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Essays on Health-Related Problems and Consequences on Household Economic Outcomes in Ethiopia

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by

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Contents

List of Tables

List of Figures

Acronyms

AgSS: Agricultural Sample Survey

BMI: Body Mass Index

CBHI: Community-Based Health Insurance

CSAE: Central Statistical Agency of Ethiopia

EHI: Employer Health Insurance

EHIA: Ethiopian Health Insurance Agency

EMoH: Ethiopian Ministry of Health

ESS: Ethiopian Socioeconomic Survey

ESS1: The first wave of the Ethiopian Socioeconomic Survey

ESS2: The second wave of the Ethiopian Socioeconomic Survey

ESS3: Third Wave of Ethiopian Socioeconomic Survey

ESS4: The fourth wave of the Ethiopian Socioeconomic Survey

FAO: Food and Agriculture Organization

HIV/AIDS: Human Immunodeficiency Virus /Acquired Immune Deficiency Syndrome

ICF: International Classification of Functioning, Disability, and Health

IFAD: International Fund for Agricultural Development

LSMS: ISA: Living Standards Measurement Study-Integrated Surveys on Agriculture

MHOs: Mutual Health Organizations

NGOs: Non-governmental Organizations

PHI: Private Health Insurance

RuLIS: Rural Livelihoods Information System

SDGs: Sustainable Development Goals

SHI: Social Health Insurance

UHC: Universal Health Coverage

USD: United States Dollar

WB: World Bank

WHO: World Health Organization

Introduction

This thesis contains four chapters on health problems and their impact on household economic outcomes. The first three chapters are interrelated and all conduct empirical investigations using data from the Ethiopian Socio-Economic Survey. The first chapter focuses on the impact of deaths and illness on current household income and non-health consumption, while the second chapter discusses coping strategies for deaths and illness that may have long-term effects on income opportunities and consumption. Unlike the first chapter which traces the consequences of actual death and illness whose onset is known, the third chapter discusses the consequences of disability whose onset is unknown in the survey. The fourth chapter highlights the main findings of the first three chapters and policy implications.

In the first chapter, we discuss the impact of death and illness on household income (earned and unearned) and non-health consumption (food, non-food, and education) for the overall sample and subsamples. Our contribution to the literature on Ethiopia includes the use of nationally representative data, identifying the effects for different subsamples, the inclusion of household income as one of the outcome variables of interest, two measures of income and consumption (per capita and adult equivalent measures), and the use of two measures of death (an aggregate measure of death and death disaggregated by the death of the head and non-head members).

With a few exceptions, the results suggest that the insurance mechanism in the country does not fully insure household income and consumption against death and illness. In general, while there is evidence of risk-sharing (due to increases in unearned income in some cases), this is not sufficient to confirm the hypothesis of full insurance against death and illness in our data. The results show that, after a death or illness, almost all household groups suffer from a decrease in consumption of one or more items and/or earned income.

The second chapter examines households' choice of coping strategies after deaths and illness in the overall sample and different subsamples. We contribute to the literature by examining coping strategies separately for death and illness using nationally representative data, and by considering a more comprehensive list of coping strategies. An appropriate empirical strategy (multivariate probit modeling) is used to address the interdependence between alternative coping strategies.

The results show that Ethiopian households as a whole, urban, female-headed, and non-poor households experiencing death resort to the sale of assets, supplemented by the use of additional work, and other aggregate coping strategies. Similarly, rural, male-headed and poor households tend to jointly use additional work and other aggregate coping strategies following death. Households as a whole, and in subsamples, tend to jointly use the sale of productive assets, help particularly from individuals, and credit to cope with illness experiences. All households use costly coping strategies (sale of productive assets or expensive credit from informal sources) to cope with death and/or illness. The use of costly coping strategies in the face of death and/or illness may affect long-term welfare.

The third chapter focuses on the prevalence of disability and its effects on household consumption and the decision to enroll in the community-based health insurance scheme. We estimate fixed effects and multivariate probit models to analyze the impact of disability on consumption and enrollment in community-based health insurance. We contribute to the literature as this study is the first to provide a comprehensive and country-specific assessment of the prevalence rate of disability within households as well as its impact on household consumption and enrollment in community-based health insurance.

The prevalence rate for disability is as large as 30% of surveyed households. The results of the fixed effects model show that disability of a severe degree of difficulty affects household consumption of all items, implying both short-run and long-run effects. The result also shows the presence of adverse selection in community-based health insurance.

Overall, our results suggest that neither current nor long-term household welfare is insured in the face of health problems because of the absence or inadequacy of formal insurance institutions, which, in turn, leads to the use of costly coping strategies. And yet, the financial sustainability of the existing community-based health insurance is characterized by the existence of disability-induced adverse selection. We suggest the full-scale operation of the community-based health insurance mandatory for all target households in the informal sector and an immediate roll-out of the legislated social health insurance for individuals in the formal sector. The provision of public health services in the promotion and prevention of public health could prevent the occurrence of health problems and their adverse consequences ex-ante. In addition, well-targeted government social protection programs would protect against household impoverishment following short-term and long-term health problems.

Chapter 1

Household income and consumption consequences of death and illness: Evidence from Ethiopia

1.1. Introduction

Households in developing countries like Ethiopia face many shocks that cause significant economic disruption (Dercon & Krishnan, 2000; Heltberg & Lund, 2009). One of these shocks commonly reported by Ethiopian households is the health shock. A health shock can be a death or illness of a household member. According to the report of the second wave of the Ethiopian Socioeconomic Survey (ESS), an illness shock of a household member is the second most reported shock after the shock due to an increase in food prices and is reported by 10% of the surveyed households (CSAE & WB, 2015). In the recent survey, exposure to illness increased and took first place with about 23% of households exposed to this shock in the previous year of the third wave 2015/2016 ESS (CSAE & WB, 2017).

Households with health shocks face two important economic costs that eventually cause a fall in consumption: direct costs of health expenditure; and indirect cost of income loss due to the fall in labor supply and/or productivity (Alam & Mahal, 2014; Genoni, 2012; Gertler & Gruber, 2002; Grimm, 2010; Wagstaff & Lindelow, 2014). In Ethiopia, where there are no well-developed formal health risk-sharing institutions, households with sick members spend a larger proportion of their total expenditure as out-of-pocket expenditure on seeking health services (EMoH, 2019). Impoverishment occurs when health expenditures are catastrophic, that is, in a situation where the household's expenditures are so high relative to its available resources that the household must forego the consumption of other non-health necessary goods and services (Alam & Mahal, 2014; Xu et al., 2003; Van Doorslaer et al., 2006). Aside from direct health expenditure costs, household income may also decline if the labor supply and/or productivity of the sick member and caregivers are reduced.

