

Chhay, Panharoth; Rahut, Dil Bahadur

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Health shocks and overindebtedness: A panel data analysis from rural Viet Nam

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**HEALTH SHOCKS AND
OVERINDEBTEDNESS:
A PANEL DATA ANALYSIS
FROM RURAL VIET NAM**

Panharoth Chhay and Dil B. Rahut

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Panharoth Chhay is a Research Associate at the Asian Development Bank Institute. Dil B. Rahut is vice chair of research and senior research fellow at the Asian Development Bank Institute.

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Please contact the authors for information about this paper.

Email: pchhay@adbi.org

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

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Abstract

Rural households in developing countries have limited capacity to cope with and manage shocks, thereby resulting in chronic poverty, indebtedness, and a decline in overall well-being. Therefore, this study analyzes the effects of health shocks on overindebtedness in rural Viet Nam using four rounds of a balanced panel data set of about 1,750 households observed over a decade (2007, 2010, 2013, 2016). Employing the household-level fixed-effect model, this study finds that health shocks reduce household income and increase health expenditure among rural Vietnamese households. It also finds that households cope with health shocks mainly by borrowing from more sources. Households experiencing health shocks are 2.2 to 3.1 percentage points more likely to be overindebted, which occurs primarily among households without health insurance, suggesting that social health insurance can reduce households' vulnerability to the consequences of health shocks. These findings strongly support efforts to expand access to social health insurance in rural Viet Nam.

Keywords: health shocks, overindebtedness, social health insurance, household-level fixed effects, rural Viet Nam

JEL Classification: E21, E24, I13, I15

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1. INTRODUCTION

Rural households' livelihood in developing countries is vulnerable to a variety of covariate shocks, such as those related to weather, markets, and institutional failures, and/or idiosyncratic shocks, such as health-related shocks, job loss, and a shortage of agricultural input (von Braun 1994; Weinberger and Jutting 2000), which results in considerable fluctuations in income and consumption (Heltberg and Lund 2009; Thanh and Duong 2017). Although unpredictable, health shocks, in particular, are common and may have unexpected adverse effects on the economic activities of the household (Gertler and Gruber 2002; Nguyen et al. 2020).

Besides the loss in income due to the decrease in labor supply and productivity, households experiencing health shocks have to spend on medical bills in diagnosing and treating the illness (Gertler and Gruber 2002). In response to the loss of income and the increase in expenditure, rural households may sell assets, borrow, and withdraw children from school to substitute for the loss of labor supply, all of which have potentially adverse impacts on future household welfare (Khan, Bedi, and Sparrow 2015). With low shock coping capacity (resilience) and the lack of social insurance programs, rural households may fall into poverty after experiencing health shocks (Khun and Manderson 2008). According to the World Bank (2014), approximately 100 million people annually fall into poverty due to healthcare expenditure.

The literature on the economic consequences of health shocks in developing countries shows mixed findings. One group of studies (e.g., Gertler and Gruber 2002; Asfaw and von Braun 2004; Wagstaff 2007; Gertler, Levine, and Moretti 2009; Nguyen and Mangyo 2010) found that health shocks significantly reduce household consumption, while another strand of studies (e.g., Townsend 1994; Genoni 2012; Islam and Maitra 2012; Khan, Bedi, and Sparrow 2015) found no such effects. Islam and Maitra (2012) and Khan, Bedi, and Sparrow (2015) concluded that households may be able to maintain consumption – at least in the short run – in their ability to adopt coping strategies in response to such shocks.

Borrowing is one of the most common coping strategies rural households use to pay for health expenditure and smooth consumption. For instance, Ambrosius and Cuecuecha (2013), Mohanan (2013), Khan, Bedi, and Sparrow (2015), and Mitra et al. (2016) found that the amount of debt increased following a health shock. Similarly, Gertler, Levine, and Moretti (2009), Islam and Maitra (2012), and Thanh and Duong (2017) emphasized the critical role of microfinance institutions in mitigating the adverse effects of health shocks on household consumption. Although loans can be used to smooth consumption and pay for hospital bills in the short run, most households experiencing health shocks do not use loans for productive purposes. At the same time, they have to pay interest, which is usually high if it comes from informal lenders. This can potentially lead to overindebtedness, especially for households that are already indebted before experiencing health shocks. Overindebtedness has deleterious effects on future household welfare and may push households into impoverishment (Bateman and Chang 2012).

Using four rounds of a balanced panel data set of about 1,750 households observed over almost 10 years (2007, 2010, 2013, 2016), the objective of this paper is to empirically investigate whether rural households in Viet Nam become overindebted after experiencing health shocks. As the existing literature focuses mostly on the effects of health shocks on income, expenditure, and coping mechanisms, the main contribution of this study is that it further investigates the effects of health shocks on

overindebtedness – a consequence of the most commonly used coping mechanism of health shocks.

