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Are Health Shocks Different?

Evidence from a Multi-Shock Survey in Laos

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Abstract

In Laos health shocks are more common than most other shocks and more concentrated among the poor. They tend to be more idiosyncratic than non-health shocks, and are more costly, partly because they lead to high medical expenses, but also because they lead to income losses that are sizeable compared with the income losses associated with non-health shocks. Health shocks also stand out from other shocks in the number of coping strategies they trigger: they are more likely than non-health shocks to trigger assistance from a nongovernmental organization and other households, dis-saving, borrowing, asset sales, an early harvest, the pawning of possessions, and the delaying of plans; by contrast, they are *less* likely to trigger assistance from government. Consumption regressions point to only limited evidence of households not being able to smooth consumption in the face of any shock. However, these results contrast with households' own assessments of the welfare impacts of shocks. The majority said they had to cut back consumption following a shock and that shocks considerably affected their welfare. Only health shocks are worse than a drought in terms of the likelihood of a family being forced to cut back consumption and in terms of the shock affecting a family's well-being "a lot." The poor are especially disadvantaged in terms of the greater damage that health shocks inflict on household well-being. Health shocks stand out too in leading to a loss of human capital: household members experiencing a health shock did not recover their former subjective health following the health shock, losing, on average, 0.6 points on a 5-point scale. The wealthier and better educated are better able to limit the health impacts of a health shock; the data are consistent with this being due to their greater proximity to a health facility.

This paper—a product of the Human Development and Public Services Team, Development Research Group—is part of a larger effort in the department to analyze public policies relating to health and poverty. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at awagstaff@worldbank.org.

Are Health Shocks Different?
Evidence from a Multi-Shock Survey in Laos

by

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I. **INTRODUCTION**

While there is a growing literature on the incidence and consequences of shocks in developing countries, most of the studies to date take a partial approach, analyzing one particular shock or set of shocks. For example, Kochar (1999) looks at agricultural shocks in India, Hoddinott (2006) looks at the effects of drought in Zimbabwe, Gertler and Gruber (2002) look at the effects of health shocks in Indonesia, and Friedman and Thomas (2009) look at the effects of the 1997 financial crisis in Indonesia. Relatively few studies compare different types of shocks. There are exceptions. Kenjiro (2005) compares crop failure and illness in Cambodia and finds that while similar in terms of incidence, illness has a larger impact on living standards; and Heltberg and Lund (2009) report the results of a multi-shock study in Pakistan, covering natural and agricultural shocks, economic shocks, law and order-related shocks, family shocks, and health shocks. Similar "shocks surveys" have also been implemented elsewhere (see Hoddinott and Quisumbing 2003; Hoddinott and Quisumbing 2003; Dercon et al. 2005), but these studies are exceptions. The first aim of this paper therefore is to add to the relatively slim literature by comparing a broad range of different types of shocks in terms of their incidence, distribution between the poor and better off, idiosyncraticity, costs, coping responses, and the degree to which households are able to smooth consumption following shocks.

As well as shedding light on how health shocks compare with other shocks along these traditionally-explored dimensions, we also explore new angles to health and other shocks. In addition to presenting (some necessarily incomplete) evidence on consumption-smoothing, we present data on households' own assessments of the impacts of shocks on well-being: our survey asks households whether they cut back consumption following a shock, how far it affected household welfare, and how far the household had recovered from the shock by the time of the interview. This 'softer' evidence is a

useful complement to the 'harder' evidence from consumption-smoothing regressions, particularly in situations like ours where panel data are not available, but may also be useful when they are given Chetty and Looney's (2006) observation that a zero coefficient on shocks could simply reflect low-income households being highly risk-averse and using whatever methods they can to avoid a drop in consumption, even if they have consequences for future welfare.

Finally, we seek to make a third contribution to the literature on shocks. Analyses of non-health shocks routinely inquire about the asset losses associated with shocks, e.g. the lost or damaged equipment and infrastructure associated with weather-related shocks. Analyses of health shocks, by contrast, do not, focusing instead on the consumption and sometimes labor-market consequences of health shocks (Gertler and Gruber 2002; Wagstaff 2007). Yet a health shock is likely to result in some depletion of an individual's health 'capital'. The pure neoclassical model of health capital would rationalize this in terms of people choosing to reduce their health stocks following an unexpectedly high user cost of health capital; see Grossman (1972) and the articles reviewed in Grossman (2000). An alternative explanation is that, contrary to the traditional neoclassical model, people are unable to instantaneously adjust their health stocks to the optimal level (Wagstaff 1993). In this paper, we are agnostic on the reason for any decline in health status following a health shock; we aim instead simply to shed light on its magnitude and on the factors affecting its size. We hypothesize that some groups are likely to be especially disadvantaged, e.g. those living far from health facilities and other amenities that are conducive to people recovering their health following a health shock. This aspect of the paper builds on recent research in the US on the health impacts of health shocks (Smith 1999; Goldman and Smith 2002).

Our paper, like that of Heltberg and Lund (2009), uses a cross-section retrospective survey instrument designed specifically to get the incidence and consequences of the full gamut of shocks

experienced by households in a typical developing country. The country where we implement the survey is Laos. We inquire about natural and biological hazards (such as floods, mudslides, earthquakes and pest infestation), economic shocks (such as price changes and inability to find work), socio-political shocks (such as crime and ethnic or religious conflict), family shocks (such as divorce), and health shocks (illness, injury and death). In the event, some of the shocks asked about in the survey had not been experienced at all, or had but only by a very few households: no earthquake occurred in the areas sampled during the previous 12 months, and no household admitted to having been the victim of ethnic or religious conflict. We inquire about the incidence of shocks over the previous 12 months, the timing of shocks, and the costs in terms of lost income, asset losses, and additional expenditures, including health expenses. We ask about assistance with the costs of shocks, and about coping strategies employed. Finally, we ask households to assess the impacts of shocks on their family's well-being, and the impacts of health shocks on health status. The survey thus allows us to compare self-report welfare impacts with the results of a traditional consumption-smoothing analysis.

We begin by comparing the incidence of different shocks, their distribution across the distribution of a (pre-shock) wealth measure, and their idiosyncraticity. We find that health shocks are more common than other shocks and (in contrast to non-health shocks) more pronounced among the poor. We also find that health shocks are more idiosyncratic than non-health shocks. Next we compare shocks in terms of costs, as reported by the households experiencing the shocks. We find that, factoring in direct costs (extra spending on health care and other household budget items), indirect costs (lost income) and asset losses, health shocks entail considerably larger costs, on average, than non-health shocks. We then compare shocks in terms of the assistance households receive from others, including government programs and non-government organizations (NGOs), and the coping strategies they employ. We find that government and NGO programs provide assistance in only a very small fraction of

cases; where government assistance occurs, it is disproportionately to the better off. If it comes, assistance is largely from other households. The most common coping strategy is dissaving, but borrowing is also quite common, as are—albeit to a lesser extent—selling assets and delaying plans. Dissaving is more likely and borrowing is less likely following a covariate shock like an agricultural shock. Health shocks stand out from other shocks in triggering multiple coping strategies. We next estimate consumption regressions, and find only limited evidence of households not being able to smooth consumption in the face of shocks. These results contrast with households' responses to questions asking their own assessment of the impacts of shocks: the majority said they had to cut back consumption following a shock, and reported that it affected their welfare, with a mean score of 3.2 on a 4-point scale ranging from 1 (not at all) to 4 (a lot). Finally, we find that household members experiencing a health shock did not recover their former subjective health following a health shock, losing, on average, 0.5 points on a 5-point scale.

II. **THE SETTING**

Lao PDR is one of the poorest countries in South East Asia, with an ethnically diverse and predominantly rural population.[1] The Central and Southern regions are mountainous in the east, but also endowed with fertile plains that can be irrigated for rice and other crops along the Mekong and other rivers; the North is mainly mountainous and rugged, with no irrigable land other than limited mountain valleys. In many parts of the country, economic integration is limited, with 30 percent of villages in the Northern and Southern parts of the country having no wet season road access (World Bank 2010).

[1] In 2007, 71% of the population was engaged in agriculture as the primary source of employment and income (World Bank (2010)).

Although Lao PDR has witnessed rapid economic growth and poverty reduction over the past 15 years, the incidence of poverty remains high in remote rural areas, in the uplands, and among ethnic minorities. Vulnerability to poverty is also a significant concern. For example, in the nationally representative Lao Expenditure and Consumption Survey, a large proportion of village leaders identified natural shocks, particularly insect infestations and animal disease, as constraints on income growth. A growing share of villages also report lack of jobs as a constraint. Similar findings are reported from a vulnerability assessment in three provinces (Committee for Planning and Cooperation and UNCRD 2002), with low income, shortage of capital or credit, lack of land or poor soil quality, natural disasters, pests and livestock disease, lack of employment opportunities, and illness as important sources of vulnerability. Qualitative poverty assessments (Asian Development Bank/National Statistics Center 2001; Asian Development Bank/National Statistics Center 2006) paint a similar picture. They highlight the importance of natural resources to household livelihoods, and the risks associated with loss of land and agriculture related shocks, but also illustrate the widespread and sometimes devastating effect of illness, injury and deaths on household welfare.