In Ethiopia, the resources allocated to the health sector are far below what is estimated in low-income countries for the use of basic health services. While the estimated per capita health expenditure required for essential services in low-income countries is the US $86, it is the US $33.2 in Ethiopia in 2016/2017 (EMoH, 2019). Health expenditure in Ethiopia is financed from four sources: government health expenditure; household out-of-pocket expenditure; donors and private employers; NGOs, and others. These sources respectively finance 32%, 31%, 35%, and

2% of total health expenditure in 2016/2017 (EMoH, 2019). These figures show that the health financing system in Ethiopia is characterized by high dependence on external assistance and high out-of-pocket payments. Dependence on out-of-pocket expenditure can expose households to financial risks and eventually to impoverishment. The share of out-of-pocket expenditure in total health expenditure in Ethiopia is much higher than the globally recommended level.[1]

Poor households may forego health services that they would otherwise use if they were insured, and, hence, poverty or inability to pay for health services may determine the forgone medical care (Abiola et al., 2011). The household's welfare loss from the health shock is large if the household foregoes health services when it needs them and/or if it spends a lot of money to obtain health services. Both possibilities are likely if households are not (fully) insured. Formal health insurance coverage in Ethiopia is quite low. According to the Ethiopian Health Accounts Survey of 2014 on health service utilization and household expenditure, national health insurance coverage was only 1.25% in 2010/2011 (EMoH, 2014). Before 2011, health insurance in Ethiopia was provided by some employers (a few private organizations and public companies) for their employees. More recently, coverage has improved somewhat as a pilot Community-Based Health Insurance (CBHI) program was introduced in 13 districts of the four main regions (Tigray, Amhara, Oromiya, and Southern Nations, Nationalities, and People's Region) of Ethiopia in 2011 to reduce financial barriers to health care for rural and urban residents in the informal sector. In 2014, CBHI was expanded to other woredas[2] in the four pilot regions and other regions that were not part of the pilot.

Despite some progress, achieving universal health coverage (UHC) is a challenge for Ethiopia's health system. Achieving UHC is one of the goals set by nations, including Ethiopia, with the adoption of the Sustainable Development Goals (SDGs). The two interlinked components of UHC, namely providing the full range of quality essential health services (promotion, prevention, treatment, rehabilitation, and palliation) to all people when they need them, and protecting them from financial hardship, are barely achieved in Ethiopia. The low progress towards UHC is due to the low utilization of health services and the high burden of out-of-pocket health financing which is the most regressive form of health financing.

[1] To prevent financial catastrophe and impoverishment as a result of health care utilization, WHO has proposed a threshold for out-of-pocket spending of 20% (WHO, 2010).
[2] Woreda refers to the fourth lower level of government administrative division in Ethiopia.

This financial hardship associated with out-of-pocket payments for health care, combined with the negative impact on the labor supply and/or productivity of sick individuals and their caregivers, has implications for household income and consumption. As Asfaw and Braun (2004) correctly noted, the absence of formal risk-sharing institutions has led Ethiopian households to develop their own community informal risk-sharing arrangements such as extended family network, iddir, equib, senbete, debo and mahiber[3] to share and avoid risks. Although the existence of these informal community risk-sharing systems cannot guarantee complete protection against health risks to income and consumption, they can perform some of the tasks that formal risk-sharing institutions can do. Thus, it is not clear a priori whether Ethiopian households' income and consumption are fully protected against unexpected risks of death and illness shocks. This is precisely the objective of this chapter.

This chapter is divided into seven sections. An introduction is provided in Section 1.1. The health system in Ethiopia is briefly described in Section 1.2. Section 1.3 presents the theoretical and empirical literature on the subject. A brief explanation of the data and the methodology used is given in Section 1.4, while Section 1.5 is devoted to the discussion and presentation of results. Section 1.6 discusses some robustness checks. The conclusions are drawn in Section 1.7.

1.2. Health system in Ethiopia

Health financing has been a major challenge for Ethiopia as is the case for any developing country. Many Ethiopians cannot afford to get access to health care services due to financial shortages. This made achieving UHC difficult for Ethiopia. An under-financed health sector, inefficient and inequitable use of resources, overreliance on direct payments at the time people need care, and high out-of-pocket spending burden on households are identified as critical challenges for the health system in Ethiopia (WHO, 2010).

The Ethiopian government recognized that health cannot be financed only by the government and underlined the importance of promoting cost-sharing of health service provision. To this end, in 1998, the Ministry of Health of Ethiopia developed and endorsed a health financing strategy identifying resources for the health sector to be mobilized from different sources and permitting the government to provide health services through its health facilities through a cost-sharing

[3] The communal informal institutions of Iddir, Equib, Senbete, Debo, and Mahiber are defined respectively as burial societies, credit associations, some social gatherings, labor-sharing arrangements, and religious gatherings.

arrangement with users. This health care financing document has become a very important policy document for introducing health financing reforms. One component of the health financing reforms is the initiation and enforcement of health insurance.

As part of the 1998 health financing reform and as a response to this lack of financial means for health care provision, the Ethiopian government established two formal health insurance schemes, respectively the CBHI for citizens in the informal and agriculture sectors, and the Social Health Insurance (SHI) for the formal sector. The CBHI and SHI schemes are aimed at raising the very low national health coverage of private health insurance in the country. The Ethiopian Health Insurance Agency (EHIA) is responsible to run the programs and different branches are expected to be introduced in major cities all over the country whenever required to efficiently manage the program. The EHIA's CBHI National Coordination Unit is responsible to manage CBHI. Any beneficiary of the insurance package is expected to follow the referral system except in emergency cases to get the services provided by the insurance contract. Ethiopia has a decentralized three-tier system of primary, secondary, and tertiary government health care providers. From the lowest to the highest level of the referral system, the three tiers are the primary health care unit, (which comprises five satellite health posts, one health center, and one primary hospital), general hospitals (second tier), and specialized hospitals (tertiary tier). Specialized hospitals serve as the referral center for the secondary providers (general hospitals), which in turn is the center for the primary providers (primary hospitals). Primary hospitals serve as referral centers for health centers and practical training centers for nurses and paramedical health professionals.

