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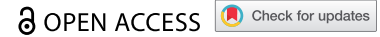View related articles ⧉

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Economic Consequences of Ill-Health in Rural Ethiopia

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ABSTRACT

We use three years of household panel data to analyze the effects of ill-health on household economic outcomes in rural Ethiopia. We examine the immediate effects of various ill-health measures on health expenditure and labor supply, the subsequent coping responses, and finally the effect on income and consumption. We find evidence of substantial economic risk in terms of increased health expenditure and reduced agricultural productivity. Households are able to smooth consumption by resorting to intra-household labor substitution, borrowing and depleting assets. However, maintaining current consumption through borrowing and depletion of assets is unlikely to be sustainable and displays the need for health financing reforms and safety nets that reduce the financial consequences of ill-health.

Introduction

Academic and policy discussions on poverty dynamics in low-income rural settings often rely on analyses of the effects of ill-health on household consumption to judge the value of social safety nets and health financing reforms.[1–7] Indeed, a growing body of empirical literature has assessed the various links in this causal chain from ill-health to household consumption and potential poverty traps.[8–15] For example, in an early study in rural India, Townsend[3] reported that the "percentage of year that an adult male is sick" has no effect on household consumption. More recently, using data from rural Bangladesh, Islam and Maitra[11] also find that household consumption is fairly well insured against "incidence of illness, number of days of sickness and death of the main income earner". In contrast, Gertler et al.[6] in Indonesia and Wagstaff[13] in Vietnam (rural sample) report that consumption is sensitive to "limitations in physical functioning", and "death of a working member, incidence of long spells of hospitalization and sizable drop in BMI of the head", respectively. The mixed evidence on household ability to insure consumption against ill-health warrants context-specific studies on the channels through which ill-health affects consumption and on coping strategies. Identifying these channels is instructive in order to understand the longer-term effects of ill-

health and to determine the scope and welfare effects of public interventions.

We contribute to this literature by offering a comprehensive analysis of different channels through which household economic welfare is affected in rural Ethiopia. Residents in rural Ethiopia rely mainly on agricultural activities and some off-farm work to support their livelihood. We use three years of household panel data to examine the immediate effects of ill-health on health expenditure and labor supply, the subsequent coping responses and finally the effects of ill-health on income and consumption.

In addition to examining a range of channels and economic outcomes we employ four measures of ill-health of varying severity, reflecting different dimensions of ill-health. The magnitude of the effects of ill-health on economic welfare may depend not only on the country context but also on the severity and type of health measure used. For instance, Gertler and Gruber[15] find that minor illnesses are insured while less frequent and severe illnesses are not. Cochrane[1,2] reports similar results using US data. The existing evidence on Ethiopia[4,5] does not distinguish between illness severity and results are mixed. While Dercon et al.[5] reject the hypothesis of full consumption insurance against the "illness of a household member", Asfaw and von Braun[4] find that food consumption is protected against the "illness of the household head" while non-food consumption is not.

We find that ill-health leads to an increase in health expenditure and a reduction in crop output. The effect on crop output occurs despite intra-household labor substitution and hiring-in of labor, which may point to labor productivity differences and the use of productive resources for financing health care. Households are able to protect their consumption by depleting livestock and by borrowing.

Following this introduction, section 2 outlines a framework. Section 3 describes data and methods. Section 4 presents estimates while section 5 concludes.

Analytical Framework

The two immediate economic effects of ill-health in agrarian settings are its effects on labor supply and on health expenditures (see Figure 1). Depending on its severity, ill-health may affect both labor productivity and labor supply in both on-farm and off-farm income generating activities. Whether this translates into a reduction in income in the current context, where households are primarily engaged in self-employed agriculture, is not clear. First, as noted by Kochar,[16] it depends on whether illness occurs in the slack or peak seasons. Second, since the need for specialized skills may not be as high as compared to other occupations, there is greater possibility for both inter- and intra-household labor substitution. Overall, the effect on income will depend on the effectiveness of a household's coping strategy, that is, whether it is possible to compensate for the entire reduction in labor supply and whether there are productivity differentials between the sick member and substituted labor. It is also possible that households have other risk mitigation strategies in place, such as social networks, to protect themselves from these adverse effects. Our examination of the effect of ill-health on household consumption measures the net effect after accounting for such ex-ante and ex-post strategies.

