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Abstract

We assess the financial risk of ill health for households in Indonesia, the role of informal coping strategies, and the effectiveness of these strategies in smoothing consumption. Based on household panel data, we find evidence of financial risk from illness through medical expenses, while income from informal wage labour is exposed to risk for the poor and income from self-employed business activities for the non-poor. However, this lead to imperfect consumption smoothing only for the rural population and the poorest quartile; the non-poor seem to be able to maintain current spending. Borrowing and drawing on buffers, such as savings and assets, seem to be key informal coping strategies for the poor, which infers potential negative long term effects. While these results suggest scope for public intervention, the financial risk from income loss for the rural poor is beyond public health care financing reforms. Rather, formal sector employment, which reduces income risks, seems to be a key instrument for financial protection from illness.

Key words: Illness, income, consumption smoothing, coping strategies, Indonesia

JEL: O15, I15

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Financial Consequences of Ill Health and Informal Coping Mechanisms in Indonesia

1. Introduction

Indonesia has recently formulated ambitious objectives for health care financing reforms, which focus largely on social risk management, in terms of reducing financial risk from ill health and seeking health care. Following initial reforms in 2005, with the introduction of subsidised social health insurance for informal sector workers and the poor, the current policy debate is concentrated on scaling up to universal health insurance and aligning existing social health insurance programs and sub-national health care financing policies.

Nevertheless, questions remain regarding the extent and nature of financial risk from ill health. For example, what financial risk from illness do households face, and what are the main sources of this risk (e.g. medical expenses, income loss)? What are the main (informal) coping strategies employed by households, and to what extent do these strategies allow households to deal with the financial consequences of illness. Mapping these transmission channels and understanding coping behaviour are important for identifying the scope for public intervention, and for tailoring social policy responses to the main sources of financial risk of ill health.

Empirical evidence for developing countries generally finds that households are constrained in their ability to insure against ill health and only partly able to smooth consumption, in particular in the event of large infrequent high cost shocks and chronic illness (e.g. Townsend, 1994; Gertler and Gruber, 2002; Asfaw and Braun, 2004; Wagstaff, 2007; Gertler, Levine and Moretti, 2009; Nguyen and Mangyo, 2010). However, these studies remain predominantly reduced form analyses, and fail to pin

down the transmission channels through which health shocks affect household living standards. Most studies identify medical spending as one source of risk, while there is limited evidence of income loss due to illness (e.g. Kochar, 1995; Lindelow and Wagstaff, 2005; Wagstaff, 2007). For Indonesia, Gertler and Gruber (2002) show that earnings by heads of households are affected as a result of major illness. In addition, little is known of the role of coping mechanisms that households employ to self-insure against ill health, and the relative financial contributions from these strategies. Gertler, Levine and Moretti (2009) investigate the role of formal coping mechanisms, finding that living near a micro-finance institute increases Indonesian households' ability to smooth consumption when faced with medical expenses and income loss due to illness. Islam and Maitra (2011) find similar results in Bangladesh.

This paper aims to address some of these gaps in the empirical evidence. We first assess the distribution of self-reported ill health in Indonesia and whether households are able to smooth consumption. In line with earlier studies for Indonesia, we find evidence of imperfect consumption smoothing, in particular for poor and rural households. We then identify the main sources of financial risk of ill health, such as out-of-pocket (OOP) spending on health care and reduced household income through forgone earnings, using detailed information on type of income source (wage labour, agriculture self-employed, non-agricultural self-employed, and transfers and remittances) for different socio-economic groups. Finally, we assess the informal coping strategies invoked by households to deal with ill-health related costs (such as borrowing, selling assets and relying on family networks), and the effectiveness of these strategies in smoothing consumption.

2. Empirical approach

2.1 Smoothing and financial risk of illness

We apply a general framework of consumption smoothing, which is displayed in Figure 1. Households that experience illness are faced with subsequent sources of financial risk: required medical expenses (2A), indirect cost of seeking treatment (2B) and reduced income (2C). With imperfect financial markets, households may invoke (informal) coping strategies (3) to deal with these risks, and the choice of strategy will have consequences for consumption and poverty (4). For example, financing from disposable income may reduce current consumption, possibly leading to transient (food) poverty. Alternatively, households may resort to traditional coping strategies such as selling assets or incurring debt, which may affect future income. Finally, household may decide to forgo treatment, at the cost of depreciating their human capital.