The SHI includes all formal employees and pensioners of the government and private institutions (including employees of the non-profit organizations) except defense workers of the country. The beneficiary of the SHI Scheme has the right to receive specified health care services from those health facilities which have signed a contract with the EHIA. The benefits of the package are outpatient care, inpatient care, delivery services, surgical services, diagnostic tests, generic drugs included in the drug list of the agency, and prescribed medical practitioners. The insurance premium for formal workers is 6% of their salary while it is 2% for pensioners and this premium is paid by both the workers themselves and their employers. Both government and private-sector workers contribute 3% of their monthly salary while pensioners contribute 1% of their pension payment. The government contributes the remaining 3% of the salary for its

employees and 1% of the pension for pensioners. Private employers contribute 3% to their employees. SHI members are eligible to enroll their spouses and children under the age of 18 years. However, members having more than four children and more than one spouse can register their spouse or children as beneficiaries with additional monthly premium contributions per extra spouse and children. To address the problem of adverse selection, membership in SHI is mandatory for all formal workers and pensioners. A 5% co-payment for outpatients at the point of getting the service, reinsurance to guarantee the sustainability of the insurance institution, and a 50% bypass fee[4] if the beneficiary bypasses the referral system are the techniques to be implemented to solve potential problems associated with moral hazard. The SHI program is yet to start.

CBHI is a publicly subsidized scheme in which households pay into community funds. CBHI covers general inpatient and outpatient health care service costs at local health centers. It also covers costs at hospitals when a sick member is referred by lower-level health facilities. At the woreda level, three officers administer the fund, manage user databases, and reimburse health care providers. At the kebele level,[5] the executive body registers members and collects insurance premiums. Participation in the CBHI program is voluntary and the CBHI is financed by premiums paid by community members, and subsidies from the government. First, the villages in the kebele decide whether to join the program with a simple majority and it is up to each household to decide whether to join the scheme or not. Payment for providers of the health care service is made based on fee for service basis. Members pay a premium of Birr 10.5 to Birr 15 per month per household (the premium varies from region to region).[6]

To boost affordability, the federal government provides a total premium subsidy of 25% for all CBHI members. In addition, woreda and regional governments finance a full premium subsidy to the poorest 10% of the population. In each CBHI woreda, poor (indigent) households are identified, and 30% of their insurance premiums are covered through the woreda budget and the rest 70% through the regional budget. Currently, there is no co-payment under the CBHI scheme. The scheme is designed by making the household a unit of membership and a waiting period of

[4] Bypassing occurs when a patient member chooses the next-level health facility with no referral. Members who bypass are required to pay 50% of the total medical expense or they are liable to a 50% bypass fee.
[5] Kebele refers to the lowest government administration level next to woreda.
[6] Based on the third wave Ethiopian Socioeconomic Survey, average household monthly income is Birr 825.25. Household monthly contribution for CBHI ranges from 1.27% to 1.82% of average monthly income of households.

one month to reduce adverse selection. In addition, the moral hazard from bypassing the referral system is addressed by making members liable for 50% of the total health expense.

1.3. Review of related literature

1.3.1. Measurement of health problems

There is no single definition of health shock. Health shock is a multi-dimensional concept. Measuring health changes is made difficult by the fact that it takes many forms and different levels of intensity (Mitra et al., 2016). Broadly speaking, a household would face two types of health shocks. These are death and illness shocks. There is no difference in the literature on how to measure death though its effect on the household depends on which member in the household experiences death. However, differences exist in the literature on how illness shock is measured at the household level. Indeed, the effect of illness shock depends on which member of the household is the victim of the illness. Currie and Madrian (1999) categorize eight common measures of health in economics: 1) self-reported health status (whether someone is in excellent, good, fair, or poor health); 2) whether there are health limitations on the ability to work; 3) whether there are other functional limitations such as problems with activities of daily living (ADL); 4) the presence of chronic and acute conditions; 5) the utilization of medical care; 6) nutritional status (e.g., height, weight, or body mass index); 7) clinical assessments of such things as mental health or alcoholism; and 8) expected or future mortality. The first measure is subjective, and it is reported by individuals themselves usually out of a five-point scale (poor, fair, good, very good and excellent) about their general health status or a binary response (yes/no) to the question of whether they are generally ill or not. Some authors (such as Heiss, 2011; Ware et al., 1987) argue that self-stated health status is the best measure of general health as it is correlated with subsequent morbidity and mortality, and measures health in a more comprehensive way than measures of specific and objective health components. Not only subjective health measures, but self-reported health measures have also objective content for their predictive power of mortality (Heiss, 2011). However, there is also a concern that self-stated health measure is prone to measurement errors as good or bad health may not be the same for all people, and the measure depends on the respondents' behavior and their understanding of their health (Genoni, 2012; Strauss & Thomas, 1998).

The measures under (2-6) can be self-stated or objectively measured. Clinical assessment is an objective diagnosis-based measure while expected or future mortality is a model-based mostly

aggregate measure of health. Objective measures give a better measure of health. Self-reported specific health conditions such as the presence of chronic and acute conditions and functional limitations on the activities of daily living give a more reliable measure of health compared to self-reported general health (Genoni, 2012; Gertler & Gruber, 2002; Strauss & Thomas, 1998).

Due to limited information on other measures of ill-health status, previous studies in Ethiopia used only the first three measures of illness. In this study, we are restricted to using self-reported illness and death to capture health shocks.[7] We use the terminology death and illness shocks because the surveys we use collect these health measures under the shocks section. However, it should be noted that death and illness may not be pure shocks. Measurement errors (which may be random or systemic) associated with the self-reported health shocks and the subsequent endogeneity may bias the estimates (Mitra et al., 2016). Even if death is reported by a household respondent, it is more objectively measured compared to self-reported illness measures. The state of death is clear to all people to understand and households report the death of any member correctly unless they have a reason to deliberately understate or overstate it. In the surveys we use, there is no incentive for households to wrongly report death experiences. The systematic component of the measurement error is taken care of by our fixed effect estimation technique. However, random measurement error remains to be an issue in surveys that collect self-reported health measures.