Conditional on seeking medical care, the second source of financial risk is increased health expenditure. The implications of this for household income and consumption depend on how health care is financed. First, households may rely on savings to meet such costs. To the extent that the use of savings to finance medical care curtails the ability of households to invest or purchase agricultural inputs, it may translate into reductions in crop output. Second, households may sell livestock and/or borrow to finance health care needs.[a] Such coping responses are likely to have deleterious consequences for future income and consumption, but they may protect current consumption. There are other coping possibilities, such as remittances from friends and relatives, which may have limited consequences for future income and consumption.[b] Notwithstanding this possibility, the main point is that focusing only on consumption provides an incomplete picture of the consequences of ill-health.

We begin by examining the immediate effect of the health status of a household head on labor supply and health expenditure, followed by an assessment of coping responses.[c] Specifically, we consider the effects on intra-household labor substitution, livestock holdings and
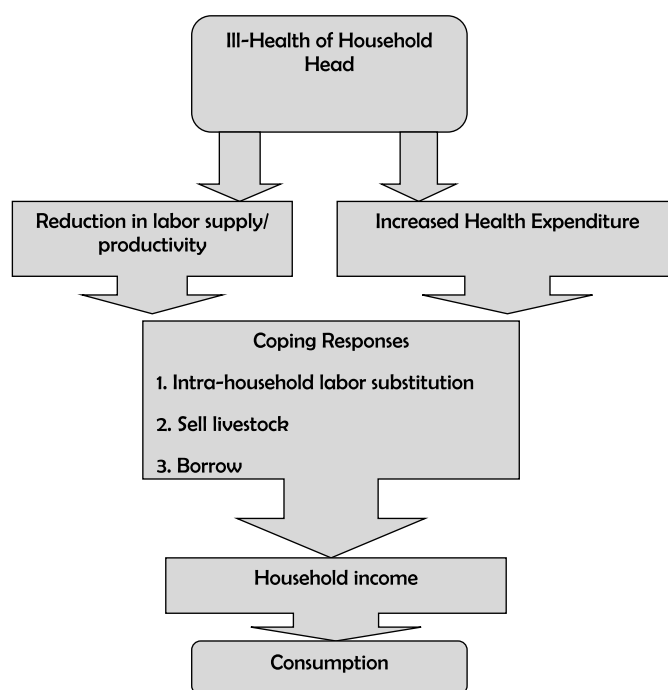
Figure 1. Conduits of impoverishment due to ill-health Source: Authors' elaboration.

borrowing.[d] Finally, we assess the effects of ill-health on income and consumption.

Data and Methods

Data

The study is based on three rounds of panel household survey data collected in 16 rural districts, located in four regions of Ethiopia (Tigray, Amhara, Oromiya, SNNPR) that together account for about 86% of the country's population.[17,e] The surveys were conducted in March-April 2011, 2012 and 2013. Within each district the surveys were canvased in six randomly chosen villages. In each of the 96 villages, 17 households were randomly surveyed, yielding 1,632 households comprising 9,455 individuals. Of the original sample of households, 98% and 97% were re-surveyed in 2012 and 2013, respectively.

The survey contains information on a variety of individual and household socioeconomic attributes such as consumption expenditure, crop output, off-farm income, on-farm and off-farm labor supply, livestock holdings, household demographics, employment and household health conditions. The survey contains a detailed health module that asks respondents to provide for each household member age 6 and older, information on general health status (excellent, very good, good, poor, very poor), incidence of illnesses experienced in the two months preceding the survey, information on prolonged illnesses expressed as experiencing symptoms for more than 30 days, and information on the ability to carry out activities of daily living (ADL). The ADL includes (i) stand up after sitting down, (ii) sweep the floor, (iii) walk for 5 km or for an hour (if age 10 and older), (iv) carry 20 liters of water for 20 meters (if age 15 and older), and (v) hoe a field for three hours (if age 15 and older). The responses are coded as "can do it easily (code = 1), with a little difficulty (code = 2), with a lot of difficulty (code = 3) and not at all (code = 4)".