In our empirical analysis we aim to identify a number of these relationships:

A. Reduced form relationship between ill health and household expenditure (1 →4).
B. Main sources of risk (1 →2A and 2C).
C. Coping mechanisms induced by ill health (1 →3).
D. The mitigating effects of coping mechanisms (3 →4, in case of ill health).

2.2. Methods

To assess the effect of ill health on consumption (relation A), and income and medical expenses (relation B), we use Generalized Linear Models (GLM), which are well suited to deal with skewed outcomes and avoid retransformation problems (Mihaylova *et al.*, 2011; Buntin and Zaslavsky, 2004; Manning and Mullahy, 2001). Let y_{it} represent the

income of household *i* at time *t* = 2003, 2004. This, and each of the other expenditure/income variables, is assumed to be generated as follows:

$$g\{E(y_{it})\} = h_{it}\gamma + x_{it}\beta + \theta_t + \alpha_i \ , \qquad y_{it} \sim F \tag{1}$$

with $g(.)$ representing the link function and $F(.)$ the distributional family of the GLM. The model includes a variable indicating that a household experienced illness in period t (h_{it}), a time effect (θ_t) which captures the trend in income common across all households, a full set of household fixed effects (α_i) which absorb time invariant differences, and an array of time varying household characteristics (x_{it}).

In these models we assume a log link and Poisson family such that (1) is a fixed effects Poisson model (FEP), and calculate robust standard errors. This model has the advantage of being easily estimated, and while Poisson models are typically used for count data, they do not require the variable of interest to follow a Poisson distribution. In fact, all that is needed for the FEP estimator to be consistent is that the conditional mean is correctly specified (Santos Silva and Tenreyro, 2006; Wooldridge, 2002).[1] As such, the FEP is a useful and very robust estimator in the context of panel data on skewed and censored outcomes, such as health and other spending.

To establish the coping strategies that households are most likely to use in response to ill health (relation C), we assume an identity link and Gaussian family such that (1) is a linear probability model with household fixed effects.[2] These models are

[1] The FEP is optimal when the conditional variance is proportional (not equal) to the conditional mean, but also consistent when this is not the case.

[2] We assessed the robustness of results to using a conditional logit (available upon request). While the result of *family assistance* being the most frequent coping strategy is confirmed, some results differ. We

estimated separately for each of the (binary) coping strategies and only on the sample of households who experienced illness or other shocks in the respective survey year.

Finally, to identify the effect of coping strategies on households' incomes and expenditures in the event of ill health (relation D), we add a full set of indicator variables of coping strategies to model (1) (with log link and Poisson family) and limit the sample to those households that experienced at least one ill health event over the two survey waves.

A key empirical challenge is to deal with the potential endogenous nature of self-reported ill health with respect to household income and consumption. In particular, unobserved heterogeneity in preferences and latent health status may threaten internal validity. To a large extent this unobserved heterogeneity will be eliminated by means of household fixed effects. In addition, changes in demographic, education and housing characteristics of households should capture important time variant confounders.

2.3. Data

The study draws on the nationally representative Indonesian Socio-economic survey (*Susenas*), which was conducted for a household panel in 2002, 2003 and 2004. In 2003 and 2004, the survey includes special modules on household expenditure, income, self-reported threats to household welfare, and strategies households used to cope with these threats. The questions on self-reported threats ask whether the welfare of the household has been affected during the last year by an event related to illness, natural

do prefer results from a linear probability model, as the conditional logit uses only those observations for which the dependent variable varies over time, which drastically reduces sample size.

disasters, loss of employment or pension, conflict, divorce, theft, business risk or government policies.[3]

The ill health events may reflect unexpected health shocks, but also lasting conditions and chronic illness that may affect household welfare. In the remainder of the paper we will therefore refer to ill health events, rather than health shocks. The coping responses are not directly linked to specific events. Rather, when a household reports one or more events, they are asked what kind of coping strategies were employed in response to any event. Descriptive statistics of the various events that affected household welfare and coping variables are given in Table 1. Besides illness, we include the other self-reported events as control variables in all regressions.