Employing the household-level fixed-effect model, this study finds that health shocks reduce household income and increase health expenditure among rural households in Viet Nam. The study also finds that households cope with health shocks mainly by borrowing from more sources. Households experiencing health shocks are 2.2 to 3.1 percentage points more likely to be overindebted, and this consequence occurs mainly among households that do not have health insurance, suggesting that social health insurance can reduce a household's vulnerability to the effects of health shocks. These findings strongly support efforts to expand access to social health insurance in rural Viet Nam.

The remainder of this paper is structured as follows: Section 2 gives a brief background of social health insurance in Viet Nam; Section 3 provides a literature review; Section 4 presents an explanation of the data and measures; Section 5 outlines the empirical strategies; Section 6 discusses the empirical results; and Section 7 offers conclusions.

2. SOCIAL HEALTH INSURANCE IN VIET NAM

Since the launch of the *Đổi Mới* reform that shifted Viet Nam from a centrally planned to a market-based economy, the economic growth in Viet Nam has been impressive at about 7–8% per year. With its rapid economic growth and reduced poverty, Viet Nam became a lower-middle-income country in 2010. The downside of the rapid economic growth over recent decades has been an increase in income inequalities, which has greatly influenced the government's health financing policies (Ekman et al. 2008).

The social health insurance system in Viet Nam was established in 1992 and has since undergone significant reforms until recently. The current health insurance system is divided into two programs, compulsory health insurance (CHI) and voluntary health insurance (VHI). The CHI consists of three separate programs: the social health insurance scheme for the formally employed, the Health Care Fund for the Poor (HCFP), and the free healthcare for children under six (Ekman et al. 2008). The HCFP is a noncontributory health insurance program for the poor, ethnic minorities in mountainous areas, and people in difficult circumstances. The remainder of the population (e.g., dependents of those covered by CHI, farmers, the self-employed, and students) is eligible for VHI.

The benefits package of the insurance covers a broad range of services, including ambulatory care, rehabilitation, advanced diagnostics, and curative services (World Bank 2017). However, approximately 19% of the whole population were still uninsured as of 2016, mainly the self-employed or employees of small enterprises (Le et al. 2020). The out-of-pocket payments also remained high at 57% of total health expenditure in 2012 (Le et al. 2020). According to the World Bank (2017), even noncontributory insured individuals still face burdensome and unpredictable out-of-pocket payments such as “fees for equipment provided by private investors, drugs outside of the insurance formulary, and costs of transportation, food, and accommodations for family members accompanying patients.”

3. LITERATURE REVIEW

There is abundant literature on the economic consequences of health shocks in developing countries; however, the results are mixed. One strand of literature (e.g., Gertler and Gruber 2002; Asfaw and von Braun 2004; Wagstaff 2007; Gertler, Levine, and Moretti 2009; Nguyen and Mangyo 2010) found that households are unable to smooth their consumption against serious health shocks, while another group of studies (e.g., Townsend 1994; Genoni 2012; Islam and Maitra 2012; Khan, Bedi, and Sparrow 2015) found no significant effects of health shocks on household consumption.

Using panel data from rural India, Townsend (1994) concluded that after controlling for village-level consumption, household consumption is not affected by contemporaneous own income, illness, or other idiosyncratic shocks. A subsequent study by Gertler and Gruber (2002) distinguished different degrees of severity of illnesses and found that Indonesian households are able to fully insure against the economic costs of illnesses that do not affect physical functioning, insure against 71% of the economic costs of illnesses that moderately limit physical functioning, but only insure against 38% of the economic costs of illnesses that severely limit physical functioning.

A study by Asfaw and von Braun (2004) examined the impact of illnesses on the consumption of rural Ethiopian households by looking separately into food and nonfood items. They found that illnesses reduced the amount of purchased food consumption and nonfood consumption; however, the estimation result for total food consumption was not significant. The authors explained that total food consumption could be insured against illnesses of the household head due to the existence of risk-sharing arrangements and own production of basic food items. Wagstaff (2007) studied the economic consequences of health shocks in Viet Nam and found that the incomes of urban households are more vulnerable to health shocks than those of rural households. The study also found that households spend less on food following a health shock, but more on budget items such as housing and electricity.