Measures of Ill-Health

The information from the survey is used to construct four variables which capture the health status of a household head. First, any illness experienced in the two months preceding the survey may be characterized as a short-term measure of health status, which reflects less severe illnesses and with which it might be easier to cope. Second, longer spells of illness, reflected by symptoms that have been persisting for 30 days or more, may have more serious labor supply consequences and require costlier medical treatment. Third, self-assessed health (SAH) status is a measure that covers multiple dimensions of health.

A key issue with the use of self-reported illness and the SAH measure is that the perception and awareness of health are likely to be correlated with a household's cultural and socio-economic background.[11,18,f] Although these are valid concerns, panel data allows us to control for household fixed effects which should mitigate concerns about the effect of wealth and educational status on self-reported illnesses.

The ADL index is potentially a more objective indicator of health status.[15] Our computation of this index follows Gertler and Gruber[15] and Gertler et al.[6] and is based on the algorithm developed by Stewart et al.[19]

$$ADL_i = \left(\frac{Tscore_i - Minimumscore}{Maximumscore - Minimumscore} \right)$$

where $Tscore_i$ is the sum of the scores on all the ADL reported by individual i, while the minimum and maximum score relate to the minimum and maximum $Tscore$ in the data. The index takes the value one if an individual cannot perform any of the five activities (or is the least able individual in the sample) and a value of zero if the individual can perform all activities easily (or is the most able in the sample).

Descriptive statistics for the four health measures are provided in Table 1. In 2011, about 20% of household heads reported that they had experienced an illness in the two months preceding the survey. In 2012 and 2013 the incidence of illnesses was lower at 13.5 and 15.3%, respectively. Depending on the year, the incidence of prolonged illnesses ranges between 5.4 to 9%. The share of household heads reporting poor or very poor health status ranges between 6 to 9%. Consistent with the low incidence of poor health status, the ADL index ranges between 0.051 and 0.080, which indicates that, on

Table 1. Summary statistics of health measures of the household head

Health measures	Mean/ % of household heads			Change 2011–2012 (% of household heads)			Change 2012–2013 (% of household heads)		
	2011	2012	2013	Improve	Same	Worsen	Improve	Same	Worsen
Activities of daily living (ADL) index	0.051 (0.147)	0.058 (0.159)	0.080 (0.187)	10.7	74.1	15.2	14	66.1	19.9
Prolonged illness (symptoms for more than 30 days)	9.1	5.4	6.2	7.8	88.1	4.1	4.3	90.4	5.3
Illness in the two months preceding the survey	20.1	13.5	15.3	15.9	74.4	9.7	10.8	76.7	12.5
(Very) Poor Self-Assessed Health Status	6.1	6.2	8.9	4.5	90.9	4.6	4.9	87.2	7.8

All health measures except for the ADL index are dummy variables. For ADL standard deviations are reported in parentheses. Number of observations in 2011, 2012 and 2013, depending on the health measure, range between [1627–1632], [1582–1597] and [1566–1583] respectively.

average, household heads are readily able to carry out most ADL. Over time, based on all four measures, there are changes in health status, although poor self-assessed health status and the incidence of prolonged illnesses are relatively stable (11% of household heads report a change) as compared to recent illnesses (24%) and the ADL index (30%). The fluctuation in the ADL index is similar to findings reported in Gertler et al.[6] and Gertler and Gruber.[15]

Outcome Variables

We measure household expenditure on health care by aggregating costs incurred for outpatient and inpatient care, including traditional treatments. This includes expenditure on consultation, diagnostic tests, medicine, transportation and other inpatient care related costs. Information on outpatient care was reported for the two months preceding the survey while information on inpatient care was provided for the twelve months preceding the survey. We extrapolate the health care costs incurred for outpatient care and use annualized health expenditure as our outcome variable of interest.

The survey records each household member's (age 6 and older) engagement in on- and off-farm activities in the four weeks preceding the survey.[g] The information includes the number of days worked and the average number of hours per day worked on both types of activities. The two variables used to capture labor supply are the total number of hours worked (both on and off-farm) in the four weeks preceding the survey by the household head and the rest of the members of the household.