In the Lao context, risks (agriculture, health, employment, prices, etc.) translate into significant vulnerabilities due to the limited access to formal insurance institutions and safety nets. For example, while there are donor supported programs for providing food relief in the event of disasters, there are no programs to systematically support households during the agricultural low-season or in the event of crop failure or livestock disease. Similarly, poor and near-poor households affected by food price increases, reductions in wages or remittances, or unemployment are also largely uncovered. Hence, when shocks materialize, households tend to rely on precautionary savings and informal networks to manage risks.

The financial costs associated with health care are particularly problematic, both because they are unpredictable, and because they are sometimes very substantial. In the past, government provided free health care services, although both the range of services and the geographic coverage of the provider network were very limited. However, cost-sharing has been a formal government policy since the 1990s, initially through the introduction of revolving drug funds, and later through a national policy on user fees. With the growing importance of user fees, combined with the steady expansion of the private health care sector, out-of-pocket payments have come to play an increasingly important role in financing health care. According to the most recent National Health Accounts estimates, out-of-pocket expenditures accounted for around 74% of total health expenditures. These expenditures include payment of user fees in public facilities, as well as expenditures on health care and drugs from private providers (clinics, pharmacies, drug vendors, traditional practitioners, etc.) within Laos and abroad. The heavy reliance on out-of-pocket payments results in considerable financial barriers to utilization of health services, contributing to low levels of utilization and significant health-related financial risk. The Health Care Law includes provisions for health care to be provided for free to poor patients. However, in practice, these provisions are rarely implemented. In response to the growing reliance on user-fees in the health system, the government, sometimes with support from development partners, has put in place different health protection schemes, but coverage remains low (approximately 10 percent of the population).[2]

III. **THE SURVEY**

The survey was implemented in three provinces (Vientiane Capital, Phonsaly, and Attapeu) in Laos between March and June 2008. Both Attapeu, located in the south-eastern corner of the country,

[2] Schemes include (i) the Civil Service Health Insurance (CSHI), (ii) the Social Health Insurance Fund (SHIF), (iii) Community Based Health Insurance (CBHI), and (iv) Health Equity Funds (HEF)

and Phonsaly, in the far north, are poor and predominantly rural. Phonsaly, which borders China, is one of the most ethnically diverse provinces in the country, while Lave Nge and Talieng ethnic groups comprise the majority in Attapeu. Vientiane Capital, in turn, contains the largest urban center in the country, but also peri-urban and rural areas surrounding the city. The incidence of poverty is lower, and livelihoods tend to be more diverse. Hence, although the survey is not nationally representative, it includes locations that reflect the demographic and socioeconomic diversity of the country.

The clustered random sample includes 600 households from 30 randomly selected enumeration areas (see details in Table 1). In each of the 30 communities the household survey was administered to 20 randomly selected households. Moreover, the sample was stratified to permit an analysis of how outcomes and coping strategies vary across urban and rural settings. Sample weights were calculated and used in the analysis to account for the oversampling in urban areas, and in Attapeu and Phonsaly.

The survey instruments were designed to collect data on household composition and characteristics, housing characteristics and asset ownership, employment and livelihoods, household expenditures and consumption (based on recall of both food and non-food consumption), shocks (including their frequency and impact on welfare), prevention and mitigation activities, households coping strategies, and government/NGO programs.

IV. **INCIDENCE, INEQUALITY AND IDIOSYNCRATICITY OF SHOCKS**

Pest infestation and crop/livestock disease are the commonest shocks in Laos, hitting 25 percent of households, see Table 2. Illness is the next commonest shock, hitting 23 percent of households, followed by drought which affected 16 percent of households. Floods and mudslides are also relatively common, as, surprisingly, is death which affected 3 percent of households. Shocks linked to natural and

biological hazards and to family and health events are far more common than economic and socio-political shocks in Laos. Although comparisons across countries and surveys are at best indicative due to differences in the survey modules, recall periods, and so forth, the results are similar to those reported from a risk and vulnerability survey in Guatemala, where agriculture shocks (pests and bad harvests) predominated (Tesliuc and Lindert 2002). Accidents of breadwinner were reported by over 8 percent of households, but the survey does not contain information about other forms of health shocks. Agriculture shocks were also frequent in Tanzania (2007) and Ethiopia (Dercon *et al.* 2005), although many households also report deaths and serious illness. In contrast, Heltberg and Lund (2009) found that health shocks dominated other shocks in Pakistan.

Which shocks disproportionately hit the poor? Getting at this is not straightforward since consumption and income themselves respond to shocks. The same is true of assets, such as TVs, radios, and bicycles, which are sometimes used in asset-based indices of wealth (cf. e.g. Filmer and Pritchett 2001). We measure wealth for the purpose of Table 2 by applying Principal Components Analysis (PCA) to a vector of housing characteristics, e.g. type of floor, type of roof, etc. These are likely to change relatively slowly, and in response to long-term trends in incomes rather than to shocks. We use the first principal component; reassuringly, it has the highest mean score in Vietniane and the lowest mean scores in the poorer (largely rural) provinces of Phongsaly and Attapeu. Ranking households by their wealth index and computing the concentration index[3] of the shock variable, we find that the commonest shocks are also disproportionately concentrated among the poor, as reflected in a highly negative concentration index. The other highly unequally distributed shock is "divorce, abandonment, or internal

[3] The concentration index is analogous to the Gini coefficient except that individuals or households are ranked by (in this case) wealth and inequality in the variable of interest is assessed relative to the wealth ranking. The concentration curve thus graphs the cumulative distribution of the variable of interest on the y-axis against the cumulative fraction of the population ranked in ascending order of (in this case) wealth. See e.g. Kakwani et al. Kakwani, N., A. Wagstaff and E. van Doorslaer (1997). "Socioeconomic Inequalities in Health: Measurement, Computation, and Statistical Inference." Journal of Econometrics **77 1**: 87-103..

or extended family disputes", which is among the least common shocks in Laos but the shock that is most disproportionately concentrated among the poor.

Heltberg and Lund (2009) found a wealth gradient for health shocks but not agricultural shocks. Tesiluc and Lindert (Tesliuc and Lindert 2002) also report an association between the incidence of shocks and household characteristics such as poverty status or the gender and ethnicity of the household head, with poor, indigenous, and male-headed households being more likely to experience bad harvests, droughts and pest infestations, while the reverse is true for lost terms of trade, falling incomes, and lost jobs. However, they note that this is association is at least in part due to the relationship between poverty, rural location, ethnicity, and livelihood patterns. In the case of rural Ethiopia (Dercon *et al.* 2005), illness shocks are more commonly reported by male-headed households, while better off households are more likely to report pest, input and output shocks. However, the incidence of other types of shocks does not differ markedly by characteristics such as sex or age of head, household size or dependency ratios, or socioeconomic status.

Table 2 sheds light on how idiosyncratic shocks are by looking at the value of the R^2 in a regression of the shock on a vector of village fixed effects. These account for nearly 40 percent of the inter-household variation in whether a household experienced an unexpected decline in prices of or demand for commodities they sold and whether or not a household experienced a pest infestation. By contrast, village fixed effects account for only 5 percent of the inter-household variation in whether a household had been subjected to a crime. The R^2 figures suggest that health shocks are, for the most part, more idiosyncratic than agricultural and economic shocks. Dercon et al. (2005) assess the idiosyncracity by asking households about the extent to which other households in the community and area have been affected. They find that drought, input and output shocks are covariate (most households indicate that the entire village was affected), while theft or other crimes, death or illness are

described in more than 90% of cases as idiosyncratic, and pests and diseases affecting crops or livestock appearing to be a mix of idiosyncratic and covariate shocks. In contrast, Tesiluc and Lindert (2002) find that most shocks, with the exception of "inflation", in Guatemala are idiosyncratic, with less than 10 percent of households in the primary sampling unit reporting a shock in most cases.

V. **INCOME LOSSES AND OTHER COSTS ASSOCIATED WITH SHOCKS**

Table 3 shows the costs of different types of shocks (expressed as a percentage of average annual per capita food consumption) among those experiencing shocks, while Table 4 shows the *expected* costs (i.e. the probability of a shock times the cost if it occurs).