Subsequent studies started to analyze the coping strategies used by households in response to health shocks and their heterogeneous effects. Gertler, Levine, and Moretti (2009) contributed to the existing literature by assessing whether access to microfinance savings and lending institutions helps Indonesian households smooth consumption on the onset of health shocks. The study used geographical proximity to financial institutions as a proxy for access to one. They found that access to these institutions can help households to self-insure consumption against health shocks. Genoni (2012), another study on Indonesian households, found that health shocks significantly reduce incomes; however, the effects on total nonmedical and food expenditures were very small and statistically insignificant. The authors also found that the effects on incomes are larger for less educated individuals and are concentrated in small households. They also found evidence that households with health shocks receive transfers from noncoresident family members, but did not find evidence of depletions in the liquid asset.

Using data from Bangladesh, Islam and Maitra (2012) estimated the effects of health shocks on household consumption and how access to microcredit affects households' response to such shocks. The authors found that households sell livestock to insure consumption during health shocks. Access to microcredit was found to have a mitigating effect since households with access to microcredit do not need to sell livestock in order to insure consumption.

Mohanani (2013), estimating the effects of exogenous bus accident injuries in India, found that households faced with shock-related expenditures are able to smooth consumption in food and housing, while educational expenses see some reductions. The author also found evidence that households used debt as the primary mitigating mechanism, leading to higher levels of indebtedness. Similarly, Ambrosius and Cuecuecha (2013) found that serious health shocks doubled the average debt burden of exposed households. The study also found that households receiving remittances did not increase their debts due to health shocks.

Sparrow et al. (2014) analyzed the heterogeneous effects of health shocks among different income quartiles and formal and informal sectors. They found that for the poor and the informal sector households, health shocks negatively affect income from wage labor, whereas for the nonpoor and formal sector, it is income from self-employed business activities that is negatively affected. However, only for the rural population and the poor does this lead to a decrease in consumption, whereas the nonpoor seem to be able to protect current household spending.

Khan, Bedi, and Sparrow (2015) found that health shocks decrease household income and increase health expenditure; however, they did not find significant negative effects of health shocks on household consumption. They also found that households' most prominent coping strategies in response to health shocks were borrowing from moneylenders and selling productive assets, which were found to have detrimental effects on households' future consumption. Similarly, Mitra et al. (2016) found that households in Viet Nam are able to smooth total nonhealth consumption when facing a health shock by borrowing, selling assets, and decreasing education expenditures. They further found that female-headed and rural households are the least able to smooth consumption.

Previous literature reviews show that borrowing is one of the most common coping strategies rural households use to pay for health expenditure and smooth consumption. In the case of Viet Nam, Nguyen et al. (2012) found that households of all income levels in Dai Dong commune borrowed to pay for inpatient treatments. Although loans can be used to smooth consumption and pay for hospital fees in the short run, most households experiencing health shocks do not use their loan for productive purposes. At the same time, they have to pay interest, which is usually high if it comes from informal lenders. This can potentially lead to overindebtedness, especially for households that are already indebted before experiencing health shocks. As the existing literature focuses mostly on the effects of health shocks on income, expenditure, and coping mechanisms, it is important to further investigate the effects of health shocks on overindebtedness. Bateman and Chang (2012) stated that overindebtedness has deleterious effects on future household welfare and may push households into impoverishment.

4. DATA AND MEASURES

4.1 Data Source

This study employs four rounds of a balanced panel data set observed over almost 10 years (2007, 2010, 2013, 2016), collected under the "Vulnerability to Poverty in Southeast Asia" research project funded by the German Research Foundation (DFG). The survey was conducted in three provinces, Ha Tinh, Thua Tien Hue, and Dak Lak, in central Viet Nam. The selected provinces are located along the borders of the Lao PDR and Cambodia, exhibiting a certain degree of variation in terms of agro-ecological conditions, infrastructure, and development potential.

A three-stage cluster random sampling method was used to select the sample to obtain a representative sample of the rural population in the three chosen provinces.¹ The total sample size is 2,200 rural households in 220 villages. To obtain balanced panel data over the years, the final sample households after the data cleaning process were reduced to about 1,750. The household survey includes a wide range of information on household characteristics such as age, gender, and education level of household head, various types of shocks, borrowing and lending, agriculture and livestock production, household income, and expenditure. The village head survey also provides important information on the village-level infrastructure, economic, and environmental conditions.

4.2 Measures

The health shocks variable is constructed based on the information in the “shocks” section; it is a binary variable that equals one if the household experienced an illness(es) of a household member in the previous year.² The main dependent variable is household overindebtedness. Following Chichaibelu and Waibel (2018), this study uses two indicators of overindebtedness. The first indicator takes on a value of one when a household experiences a default or an arrear on a loan commitment during the previous year – henceforth, the “default” indicator. The second indicator uses the level of the “debt service”; it takes on a value of one when a household’s ratio of debt service per year to yearly income exceeds 50%. In this study, the debt service per year is the sum of the principal paid per year and the interest paid per year.