Information on livestock holdings is recorded for goats, sheep, calves, bulls and oxen. We use the number of different types of livestock owned rather than their monetary values. While this measure is less susceptible

to reporting mistakes, it does not account for differences in the quality of livestock. The probability of borrowing and the monetary value of all outstanding loans at the time of the survey are used to measure indebtedness.

Household income consists of two elements—the value of crop output and off-farm income. The survey gathered information on household annual output of 33 different crops. We use information on the per unit sales price of each crop to calculate the value of crop production. If a household did not sell a particular crop then we use the median district price of that crop to value crop output.[h] Off-farm income is calculated by multiplying the number of days worked in the past month by remuneration per day.[i]

Our surveys collected information on the quantity and monetary value of 41 food items consumed in the week preceding the survey and expenditure on 34 non-food items in the past month or year. This information is used to compute monthly per adult equivalent food and non-food consumption expenditures (excluding health expenditures).[j] Table 2 provides summary statistics.

Methods

Our empirical strategy is similar to that of other studies in this genre[4,10,15] and relies on a first-difference regression:

$$\Delta(Y_{ivt}) = \alpha_0 + \alpha_1 T_t + \theta_v + \beta \Delta H_{ivt} + \sum_j \lambda_j \Delta X_{ivt} + \Delta \varepsilon_{ivt}.$$

(1)

For household i located in village v, we model changes in an outcome variable of interest (ΔY_{ivt}) as a function of a time dummy (T), a village fixed effect (θ_v), changes in the health conditions of the household head (ΔH_{ivt}), and changes in a vector of controls (ΔX_{ivt}) which includes

Table 2. Means and standard deviations of outcome variables

Outcome variables (Ethiopian Birr)	2011	2012	2013	Outcome variables	2011	2012	2013
Total consumption	249	367	406	Goats #	0.957	1.04	1.109
	(162)	(692)	(529)		(3.754)	(3.834)	(3.235)
Food consumption	206	303	340	Sheep #	1.331	1.365	1.377
	(138)	(679)	(515)		(2.764)	(3.153)	(2.957)
Non-food consumption	43	64	66	Calves #	0.651	0.687	0.654
	(42)	(83)	(61)		(1.019)	(1.238)	(1.944)
Crop output (year)	7758	10,781	11,409	Bulls #	0.366	0.338	0.371
	(14,137)	(23,369)	(16,184)		(1.013)	(1.085)	(1.417)
Total income (year)	9354	12,024	13,574	Oxen #	1.061	1.031	1.042
	(17,306)	(18,572)	(17,222)		(1.139)	(1.53)	(1.198)
Health expenditure (year)	359(1276)	393	353	Total labor supply (household)	229	225	262
		(1624)	(1405)		(247)	(213)	(215)
Outstanding loan	666	635	798	Total labor supply (head)	92	89	102
	(1450)	(1432)	(1970)		(77)	(76)	(82)
				Total labor supply (others)	137	137	160
					(206)	(170)	(177)

Unless specified the variables are in monthly terms; standard deviations are in parentheses; Number of observations in 2011, 2012 and 2013, depending on the outcome variable, range between [1539–1632], [1473–1599] and [1471–1583] respectively.

household economic status (main occupation of the household head, asset index quintiles, membership in a productive safety net programme), demographics (age, sex and religion of the head, age-sex composition of the household), human capital (educational status of the head), social capital (if the household has someone to rely on in times of difficulties), the incidence of shocks in the twelve months preceding the survey (economic, natural and crime-conflict) and a random error term $(\Delta \varepsilon_{ivt})$.[k] Our focus is on the coefficient, β, which reflects sensitivity to ill-health.[l] We estimate several variants of (1) using different empirical methods, depending on the nature of the dependent variable, and provide robust standard errors clustered at the village level.