The detailed household spending data is aggregated to three categories: food, non-food and OOP health spending. Household income is categorised by wages, agriculture self-employed, non-agriculture self-employed and remittances.[4] Per capita household expenditure is used as welfare indicator for ranking households by quartile, as this provides a more accurate reflection of wealth and purchasing power than annual income. We define per capita expenditure quintiles based on 2002 spending, since these are exogenous to self-reported ill health in 2003 and 2004, unlike the 2003 and 2004 consumption quartiles. Expenditure and income are given in Table 2, expressed in 2002 prices and adjusted for regional price differences, using regional variation in poverty lines. All models further include a vector of household characteristics related to

[3] The exact phrasing of the question reads "During the past year, did the household experience events that negatively affected the household's welfare?" ("*Selama setahun terakhir, apakah rumah tangga mengalami kejadian yang berdampak negatif terhadap kesejahteraan rumah tangga anda?*")

[4] The *Susenas* survey also reports income from capital gains, interest and rent, but these unearned sources of income are not considered in our analysis.

demographics (household size, female head of household), education of the head of household, dwelling characteristics (walls of bamboo, a floor made of earth, floor area, private toilet, a closed sewer, electricity connection, access to clean drinking water, and direct access to a private or public water facility) and insurance status (see Table 3). The latter is captured by indicators for enrolment in social health insurance for the public (*Askes*) and private sector (*Jamsostek*), a targeted fee waiver program for the poor, and other insurance programs that are recorded in the survey.

These health financing programs are important determinants of financial risk and coping strategies in response to ill health, but also likely to be endogenous to household consumption through targeting or self-selection. It is not the objective of this paper to evaluate the effects of these health financing programs, which will merely serve as controls. We will therefore refrain from interpreting the results for these programs, and assess any potential endogeneity bias by means of a sensitivity analysis. We find that the results are robust to including these variables.[5]

We restrict our analysis to the 2003 and 2004 waves of the balanced panel of 7,724 households. The data shows a substantial rate of attrition, as initially 9,484 households were sampled. Based on 2002 characteristics, the balanced panel and the households lost due to attrition look fairly similar on average, although there are some differences. The sub-sample of households that dropped out in 2003 and 2004 has a lower rural share (51 versus 58 percent urban share), which is reflected in slightly higher household spending levels, education and living conditions.[6] We further test for

[5] The results are not shown here, but are reported in a supplemental appendix.

[6] The relatively larger urban share may be due to the higher degree of mobility of urban households, reducing the probability of being revisited in 2003 and 2004. The results are given in a supplementary appendix.

attrition bias by adding an attrition selection term to the consumption smoothing regressions.[7] We find that the results are not sensitive to including the selection term and the coefficient for the selection term is not statistically significant, suggesting that our results are not sensitive to attrition bias.

3. Results

3.1. Patterns in self-reported ill health and coping response

On average, 7.9 percent of the sample reported that household welfare in the previous year was affected by ill health in 2003, compared to 6.5 percent in 2004 (Table 1). The frequency of reported ill health events is similar to that of natural disasters (8.8/5.6 percent), but much smaller then self-reported income loss due to business risk (22.0/17.4 percent) and government policies (58.0/34.8 percent).

Self-reported ill health events are more common among the poorer population groups, as illustrated by the negative concentration index (CI = -0.02)[8]. However, it seems that they are more equally distributed across the population than income risk

[7] The selection term is the inverse Mills ratio based on a selection probit where the probability that a household remains in the balanced panel is explained by the 2002 values of all the explanatory variables used in equation (1). To aid identification, we also add the ID code of the 2002 enumerator, based on the hypothesis that the probability of participating in the following survey rounds is partly based on a household's experience in the first survey. We estimate the smoothing equation as an OLS difference regression, where the error terms in the selection and smoothing equations are assumed to have a joint normal distribution (see the supplementary appendix for details and results).

[8] A concentration index is a rank based measure of socioeconomic inequality with positive values indicating that the variable of interest is more prevalent among the rich and vice versa (Erreygers, 2009; Wagstaff, Paci and Van Doorslaer, 1991).

from business activities, government policies and natural disasters. Conflict, divorce and theft are fairly equally distributed across income levels, while job loss is relatively more frequent among the non-poor.

In general, borrowing is the most prominent coping response, followed by adjusting consumption and family assistance (lower panel of Table 1). Drawing on savings, increased labour activity and selling assets are the least frequent coping strategies.

3.2 Consumption smoothing and coping with risk

A. Consumption smoothing

The reduced form effects of self-reported ill health on food and non-food consumption are presented in the first two columns of Table 4. The results suggest imperfect smoothing for rural households, with an ill health event reducing non-food spending by 6.6 percent. These negative effects are concentrated with the poorest two quartiles (10.1 and 7.7 percent, respectively), yet only statistically significant for non-food spending of the poorest quartile.