The default indicator tends to understate the level of household overindebtedness due to the lengths to which households will go to avoid defaulting. Some households may forgo their basic needs, while others may take on new loans to service the existing ones (Chichaibelu and Waibel 2018). The default indicator thus shows an understated level of overindebtedness until it becomes a serious crisis (Schicks and Rosenberg 2011; Schicks 2014). Therefore, both the debt service indicator and the default indicator are employed in this study. Although there is no commonly accepted definition of household overindebtedness, previous studies on overindebtedness have found that these two objective indicators of overindebtedness align reasonably well with the subjective perceptions of households (Rinaldi and Sanchis-Arellano 2006; Keese 2012; D’Alessio and Iezzi 2013).³

Besides overindebtedness, this study also analyzes a comprehensive range of other economic outcomes such as household income (total, earned, and unearned income per capita), expenditure (total, food, health, and education expenditure per capita), and household assets, including livestock value and land size owned.

4.3 Sample Characteristics

Table 1 provides descriptive statistics of dependent and independent variables used in the analyses. On average, approximately 35% of the sample in 2007 reported experiencing health shocks of a household member, which declined to 30%, 34%, and 32% in 2010, 2013, and 2016, respectively. In 2007, about 31% of the households in the sample reported having health insurance, and in 2010, 2013, and 2016, the share of households with health insurance increased to 47%, 41%, and 45%, respectively.

¹ For detailed information regarding the sampling procedure, see Hardeweg, Klasen, and Waibel (2013).

² A limitation of this study is that it relies on a subjective measure of health shocks since the objective measure of health shocks is not available in the survey.

³ The subjective indicator of overindebtedness is not available in the survey.

The default indicator (overindebtedness) generally shows a lower incidence than the debt service indicator. Based on the default indicator, approximately 8.3% of households have been overindebted over the years. Alternatively, based on the debt service indicator, approximately 21.75% of households have been overindebted over the years. The average household has had about one loan over the years

Table 1: Descriptive Statistics of Dependent and Independent Variables

Variable	2007		2010		2013		2016	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Health shocks	0.35	0.48	0.30	0.46	0.34	0.47	0.32	0.46
Total income per capita	846.02	1,616.00	1,137.42	1,698.58	1,458.58	1,847.86	1,786.35	2,176.77
Earned income per capita	750.14	1,557.70	903.82	1,607.62	1,218.97	1,635.37	1,394.48	2,015.16
Unearned income per capita	95.88	428.21	233.59	534.82	239.62	731.38	391.87	823.70
Total expenditure per capita	1,126.75	784.79	1,309.07	859.16	1,549.02	1,162.15	1,960.53	1,512.31
Food expenditure per capita	483.96	231.95	728.11	373.96	667.42	417.91	860.92	560.72
Health expenditure per capita	43.74	75.33	61.92	238.12	61.81	170.14	120.82	322.08
Education expenditure per capita	60.01	110.16	60.27	131.27	94.72	217.70	163.65	577.03
Number of loans	1.19	1.14	1.38	1.30	1.79	1.73	1.20	1.29
Overindebtedness (debt service)	0.27	0.44	0.24	0.43	0.16	0.37	0.20	0.40
Overindebtedness (default)	0.10	0.29	0.07	0.26	0.08	0.28	0.08	0.27
Health insurance	0.31	0.46	0.47	0.50	0.41	0.49	0.45	0.50
Flood	0.17	0.38	0.18	0.38	0.17	0.37	0.08	0.27
Drought	0.26	0.44	0.17	0.37	0.24	0.43	0.29	0.45
Storm	0.01	0.10	0.21	0.41	0.06	0.24	0.03	0.17
Land size (1000 m ²)	0.83	1.73	0.95	3.31	0.95	2.47	3.87	2.52
Livestock value	539.76	1,584.17	946.84	2,284.21	1,234.81	4,753.98	1,472.28	4,643.86
Household size	4.96	1.73	5.37	1.88	4.73	1.78	5.86	2.08
Dependency ratio	73.76	66.78	63.51	65.36	55.33	60.33	57.92	67.36
High education ratio	10.62	17.46	12.35	18.16	11.99	19.98	13.22	17.74
Observations	1,748		1,754		1,755		1,757	

Figures are in USD in PPP (2005).