The cost of shocks in terms of lost assets can be considerable. Among those suffering from a crime, the loss of assets amounts to 180 percent of average annual per capita food consumption. Natural and biological shocks result in average asset losses of around 100 percent of average annual food consumption. Income losses occur following both health and non-health shocks, with falls in selling prices and illness leading to the biggest income losses. The medical expenses associated with health shocks—particularly a death—are dramatic. But so too are the other expenditures associated with health shocks, which far exceed those associated with non-health shocks. In the case of health shocks, the high expenditures likely reflect funeral costs in the case of a death, the transport costs associated with receipt of medical care, and perhaps expenditures associated with other amenities whose use increases caring for a sick family member. Overall, health shocks entail considerably larger costs, on average, than non-health shocks. An illness, on average, entails costs equal to 250 per cent of annual average per capita food consumption, with a death costing nearly 400 percent of average annual food consumption. The last column shows that, for the most part, the costs of shocks are higher for the better off; presumably this is because they have more assets and a larger income stream at risk and

have more resources to purchase medical care and other goods and services. It is noteworthy that the costs associated with injury are, however, larger among the poor.

The gap between health and non-health shocks in *expected* costs is smaller, reflecting the fact that health shocks are only slightly more common than non-health shocks, and that the commonest shock (pest infestation) is also fairly costly. However, the expected annual cost associated with illness is equal to 60 percent of annual average per capita food consumption—a considerable amount. This expected cost, however, is larger among the better off, reflecting the greater expenditures on medical care and other goods and services by the better off in the event of an illness.

VI. **COPING WITH SHOCKS**

Table 5 shows the frequency of use of different coping strategies, broadly interpreted to include assistance from government, NGOs and other households, and health insurance reimbursement, as well as the more 'traditional' coping strategies, such as dissaving, selling assets, and pawning possessions.

On average, a shock resulted in 1.6 coping strategies being employed. Health shocks trigger more coping strategies than non-health shocks—more than two, on average. Less than 2 percent of shocks trigger assistance from the government: where it occurs it is for drought and floods. The fraction of households getting assistance from an NGO is even smaller—just 1 percent. By contrast, 20 percent of shocks triggered assistance from other households, and for all types of shock. Just 2 percent of shocks resulted in reimbursement (or help with medical care expenses) from a health insurance scheme. This reflects in part, of course, the fact that non-health shocks do not result in medical care expenditures. However, the figure for health shocks specifically is not much larger. By contrast, 85 percent of shocks led to the household dissaving, again across all shocks, and 26 percent of shocks led to the household

borrowing, an especially common strategy in the case of health shocks. In only 6 percent of shocks did the household sell assets, though this too was a common strategy in the case of health shocks. In less than 1 percent of shocks did the household harvest early, and in only 2 percent of shocks did the household delay its plans. These figures indicate that in Laos households are heavily reliant on their own saved resources or those of other households, with borrowing being a common coping strategy. By contrast, government programs and schemes run by NGOs are conspicuous by their absence.

Table 6 investigates—via regression analysis—the impacts of different types of shocks on the use of different coping strategies, holding constant household wealth, the household's ethnicity and the age of its head. This provides a check on the averages in Table 5 which could be driven by a correlation between the likelihood of a shock occurring and one of these factors. The omitted shock in Table 6 is drought. If the shock is a health shock, significantly more coping strategies are employed. Other things equal, if the shock is a death rather than a drought, the household employs 0.5 more coping strategies. By contrast, pest infestation and crime result in significantly fewer coping strategies being employed. Households with an elderly head employ fewer coping strategies.

None of the regressors in Table 6 has a significant effect on the probability of receiving help from government or the NGO—few people receive such help, and there is no discernable pattern in the data; it is not the case, for example, that the poor and ethnic minorities are more likely to be assisted by the government or by an NGO. Only two factors significantly increase the likelihood of being helped by another household, namely if the shock is an illness or a death. By contrast, if the shock is a pest infestation or a crime, other households are less likely to help. At least in the case of pest infestation, the patter likely reflects the fact that pest infestation is a covariate shock and households are therefore not in a position to help one another (cf. e.g. Kenjiro 2005).

Unsurprisingly, too, health shocks are more likely than drought to trigger health insurance reimbursement. Dissaving shows few systematic patterns, other than that it is more commonly used in response to pest infestation than in response to drought. Borrowing, by contrast, is less likely to be used in response to pest infestation and crime than in response to a drought, while borrowing is *more* likely to be used in response to an illness. The sale of assets is more common in response to a death than in response to drought and less common in response to floods. Wealthier households are less likely to resort to an early harvest; otherwise there is no pattern in the data. Health shocks are more likely than drought to result in households pawning their possessions; the same is true of households experiencing floods. Again, these patterns likely reflect in apart the differences across shocks in their idiosyncraticity: selling assets is more attractive financially for idiosyncratic risks like health shocks than for covariate risks like drought since multiple households selling assets will drive down the price of the asset and reduce the returns from asset sales.

VII. **IMPACTS OF SHOCKS ON WELL-BEING**

Traditionally, the welfare cost of shocks—and hence the potential value of formal insurance programs—has been analyzed through consumption-smoothing regressions. The (log of the) change in consumption is regressed on a vector of shocks, and a significant negative coefficient on the shock variables is considered evidence of an inability to smooth consumption in the face of shocks and hence a positive value of formal insurance arrangements (cf. e.g. Townsend 1994; Gertler and Gruber 2002; Asfaw and von Braun 2004). The Laos survey does not allow us to estimate a standard consumption-smoothing regression because it does not contain pre-shock consumption. Instead, we estimate an equation linking consumption to shocks. This can be thought of as a misspecified version of the correct consumption-smoothing model linking current consumption to shocks and lagged consumption, where the coefficient on the latter is constrained to be one. We cannot include lagged consumption but we can

include determinants of lagged consumption, such as pre-shock wealth. Christiaensen et al. (2007), who had a similar type of dataset, adopt the same approach. We may, of course, end up omitting relevant determinants of lagged consumption. If, on balance, these are negatively correlated with shocks (Table 2 shows that most shocks are more common among the poor), our estimated effects of shocks on consumption will be underestimated. As a result, we may end up with estimates of the effects of shocks on consumption that are more negative (or less positive) than is warranted, and we will end up rejecting the full-insurance hypothesis more often than justified.

We break consumption down into nonmedical/nonfood spending and food consumption. We also report results for medical expenditure, which is likely to *increase* in response to health shocks. Medical spending is measured over the previous 30 days. Some items of nonfood spending are over the last 30 days, while others are over the last 12 months; the former have been annualized. All food consumption is measured with reference to the previous 12 months. All consumption variables are measured in per capita terms, but household size has been adjusted upwards to include any deaths in the previous 12 months; any effects on aggregate consumption ought therefore to be properly captured in our results. Our regressions include the vector of shocks, pre-shock wealth (measured through the value of the first principal component of the PCA described in section IV), each of the shock dummies interacted with wealth, the age of the household head (entered as a vector of dummies), a dummy indicating whether the household head is female, the ethnic group of the household (four groups), the education levels of the household head and the spouse (a series of dummies), the marital status of the head (also a series of dummies), the size of the household (dummies for 1, 2, 3, 4, 5 6, 7, and 8 or more members), a dummies indicating whether grandparents live in the house, and village fixed effects.

Table 7 reports the parameters of interest, namely the effects (for the poorest and richest quintiles separately) of a specific type of shock on consumption, holding constant pre-shock wealth. The

full results are reported in Table A1 in the Appendix. The first two columns of Table 7 show that health shocks increase medical care expenditures, as expected, though significantly so only for injuries among the poorest 20% and for illness among the richest 20%. There are only six significant effects in the nonmedical/nonfood expenditure regressions, three negative and thee positive, and only four in the food consumption regressions (again half of them positive).

Table 7 hardly provides overwhelming evidence that shocks cause households in Laos to cut back their food and nonfood consumption, and that the poor are worse affected by shocks than the better off. There are a couple of possible responses to these results. One is to take them at face value, and consider their welfare implications. Chetty and Looney (2006) argue that a zero coefficient on shocks could simply reflect high relative risk aversion, which could be due to a low level of consumption. Households close to the subsistence level of consumption, and hence highly risk-averse, will use whatever methods they can to avoid a drop in consumption, including desperate measures such as taking children out of school. Chetty and Looney argue that researchers finding evidence of consumption smoothing ought to establish why households are able to smooth consumption. Is it because of well-functioning insurance markets, or because households have low levels of consumption and hence high levels of risk-aversion? The other possible response to Table 7 is that the results are not a real test of full insurance due to a model misspecification or inappropriate estimation method. Our specification does indeed fall far short of the consumption-smoothing gold standard regression. We can, however, speculate about the possible direction of bias. Insofar as the omitted determinants of lagged consumption are negatively correlated with shocks, our estimates will be biased downward, leading us to find too many—rather than too few—instances of less-than-full insurance. But it is possible that the omitted determinants are, on balance, positively correlated with lagged consumption. Moreover, unlike some studies of consumption-smoothing, we have not addressed the possibility that measurement error

may exist in the data. Certainly, several studies using panel data and (in some cases) the use of instrumental variables (IV) to address measurement error have found evidence of incomplete insurance following income, health and other shocks (cf. e.g. Ravallion and Chaudhuri 1997; Jalan and Ravallion 1999; Gertler and Gruber 2002).