B. Main sources of risk

The main sources of financial risk following ill health are given in the last 5 columns of Table 4. OOP health spending seems to be a key source of risk for all wealth quartiles, with an ill health event close to doubling health OOP expenditures (and even more than doubling for the second and fourth quartile). Non-agricultural income from self-employment is sensitive to ill health, with the effect for urban larger than for rural households, but urban households also receive more transfers than their rural

counterparts. The results for socioeconomic subgroups (row 5-8) reveal that wage income is negatively affected by ill health for the two poorest quartiles, yet it is only statistically significant for the second quartile. For these poorest quartiles, this may reflect wage income earned predominantly in the informal sector, while the richest half of the sample that earns a wage income are more likely to enjoy the relative protection from the formal sector. However, for the richest quartile health shocks pose a sizable threat to non-agricultural income risk, presumably referring to self-employed business and entrepreneurs.

C. Coping mechanisms induced by health shocks

Coping responses to self-reported ill health are given in Table 5, where the coefficients reflect the percentage point increase in the probability of using a particular coping mechanism in response to ill health that is affecting income. The most commonly used strategies are to rely on family assistance and to borrow (marginal effects of respectively 0.21 and 0.15), as already suggested by the summary statistics in Table 1. This is followed by decreasing consumption and selling assets. Urban households are more likely to borrow and sell assets, but less likely to use savings as compared to rural households. This could indicate that credit markets in urban areas function better and are more accessible than in rural areas. Poor households are more likely to reduce current consumption and deplete buffers such as savings, compared to those in the upper quartiles. Relying on family networks, borrowing and selling assets are common strategies across all wealth levels.

D. The mitigating effects of coping mechanisms

Having established the most frequently used coping strategies, we investigate which strategies are offering the most financial protection (in the short term). Table 6 shows the effects of coping mechanisms on OOP health spending and consumption smoothing for households in the poorest quartile that report to have experienced an ill health event in either 2003 or 2004. The results suggest that first borrowing and then selling assets are the most effective responses for financing health care (increasing OOP spending by 59 and 45 percent, respectively) while savings and incurring debt are used for consumption smoothing . While family assistance is the most common response to a health shock, it seems to have little effect on reducing financial risk for the poor.

4. Conclusion

This paper investigates financial risks of ill health in Indonesia, and the role of informal coping mechanisms in consumption smoothing. We find evidence of financial risk from illness through OOP health payments across the population, while income from informal wage labour is exposed to risk for households in the poorest quartiles and income from self-employed business activities for the wealthiest quartile. However, only for the rural population and the poorest quartile do we see smoothing to be imperfect and non-food expenditure to be affected by ill health; the wealthiest half of the population seems to be able to maintain current spending.

Borrowing appears to be a key coping strategy for the poor to deal with financial risk from ill health, which infers potential long term effects through incurring debt. In addition, future income may be affected by depleting buffers such as assets and savings for consumption smoothing and financing health care.

Our findings suggest that there is indeed scope for expanding social health insurance to the informal sector, as OOP is a key source of financial risk and thereby presumably a barrier to seeking health care. This seems to be in line with studies that find utilisation of public outpatient care by the poorest households in Indonesia to increase through subsidised social health insurance (Sparrow, Suryahadi and Widyanti, 2010) and targeted user fee waivers (Pradhan, Saadah and Sparrow, 2007).

However, the financial risk from income loss for the rural poor falls partly beyond the reach of public health care financing reforms as it also points to the need for income insurance. Combined with potential long term effects of subsequent coping strategies, uninsured income loss may induce poverty traps.

Most income risk seems to stem from the informal sector that harbours the bulk of the labour force from the poorest half of the population, while the formal sector provides financial protection from illness not only through health insurance, but also by reducing income risk. The policy implications are twofold. Fully protecting households from financial consequences following ill health would require a broader social security network that also covers the informal sector. In addition, Indonesia needs to move forward with the transformation of its economy from an informal to a formal sector dominated economic structure.

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Tables

Table 1: Descriptive statistics of the prevalence of various threats affecting household welfare and associated coping strategies.