The average total income per capita was approximately US\$846 in 2007, which increased to US\$1,137 in 2010, US\$1,459 in 2013, and US\$1,786 in 2016. On average, roughly 82% of the total income is earned income, and another 18% is unearned income. Earned income includes income from wages, businesses, crops and livestock production, and fishing, hunting, collecting, and logging. Unearned income includes income from remittances, land rent, and capital lending. We divide income into earned and unearned categories as earned income can be affected by ill-health events, while unearned income may not be affected.

The average total expenditure per capita was about US\$1,127 in 2007, and it increased continuously from US\$1,309 in 2010 to US\$1,549 in 2013, and to US\$1,961 in 2016. Approximately 43–56 % of the total expenditure is spent on food, while only about 3.9–6.2% and 4.6–8.3% are spent on health and education, respectively. The average household size increased from approximately five members in 2007, 2010, and 2013 to about six members in 2016.

5. EMPIRICAL STRATEGY

This study employs the household-level fixed-effect model to assess the effects of health shocks on household overindebtedness and other economic welfare outcomes. The estimation equation to estimate the effect of health shocks using the household-level fixed-effect model can be written as:

$$y_{it} = \mathbf{X}'_{it} \boldsymbol{\beta}_1 + \beta_2 H_{it} + c_i + \delta_t + \varepsilon_{it} \quad (1),$$

where y_{it} is the overindebtedness and other economic welfare outcomes such as income, expenditure, and assets of household i in time t ; \mathbf{X}'_{it} is a vector of time-varying household-level controls including health insurance status, weather shocks such as flood, drought, and storm, land size owned, livestock assets, household size, dependency ratio, and high education ratio; H_{it} represents health shocks experienced by household i in village t ; c_i is household fixed effects; δ_t is time fixed effects; and ε_{it} is a random error term.

The household-level fixed-effect method can capture the unobservable household time-invariant characteristics such as preferences and human capital endowment that affect both the self-reported health conditions and the economic outcomes. For instance, an individual's health awareness and healthcare routine can affect their health outcome but might itself be influenced by socioeconomic factors. Since these unobserved confounding factors are typically time-invariant, they can be addressed using the household-level fixed-effect strategy. Furthermore, the household-level fixed-effect model can also remove the systematic measurement error that may be present in the data.

The estimation results of the household-level fixed-effect method will be biased in the case of state dependence that occurs when the household's underlying preferences change after experiencing health shocks. Gertler and Gruber (2002) suggested a test for distinguishing state dependence by examining how the effects of health shocks vary with the abilities of households to self-insure. Typically, the effects of health shocks on expenditure are smaller for those households that are better able to self-insure. However, the level of state dependence should be the same between these two groups. Therefore, if the effects of health shocks are much larger for the poorer households, it suggests that these effects are due to budget constraints, and not to state dependence (Gertler and Gruber 2002).

We follow this test and run the analyses in different subsamples: households with versus without health insurance and lower- versus higher-income quantiles. As the next section will show, we found that the effects of health shocks on food expenditure are significantly larger among households that do not have health insurance and those in the lower-income quantile, suggesting that state dependence is not driving our results.

6. EMPIRICAL RESULTS

The significant negative effects of health shocks of household members on household income are shown in Table 2. The effects of health shocks on household expenditure are given in Table 3, while the effects of health shocks on household assets and overindebtedness are shown in Table 4. This study also indicates the disaggregated effects of health shocks by health insurance status in Table 5. The results in Table 2 show that the health shocks of a household member significantly reduce household

total income per capita by approximately US\$93. When we disaggregate household total income per capita into earned and unearned income per capita, we find that a large share of the reduction in total income comes from the earned income sources. Specifically, the health shocks of a household member significantly reduce earned income by about US\$66, while the effects on unearned income are statistically insignificant.

Table 2 also provides evidence that households with health insurance tend to have a higher income than those without health insurance. Although the noncontributory health insurance programs in Viet Nam are designed to help the poor, contributory health insurance is mostly used by relatively better-off households who would pay for the insurance. The near-poor households without any savings may not be interested in the program. Due to this self-selection of those households with health insurance, it is challenging to evaluate the impacts of the health insurance program. Table 2 also shows the significant positive relationship between household income and the share of household members that have completed high school or university, confirming the importance of education in generating income.