Given the difficulties associated with drawing policy inferences from consumption regression results like those in Table 7, we explore next a complementary approach, namely to ask people about the impacts of shocks, in much the same way as poverty analysts complement quantitative poverty assessments with evidence on how people assess their own living standards (cf. Pradhan and Ravallion 2000; Deaton 2010). The first line of Table 8 presents some self-reported data on the impacts of shocks that paint a rather different picture from the consumption regressions. Among the 721 shocks reported, 66 percent resulted in the household cutting back its consumption, according to responses to a question inquiring whether the shock led to a cut-back in consumption. For each shock, households were asked on a 4-point scale (where 1 is the minimum and 4 the maximum) how far the shock affected the family's well-being *at the worst moment*; the mean response was 3.3. For each shock, the household was asked how far it had recovered, with 1 being the least progress and 4 being a complete recovery; the mean response was 3.0. These numbers suggest an initial appreciable impact of shocks, with some—but less than full—recovery. The poorest 20% were more likely to cut back than the richest 20%, and were more affected; by contrast, if anything, the poorest 20% were more likely to have recovered.

The rest of Table 8 asks whether some shocks were more likely than other shocks to cause families to cut back their consumption, and whether some shocks led to larger self-reported changes in well-being and a slower recovery. These regressions include interactions between the shocks and wealth, and the same variables entered in the consumption regressions in Table 7, including village fixed effects. The first model is a probit model, and the other two are ordered probits. The coefficients

reported are the linear combinations of the marginal effects on the shock variable and its interaction with wealth, evaluated at the quintile's mean wealth score and for the variable's highest category. Among the poorest 20% only the three health shocks were more likely than the omitted shock (drought) to lead to a statistically significant cut in consumption. Among the richest 20%, the picture is different: no shock is more likely than drought to lead to a cut in consumption, but one (crime) was less likely to lead to a cut in consumption. Among the poorest 20% only the two health shocks were more likely than the omitted shock (drought) to result in welfare being affected "a lot", namely illness and death; by contrast, two shocks were less likely than drought to result in welfare being affected a lot, namely non-payment of income and crime. Among the richest 20%, a somewhat similar picture emerges with a death being the only shock more likely than a drought to result in welfare being affected "a lot". Finally, among the poorest 20% only a death has a lower probability than a drought of the household having completely recovered from a shock. This pattern is not, however, seen in the richest quintile.

The self-reported data on the effects of shocks thus lead to three conclusions, all at odds with the results from the consumption regressions in Table 7: shocks do result in households cutting consumption and having adverse effects on their welfare; only health shocks are worse than a drought in terms of the likelihood of a family being forced to cut back consumption and in terms of the shock affecting a family's well-being "a lot"; the poor are especially disadvantaged in terms of the greater damage that health shocks inflict on household well being.

VIII. **HEALTH IMPACTS OF HEALTH SHOCKS**

This section explores the question of whether health shocks result in a reduction in health 'capital', or whether people are, on average, able to recover their health following a health shock. In the case of agricultural and economic shocks, it is common to inquire about the destruction of assets

following the shock. Analyses of health shocks, by contrast, typically do not, focusing instead on the consumption and labor-market consequences of health shocks. Yet it seems likely that a health shock will result in some depletion of an individual's health 'capital', either because people choose to reduce their health stocks following an unexpectedly high user cost of health capital, or because they are unable to instantaneously adjust their health stocks to the optimal level (cf. Grossman (1972; 2000) and Wagstaff (1993)); the latter explanation is likely to be particularly relevant when the health shock in question is an injury or the onset of a chronic condition. Recent research from a number of disciplines confirms that health shocks have lasting impacts on health. For example, Smith (1999) has shown that health events in the US—particularly major ones—cause people to revise downwards their life expectancy, while Case et al. (2005) have shown that poor health in childhood in South Africa increases the likelihood of poor health in adulthood. It seems plausible that the amount by which health status deteriorates following a health shock is not a given, but rather will depend on the person's circumstances and characteristics, with individuals in more favorable circumstances better able to recover their health following a health shock or at least limit its impact on their health status (cf. Smith 1999). Goldman and Smith (2002) have emphasized the role of education, hypothesizing that people with higher levels of education are better able to adhere to treatment and disease management regimes following the onset of a chronic condition. While it makes sense to downplay the roles of wealth and remoteness in a setting like the US, these factors seem likely to have some importance in a country like Laos, where health insurance is minimal and distance to health facilities often considerable.

Respondents in our survey were asked to rate the health of the person experiencing the health shock on a five-point scale before the health shock and "after the recovery", with 1 being least healthy and 5 being most healthy. Table 9 shows that, on average, there was a statistically significant decline in the health status of people experiencing health shocks of 0.6 points on the 5-point scale. The two

regressions in Table 9 try to tease out the factors explaining the variation in the change in health following a health shock. The first includes village fixed effects. Illness results in a smaller decline in health status than an injury (the omitted shock in the last two columns). Wealthier households experienced a smaller loss of health capital following a health shock. By contrast, elderly people experienced a larger loss. The results are consistent with the hypothesis that education helps limit the impact of a health shock on health status: the education variables are jointly significant, although the coefficients do not increase monotonically with education level.

The last column replaces the village fixed effects by an estimate of the number of hours it takes people living in the respondent's village to get to the closest health facility (which could be a dispensary/health post or a hospital—whichever is closer). The estimated coefficient is consistent with people living close to (far from) a health facility experiencing smaller (larger) health capital losses following a health shock, and in this regression the coefficients on wealth and education are insignificant.

The most obvious explanation of the coefficient on distance to health facility is that people living far from a health facility do not get medical care soon enough after a health shock, or do not get it at all. It ought, however, to be acknowledged that the time-to-nearest-clinic variable may simply be capturing remoteness. When this time measure is replaced by a variable capturing the number of hours it takes to reach the closest secondary school, the results are qualitatively similar, though the coefficient is around 30 percent smaller in absolute value. Clearly, there is no plausible causal mechanism in the case of a secondary school. But there are other inputs aside from health care that may affect the speed with which someone's health recovers after a health shock, and remoteness likely adds to the time cost associated with getting them. We cannot be 100 percent sure, then, that it is indeed lengthy travel time

to a health facility that is slowing down or reducing the likelihood of a full recovery following a health shock; the results are, though, consistent with this interpretation.

IX. **CONCLUSIONS**

This paper has confirmed the significance of risk and vulnerability for households in developing countries. Results from three provinces in Laos with very different topographic, demographic, and socio-economic characteristics indicate that health- and agriculture-related shocks are not only very common, but have a substantial impact on household welfare. More than 30 percent of households report a death, injury or serious illness in the household over the last 12 months, while nearly 40 percent report drought, pest, other crop-loss, or livestock disease. In both cases, shocks are concentrated among the poor. Agriculture-related shocks primarily result in asset losses, equivalent to nearly 100 percent of per capita food consumption. Health shocks, in contrast, tend to impact on households primarily through loss of income and, in particular, medical and nonmedical expenditures.

The survey also highlighted that, in the Lao context, there are very few formal safety net programs (government, donor, or NGO supported) to help households manage the risks. Dissaving, borrowing, sale of assets, and support from other households are the predominant coping mechanisms. The regression results reported in the paper imply that households are for the most part able to smooth consumption in the face of shocks. However, consumption-smoothing results from cross-section data are known to suffer from important methodological problems, and subjective ratings of the impact of shocks and the extent they have recovered indicate that many of the shocks resulted in reduced consumption and had lasting impacts. Moreover, even if households are able to smooth consumption, this may be achieved through strategies that have long-term consequences for household welfare. Hence, from a policy perspective, it will be important to complement efforts to sustain poverty

reduction in Laos with policies and programs aimed at reducing household vulnerability. Given the pattern of shocks, programs focused on income protection in the face of agriculture shocks (e.g. public works programs) and on reducing out-of-pocket expenditures associated with illness (e.g. direct or indirect subsidies to reduce the cost of health care services) would seem particularly pertinent.

From a methodological perspective, the paper has highlighted the value of comprehensive risk and vulnerability surveys. These surveys provide comparable data across several types of shocks, including on prevalence, risk management strategies, and impacts. The Lao survey also included notable innovations to capture pre- and post-shock measures of subjective welfare and health status, which allowed for an analysis of subjective welfare impacts, and also provided evidence on the extent to which health (and other) shocks result in a long-term loss of human capital. The use of retrospective data (collected after a health shock) on health status before and after the shock ought to reduce reporting biases. Just as one ought to worry about different people having different thresholds affecting whether they report their health as, say, “good” or “excellent” so one ought to worry about people’s thresholds varying over time; this would limit the scope for getting accurate estimates of the impacts of health shocks using self-assessed health status data collected at different points in time. By contrast, there is no doubt that our ability to accurately get at the consumption consequences of shocks would have been increased by having consumption data measured through a survey undertaken 12 months earlier.