At the household level, microeconomic analysis of illness starts from the utility function. According to the WHO guideline (WHO, 2009), the key arguments of the utility function or economic welfare can be summarized as the consumption of non-health goods and services, leisure, and health itself. Ill health adversely affects utility or welfare directly or indirectly. It has a direct negative effect as the individuals or the society, in general, prefers to be healthier. Household expenditures on health services and goods increase due to illness events. Indirectly, utility is also negatively affected by the fall in consumption of non-health goods and services or loss of earned income that allows people to consume market goods. Not only current consumption but households' future consumption possibilities may worsen due to the possible liquidation of savings or assets. Furthermore, illness shock may also impede the consumption of non-market activities like housework or leisure time.

[7] We consider the other measure of health, the problems of functional limitations on the activities of daily living in the third chapter. This measure does not appear on the shocks section of the survey and the onset of this measure is not known. We call this measure of health problem as disability not disability shock.

Death shocks are different from illness shocks in terms of household consumption requirements after the shock. Apart from the direct costs of funeral and medical expenses and the possible income loss, the death shock reduces the number of consumption units as the available income has to be shared among fewer surviving members (Grimm, 2010; Kadiyala et al., 2011). The net effect on the surviving members of the household depends on how large the consumption and income contribution of the dead member in the household was. The total economic cost of death shock depends on the relative magnitude of the two values. The first is the funeral and medical costs after the death of the member, and the loss in income which was earned before the death of the member. The second value is the value of the basket of goods formerly consumed by the deceased household member. It is not possible to tell a priori which value dominates and whether the economic costs of the household death shock are positive or negative. The existing empirical literature on this issue is mixed.

1.3.2. Health shocks and household economic outcomes

Health shocks in the form of illness and/or mortality are commonly faced by households in both developed and developing countries. However, households in developing countries face the biggest hardship compared to developed counterparts as their income is low and more volatile and access to formal insurance is limited (Asfaw & Braun, 2004; Dercon & Krishnan, 2000; Heltberg & Lund, 2009; Islam & Maitra, 2012; Porter, 2012). Only a small percentage of the population is formally insured against such shocks in most low and middle-income countries, and the entire risk may not be covered even if there is formal insurance (Grimm, 2010). First, the household may need to spend money to buy diagnostic or treatment services in case the health insurance is partial. This is the case when the health insurance is contracted to cover only some specified health care services or health care financing is shared between the patient and the insurer. Second, even if the formal health insurance covers the medical expenditure, the household may still be impacted via the labor supply and/or productivity effect as the affected household needs time to recover before starting the normal activity.

There are two channels through which health shocks may have an immediate impact on household non-health consumption (Genoni, 2012; Gertler & Gruber, 2002; Grimm, 2010; Wagstaff & Lindelow, 2014; Yilma et al., 2021). These channels are expenditure on health care services and a fall in labor supply and/or productivity and the associated fall in earned income following health shocks. Figure 1 illustrates these two channels. To get health care services

following a health shock, the household is required to pay money unless fully covered with health insurance. How big the spending is, depends on whether the household is covered with insurance partially or fully and the level and the cost of treatment or medication required. In this regard, Alam and Mahal (2014) argue that depending mainly on whether social protection mechanism exists, out-of-pocket payments can vary. They went on to say that the medical out-of-pocket expenditure would be low if good-quality subsidized public facilities are accessible to households, or if there is health insurance coverage that pays for the use of health services. The larger the payment for health expenditure is, the larger the impact on consumption of non-health goods, given the budget constraint.

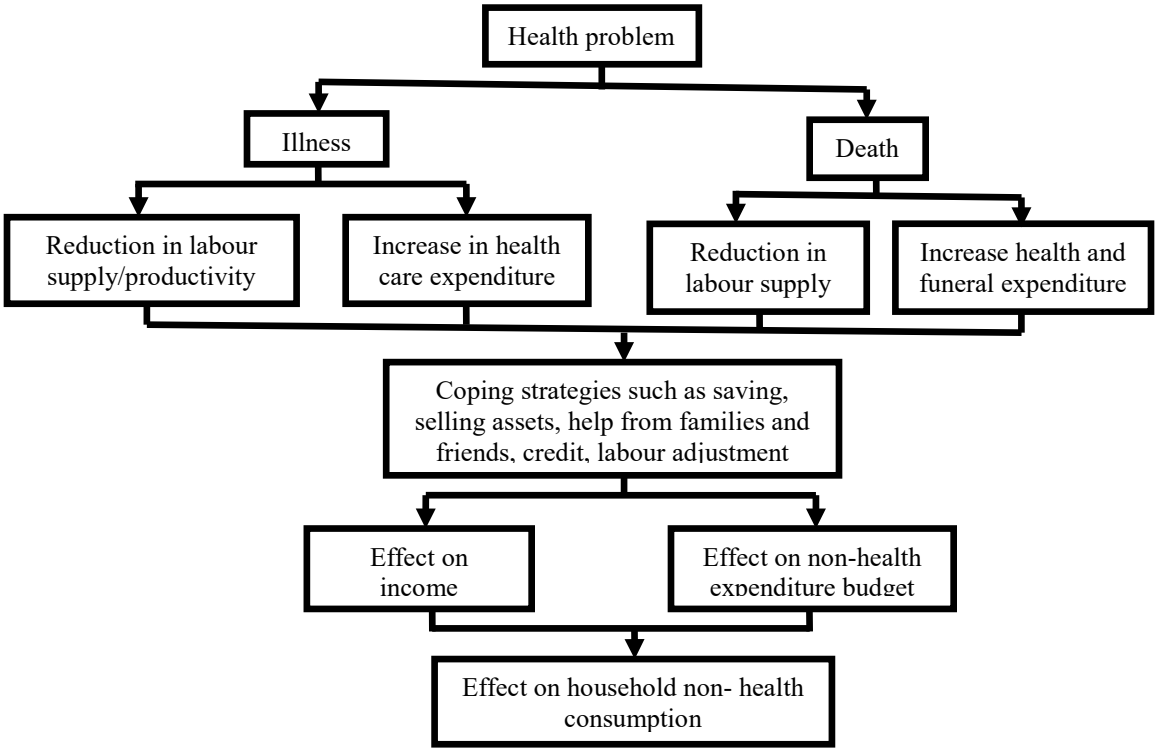

Figure 1. Channels death and illness affect consumption

The other channel is through the labor market. The number of hours worked (labor supply) and/or productivity of the affected members of the households or their caregivers would fall following health shocks especially when the affected members and caregivers are of working age (Alm & Mahal, 2014; Genoni, 2012; Gertler & Gruber, 2002; Kadiyala et al., 2011; Wagstaff, 2007; Wagstaff & Lindelow, 2014; Yilma et al., 2021). This could affect the amount of income the affected member of the household or the caregiver would earn in the labor market. The effect of health shocks on households' total (earned and unearned) income depends on the type of work

the affected household member is engaged in, the existence of social protection schemes, as well as the possibility of inter-or intra-household labor substitutions or labor supply adjustments by non-affected members of the household (Alam & Mahal, 2014; Wagstaff, 2007). Unearned income may increase if social protection schemes or informal solidarity arrangements protect against income losses in the event of health shocks. Social protection schemes tend to be more widespread in urban areas especially in developed countries while informal solidarity arrangements tend to be strong in rural areas of developing countries (Wagstaff, 2007).