	2003 mean	2004 mean	Total sample	
			Concentration index	Std. error
Self-reported threats (1/0)				
Health	0.079	0.065	-0.019	0.003
Natural Disaster	0.088	0.056	-0.036	0.003
Loss of job or pension	0.029	0.026	0.010	0.010
Conflict, divorce or theft	0.018	0.018	-0.006	0.008
Business risk	0.223	0.174	-0.144	0.005
Government policies	0.580	0.348	-0.053	0.005
Other shocks	0.227	0.367	0.015	0.009
Self-reported coping strategies (1/0)				
Use saving	0.115	0.085		
Borrow money	0.223	0.179		
Sell assets	0.084	0.067		
Ask (extended) family to help	0.170	0.146		
Increase labour	0.108	0.075		
Reduce consumption	0.183	0.118		
Other	0.184	0.156		
Observations	7724	7724		

Notes: Coping strategies are not mutually exclusive. Corrected concentration indices are calculated as suggested by Erreygers (2009) to account for the binary nature of the dependent variables.

Table 2: Descriptive statistics of household expenditures and income.

	2003		2004	
	Mean	Std. error	Mean	Std. error
Expenditure				
Food spending	150,827	79,380	144,855	76,601
Non-food spending (excl. OOP health)	109,133	139,488	113,536	152,513
OOP health spending	4,749	15,824	5,706	21,841
Income				
Salary & wage income	118,983	234,206	122,327	230,586
Agricultural Income	61,049	104,347	56,997	101,056
Non-agricultural Income	84,642	265,517	87,381	321,032
Remittance and transfers	34,974	121,934	37,888	126,606

Notes: All spending and income variables are expressed in Indonesian Rupiah, in per capita terms, in 2002 prices and adjusted for regional price differences, using regional variation in poverty lines.

Table 3: Descriptive statistics (means) of household characteristics.

	Balanced panel	
	2003	2004
Household size (persons)	4.00	4.00
Female head of household (1/0)	0.13	0.13
Highest education head of household (1/0)		
No education	0.33	0.34
Primary schooling	0.32	0.32
Junior secondary	0.12	0.12
Senior secondary	0.17	0.17
Higher	0.05	0.05
Health Insurance (1/0)		
Insured through *Askes* or *Jamsotek*	0.13	0.14
Health card	0.11	0.10
Other insurance	0.05	0.07
Household owns house (1/0)	0.85	0.85
Walls made of bamboo (1/0)	0.13	0.12
House has earth floor (1/0)	0.16	0.14
Total floor area (m^2)	67.98	70.21
Access to clean drinking water (1/0)	0.34	0.35
No access to private/public water facilities (1/0)	0.14	0.15
House has private toilet (1/0)	0.58	0.59
House has closed sewer (1/0)	0.42	0.44
Access to electricity (1/0)	0.86	0.86
Rural (1/0)	0.58	0.58
Number of observations	7,724	7,724

Table 4: Effect of self-reported ill health on per capita expenditures (OOP, food, non-food) and income (wage, agriculture, non-agriculture, transfer/remittance) for the total sample and by population subgroup

	Expenditures			Income			
Dependent variable	Food	Non-food (excl. OOP)	OOP	Wage	Agriculture self-employed	Non-agriculture self-employed	Transfers
Full sample	0.012	-0.015	0.974***	0.030	-0.066	-0.411***	0.089
Urban	0.044	0.02	1.093***	0.005	0.012	-0.394**	0.266***
Rural	-0.011	-0.066*	0.868***	0.062	-0.066	-0.223**	-0.027
Subgroups							
Quartile 1	-0.027	-0.101**	0.713***	-0.153	0.016	0.003	0.142
Quartile 2	-0.030	-0.077	1.154***	-0.217*	-0.069	-0.06	0.211*
Quartile 3	0.025	0.044	0.817***	0.118	-0.106	-0.070	-0.108
Quartile 4	0.046	0.018	1.118***	0.082	-0.081	-0.614***	0.168

Notes: Table show coefficients from Poisson models with household fixed effects. Models include covariates as explained in section 2.2, indicator variables for other shocks and a year dummy. Quartiles are constructed on the basis of total per capita household expenditures in 2002. *,**,*** indicate significance at the 10%,5% and 1% respectively.