Table 1: Sample design

	Communities			Households		
	Rural	Urban	Total	Rural	Urban	Total
Vientiane Capital	3	5	8	60	100	160
Phonsaly	8	3	11	179	41	220
Attapeu	9	2	11	180	40	220
Total	20	10	30	419	81	600

Table 2: Incidence, inequality and idiosyncraticity of shocks

	Mean	Inequality	Idiosyncraticity
Natural and biological hazards			
Drought	0.156	-0.346	0.254
Floods, mudslides, storms	0.072	-0.258	0.203
Frost, extreme cold	0.015	0.097	0.063
Pest infestation, crop and livestock diseases	0.248	-0.358	0.383
Economic shocks			
Unexpected decline in prices or demand for commodities that you sell	0.043	-0.138	0.387
Impossible to find work	0.034	0.242	0.068
Non-payment or delay in payment of income	0.031	0.269	0.063
Socio-political shocks			
Crime (robbery, theft)	0.035	0.007	0.047
Family and health events			
Divorce, abandonment, or internal or extended family disputes	0.005	-0.555	0.064
Injury	0.046	0.069	0.075
Illness	0.231	-0.208	0.115
Death	0.032	-0.301	0.070

Notes: 'Inequality' captures the extent to which the shock in question is higher among the poor (as measured by the housing-based wealth index). The degree of inequality is measured by the concentration index which is a Gini-like measure where the concentration curve plots the cumulative fraction of persons being affected by the shock against the cumulative fraction of the sample ranked by the wealth index. A positive value indicates higher values, on average, among the better off; a negative value indicates higher values, on average, among the less well off. 'Idiosyncraticity' captures the degree to which the risk of the shock varies across households at the village level. It is measured here by the R^2 from a linear-probability regression of the shock on a vector of village dummies. High values of the R^2 indicate that where the household lives explains a high fraction of the inter-household variation in the risk of the shock.

Table 3: Income losses and costs associated with shocks among households affected by shocks, as % of average per capita food consumption

	No. HHs hit by shock	Asset loss	Income loss	Medical expenses	Other expenses	Total costs	CI
Natural/biological hazards							
Drought	120	87%	13%	1%	9%	109%	0.146
Floods, mudslides, storms	62	96%	26%	0%	2%	124%	0.004
Pest infestation, etc.	240	98%	23%	1%	4%	126%	0.218
Economic shocks							
Decline in selling prices	29	0%	107%	0%	33%	139%	0.124
Impossible to find work	10	0%	51%	0%	24%	74%	-0.002
Non-payment of income	10	0%	29%	0%	16%	45%	0.015
Socio-political shocks							
Crime (robbery, theft)	18	180%	12%	1%	9%	202%	0.324
Family and health events							
Divorce, etc.	6	0%	0%	3%	5%	8%	2.203
Injury	17	0%	30%	67%	48%	145%	-0.179
Illness	176	0%	84%	134%	33%	251%	0.405
Death	31	0%	13%	219%	151%	383%	-0.013

Notes: No. households in sample is 600.

Table 4: Expected income losses and costs associated with shocks, as % of average per capita food consumption

	Asset loss	Income loss	Medical expenses	Other expenses	Total costs	CI
Natural/biological hazards						
Drought	14%	2%	0%	2%	18%	-0.287
Floods, mudslides, storms	8%	2%	0%	0%	11%	-0.256
Pest infestation, etc.	32%	8%	0%	1%	42%	-0.236
Economic shocks						
Decline in selling prices	0%	4%	0%	1%	6%	-0.034
Impossible to find work	0%	1%	0%	0%	1%	0.241
Non-payment of income	0%	0%	0%	0%	1%	0.276
Socio-political shocks						
Crime (robbery, theft)	4%	0%	0%	0%	5%	0.261
Family and health events						
Divorce, etc.	0%	0%	0%	0%	0%	-0.284
Injury	0%	1%	2%	1%	3%	-0.014
Illness	0%	20%	33%	8%	61%	0.157
Death	0%	1%	9%	6%	16%	-0.314

Notes: No. households in sample is 600.

Table 5: Number of coping strategies and average use of specific strategies, by type of shock

	No. coping strategies	Help from govt.	Help from NGO	Help from others	Health insurance	Dissaved	Borrowed	Sold assets	Early harvest	Pawned possessions	Delayed plans
Drought	1.490	0.069	0.026	0.242	0.000	0.826	0.228	0.057	0.006	0.000	0.036
Floods, mudslides, storms	1.410	0.066	0.000	0.141	0.000	0.806	0.211	0.009	0.009	0.058	0.115
Frost, extreme cold	1.711	0.000	0.042	0.626	0.000	0.416	0.584	0.000	0.000	0.000	0.042
Pest infestation, etc.	1.148	0.024	0.017	0.067	0.000	0.953	0.059	0.020	0.000	0.000	0.008
Decline in selling prices	1.924	0.000	0.000	0.462	0.000	0.625	0.558	0.118	0.000	0.000	0.161
Impossible to find work	2.037	0.000	0.000	0.519	0.000	0.880	0.568	0.000	0.000	0.000	0.139
Non-payment of income	1.395	0.000	0.000	0.395	0.000	0.605	0.395	0.000	0.000	0.000	0.000
Crime (robbery, theft)	1.052	0.000	0.000	0.052	0.000	0.857	0.026	0.000	0.000	0.000	0.117
Divorce, etc.	1.129	0.000	0.000	0.314	0.000	0.814	0.000	0.000	0.000	0.000	0.000
Injury	2.352	0.000	0.089	0.374	0.177	0.898	0.305	0.102	0.000	0.108	0.299
Illness	1.973	0.000	0.003	0.397	0.042	0.817	0.380	0.115	0.020	0.024	0.175
Death	2.346	0.020	0.000	0.553	0.020	0.872	0.375	0.277	0.000	0.000	0.229
Overall	1.611	0.023	0.014	0.265	0.020	0.846	0.257	0.063	0.007	0.016	0.100

Table 6: Factors affecting the use of different coping strategies

	No. coping strategies	Help from govt.	Help from NGO	Help from others	Health insurance reimbursement	Dissaved	Borrowed	Sold assets	Early harvest	Pawned possessions	Delayed plans
Shocks											
Floods, mudslides, storms	-0.086	-0.008		-0.112		-0.001	-0.034	-0.051**	0.002	0.860***	0.093
	(-0.77)	(-0.54)		(-1.32)		(-0.01)	(-0.36)	(-2.51)	(0.29)	(8.62)	(0.87)
Frost, extreme cold	0.081		0.001	0.349		-0.336	0.307				-0.003
	(0.54)		(0.05)	(1.46)		(-1.44)	(1.44)				(-0.04)
Pest infestation, etc.	-0.232**	-0.030	0.000	-0.199***		0.129***	-0.193***	-0.039			-0.064
	(-2.48)	(-1.08)	(0.04)	(-3.76)		(3.51)	(-3.92)	(-1.29)			(-1.63)
Decline in selling prices	0.253			0.213		-0.176	0.320**	0.075			0.153
	(1.57)			(1.56)		(-1.40)	(2.50)	(0.65)			(1.12)
Impossible to find work	0.296			0.263		0.067	0.324*				0.107
	(1.52)			(1.30)		(0.81)	(1.65)				(0.75)
Non-payment of income	-0.077			0.141		-0.159	0.152				
	(-0.47)			(0.74)		(-0.95)	(0.82)				
Crime (robbery, theft)	-0.341***			-0.187***		0.037	-0.201***				0.095
	(-3.31)			(-3.45)		(0.41)	(-4.92)				(0.65)
Divorce, etc.	-0.310			0.048		-0.039					
	(-1.14)			(0.25)		(-0.22)					
Injury	0.426**		0.009	0.114	0.909***	0.077	0.063	0.047		0.966***	0.286**
	(2.34)		(0.32)	(0.72)	(12.30)	(1.15)	(0.45)	(0.48)		(20.56)	(2.22)
Illness	0.296***		-0.012	0.153**	0.134**	-0.005	0.153**	0.055	0.006	0.210**	0.145*
	(2.74)		(-1.52)	(2.07)	(2.45)	(-0.10)	(2.07)	(1.09)	(0.88)	(2.31)	(1.84)
Death	0.485***	-0.018		0.323**	0.818***	0.022	0.158	0.252**			0.259
	(3.14)	(-0.91)		(2.52)	(11.04)	(0.34)	(1.18)	(2.03)			(1.40)
Other determinants											
Wealth	-0.018	0.010	0.001	-0.008	0.000	-0.002	-0.006	-0.017	-0.011*	-0.000	0.005
	(-0.38)	(0.92)	(0.42)	(-0.21)	(1.04)	(-0.05)	(-0.17)	(-1.00)	(-1.69)	(-1.14)	(0.32)
Ethnic minority	-0.113	-0.049	-0.017	-0.048	-0.000	0.075	-0.041	-0.048*	-0.010	-0.001	-0.019
	(-1.28)	(-1.48)	(-1.39)	(-0.73)	(-0.56)	(1.64)	(-0.70)	(-1.75)	(-1.12)	(-1.05)	(-0.55)
Age household head	-0.114**	-0.001	-0.009	-0.064	-0.000	-0.005	-0.096**	0.000	0.001	-0.000**	-0.007
	(-2.15)	(-0.06)	(-1.54)	(-1.48)	(-0.15)	(-0.12)	(-2.10)	(0.03)	(0.34)	(-2.04)	(-0.31)
N	725	452	559	725	343	725	716	673	356	373	709
Pseudo R^2		0.106	0.181	0.139	0.248	0.097	0.150	0.107	0.170	0.206	0.138

Notes: First row shows the mean of the dependent variable and the t-statistic for the hypothesis that the variable is not different from zero. Remaining rows are the results of a regression analysis. Model for number of coping strategies is a Poisson model. The others are probit models. All models include village fixed effects. Omitted shock is drought. Numbers in parentheses are t-statistics. *** p<.01, ** p<.05, * p<.1.