Health care expenditure and income consequences of health shocks put pressure on the resources households would spend on non-health consumption and the welfare of the household could be deteriorated. This implies that the household should move resources from non-health consumption to health consumption expenditure or use other coping mechanisms so that the previous level of the current welfare could be maintained. However, coping with the health shocks by divesting productive assets or borrowing (especially with high interest from informal sources) would negatively affect long-term income and consumption, although it would smooth out short-term consumption (Alam & Mahal, 2014; Carter et al., 2007; Dabla-Norris & Gündüz, 2014; Flores et al., 2008; Sparrow et al., 2014). Reduction in household income and the use of coping strategies such as savings, loans and assets following health shocks may adversely affect investment in physical, financial, and human capital, which in turn affect future consumption possibilities (WHO, 2009). Coping strategies for health shocks are analyzed in chapter 2. Alternatively, households affected by health shocks may forego health care services due to the inability to pay for health expenditures. Foregoing health care services could lower out-of-pocket health expenditure at the expense of deteriorated health status and human capital, which directly affects the utility of the household (Abiola et al., 2011; Sparrow et al., 2014; WHO, 2009).

Empirical evidence on the effect of illness and mortality shocks on household economic outcomes in developing countries is mixed. For three villages in Southern India, Townsend (1994) shows that household consumption was not found to be much influenced by idiosyncratic shocks like illness, income, and unemployment. In one of the three villages, however, Townsend finds evidence of less well-insured landless households compared to their neighbors. By studying the intensity of illness in Indonesia, Gertler and Gruber (2002) conclude that severe illness shocks limit households' ability to physically perform everyday activities that households could not be able to adequately insure against severe illness while they could fully insure themselves

for minor illnesses. Kochar (1995) finds mixed results for illness in South India depending on whether the ill household members are men or women, and whether work is seasonal or not. According to her, illnesses among women had no effect at all while illnesses among men decreased wage income and increased informal borrowing during peak periods of the agricultural cycle, but had no effect during slack periods. Wagstaff (2007) using Vietnam evidence finds that an increase in unearned income[8]after health shocks partially offsets reductions in earned income and large increases in medical spending even among insured households. Beegle (2005) finds no impact on the labor supply of individuals in households that faced a prime-age adult death in northwest Tanzania. Yamauchi et al. (2008) analyze the impact of prime-age adult mortality on the transition made by adolescents from school to the labor market in South Africa and conclude that prime-age adult mortality schooling and widens intergenerational inequality while it increases labor supply. Similarly, Gertler et al. (2004) find evidence of a negative child education enrollment effect of parents' death in Indonesian households.

There is also some evidence on the effect of mortality and illness on consumption in rural Ethiopia. Asfaw and Braun (2004) use a two years panel from the Ethiopian rural household surveys covering 15 peasant associations in the four biggest regions of the country and examined the hypothesis of full consumption insurance against illness. They estimate the impact of illness of the household head on the change in consumption distinguishing the consumption items into purchased food items, total food items (composed of food from own stock, purchased food and gift), and non-food items net of health expenditure. Asfaw and Braun (2004) find that the growth rate of purchased food and non-food items (excluding health consumption) are significantly and negatively affected by the illness of the household head. On own produced food and gift consumption items, they fail to reject the hypothesis of full consumption insurance against illness. This differential impact of illness indicates that consumption smoothing by households or other risk-sharing institutions can vary depending on the consumption item considered.

[8] Wagstaff (2007) define earned income as income that comes from work in the labor market by any household member where as unearned income is any earning the household gets without working by any member of the household. Earned income includes wage income as well as income from agriculture and any family business. Unearned income can be incomes from asset sales, borrowings, and savings withdraw, private transfers (comprised of domestic and international remittances and donations from charities), and public transfers (including pensions, social welfare, and retirement allowances).

Dercon (2004) analyzes the persistent impact of shocks and the famine of the 1980s on growth rates (measured by changes in real per adult equivalent consumption) in the 1990s in six villages of rural Ethiopia using a household panel data set covering 1989 to 1997. In this study, only a serious illness of adults, which affects the ability to work, is considered a health shock. Using different estimation techniques, Dercon (2004) finds that serious illness in adults significantly reduces the growth rate in consumption. However, this study as the author admitted, is based on so small a sample (only six villages and about 342 households) that the results cannot be generalized even to rural Ethiopia.

Similarly, using a rural household survey, Dercon et al. (2005) study the impact of health and non-health shocks[9] on household well-being (the log per capita consumption) for 15 Ethiopian rural villages. The authors assess the impact of shocks that occurred five years before (between 1999 and 2004) on per capita consumption in 2004. In addition, they also examine the extent to which the impact of shocks differs across different household types disaggregated by sex of the head, schooling of the head, and landholdings. They provide evidence of a negative impact of illness on consumption for households of rural Ethiopia while they find no effect of mortality. Their results also show significant negative effects of illness for richer households (households in the top two land quintiles) and households headed by uneducated heads. Dercon et al. (2005) also classify shocks five years before the 2004 survey (from 1999 to 2004) into those that occurred in the previous two years and those that occurred between two and five years before the 2004 survey to explore whether shocks have long-lasting effects. They find that the negative relationship between shocks and consumption also holds in the long run as an illness reported between 1999 and 2001 (two and five years before the 2004 survey) appear to have significantly affected consumption over years later in 2004. This result indicates that uninsured illness has a persistent effect on reducing consumption.