Table 5: Effect of ill health on the choice of coping strategies

Dependent variable	Use Savings	Borrow non-collateral	Sell assets/ pawned	Family Assistance	Increase labour	Decrease consumption	Other
Full sample	0.033*	0.153***	0.086***	0.215***	0.042**	0.091***	0.004
Urban	0.034	0.203***	0.145***	0.222***	0.103***	0.116***	0.014
Rural	0.040**	0.118***	0.056***	0.221***	0.003	0.076***	0.001
Subgroups							
Quartile 1	0.047**	0.211***	0.111***	0.309***	0.057*	0.166***	0.000
Quartile 2	0.054*	0.090**	0.116***	0.179***	0.049	0.104***	0.071*
Quartile 3	0.013	0.178***	0.025	0.145***	-0.030	0.029	0.012
Quartile 4	-0.006	0.121***	0.115***	0.209***	0.074**	0.053	-0.071

Notes: Coefficient from linear regressions with household fixed effects. Models include covariates as explained in section 2.2, indicator variables for other shocks and a year dummy. Quartiles are constructed on the basis of total per capita household expenditures in 2002. *,**,*** indicate significance at the 10%,5% and 1% respectively.

Table 6: Effect of coping mechanisms on per capita expenditures (OOP, food, non-food) in case of ill health, for the poorest quartile

Dependent variable	OOP	Food	Non-Food (excluding OOP)
Saving	0.183	0.202***	0.246**
Borrow	0.588***	0.043	0.127*
Sell assets	0.448*	0.026	-0.095
Family	0.057	-0.064*	-0.069
Labour	-0.333	0.034	-0.038
Consumption	-0.419*	-0.063	0.002
Other	-0.03	0.025	0.011

Notes: Tables show coefficients from Poisson models with household fixed effects. Models include covariates as explained in section 2.2, indicator variables for other shocks and a year dummy. Sample limited to those households ever experiencing a health shock, and in the poorest quartile (based on 2002 per capita spending).

*,**,*** indicate significance at the 10%,5% and 1% respectively.

Figures

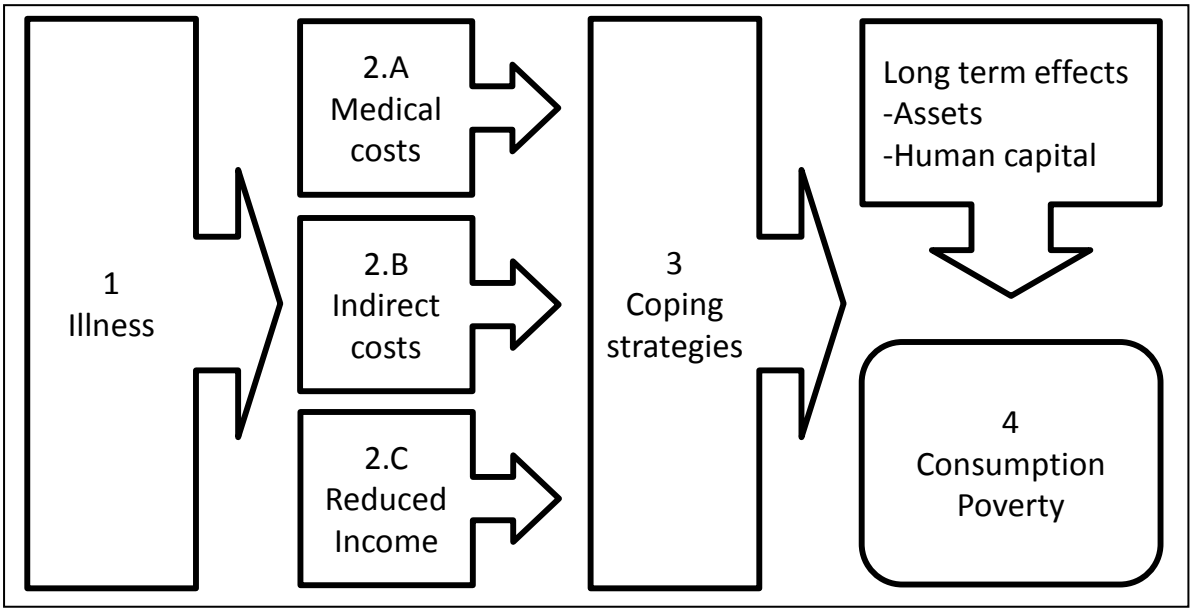

Figure 1 Consumption smoothing, channels of financial risk of illness and the role of coping strategies