Table 7: Consumption and shocks

	Medical spending		Nonmedical nonfood spending		Food consumption		Total consumption	
	Poorest 20%	Richest 20%	Poorest 20%	Richest 20%	Poorest 20%	Richest 20%	Poorest 20%	Richest 20%
Drought	0.813**	-0.419	0.205*	0.141	0.052	0.513*	0.164**	0.214
	(2.22)	(-0.39)	(1.81)	(0.40)	(0.71)	(1.78)	(2.23)	(0.88)
Floods, mudslides, storms	0.563	-2.430	0.208	0.022	0.003	-0.075	0.017	-0.033
	(0.91)	(-1.58)	(1.04)	(0.05)	(0.03)	(-0.22)	(0.14)	(-0.11)
Frost, extreme cold	0.806	-2.859*	0.011	-0.574***	-0.033	0.047	0.037	-0.289
	(0.97)	(-1.92)	(0.04)	(-2.71)	(-0.11)	(0.26)	(0.12)	(-1.47)
Pest infestation, etc.	0.019	-0.094	-0.013	0.222	0.030	0.094	0.050	0.064
	(0.05)	(-0.16)	(-0.13)	(1.17)	(0.47)	(0.54)	(0.74)	(0.44)
Decline in selling prices	-0.033	-1.657*	0.016	-0.157	-0.824***	0.152	-0.406***	-0.071
	(-0.05)	(-1.87)	(0.06)	(-0.79)	(-5.18)	(0.80)	(-2.39)	(-0.48)
Impossible to find work	-0.156	0.524	-0.790*	-0.174	0.505**	0.024	0.012	-0.180
	(-0.12)	(0.36)	(-1.82)	(-0.72)	(2.11)	(0.17)	(0.05)	(-1.02)
Non-payment of income	2.192**	0.502	0.441	-0.277	0.086	-0.247	0.482	-0.201
	(2.27)	(0.38)	(1.10)	(-1.03)	(0.27)	(-1.54)	(1.02)	(-1.26)
Crime (robbery, theft)	-1.096	-4.965	0.140	0.816***	-0.021	0.394**	0.026	0.612***
	(-0.34)	(-1.32)	(0.41)	(2.85)	(-0.13)	(2.12)	(0.10)	(2.71)
Divorce, etc.	-0.480	0.324	-0.185	0.910	-0.059	0.662	-0.084	0.577
	(-0.33)	(0.06)	(-0.72)	(0.89)	(-0.43)	(1.11)	(-0.46)	(0.79)
Injury	2.523***	1.848	0.396	0.349	-0.289	-0.086	0.182	0.150
	(2.60)	(1.14)	(1.08)	(1.16)	(-0.81)	(-0.44)	(0.57)	(0.73)
Illness	0.335	2.824***	0.240***	-0.174	0.005	0.038	0.089	0.101
	(0.94)	(7.17)	(2.58)	(-1.07)	(0.07)	(0.30)	(1.32)	(0.74)
Death	0.246	0.323	0.390	-1.072***	-0.012	-0.188	0.213	-0.679***
	(0.52)	(0.42)	(1.60)	(-3.46)	(-0.11)	(-0.76)	(1.26)	(-2.36)

Notes: All spending variables are expressed in per capita terms, with household size adjusted upwards to include any deaths in the last 12 months. All models include, in addition to the shock dummies, pre-shock wealth, each of the shock dummies interacted with wealth, the age of the household head (entered as a vector of dummies), a dummy indicating whether the household head is female, the ethnic group of the household (four groups), the education levels of the household head and the spouse (a series of dummies), the marital status of the head (also a series of dummies), the size of the household (seven dummies), dummies indicating whether grandparents live in the house, and village fixed effects. The medical spending regression is a Poisson model, i.e. a generalized linear model with a log link function and a variance proportional to the mean (Buntin and Zaslavsky 2004). The dependent variable in the other regressions is the natural logarithm of spending, and the model is OLS. The first number in the pair is the linear combination of the coefficients on the shock variable and on its interaction with wealth, evaluated at the mean wealth score of the quintile in question. All linear combinations are to be interpreted as semi-elasticities, i.e. value of 0.1 means the shock in question raises consumption by 10%. Numbers in parentheses are t-statistics. *** p<.01, ** p<.05, * p<.1.

Table 8: Self-reported impacts on consumption (marginal effects)

	Did household cut back consumption? No (0), yes (1)		How far did shock affect household welfare? Not at all (1), some (2), much (3), a lot (4)		How far has household recovered from shock? Not at all (1), some (2), a lot (3), yes completely (4)	
	Poorest 20%	Richest 20%	Poorest 20%	Richest 20%	Poorest 20%	Richest 20%
Mean	0.616	0.514	3.287	2.904	3.078	2.698
Shocks						
Floods, mudslides, storms	0.221	-0.527	-0.445*	-0.116	0.408	-0.684
	(0.78)	(-1.09)	(-1.72)	(-0.15)	(1.17)	(-0.63)
Frost, extreme cold	1.121	-1.103	-0.529	0.827	-0.135	-1.772*
	(1.31)	(-1.20)	(-0.83)	(1.14)	(-0.11)	(-1.94)
Pest infestation, etc.	0.128	-0.619	-0.149	0.051	0.053	-0.771
	(0.71)	(-1.02)	(-0.92)	(0.11)	(0.33)	(-1.37)
Decline in selling prices	-0.892	0.945	-1.072	-0.458	-0.266	-0.593
	(-1.62)	(1.12)	(-1.47)	(-0.78)	(-0.69)	(-0.82)
Impossible to find work	-1.993	-0.995	0.173	-1.550***	1.339	-1.145
	(-1.38)	(-1.17)	(0.15)	(-2.58)	(1.50)	(-1.62)
Non-payment of income	-1.861	-0.474	-3.050**	-2.413***	-0.779	1.207
	-1.23	-0.58	(-2.09)	(-2.84)	(-0.78)	(1.42)
Crime (robbery, theft)	-0.417	-2.900***	-1.637***	-1.462**	0.247	3.268***
	(-0.90)	(-2.89)	(-2.97)	(-2.09)	(0.44)	(3.10)
Divorce, etc.	-0.820	1.452	-0.116	1.038	-0.129	-3.052
	(-0.95)	(0.39)	(-0.33)	(0.32)	(-0.28)	(-1.53)
Injury	2.846**	-0.946	-0.763	-0.550	0.079	0.503
	(2.14)	(-1.10)	(-0.91)	(-0.89)	(0.13)	(0.60)
Illness	0.698***	-0.964	0.438***	-0.909*	-0.198	0.171
	(3.33)	(-1.39)	(2.52)	(-1.70)	(-1.00)	(0.23)
Death	0.813**	-1.545	1.090***	2.462***	-0.760***	1.223
	(2.14)	(-1.62)	(3.35)	(2.87)	(-2.98)	(1.21)

Notes: First row shows the mean of the dependent variable. Remaining rows are the results of a regression analysis. The first model is a probit, the rest are ordered probits. All models include, in addition to the shock dummies, pre-shock wealth, each of the shock dummies interacted with wealth, the age of the household head (entered as a vector of dummies), a dummy indicating whether the household head is female, the ethnic group of the household (four groups), the education levels of the household head and the spouse (a series of dummies), the marital status of the head (also a series of dummies), the size of the household (seven dummies), dummies indicating whether grandparents live in the house, and village fixed effects. The first number in the pair is the linear combination of the marginal effects on the shock variable and on its interaction with wealth, evaluated at the mean wealth score of the quintile in question, and for the highest category (i.e. 1 in the first, and 4 in the second and third variables). The first number in the pair is the linear combination of the coefficient on the shock variable and its interaction with wealth, evaluated at the mean wealth score of the quintile in question. Numbers in parentheses are t-statistics. *** p<.01, ** p<.05, * p<.1.