The use of a difference specification allows us to identify the effect of ill-health on various outcomes after controlling for the effects of time-invariant observed and unobserved variables. For instance, a household's unobserved health endowment is likely to be correlated with the ill-health measures and labor supply and might confound estimates of the effect of illness on labor supply. However, as long as such endowments are time-invariant, estimates based on (1) will not be affected. The set of village fixed-effects controls for village-specific differences in, among others, susceptibility to covariate shocks. To control for time-varying household specific shocks we estimate (1) with the inclusion of a set of variables that captures the incidence of natural, economic and crime/conflict shocks.

Despite relying on a difference specification and the inclusion of various controls, there are empirical issues that warrant a discussion. For a number of the outcome variables, such as health expenditure or the value of outstanding loans, the distributions are censored at zero and skewed. One possibility is to work with logged values of the variables and we do so in the case of consumption where we log consumption before differencing. For the other outcome variables, due to zero values we work with levels. However, since the outcome variables are in first differences, skewness is minimized even without a log transformation.[m] The tables reported in the main body of the paper are based on OLS or logit models with changes in log consumption and changes in levels of other outcomes as dependent variables. As robustness check and to probe sensitivity of our results to the choice of specification, we also estimate alternative models to deal with non-normal distributions (see the supplemental appendix).

Changes in the health measures used in (1) and a number of the outcome variables may be simultaneously determined. For instance, household-specific changes in income due to crime or conflict may also have adverse effects on health outcomes. Several remarks are in order. First, we explicitly control for the incidence of natural, economic and conflict/crime shocks in (1). Second, we use several measures of ill-health and while the self-reported illness measures are more likely to be susceptible to feedback effects it is less likely that the ADL index is prone to such feedback effects. For instance, concerted labor effort is more likely to translate into illness as compared to influencing the ability of individuals to engage in various ADL.

Moreover, the estimates of β in Equation (1) may be confounded if changes to health status induce changes in consumption preferences. To assess this, following Gertler and Gruber,[15] we examine how estimates of (1) vary by the ability (poor/non-poor) of a household to self-insure (these results are in the supplemental appendix).

A final concern is that the introduction of the pilot community based health insurance scheme in some of the districts during the time period covered by the data may potentially confound estimates based on (1). While an evaluation of the scheme is beyond the scope of this paper and the variable is excluded from our main specification, we do find that our estimates are not sensitive to household uptake of the scheme (see the supplemental appendix).

Estimates

Effects on Health Expenditure and Labor Supply

Estimates of the effect of the four health measures on annual health expenditure are reported in column 1 of Table 3. All the measures show that experiencing an illness or deterioration in health status leads to statistically significant increases in health expenditure. For instance, households experiencing an illness in the two months preceding the survey are likely to experience an 874 Birr increase in annual household health expenditure while those who experience prolonged illness may expect to spend 1,100 Birr on health care. These figures amount to between 4.1 and 5.3% of annual household consumption in 2012.[n] A change in the household head's health status to poor/very poor is associated with an expenditure increase of about 793 Birr a year while a deterioration in the ADL index of 0.2, which is equivalent to a movement from being able to easily do all the ADL to an inability to execute one of them, is associated with additional expenditures of 334 Birr a year.[o]

Column 2 provides estimates of the effect of the various health measures on the labor supply of the household head while columns 3 and 4 contain labor supply estimates for other household members and the household as a whole, respectively. Deteriorations in self-assessed health status and in the ADL index are associated with reductions in labor supply of between

Table 3. Effect on health expenditure, labor supply, income and consumption

	Health expenditure	Labor supply (head)	Labor supply (others)	Labor supply (household)	Crop output	Total income	Total consumption
ADL index	1,670***	−17.06*	36.94	25.31	−3,180	−3,527	0.117
	(542.8)	(9.463)	(30.16)	(35.56)	(2,048)	(2,476)	(0.079)
Prolonged illness	1,108***	1.355	20.82	21.22	−1,247*	−802.3	0.005
	(301.5)	(4.767)	(12.91)	(14.17)	(637.2)	(1,933)	(0.029)
Illness	873.9***	−0.260	16.50**	15.52	−2,008**	−564.6	0.0004
	(168.1)	(3.307)	(7.889)	(9.724)	(914.5)	(850.5)	(0.029)
(Very) poor SAH	792.7***	−12.23***	10.54	−4.556	−1,234*	−1,577	0.011
	(254.0)	(4.648)	(14.78)	(17.27)	(687.5)	(1,006)	(0.038)

Each coefficient is from a separate linear regression of equation (1). Number of observations ranges between [2664–3106]. Not reported but included in the specification are village fixed effects and measures of economic status, human capital, social capital, demographics, religion, year and shock dummies. Clustered standard errors (at Kebele/village level) are reported in parentheses.
Statistical significance: * 10%, ** 5%, *** 1%.