Supplemental appendix

Table 7: Sensitivity to including health financing programs: Effect of self-reported ill health on per capita expenditures (OOP, food, non-food)

Dependent variable	Food	Non-food (excl. OOP)	OOP
Including health financing programs			
Ill health	0.012	-0.015	0.974***
Social health insurance	0.021	0.009	0.225*
Targeted fee waiver for the poor	0.021	-0.020	0.056
Other health insurance	0.055***	0.025	0.315***
Excluding health financing programs			
Ill health	0.011	-0.015	0.974***

Notes: Tables show coefficients from Poisson models with household fixed effects. Models include covariates as explained in section 2.2, indicator variables for other shocks and a year dummy. Other covariates are omitted for convenience.

*,**,*** indicate significance at the 10%,5% and 1% respectively.

Table 8 Descriptive statistics for balanced panel and attrition sample

	Balanced panel		Attrition	
	2002	Std. error	2002	Std. error
Food spending	155,699	80,948	181,627	103,668
Non-food spending	100,356	136,701	123,279	162,033
OOP health spending	6,015	30,834	7,675	48,488
Household size (persons)	4.03	1.66	3.83	1.83
Female head of household (1/0)	0.12	0.33	0.17	0.37
Highest education head of household				
No education (1/0)	0.35	0.48	0.28	0.45
Primary schooling (1/0)	0.31	0.46	0.28	0.45
Junior secondary (1/0)	0.12	0.33	0.14	0.35
Senior secondary (1/0)	0.17	0.37	0.23	0.42
Higher (1/0)	0.05	0.22	0.07	0.26
Household owns house (1/0)	0.83	0.37	0.70	0.46
Walls made of bamboo (1/0)	0.14	0.35	0.12	0.32
House has earth floor (1/0)	0.16	0.37	0.12	0.33
Total floor area (m^2)	68.00	55.55	61.00	58.10
Access to clean drinking water (1/0)	0.33	0.47	0.43	0.49
No to private/public water facilities (1/0)	0.14	0.35	0.18	0.38
House has private toilet (1/0)	0.55	0.50	0.58	0.49
Closed sewer (1/0)	0.38	0.49	0.47	0.50
Access to electricity (1/0)	0.85	0.36	0.86	0.35
Rural (1/0)	0.58	0.49	0.51	0.50
Number of observations	7,724		1,760	

Attrition bias

To assess the threat of attrition bias, we define selection into the 2003-2004 balanced panel by a binary indicator s_{it} which we model as a function of all control variables (x_{it}) that are included in equation (1):

$$s_{it} = 1[x_{it-2}\delta + z_{it-2}\phi + u_{it} > 0] \quad (2)$$

We then construct an inverse Mills ratio (λ_{it}) based on probit estimates of equation (2), which we include in a difference specification of the consumption smoothing equation:

$$\Delta \ln (y_{it}) = \Delta h_{it}\gamma + \Delta x_{it}\beta + \lambda_{it}\rho + \Delta\varepsilon_{it} \quad (3)$$

To aid identification, we also include the ID codes of the 2002 enumerators (z_{it-2}) in the selection equation, based on the hypothesis that the probability of participating in the following survey rounds is partly based on a household's experience in the first survey. We find that the 2002 enumerator ID is indeed statistically significant in the selection probit, at 1.6 percent level. We further assume that the enumerator ID in 2002 does not influence the values *y* in 2003 and 2004.

Under the assumption that u_{it} and $\Delta\varepsilon_{it}$ have a joint normal distribution, we estimate the smoothing regressions by means of OLS. While the OLS results differ slightly from the FEP estimates, they are similar in order of magnitude and statistical significance. The results are summarized in Table 9. The coefficients for λ are not statistically significant and the ill health effects are robust to including the selection term, which suggests that our results are not prone to attrition bias.

Table 9: Test for attrition bias

Dependent variable	Food		Non-Food (excl. OOP)		OOP	
Ill health	-0.015	-0.015	-0.027	-0.027	0.654***	0.653***
	[0.013]	[0.013]	[0.017]	[0.017]	[0.047]	[0.047]
λ		0.003		0.072		0.182
		[0.034]		[0.045]		[0.127]

Notes: Tables show coefficients from difference regressions for the balanced panel. All models include similar covariates as Table 4, with all other covariates omitted from the table for convenience. Standard errors in square brackets.

*,**,*** indicate significance at the 10%,5% and 1% respectively.

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