Based on panel data from rural Ethiopia on individual nutritional status, Dercon and Krishnan (2000) study whether individual adults in the household can smooth out nutritional levels over time and whether households can share risks so that nutritional levels are smoothed across

[9] They include death and illness as health shocks. The death and illness shocks are dummies of whether the household had experienced, between 1999 and 2004, death of head, spouse or another person; and illness of head, spouse or another person.

members of households. They measure the nutritional status of adults by an index called body mass index or Quetelet index[10]. The illness shock is defined as the number of ill days in a month. They estimate the effect of these shocks on the change in the logarithm of Quetelet on both the whole sample of adults and only on couples. They find that the death and illness of male adults have a negative but insignificant effect on household-level nutritional status. In testing full risk-sharing within the household, Dercon and Krishnan (2000) show that illness of female adults significantly affects nutritional status in the poor Southern (Lowland southern region) households with this result holding both for the full sample of adults and couples. However, in other areas (households in the Northern, Central, and rich Southern areas), the effect is insignificant and the risk is fully shared within the household. Their results imply that intra-household allocation is not efficient for the poor Southern households partial risk-sharing or constrained Pareto efficiency are more likely outcomes as men are found to be insured by women but not vice versa (Dercon & Krishnan, 2000).

Kadiyala et al. (2011) use three years of panel data from the Ethiopian Rural Household Survey from 15 villages and show that rural households with prime-age mortality experience do not replace the lost labor of the deceased though their total, food and non-food expenditures are not adversely changed regardless of the deceased's sex and position, and the economic status of households. However, the dietary diversity of food consumption declined following prime-age mortality, particularly for poor households (Kadiyala et al., 2011).

Using six-round panel data from 15 villages in rural Ethiopia, Porter (2012) examines the effect of illness (measured by the number of ill-household members), and other idiosyncratic and covariate shocks on household income and consumption. Unexpectedly, illness shock is found to positively affect real household consumption per adult equivalent in three out of four specifications (Porter, 2012). The author also reports a positive effect of illness on household non-crop and wage income in the fixed-effects specification, while the effect is not significant on crop and self-employment income. In addition, using fixed-effects estimation, Porter (2012) finds that the death of any member in the household between rounds has a negative effect on self-employment income, and a positive effect on wage income, while it is not significant on crop and non-crop income. Porter (2012) does not examine the effect of death on consumption.

[10] Body mass index or Quetelet index is measured as weight in kilograms divided by squared height in meters.

Using four-round panel data of the Ethiopian Rural Household Survey from 15 villages, Skoufias and Quisumbing (2005) find that days lost due to illness do not affect household per capita food and non-food consumption, while household per capita nonfood and total consumption responds to idiosyncratic per capita income changes as an aggregate measure of idiosyncratic shocks. The authors claim that the significant effect of idiosyncratic change in income on non-food and total consumption reflects that food consumption is better insured by informal insurance arrangements than non-food consumption. Yilma et al. (2021) use three years of panel data from rural Ethiopia to show that the different measures[11] of ill-health do not affect consumption despite positive and negative significant effects on health care expenditure and agricultural productivity respectively. The authors provide evidence of the use of intra-household labor substitution, borrowing and depleting of assets to smooth out current consumption.

1.3.3. Health shocks as idiosyncratic shocks

The success and efficiency of the coping strategy in protecting a given community-e.g. poor households- from a certain shock depend on how the shock spreads across households in that community or across communities. Shocks can be classified as a covariate or as idiosyncratic shocks depending on the coverage in place. The idiosyncratic shocks affect only an isolated number of households while covariate shocks hit the whole community at once. According to Weinberger and Jütting (2000), shocks like social unrest, policy, and institutional failures, uncertainties of nature, uncertainties of both input and output markets, and the like are covariate risks. The authors also include the income failure shocks, agricultural input shortages, illness, and the like among idiosyncratic shocks while they classify covariate shocks as regional, national and international covariates depending on their degree of correlation.

However, shock classifying exercise by the degree of correlation is not always simple. Identifying the underlying sources and impacts of the shock is important in this classification. In the study of Dercon et al. (2005), the degree of idiosyncrasy or covariance of commonly reported shocks was discussed. First, they define a shock as (i) idiosyncratic if the shock is felt by one or some households in a village and (ii) covariate if it affects all households in the village or possibly households in the nearby villages. Accordingly, drought, input, and output shocks were

[11] Yilma et al. (2021) use four measures of ill-health. These are short- term measures of health status (any illness experienced in the two months preceding the survey), longer spells of illness (illness with symptoms persisting 30 days or more), self-assessed health status measuring multiple dimensions of health, and activities of daily living index.

reported to be covariate respectively by 79%, 68%, and 83% of affected households. However, theft or other crimes, death, or illness were described in more than 90% of cases as idiosyncratic. Other shocks, like Pests and diseases affecting crops or livestock, were found to combine both idiosyncratic and covariate aspects.

Accounting for the degree of correlation as just defined is important because it helps identify who should be involved in shock management as an actor, as well as the shock coping capacity of potential actors, and the appropriateness of the copying strategy (Heitzmann et al., 2002). Heitzmann et al. (2002) take an example of a shock that affects an entire region and argue that this shock cannot be effectively managed through insurance only within the region; rather it calls for risk pooling with areas that are not exposed to the shock at the same time. Regarding the actors to be involved, Holzmann and Jorgensen (1999) suggest that private informal or formal risk management arrangements can manage idiosyncratic events, such as a broken leg while highly correlated shocks, such as malaria or HIV/AIDS, tend to require the involvement of governments or international organizations.

1.3.4. Health shocks as a cause of poverty and inequality

Both death and illness shocks have implications for policy as they may broaden the resource gap within the current generation and across generations especially when there is no formal health insurance in full or partial forms. Deaton (2003) claims inequality in the distribution of income can be narrowed if a measure is taken to reduce the spread of health conditions across the population. Acknowledging the reverse causality of Poverty and ill-health, Wagstaff (2002) posits that poor people have worse health outcomes than better-off people within a country and Poor countries tend to have worse health outcomes than better-off countries. The fact that health care in low and middle-income countries is mainly financed through out-of-pocket payments at the time of use means many households suffer financial catastrophe after seeking care; or they forego necessary health care altogether (Van Doorslaer et al., 2006; Xu et al., 2003). The poor economic condition can be exacerbated and generate a vicious downward spiral if households sell off assets or livestock necessary for their survival. Whitehead et al. (2001) call this vicious downward spiral of the economic condition the "medical poverty trap." Coping mechanisms may help households to ensure coverage of their basic needs in the short run, but this may lead to substantial long-term economic costs (Flores et al., 2008). In addition, borrowing from informal

sources (if there are any) can have severe effects as households often remain in debt for a considerable time after the health shock (Damme et al., 2004).