12 and 17 hours per month (13 to 19% of average household head labor supply in 2012). The two illness measures do not translate into statistically discernible effects on labor supply. It is possible that the household head continues to supply the same amount of labor but is not as productive, an issue we cannot examine.

Coping Responses

The decline in the labor supply of the household head is matched by an increase in the labor supply of other household members. This applies for all health measures, although the effect is precisely estimated only in the case of recent illnesses. The overall outcome of this adjustment process is that at the household level ill-health does not translate into labor supply reductions.

While households might be able to compensate for health-induced reductions in the labor supply of the household head, due to differences in productivity or the need to raise resources to finance health care there may still be negative consequences. In addition to loss of income, such consequences include loss of leisure time, and a drop in school attendance (if households draw on child work).

Other coping responses include borrowing and the sale of assets. Estimates of Equation (1) for the probability of borrowing and the amount of the loan are provided in columns 1 and 2 of Table 4, while the remaining columns

pertain to the effects of ill-health on household livestock holdings. All measures of ill-health lead to an increase in the probability of having an outstanding loan. Depending on the health measure, the probability of borrowing is 1.7 to 2.6 times higher if a household head has experienced a negative health change, while 3 of the 4 health measures are associated with increases in loan amounts. For a household head experiencing deterioration in physical functioning equal to the average observed for the sub-sample that saw a fall in the ADL index (0.22 points), loan amounts may be expected to increase by 93 Birr. Illnesses and unfavorable changes in SAH are associated with increases in borrowing of 277 and 289 Birr, respectively. Prolonged illness is also associated with an increase in the loan amount but the coefficient is not statistically significant. To place this effect in perspective, consider that the increases in borrowing associated with changes in the three health measures (which are statistically significant) amount to between 25 and 36% of the increase in health expenditure induced by these measures.[p]

Households tend to sell smaller ruminants in response to ill-health (Table 4). A worsening of the SAH status of the household head and a decline in the ADL index are both associated with declines in household holdings of sheep.[q] The estimates imply that for every 10 households that experience a decline in SAH status, almost 4 sell a sheep to finance health care needs.

Table 4. Effect on indebtedness and asset stock

	Any loan	Loan amount	Goat	Sheep	Bulls	Calves	Oxen
ADL index	2.575**	422.3**	−0.198	−0.620**	−0.0659	−0.172	−0.164*
	(1.170)	(187.7)	(0.377)	(0.285)	(0.0856)	(0.109)	(0.0891)
Prolonged illness	1.666**	106.0	−0.152	−0.181	0.000700	0.0278	−0.0506
	(0.345)	(92.81)	(0.137)	(0.141)	(0.0463)	(0.0622)	(0.0351)
Illness	2.028***	277.1***	−0.0552	−0.0568	0.0203	−0.0139	−0.0314
	(0.295)	(86.29)	(0.0984)	(0.110)	(0.0468)	(0.0441)	(0.0289)
Poor/very poor SAH	1.820***	288.9**	−0.127	−0.364**	−0.0128	−0.0401	−0.0201
	(0.383)	(133.4)	(0.130)	(0.167)	(0.0492)	(0.0646)	(0.0394)

Each coefficient is from a separate regression of Equation (1). The column labeled, "Any loan", contains odds ratios from a logit fixed-effects model. Number of observations for this column ranges between [1892–1926]. The rest of the coefficients are from linear regression estimates of (1). Number of observations for these ranges between [3063–3110]. Not reported but included in the specification are village fixed effects and measures of economic status, human capital, social capital, demographics, religion, year and shock dummies. Clustered standard errors (at Kebele/village level) are reported in parentheses.
Statistical significance: * 10%, ** 5%, *** 1%.