Table 2: Effects of Health Shocks of Household Members on Household Income

	Total Income per Capita (1)	Earned Income per Capita (2)	Unearned Income per Capita (3)
Health shocks	-93.201** (41.180)	-65.800* (35.601)	-27.402 (19.599)
Health insurance	181.081*** (60.226)	150.657*** (57.897)	30.424* (18.162)
Flood	-26.195 (46.690)	-38.811 (41.088)	12.616 (22.488)
Drought	44.864 (60.347)	0.969 (52.720)	43.895* (23.394)
Storm	-223.939*** (64.934)	-192.605*** (57.584)	-31.334 (27.207)
Land size	2.843 (6.685)	1.580 (6.428)	1.263 (2.388)
Livestock assets	0.074*** (0.012)	0.075*** (0.012)	-0.001 (0.002)
Household size	-180.664*** (21.820)	-124.604*** (18.822)	-56.060*** (9.831)
Dependency ratio	-0.131 (0.438)	-0.838** (0.401)	0.707*** (0.171)
High education ratio	18.654*** (4.924)	14.156*** (4.573)	4.498*** (1.598)
2010	312.185*** (53.276)	146.954*** (49.160)	165.231*** (18.368)
2013	479.512*** (54.767)	341.302*** (50.855)	138.210*** (17.784)
2016	941.109*** (71.267)	602.071*** (66.897)	339.038*** (26.291)
Constant	1,486.330*** (146.057)	1,226.446*** (136.585)	259.884*** (47.614)
Observations	7,007	7,007	7,007
Number of households	1,757	1,757	1,757

Note: Robust standard errors are presented in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 3 shows the effects of health shocks of household members on household expenditure. Columns 1, 2, 3, and 4 display the effects of health shocks on total, food, health, and education expenditure per capita, respectively. The results show that health shocks significantly reduce food consumption per capita by about US\$26.56 and increase health expenditure per capita by approximately US\$69.54. The overall effect of health shocks on total expenditure is not statistically significant since households spend more on healthcare but less on food. The effect on education expenditure is not statistically significant either. Compared to food, where people may choose to consume more of their own produce, education expenditure in rural Viet Nam may already be at a minimum level that is less flexible in times of shock.

Table 3: Effects of Health Shocks of Household Members on Household Expenditure

	Total Expenditure per Capita (1)	Food Expenditure per Capita (2)	Health Expenditure per Capita (3)	Education Expenditure per Capita (4)
Health shocks	35.749 (22.685)	-26.564*** (10.067)	69.544*** (9.346)	-2.223 (4.861)
Health insurance	98.040*** (33.286)	41.660*** (11.733)	-1.457 (6.883)	19.269 (18.978)
Flood	38.371 (28.406)	27.265** (12.945)	-5.693 (6.224)	-3.357 (6.624)
Drought	-7.972 (29.928)	-13.561 (12.891)	-11.695 (7.299)	22.872 (14.722)
Storm	49.922 (38.438)	0.101 (18.496)	5.483 (14.726)	15.592** (7.516)
Land size	6.619 (4.269)	2.713 (1.970)	-2.079 (1.290)	0.317 (2.258)
Livestock assets	0.021*** (0.005)	0.010*** (0.001)	0.000 (0.001)	0.001 (0.002)
Household size	-125.581*** (14.185)	-47.697*** (5.369)	-7.378*** (2.685)	-9.606*** (2.979)
Dependency ratio	-0.904*** (0.231)	-0.103 (0.101)	0.074 (0.081)	-0.466*** (0.070)
High education ratio	2.337* (1.327)	1.142* (0.595)	0.216 (0.241)	-1.603*** (0.599)
2010	185.347*** (22.981)	246.028*** (10.631)	22.584*** (5.481)	-2.122 (5.781)
2013	347.508*** (26.070)	158.734*** (9.760)	17.535*** (4.733)	23.685*** (5.480)
2016	880.974*** (39.434)	394.882*** (15.686)	92.711*** (10.745)	103.374*** (14.060)
Constant	1,729.686*** (71.612)	704.759*** (28.117)	54.414*** (16.955)	147.314*** (18.263)
Observations	6,685	6,661	6,685	6,685
Number of households	1,675	1,675	1,675	1,675

Note: Robust standard errors are presented in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Since health shocks result in a reduction in income and an increase in health-related expenditure, some households may sell assets and turn to borrowing as coping strategies and fall into overindebtedness. Columns 1, 2, 3, 4, and 5 of Table 4 show the effects of health shocks of a household member on a household's livestock assets, land size owned, number of loans, and two indicators of overindebtedness, respectively. The results show that households experiencing health shocks increase their number of loans while the effects on livestock assets and land sized owned are not statistically significant. These findings suggest that borrowing is the main coping mechanism used by households experiencing health shocks. Additionally, both indicators of overindebtedness show positive and statistically significant results. Specifically, health shocks increase the probability of overindebtedness by about 2.2 to 3.1 percentage points. Relative to the mean, health shocks are associated with an approximately 14% relative increase in overindebtedness that is measured using the ratio of debt service to income. For the overindebtedness measured using whether households default or are in arrears on loans, the relative increase is about 27% due to health shocks. These findings show that borrowing – the main coping mechanism used by households on the onset of health shocks – can be an issue that has long-term effects on households' welfare.