The different strategies households use to cope with the risk only succeed in partial insurance (Morduch, 1995; Townsend, 1995) and fluctuations in consumption and other welfare outcomes are inevitable due to uninsured risk. This constitutes welfare loss given that households are 'fluctuation averse' (Dercon, 2004). Dercon (2004) goes on to say that not only the transient impact on welfare but the ex-ante behavioral and ex-post impact of an uninsured risk may worsen the impact and the associated poverty. Households' ex-ante behavioral changes against the fear of these risks may bring a significant income reduction, and more so for poor households. This coupled with the ex-post impact will push the households to poverty and widen the inequality between the poor and the better-off households. Similarly, Dercon et al.(2005) emphasize that uninsured shocks are the cause of poverty as households face the risk of income loss, consumption reduction, or sale or destruction of assets during such adverse events.

The differing constraints and opportunities facing the poor and the better-off have consequences on the choice of coping strategy, and, in turn, this has short-run and long-run implications regarding the economic outcomes. Usually, the poor are forced to cut their access to health care services or they need to switch their consumption expenditure on other goods and services, or they might be forced to sell their productive assets even at less than their market value, or they might adjust the labor supply by placing children in the work position of the dead or ill member. So, the poor fall into chronic poverty because of uninsured shocks. Not only does the level of poverty get worse but also human development outcomes will be endangered (Jacoby & Skoufias, 1997; Jensen, 2000). Health shocks could affect household investments in children if child school enrolment is reduced because of work requirements or change of residence following the shock. Gertler et al. (2004) find that a recent death of parents reduces children's short-term enrollment. They further argue that long-term effects on child school enrollment depend on the length of time away from school and the probability of reenrolling.

1.3.5. Health shocks and human capital investment

Child education and hence human capital formation is affected by death and illness shocks of parents, siblings, or other members of the household. In a developing country like Ethiopia where the poor have almost no access to credit or insurance markets, there is a tendency for households to reduce education expenditure by withdrawing children from school or using child

labor in the informal sector to supplement income. Coping with death and illness shocks by adjusting the labor supply of school-age children and engaging them in income-earning activities to avoid any drop in income- is the highest cost strategy for future household welfare. Not only is income reduced, but it may impair children's education via food deficiency and inadequate physical development. In developing countries, undernourishment and stunting are common problems, and they even get worse for households affected by health shocks. A stunted or undernourished child is unlikely to succeed in school.

Apart from engaging in income-earning activities, children may drop out of school to take care of health shock-affected household members. Health shocks can also affect children's educational outcomes in other ways. Health shocks affect children's educations as children tend to become hopeless, stressed, or lose confidence whenever their family is affected. In this case, children lose focus on follow up and their educational performance will suffer. There are some studies on the effect of parental health shocks on the educational outcomes of both younger and older children. Using household data from Indonesia, Gertler et al. (2004) find that the recent death of a parent had a large negative effect on the child's school enrollment, irrespective of the gender of the child and of the parent who died. Using the Young Lives Study data in India, Dhanaraj (2016) finds that adverse parental health shocks led to a temporary delay in primary school enrolment for the younger cohort while schooling attainment was significantly reduced for the older cohort. In Taiwan, it was found that, on average, the death of a mother has a more negative effect on children's educational attainment than the death of a father (Gimenez et al., 2013). Evans and Miguel (2007), Case and Ardington (2006), and Chen et al. (2009) also find that maternal death has a much larger impact on child education than paternal death. Similarly, Woldehanna and Hagos (2015) find that children in Ethiopia are forced to drop out of school because they are required to work at home or outside. Using the Young Lives Study data for Ethiopia, Himaz (2013) finds differential effects of a mother's death on child enrollment based on the age of the children. Reportedly, the death of the mother reduces school enrolment during the child's middle childhood (8-12 years age) while it produces a less observable impact on education if it occurred during the child's adolescence. However, the death of a father causes reductions in enrolment, test scores, and sense of agency for his children (Himaz, 2013).

1.3.6. Contributions of this chapter

To the best of our knowledge, a comprehensive study of the effect of death and illness on household income and consumption in Ethiopia is not well explored. The objectives of this study are:

1. To examine the consequence of death and illness on earned and unearned income of Ethiopian households
2. To analyze food and non-food consumption responses of Ethiopian households to death and illness
3. To examine whether income and consumption responses to death and illness are different for urban and rural households
4. To explore the consequence of illness and death on poor versus non-poor households
5. To investigate whether income and consumption consequences of illness and death are different for female-headed and male head households

Country-level evidence is required for policy making especially for a developing country at an early stage of installing formal health insurance (CBHI and SHI). To introduce the SHI and expand the existing CBHI, evidence is required to what extent households are shielding their earnings and consumption in the face of idiosyncratic illness and death shocks. For a developing country like Ethiopia, evidence of the impact of death and illness on household income and consumption is important to prioritize limited resources for their best use. Vis a vis priority setting, analyzing separately the consequence of death and illness on different household samples is crucial. One of the channels through which health shocks impact consumption is income. Income is affected as households' labor supply and/or productivity may be reduced in the face of health shocks. So, examining the effect of death and illness on income is important for policy.

Our research differs in five ways from previous studies in rural Ethiopia discussed in Section 1.3.2 (Asfaw & Braun, 2004; Dercon, 2004; Dercon et al., 2005; Dercon & Krishnan, 2000; Kadiyala et al., 2011; Porter, 2012; Skoufias & Quisumbing, 2005; Yilma et al., 2021). First, our study uses the recent available country-level representative data, while previous studies are based on old data from some rural villages of the country. Second, our study examines the effect of death and illness on the income and consumption of different groups of households. Specifically, we examine the effect by splitting the sample into rural-urban households, poor-rich households, and female versus male-headed households. Third, the effect of death and illness on households'

unearned and earned income is not examined by previous studies in Ethiopia. The exception is Porter (2012) who studies the effect of death and illness on rural households' farm and non-farm income. Fourth, we use both aggregate and disaggregate measure of death at household level. We disaggregate death into death of the head and non-head members. Previous studies in Ethiopia defined death at aggregate level i.e., for death of any household member or for death of any adult household member. Dercon et al. (2005) and Porter (2012) define death as the death of any member of the household, while Kadiyala et al. (2011) and Dercon and Krishnan (2000) use the death of any adult member in the household in their measurement of death. Fifth, we use both per capita and adult equivalent measures of household income and consumption. Previous studies used a single measure of income or consumption. Dercon et al., (2005), and Skoufias and Quisumbing (2005) use per capita measures of consumption, while Dercon (2004), Porter (2012), and Yilma et al. (2021) measure consumption in terms of adult equivalent measure. Kadiyala et al.(2011) use mixed measures i.e., per capita measures of non-food and total expenditure, and adult equivalent measures of food expenditure, while Asfaw and Braun (2004) use unadjusted measures of household-level food and non-food consumption.