Table 9: Self-reported impacts of health shocks on health status

	(1)	(2)
Mean change in health status	-0.590	
Illness	1.088***	0.440
	(3.69)	(1.10)
Wealth	1.082***	0.235
	(4.40)	(0.89)
Ethnic minority	-0.189	0.583**
	(-0.27)	(1.97)
Age	-0.015***	-0.013**
	(-3.12)	(-2.45)
Male	-0.230	-0.391*
	(-1.15)	(-1.82)
Incomplete primary schooling	-0.002	0.177
	(-0.01)	(0.85)
Complete primary schooling	2.966***	1.717**
	(2.77)	(2.33)
Incomplete lower secondary schooling	-0.323	0.302
	(-0.54)	(0.91)
Complete lower secondary schooling	1.070**	0.516
	(2.38)	(1.45)
Incomplete upper secondary schooling	1.065*	0.892*
	(1.74)	(1.68)
Complete upper secondary schooling	0.793	0.141
	(1.21)	(0.25)
Hours to nearest health facility		-0.090***
		(-2.63)
N	186	181
Adjusted/pseudo R^2	0.218	0.071
p-value joint significance of education variables	0.015	0.196

Notes: First row shows the mean of the dependent variable. Remaining rows are the results of a regression analysis The dependent variable is constructed from the question: "Imagine a set of five steps for health where on the bottom, the first step, stand the sickest and frailest, and on the highest step, the fifth, stand people in perfect health. Where on the staircase would you place the victim before your illness/injury, where when the worst and where after recovered?" The variable is the difference between the reported values before and after the health shock. Both models are ordered probits. The first includes village fixed effects. The omitted shock is injury. Numbers in parentheses are t-statistics. *** p<.01, ** p<.05, * p<.1.

Appendix

Table A1: Consumption regression results (corresponds to Table 7)

	Medical spending	Nonmedical nonfood spending	Food consumption	Total consumption
Drought	0.419	0.185*	0.200**	0.180**
	(1.14)	(1.72)	(2.29)	(2.30)
Floods, mudslides, storms	-0.393	0.149	-0.022	0.001
	(-1.00)	(0.89)	(-0.23)	(0.01)
Frost, extreme cold	-0.364	-0.176	-0.008	-0.067
	(-0.50)	(-0.86)	(-0.04)	(-0.32)
Pest infestation, etc.	-0.017	0.062	0.050	0.054
	(-0.07)	(0.76)	(0.73)	(0.87)
Decline in selling prices	-0.551	-0.039	-0.512***	-0.299***
	(-1.15)	(-0.22)	(-4.76)	(-2.58)
Impossible to find work	0.061	-0.593*	0.352**	-0.050
	(0.08)	(-1.95)	(2.25)	(-0.32)
Non-payment of income	1.652**	0.212	-0.021	0.264
	(2.25)	(0.74)	(-0.09)	(0.80)
Crime (robbery, theft)	-2.331	0.356	0.111	0.213
	(-1.59)	(1.62)	(0.91)	(1.23)
Divorce, etc.	-0.223	0.165	0.171	0.127
	(-0.15)	(0.67)	(1.26)	(0.81)
Injury	2.307***	0.381	-0.224	0.172
	(5.29)	(1.54)	(-0.86)	(0.75)
Illness	1.130***	0.108	0.015	0.093*
	(4.39)	(1.46)	(0.27)	(1.65)
Death	0.270	-0.077	-0.068	-0.072
	(0.75)	(-0.38)	(-0.60)	(-0.48)
Drought x wealth	-0.474	-0.025	0.177	0.019
	(-1.00)	(-0.16)	(1.42)	(0.18)
Floods, mudslides, storms x wealth	-1.152	-0.072	-0.030	-0.019
	(-1.50)	(-0.33)	(-0.19)	(-0.14)
Frost, extreme cold x wealth	-1.410**	-0.225	0.031	-0.125
	(-2.11)	(-1.63)	(0.23)	(-0.88)
Pest infestation, etc. x wealth	-0.044	0.090	0.025	0.006
	(-0.14)	(1.02)	(0.34)	(0.09)
Decline in selling prices x wealth	-0.625	-0.067	0.375***	0.129
	(-1.27)	(-0.49)	(3.48)	(1.36)
Impossible to find work x wealth	0.262	0.237	-0.185	-0.074
	(0.29)	(1.23)	(-1.54)	(-0.62)
Non-payment of income x wealth	-0.650	-0.276	-0.128	-0.263
	(-0.98)	(-1.50)	(-0.95)	(-1.40)
Crime (robbery, theft) x wealth	-1.489	0.260	0.160	0.225
	(-0.59)	(1.31)	(1.59)	(1.49)
Divorce, etc. x wealth	0.309	0.421	0.277	0.254
	(0.12)	(0.91)	(1.02)	(0.75)
Injury x wealth	-0.260	-0.018	0.078	-0.012
	(-0.28)	(-0.09)	(0.53)	(-0.08)
Illness x wealth	0.958***	-0.159**	0.013	0.004
	(4.37)	(-2.05)	(0.22)	(0.07)
Death x wealth	0.030	-0.563***	-0.068	-0.343***
	(0.08)	(-3.86)	(-0.67)	(-2.71)
Wealth	0.124	0.476***	0.070	0.316***
	(0.62)	(6.13)	(1.17)	(6.14)
Age household head 40-64	-0.092	0.116	-0.042	0.012
	(-0.25)	(1.48)	(-0.77)	(0.22)
Age household head 65-74	-1.876***	-0.114	-0.150	-0.167
	(-3.99)	(-0.78)	(-1.22)	(-1.41)
Age household head 75+	-0.166	-0.470**	0.117	-0.217**
	(-0.22)	(-2.30)	(0.76)	(-1.98)
Household head female	-0.772	0.116	-0.201**	-0.039

	(-1.18)	(0.67)	(-2.03)	(-0.32)
Ethnic Lao Theung	0.528	-0.444***	-0.287***	-0.296***
	(0.91)	(-2.87)	(-2.95)	(-2.64)
Ethnic Lao Sung	1.287*	-0.151	-0.202	-0.156
	(1.66)	(-0.58)	(-1.29)	(-1.13)
Ethnic other	-0.964	-0.573**	-0.218	-0.357**
	(-0.81)	(-2.52)	(-1.33)	(-2.03)
Household head Incomplete Primary	0.901**	0.267**	0.057	0.192**
	(2.50)	(2.38)	(0.74)	(2.33)
Household head Complete Primary	-0.122	-0.673***	-0.357**	-0.576***
	(-0.11)	(-2.82)	(-1.96)	(-3.03)
Household head Incomplete Lower Secondary	0.756	0.297*	0.073	0.129
	(1.45)	(1.66)	(0.55)	(0.94)
Household head Complete Lower Secondary	0.227	0.123	-0.100	-0.007
	(0.43)	(0.78)	(-0.84)	(-0.06)
Household head Incomplete Upper Secondary	-0.914	0.030	-0.115	-0.098
	(-0.57)	(0.11)	(-0.58)	(-0.62)
Household head Complete Upper Secondary	0.681	0.276*	0.014	0.148
	(1.39)	(1.83)	(0.13)	(1.37)
Spouse Incomplete Primary	0.395	-0.194*	0.038	-0.108
	(1.35)	(-1.76)	(0.57)	(-1.39)
Spouse Complete Primary	-0.528	0.427	0.217	0.322
	(-0.56)	(1.33)	(1.24)	(1.20)
Spouse Incomplete Lower Secondary	0.513	0.076	0.194*	0.054
	(1.03)	(0.43)	(1.84)	(0.46)
Spouse Complete Lower Secondary	0.869	0.233	0.167*	0.173
	(1.60)	(1.41)	(1.72)	(1.47)
Spouse Incomplete Upper Secondary	3.283***	0.108	0.081	0.183
	(3.60)	(0.40)	(0.31)	(0.81)
Spouse Complete Upper Secondary	0.333	0.135	0.150	0.100
	(0.61)	(0.70)	(1.26)	(0.70)
Household head married	-0.910*	-0.154	0.007	-0.168
	(-1.89)	(-0.40)	(0.04)	(-0.68)
Household head divorced	0.123	-0.661	-0.262	-0.574**
	(0.16)	(-1.57)	(-1.20)	(-2.16)
Household head separated	-1.212	-1.002**	-0.145	-0.500*
	(-1.27)	(-2.19)	(-0.50)	(-1.71)
Household head widowed	-0.581	-0.407	0.229	-0.208
	(-0.80)	(-1.03)	(1.29)	(-0.81)
Household size = 2	-0.474	-1.642***	-0.700***	-1.210***
	(-0.42)	(-3.50)	(-3.93)	(-5.18)
Household size = 3	-1.956*	-1.501***	-0.773***	-1.148***
	(-1.66)	(-3.24)	(-4.06)	(-5.00)
Household size = 4	-1.985*	-1.790***	-1.122***	-1.436***
	(-1.71)	(-3.88)	(-6.29)	(-6.34)
Household size = 5	-1.951	-1.815***	-1.248***	-1.486***
	(-1.62)	(-3.93)	(-6.77)	(-6.51)
Household size = 6	-2.386**	-1.676***	-1.218***	-1.441***
	(-2.12)	(-3.65)	(-6.90)	(-6.43)
Household size = 7	-2.445**	-1.624***	-1.279***	-1.427***
	(-2.03)	(-3.40)	(-6.69)	(-5.89)
Household size = 8+	-1.749	-1.850***	-1.470***	-1.619***
	(-1.49)	(-3.98)	(-8.19)	(-7.02)
One grandparent present	0.420	-0.053	0.040	-0.001
	(1.40)	(-0.44)	(0.48)	(-0.01)
Two grandparents present	0.121	-0.306*	-0.119	-0.246**
	(0.11)	(-1.75)	(-0.77)	(-2.08)
Three grandparents present	0.988	0.709***	0.832***	0.671***
	(1.35)	(3.24)	(6.42)	(4.83)
Constant	6.791***	9.028***	8.592***	9.670***
	(5.33)	(15.89)	(35.20)	(30.11)
N	600	600	599	599