In the case of the ADL index, for every 10 household heads who experience the average deterioration observed in the sample about 1 will sell livestock (sheep). There is no effect on household holdings of bulls and calves while a change in ADL has some negative effect on ox holdings. As discussed earlier, focusing only on the number of animals may not provide a complete picture as smaller and lower quality animals may have replaced household livestock holdings.

Effect on Income and Consumption

The analysis so far shows that the increase in health expenditure and the decline in the labor supply of the household head due to ill-health are compensated through borrowing and sales of small ruminants and intra-household labor substitution. Yilma et al.[20] show that financial support from family and friends is very limited and in addition to sales of assets and borrowing, households rely on savings to meet their health care needs. As long as this saving is earmarked for productive purposes, it might compromise productivity.

Estimates reported in Table 3, columns 5 and 6 display a clear negative association of ill-health with crop output and total income. The estimates for crop output are statistically significant and large while those for total income are also large but not precise. In terms of magnitude, the decline in annual household income due to a decline in self-reported health status amounts to about 10% of annual household income in 2012. For the two illness measures the effect lies between 10 and 19% of annual household income, but in contrast to the effects on crop output the estimates for total income are not statistically significant. However, these imprecise effects for total income do not provide evidence of households' ability to compensate for losses in crop output by resorting to off-farm income-generating activities, especially given the fact that the point estimates for two of the four ill-health measures suggest a larger decline in total income than crop output.[r]

The observed decline in crop output despite finding no evidence of reduced total household labor supply suggests that intra-household labor substitution involves a cost in terms of reduced labor productivity. Alternatively, crop output could be affected by the diversion of household savings to finance health care needs instead of being used to buy agricultural inputs.

Finally, we examine the effect of ill-health on consumption (Table 3). Regardless of the ill-health measure, there is no effect on total consumption. For the ADL index we see a positive coefficient but this is not statistically significant. For the other measures the coefficients are near zero and also not statistically significant.

Concluding Remarks

This paper used three waves of panel data from rural Ethiopia to examine: i) the channels of impoverishment due to ill-health, ii) the coping responses adopted by households, and iii) the effects on household income and consumption.

We find that there is substantial economic cost due to forgone crop output and increased health expenditure. Although the labor supply of the household head declines due to ill-health, intra-household labor substitution limits the overall reduction in household labor supply. However, possibly due to productivity differences between the head's labor and the substituted labor and diversion of productive resources for health care, there is a decline in household agricultural productivity. We also find that ill-health is associated with asset depletion, increases in the probability of indebtedness and increases in the amount of outstanding loans. We did not find evidence to reject the null hypothesis of food consumption insurance against ill-health.

The results presented in this paper show the value that social safety nets and health financing reforms that promote prepayment schemes may have on the economic welfare of households. In light of these results and findings of related studies[21,22] that show the effectiveness of a pilot community-based health insurance scheme in terms of reducing cost of care per visit and indebtedness in the districts covered in this study, the move of the Government of Ethiopia to expand and scale-up the scheme is commendable. Given the effects of ill-health on asset depletion and household indebtedness, both of which are likely to exert negative effects on consumption in the long-run, such a scheme may provide protection against future vulnerability. Notwithstanding these remarks, there is no doubt that such demand side health financing reforms need to be sensitive to variations in the ability of rural households to pay for insurance. Subsidies for certain target groups may well be needed to enhance insurance uptake. At the same time, to prevent drop-outs and encourage new enrollment supply side issues such as drug shortages and limited diagnostic capacity, among others, need to be dealt with in order to enhance quality of care and have a more substantial impact.