Table 4: The Effects of Health Shocks on Household Assets and Overindebtedness

	Livestock Assets (1)	Land Size (2)	Number of Loans (3)	Overindebtedness (Debt Service) (4)	Overindebtedness (Default) (5)
Health shocks	-27.658 (80.385)	-0.048 (0.060)	0.158*** (0.037)	0.031** (0.013)	0.022*** (0.008)
Health insurance	261.702*** (94.717)	-0.023 (0.056)	0.101*** (0.038)	0.035*** (0.013)	-0.001 (0.008)
Flood	85.096 (94.170)	-0.174** (0.084)	0.082* (0.048)	0.012 (0.015)	-0.007 (0.011)
Drought	32.777 (138.507)	-0.051 (0.107)	0.021 (0.046)	0.006 (0.015)	0.015 (0.010)
Storm	139.958 (102.365)	0.410* (0.234)	0.024 (0.061)	-0.011 (0.020)	0.004 (0.015)
Land size	41.981** (20.404)	- -	0.006 (0.008)	-0.001 (0.002)	-0.001 (0.002)
Livestock assets	- -	0.000** (0.000)	-0.000* (0.000)	-0.000** (0.000)	-0.000 (0.000)
Household size	28.930 (41.785)	0.004 (0.031)	0.044** (0.019)	-0.002 (0.006)	-0.003 (0.004)
Dependency ratio	-1.828** (0.712)	-0.001* (0.001)	-0.001*** (0.000)	-0.000*** (0.000)	0.000 (0.000)
High education ratio	-4.433 (5.345)	0.004** (0.002)	0.002 (0.001)	-0.000 (0.000)	0.000 (0.000)
2010	303.458*** (63.707)	0.019 (0.047)	0.148*** (0.039)	-0.030** (0.014)	-0.017* (0.009)
2013	631.926*** (118.165)	0.071 (0.055)	0.580*** (0.044)	-0.110*** (0.013)	-0.008 (0.009)
2016	723.237*** (128.064)	2.976*** (0.076)	-0.064 (0.046)	-0.064*** (0.016)	-0.006 (0.011)
Constant	451.318** (224.479)	0.881*** (0.149)	0.935*** (0.100)	0.287*** (0.030)	0.091*** (0.020)
Observations	7,014	7,014	7,014	7,014	7,014
Number of households	1,757	1,757	1,757	1,757	1,757

Note: Robust standard errors are presented in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

In an attempt to investigate whether the health insurance program in Viet Nam plays a role in mitigating the negative effects of health shocks, this study analyzes the effects of health shocks among those households with and without health insurance that are shown in Table 5. Each row of Table 5 corresponds to a different outcome variable, while each column is the result of estimation with different subsamples of interest. Column 1 shows the effects of health shocks among the whole sample that are explained above. Columns 2 and 3 show the estimation results of subsamples without and with health insurance, respectively. The results indicate that total and earned income are reduced for those households with health insurance; however, the reductions are not statistically significant for those households without insurance. There are two possible explanations for this. First, households without health insurance – mostly low-income households – are more likely to continue working even when they fall sick. Second, when one member of a poor household falls sick, other family members are also more likely to start working to replace the income loss.

The results also show that health shocks bring about a reduction in food expenditure among households without health insurance; however, the reduction in food expenditure is not statistically significant among households with health insurance. The findings in Table 5 also show that health shocks increase health expenditure for households both with and without health insurance. Even among households with health insurance, the increase in health expenditure reflects the significant and unpredictable amount of out-of-pocket payments. However, it is only among households without health insurance that health shocks can increase the number of loans and the amount of over-indebtedness. These findings indicate that those households without health insurance are more vulnerable to the consequences of health shocks than those with health insurance.

As explained earlier, there is a potential self-selection issue among households with health insurance, making it difficult to evaluate the impacts of the health insurance program. Since households with health insurance tend to have a higher income than those without health insurance, as shown in Table 2, there is a concern that households can avoid the negative effects of health shocks because of their relatively high income, not because of the health insurance. Therefore, this study divides the sample into two subsamples based on household income per capita and runs the analyses separately in the two subsamples as shown in columns 4 and 5 of Table 5. If the level of income is the driving factor behind the significant mitigating effects of the social health insurance program, households in the higher-income quantile would be better able to avoid becoming overindebted after experiencing health shocks.