R^2	0.658	0.494	0.624
Adjusted R^2	0.600	0.408	0.560

Notes: All spending variables are expressed in per capita terms, with household size adjusted upwards to include any deaths in the last 12 months. All models also include village fixed effects. The medical spending regression is a Poisson model, i.e. a generalized linear model with a log link function and a variance proportional to the mean (Buntin and Zaslavsky 2004). The dependent variable in the other regressions is the natural logarithm of spending, and the model is OLS. The first number in the pair is the coefficient and is to be interpreted as a semi-elasticity, i.e. value of 0.1 means the shock in question raises consumption by 10%. Numbers in parentheses are t-statistics. *** p<.01, ** p<.05, * p<.1.

Table A2: Full self-reported consumption impacts (corresponds to Table 8)

	Did household cut back consumption?	How far did shock affect household welfare?	How far has household recovered from shock?
	No (0), yes (1)	Not at all (1), some (2), much (3), a lot (4)	Not at all (1), some (2), a lot (3), yes completely (4)
Floods, mudslides, storms	-0.006	-0.114	0.022
	(-0.09)	(-1.28)	(0.19)
Frost, extreme cold	0.137	-0.034	-0.195
	(0.89)	(-0.21)	(-0.90)
Pest infestation, etc.	-0.041	-0.031	-0.074
	(-0.58)	(-0.57)	(-1.22)
Decline in selling prices	-0.118	-0.243**	-0.122
	(-0.70)	(-2.44)	(-1.41)
Impossible to find work	-0.563***	-0.124	0.211
	(-2.82)	(-0.52)	(0.85)
Non-payment of income	-0.504*	-0.363***	-0.051
	(-1.93)	(-11.33)	(-0.22)
Crime (robbery, theft)	-0.449***	-0.326***	0.453***
	(-3.98)	(-9.07)	(3.41)
Divorce, etc.	-0.035	0.096	-0.264***
	(-0.10)	(0.25)	(-3.84)
Injury	0.353***	-0.207	0.080
	(5.25)	(-1.52)	(0.46)
Illness	0.061	0.003	-0.029
	(0.76)	(0.05)	(-0.35)
Death	0.022	0.538***	-0.045
	(0.19)	(6.74)	(-0.36)
Drought x wealth	-0.106	0.046	-0.152
	(-1.14)	(0.39)	(-0.85)
Floods, mudslides, storms x wealth	-0.316	0.189	-0.228
	(-1.48)	(1.32)	(-1.45)
Frost, extreme cold x wealth	-0.106	0.028	-0.115
	(-1.09)	(0.38)	(-1.30)
Pest infestation, etc. x wealth	0.261*	0.086	-0.046
	(1.69)	(0.65)	(-0.35)
Decline in selling prices x wealth	0.142	-0.240	-0.345**
	(0.60)	(-1.34)	(-2.08)
Impossible to find work x wealth	0.197	0.089	0.276
	(0.80)	(0.36)	(1.41)
Non-payment of income x wealth	-0.353**	0.024	0.420**
	(-2.03)	(0.18)	(2.25)
Crime (robbery, theft) x wealth	0.323	0.160	-0.406
	(0.53)	(0.34)	(-1.27)
Divorce, etc. x wealth	-0.539**	0.030	0.059
	(-2.22)	(0.20)	(0.39)
Injury x wealth	-0.236**	-0.187**	0.051
	(-2.15)	(-2.21)	(0.44)
Illness x wealth	-0.335**	0.191	0.276*
	(-2.06)	(1.45)	(1.90)
Death x wealth	-0.106	0.046	-0.152
	(-1.14)	(0.39)	(-0.85)
Wealth	-0.042	-0.176**	0.085
	(-0.35)	(-2.36)	(0.79)
Age household head 40-64	0.062	0.018	-0.136**
	(0.97)	(0.34)	(-2.45)
Age household head 65-74	0.066	0.027	0.005
	(0.56)	(0.30)	(0.06)
Age household head 75+	-0.097	-0.059	-0.321***
	(-0.28)	(-0.45)	(-8.82)
Household head female	-0.438**	0.053	-0.180*
	(-2.30)	(0.41)	(-1.66)
Ethnic Lao Theung	0.218**	0.040	-0.101

	(2.19)	(0.35)	(-1.01)
Ethnic Lao Sung	-0.074	0.387	0.215
	(-0.20)	(1.62)	(0.90)
Ethnic other	0.465***	0.124	0.386**
	(12.71)	(0.77)	(1.98)
Household head Incomplete Primary	-0.086	-0.068	-0.131*
	(-1.22)	(-1.01)	(-1.84)
Household head Complete Primary	0.195	-0.259***	-0.093
	(1.07)	(-2.94)	(-0.58)
Household head Incomplete Lower Secondary	0.220***	-0.046	-0.210**
	(2.60)	(-0.34)	(-2.57)
Household head Complete Lower Secondary	-0.021	-0.074	-0.140*
	(-0.16)	(-0.69)	(-1.65)
Household head Incomplete Upper Secondary	-0.480***	-0.309***	0.418*
	(-2.74)	(-6.47)	(1.92)
Household head Complete Upper Secondary	-0.077	0.083	-0.103
	(-0.49)	(0.75)	(-1.04)
Spouse Incomplete Primary	0.071	0.131**	0.061
	(0.99)	(2.01)	(0.98)
Spouse Complete Primary	0.164	0.003	0.336
	(0.78)	(0.01)	(1.03)
Spouse Incomplete Lower Secondary	-0.109	0.053	0.190
	(-0.72)	(0.47)	(1.64)
Spouse Complete Lower Secondary	0.080	0.167	0.027
	(0.54)	(1.27)	(0.29)
Spouse Incomplete Upper Secondary		0.395**	-0.141*
		(2.53)	(-1.68)
Spouse Complete Upper Secondary	0.111	0.373**	0.611***
	(0.46)	(2.21)	(7.20)
Household head married	-0.411***	0.040	0.012
	(-5.56)	(0.35)	(0.09)
Household head divorced	-0.127	0.314	0.394***
	(-0.38)	(1.62)	(2.72)
Household head separated	-0.643***	0.611***	0.014
	(-8.29)	(4.99)	(0.06)
Household head widowed	-0.352	0.108	0.171
	(-1.22)	(0.68)	(0.99)
Household size = 2	0.418***	0.449***	0.023
	(13.51)	(3.95)	(1.48)
Household size = 3	0.541***	0.130	
	(15.57)	(0.74)	
Household size = 4	0.701***	0.357**	
	(20.84)	(2.47)	
Household size = 5	0.832***	0.314**	
	(29.47)	(2.13)	
Household size = 6	0.771***	0.260*	
	(24.79)	(1.84)	
Household size = 7	0.760***	0.320**	
	(24.14)	(2.24)	
Household size = 8+	0.943***	0.289**	
	(61.83)	(2.00)	
One grandparent present	-0.012	-0.024	-0.026
	(-0.18)	(-0.38)	(-0.43)
Two grandparents present	0.002	0.023	-0.064
	(0.02)	(0.18)	(-0.63)
Three grandparents present		0.677***	0.677***
		(24.67)	(24.42)
N	718	725	725
Adjusted R^2	0.244	0.211	0.146

Notes: All models also include village fixed effects. The first model is a probit, the rest are ordered probits. The first number in the pair is the marginal effect, evaluated for the highest category (i.e. 1 in the first, and 4 in the second and third variables). Numbers in parentheses are t-statistics. Due to convergence problems, household size was entered linearly in the last column. *** p<.01, ** p<.05, * p<.1.

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