Notes

a. In his work on Ethiopia, Dercon[23] notes that livestock is the most important marketable asset and accounts for more than 90% of the value of assets.
b. While relying on family and friends for support is a potential coping strategy, in a related paper. Yilma

et al.[20] find that only 5% of households who have experienced a health shock in the year preceding the survey relied on such support.

c. While it is a limitation of the paper, we focus on the health status of the household head for two reasons. First, in the Ethiopian context, it is likely that the household head is the main bread winner. Second, we focus on the health status of the household head to enhance comparability with the literature. For instance, Asfaw and von Braun's[4] paper on Ethiopia also focuses on the health status of the household head. Other papers such as Gertler and Gruber,[15] Lindelow and Wagstaff[14] and Nguyet and Mangyo[24] also focus on the health status of the household head. While they don't focus explicitly on the household head, Islam and Maitra's[11] work on Bangladesh focuses on the health status of the main bread winner and Townsend[3] focuses on adult males.

d. In principle we should also examine the effect of ill-health on household savings and gifts from family and friends. Unfortunately, we do not have data on these measures.

e. The study is part of a larger project designed to investigate the effects of pilot community based health insurance (CBHI) scheme which was launched in mid-2011. Twelve of the districts included in the survey host the CBHI scheme while one district in each region serves as a control.

f. For formal sector employees there are concerns that individuals may report that they are ill in order to justify reduced labor supply (reporting bias for the sake of sick leave). This is unlikely in the current case of, mainly, a sample of self-employed workers.

g. About 75% of households work exclusively on-farm.

h. If information on sales price was not available for particular crop in a particular *woreda* we worked with the median sales price for that crop in the zone.

i. Information on off-farm income is restricted to those who work as employees and excludes income from off-farm self-employment. Income earned from such activities was not gathered. This is likely to lead to an underestimate of total income for 93 households who (at baseline) reported that a household member was engaged in off-farm self-employment activities.

j. We use the adult equivalent measures suggested by Dercon and Krishnan.[25] The average family size is about 4.8 adults.

k. The asset index is constructed on the basis of a principal components analysis of 68 items including housing conditions, land size, consumer durables, farm equipment and livestock. For specifications where livestock is a dependent variable we exclude the asset index. The productive safety net program is a social protection program intended for food insecure households.

l. Specifically in the case of consumption, theory predicts that either through self-insurance mechanisms (such as savings) or inter-household risk sharing arrangements (support from friends and relatives) or borrowing and selling assets, households will aim to insulate consumption from transitory shocks to household income. That is, the coefficient on the measure of ill-health should not be statistically different from zero. Although households may adopt various coping measures, each of which

might be difficult to observe, the test of full insurance measures the overall contribution of all coping responses.

m. Typically, for almost all the outcome variable, first differences are evenly distributed over negative and positive values around a zero mean.

n. In 2012, on average, annual household consumption was Birr 21,139.

o. The mean change in the ADL index among those whose physical functioning declines is 0.22.

p. These percentages are based on estimates reported in Tables 3 and 4. In the case of SAH status, ill-health increases borrowing by 289 Birr and health expenditure by 793 Birr. For illness the corresponding figures are 277 and 874 and in the case of ADL they are 93 and 367 (at the average change in ADL).

q. We also estimated this effect using 'Tropical Livestock Unit' as a dependent variable. Results are statistically significantly negative only for ADL (results are not reported but could be available upon request).

r. One of the relative innovations of the paper is that we rely on four different measures of ill-health (ADL-physical impairments, prolonged illness, short-term illness, self-reported health status). These different measures are related to the duration of sickness/severity of changes in health status. However, their link to health expenditures is an empirical question and it may well be that taking into account coping strategies, short term illnesses, which may require a quick response, may have more harmful consequences than prolonged illnesses or physical impairments. Our estimates show that annual health care expenditures are higher in the case of changes in the ADL index and prolonged illnesses as compared to short term illnesses and changes in self-reported health status (see Tables 3). However, with regard to coping, short term illnesses generate much greater labor supply from within the household, are associated with a larger loan burden and larger losses in crop output as compared to prolonged illnesses (see Table 4).

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Disclosure of Potential Conflicts of Interest

No potential conflict of interest.

Ethics Approval

Ethics approval for the study was obtained from the Ethics Committee at the International Institute of Social Studies, Erasmus University Rotterdam (reference: iss0001946). The

Committee is chaired by the Deputy Rector for Research Affairs (then, Professor Mohamed Salih).

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