The results show that health shocks significantly reduce food expenditure only among the lower-income-quantile households. The results are similar to those of the without and with health insurance subsamples in columns 2 and 3, except for the results on overindebtedness. Specifically, health shocks lead to an increase in the number of loans and the amount of overindebtedness among both the lower- and higher-income-quantile households, with higher significance levels among the better-off households. These findings suggest that the income level is not the driving factor in our previous finding regarding the significant mitigating effects of the social health insurance program, which was found to prevent households from becoming overindebted after experiencing health shocks.

Table 5: The Effects of Health Shocks among Those with and without Health Insurance and Different Income Quantiles

Dependent Variables:	Whole Sample (1)	Without Health Insurance (2)	With Insurance (3)	Income Quantile 1 (4)	Income Quantile 2 (5)
Total income per capita	-93.201** (41.180)	-54.591 (50.962)	-137.320** (67.333)	-25.948 (38.927)	-129.371* (73.138)
Earned income per capita	-65.800* (35.601)	-23.178 (41.740)	-112.941* (61.611)	-46.929 (32.990)	52.349 (65.050)
Unearned income per capita	-27.402 (19.599)	-31.413 (26.793)	-24.379 (27.646)	20.981 (18.967)	-77.021** (35.182)
Total expenditure per capita	35.749 (22.685)	26.694 (28.717)	53.693 (35.885)	8.272 (23.401)	82.191** (40.149)
Food expenditure per capita	-26.564*** (10.067)	-32.322** (12.628)	-14.215 (15.994)	-27.780** (11.788)	-17.769 (16.734)
Health expenditure per capita	69.544*** (9.346)	61.226*** (12.391)	79.071*** (14.161)	47.911*** (8.318)	96.446*** (18.244)
Education expenditure per capita	-2.223 (4.861)	-1.927 (5.857)	-1.878 (8.263)	-2.137 (5.521)	-0.137 (8.525)
Livestock assets	-27.658 (80.385)	17.017 (103.421)	-60.716 (124.753)	89.712 (89.451)	-117.539 (136.539)
Land size	-0.048 (0.060)	0.056 (0.091)	-0.184*** (0.069)	-0.019 (0.096)	-0.076 (0.072)
Number of loans	0.158*** (0.037)	0.206*** (0.048)	0.081 (0.056)	0.161*** (0.051)	0.153*** (0.053)
Overindebtedness (debt service)	0.031** (0.013)	0.053*** (0.016)	0.001 (0.019)	0.005 (0.017)	0.060*** (0.017)
Overindebtedness (default)	0.022*** (0.008)	0.034*** (0.011)	0.005 (0.011)	0.021* (0.011)	0.023** (0.011)

Note: Robust standard errors are presented in parentheses. "Income quantile 1" is the lower-income quantile, while "income quantile 2" is the higher-income quantile.

*** p<0.01, ** p<0.05, * p<0.1.

7. CONCLUSIONS

This study uses three rounds of a balanced panel data set (2007, 2010, 2013, 2016) to investigate the impacts of health shocks in rural Viet Nam by using the household-level fixed-effect method. As the existing literature focuses mostly on the effects of health shocks on income, expenditure, and coping mechanisms, the main contribution of this study is that it further assesses the effects of health shocks on overindebtedness, which is a consequence of the most commonly used coping mechanism of health shocks.

This study finds evidence that health shocks reduce household income and increase health expenditure among rural households in Viet Nam. We also find that households cope with health shocks mainly by borrowing from more sources, which leads to overindebtedness. Health shocks increase the probability of being overindebted by approximately 2.2 to 3.1 percentage points. We also find evidence that households without health insurance are more vulnerable to the consequences of health shocks than their counterparts. Health shocks lead to a significant reduction in food

expenditure among lower-income-quantile households and households without health insurance. This study also found that health shocks can lead to overindebtedness only among households without health insurance, suggesting that social health insurance can significantly lower households' vulnerability to the consequences of health shocks.

A significant policy implication from these findings is the importance of expanding access to social health insurance in Viet Nam, especially to the rural near-poor population, in order to mitigate the negative consequences of idiosyncratic health shocks. Despite the current efforts from the government to achieve universal health coverage, the uptake of voluntary health insurance among the near-poor population has been slow. Expanding the benefits package of the insurance program and reducing out-of-pocket payments should also be considered as it can also encourage the uptake of voluntary health insurance among the working near-poor.

The empirical analyses in this study are not without limitations. Because of data limitations, we cannot use the instrumental variable method to address the biases that may arise because of unobservable time-varying heterogeneity and random measurement error. Another limitation is the use of a self-reported measure of health shocks since the objective measures are not available in the survey. Thus, it is important for future research to employ multiple measures of health shocks, especially objective ones.

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