note: Results estimated with household-level fixed effects logit. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 10:Results for components of unearned income

VARIABLE	Asset rentals	Boarders and lodgers	Retirement pension	Poverty, disability, welfare fund	Transfers from family and friends	Other sources	Value of in-kind gifts from family and friends	Gifts from local enterprises
SAH_CHANGE	0.031	0.010	0.039	**-0.023**	0.006	-0.076	-0.037	-0.020
	1.230	1.140	1.260	**-1.760**	0.190	-2.240	-1.080	-1.350
POOR X SAH_CHANGE	-0.022	-0.014	-0.030	**0.037**	0.027	**0.117**	**0.107**	0.026
	-0.550	-1.050	-0.630	**1.760**	0.550	**2.170**	**1.970**	1.100
LINEAR COMBINATIONS	0.009	-0.004	0.008	0.013	0.032	0.040	**0.070**	0.006
SAH_CHANGE + POOR X SAH_CHANGE	0.316	-0.449	0.239	0.895	0.933	1.048	**1.787**	0.338
N	7,486	7,486	7,486	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided).

Table 11: Components of unearned income

YEAR	Total unearned income	Components as % of total unearned income							
		Asset rentals	Boarders and lodgers	Retirement pension	Poverty, disability, welfare fund	Transfers from family and friends	Other sources	Value of in-kind gifts from family and friends	Gifts from local enterprises
1991	157.2	9.84%	0.41%	42.19%	1.42%	6.11%	27.20%	9.80%	3.02%
1993	187.9	8.73%	0.47%	44.04%	0.74%	6.32%	28.15%	9.40%	2.16%
1997	220.5	15.83%	1.03%	43.56%	2.13%	9.76%	16.92%	10.15%	0.62%
2000	326.2	17.94%	0.56%	56.09%	2.36%	13.24%	0.00%	8.78%	1.03%
Total	**225.8**	**14.24%**	**0.65%**	**48.07%**	**1.82%**	**9.78%**	**14.55%**	**9.44%**	**1.45%**

n = 2,719 (1991), 2,715 (1993), 3,089 (1997), 2,798 (2000)

Table 12: Results for log out-of-pocket medical expenditures

VARIABLE	*log out-of-pocket medical expenditures*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**0.088**		**0.114**	**0.084**	**0.084**
	7.020		**6.480**	**5.760**	**5.780**
SAH_POS_CH_LGE		**-0.182**			
		-2.400			
SAH_POS_CH_SML		**-0.082**			
		-2.460			
SAH_NEG_CH_SML		**0.068**			
		2.190			
SAH_NEG_CH_LGE		**0.240**			
		3.670			
POOR X SAH_CHANGE			**-0.058**		
			-2.100		
HI X SAH_CHANGE				0.017	
				0.540	
URB_HI X SAH_CHANGE					0.041
					1.110
RUR_HI X SAH_CHANGE					-0.032
					-0.630
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	-0.008				
	-0.179				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.018			
		-0.198			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.103			
		1.261			
SAH_CHANGE + POOR X SAH_CHANGE			**0.056**		
			2.833		
SAH_CHANGE + HI X SAH_CHANGE				**0.101**	
				3.691	
SAH_CHANGE + URB_HI X SAH_CHANGE					**0.125**
					3.735
SAH_CHANGE + RUR_HI X SAH_CHANGE					0.052
					1.092
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported

Table 13: Results for change in log out-of-pocket medical expenditures

VARIABLE	*Δ log out-of-pocket medical expenditures*				
	(A)	(B)	(C)	(D)	(E)
SAH_CHANGE	**0.060**		**0.074**	**0.056**	**0.056**
	8.780		**7.740**	**7.060**	**7.140**
SAH_POS_CH_LGE		**-0.216**			
		-5.240			
SAH_POS_CH_SML		**-0.066**			
		-3.630			
SAH_NEG_CH_SML		**0.038**			
		2.260			
SAH_NEG_CH_LGE		**0.087**			
		2.460			
POOR X SAH_CHANGE			**-0.032**		
			-2.110		
HI X SAH_CHANGE				0.016	
				0.930	
URB_HI X SAH_CHANGE					**0.046**
					2.280
RUR_HI X SAH_CHANGE					-0.046
					-1.660
LINEAR COMBINATIONS					
SAH_NEGCHANGE - SAH_POSCHANGE	**-0.052**				
	-2.209				
*SAH_POS_LGE - 2 * SAH_NEG_SML*		-0.085			
		-1.675			
*SAH_NEG_LGE - 2 * SAH_NEG_SML*		0.011			
		0.244			
SAH_CHANGE + POOR X SAH_CHANGE			**0.042**		
			3.931		
SAH_CHANGE + HI X SAH_CHANGE				**0.072**	
				4.835	
SAH_CHANGE + URB_HI X SAH_CHANGE					**0.102**
					5.614
SAH_CHANGE + RUR_HI X SAH_CHANGE					0.011
					0.415
N	7,486	7,486	7,486	7,486	7,486

Note: Results estimated with household-level fixed effects. Coefficients on controls (household mean age (level, squared, cubed), household size (level, squared, cubed), and wave dummies are not reported. t-statistics are reported under each coefficient. Coefficients in bold are significant at the 10% level (two-sided). The test for symmetry between positive and negative shocks is based on a regression where positive (SAH_POSCHANGE) and negative (SAH_NEGCHANGE) health change are included as separate variables, ranging from one to three. Results are not reported