1.4. Data and methodology

1.4.1. Methodology

Identifying the consequences of health shocks on household income and consumption is not an easy task. The results of such estimation would tend to be biased unless an appropriate method is used to tackle the obvious problem of endogeneity. The risk of estimation bias is always there as correct identification could be plagued by various concerns: simultaneity between income/consumption and health shocks; time-invariant and time-varying unobserved heterogeneity among households (self-selection into specific behavior); omitted variables correlated with income and/or consumption and health shocks; and measurement errors (systemic or random) particularly with self-reported health shocks (Genoni, 2012; Gertler & Gruber, 2002; Mitra & Jones, 2017; Mitra et al., 2016).

We employ an empirical methodology that addresses most of these estimation challenges. Given that we shall conduct the estimation on two years' panel data, the fixed effects approach would tackle most of the potential identification problems mentioned above. The theoretical underpinning for our empirical specification is the theory of full consumption insurance through formal or informal risk-pooling or self-insurance (Cochrane, 1991; Deaton, 1997; Gertler &

Gruber, 2002; Mace, 1991; Townsend, 1994). For more information about the theoretical model, refer to Appendix 1. The theory predicts that if risk sharing and consumption smoothing are possible, idiosyncratic income and health shocks are smoothed out. On the contrary, if risk sharing and consumption smoothing are imperfect, idiosyncratic death and illness will affect consumption.

A reduced form version of the theoretical model can be written as:

$$\ln C_{it} = \propto_i + H_{it}\theta + X_{it}\beta + \propto_v + \propto_t + \delta_{vt} + \varepsilon_{it} \quad (1)$$

where,

- $\ln C_{it}$ denotes the outcome variable, i.e., and is the logarithm of consumption for household 'i' in time 't'. To explore whether risk-pooling is different over major consumption items, we will also disaggregate $\ln C_{it}$ into the logarithm of household food, non-food (non-medical), education, and total consumption.
- H_{it} refers to two health shocks - dummies whether a household 'i' experienced reported death and illness of at least one member during the last 12 months before each survey. Death is 1 if the household reported the death of at least one member during the last 12 months before each survey, and, similarly, illness is 1 if the household reported the illness of at least one member during the last 12 months before each survey.
- X_{it} refers to a vector of time-varying characteristics of the household. These time-varying factors include age, gender, marital status, and education of the head; whether any member of the household has left the household for any reason; household size; shares of household members under 15 and over 64 years old; share of male household members; and month of the interview.
- $\propto_i$ is household fixed effects.
- $\propto_v$ stands for community/village fixed effects. Community fixed effects control for aggregated community-level effects such as economic growth, weather condition, covariate shocks, and infrastructure of the community that would otherwise confound identification. We define communities to be equivalent to the Ethiopian Socio-Economic survey's sampling clusters called "enumeration areas."[12]
- $\propto_t$ is a control for year dummy. It is 1 for the 2015/2016 survey, and 0 for the 2013/2014

[12] In the survey, households are selected from a total of 433 enumeration areas. We control aggregate changes at enumeration area (community level) by including community dummies in our regression.

survey.

- δ_{vt} denotes the interaction of community dummies with year dummy to control for changes in communities over time.
- θ, and β are coefficient vectors respectively for death and illness, and time-varying factors.
- ε_{it} is the household-specific time-varying error term.

In addition, we extend the full insurance benchmark to test the impact on household income as well. The idea is to test whether risk-pooling takes place to protect household income against idiosyncratic death and illness shocks or not. A similar specification to equation (2) was employed by earlier studies (Gertler & Gruber, 2002; Liu, 2016).

$$\ln Y_{it} = \propto_i + H_{it}\theta + X_{it}\beta + \propto_v + \propto_t + \delta_{vt} + \varepsilon_{it} \qquad (2)$$

where, $\ln Y_{it}$ refers to the logarithm of household unearned, earned, and total income, and the right-hand side terms are as defined above.[13] We estimate equations (1) and (2) by fixed effects estimation and the standard errors are clustered by community level. The fixed effects control household time-invariant characteristics (both observable and unobservable), and therefore avoid the endogeneity bias that could arise due to the correlation of these time-invariant household characteristics (e.g., household preferences and human capital endowments) with both health shocks and household income/consumption. This addresses our concern that the bias could occur due to time-invariant unobserved heterogeneity among households and omitted variables that correlate with both health shocks and household income/consumption. This method also addresses the measurement error in reporting death and illness assuming that some households have the same tendency over time to report better or worse conditions compared with other households. In other words, the measurement error that is constant over time (systemic measurement error) is removed with this method.

The community fixed effects $\propto_v$ are included in the model to control for unobserved aggregate changes at the community level that may be correlated with variables of our interest (death and illness) and income and/or consumption. Aggregate changes in the community like economic growth, weather events, infrastructures, and so on can be correlated with death and illness, and outcome variables (income and consumption).

The identification problem that remains is the reverse causality between the two health

[13]We measure household annual unearned income by summing annual social assistance, annual private domestic transfers, annual social insurance, and international remittances.

problems (death and illness), and income and/or consumption. Given two years of panel data, we cannot employ the dynamic general method of moments (GMM) method (or a variant) to deal with this problem. The best we can do is to instrument death and illness with relevant and valid instruments. However, instruments identified by previous related literature are not available in our dataset, and the ones available are not found to be appropriate instruments for our variables of interest (death and illness). Grimm (2010) tries to instrument death with the presence or distance to health care centers, sea level, or the crude death rate in the community, but those instruments are found to be not relevant. Similarly, the variables our dataset offers as potential instruments are found to be not relevant. These include a dummy of whether the household has safe drinking water, a dummy of whether there are groups in the community providing insecticide treatment, cost of bed nets, distance to the nearest hospital and the nearest health post. Given that we cannot control for this last source of endogeneity and also for the random type of measurement error, results from the fixed effects should be cautiously interpreted.

We make our analysis for the whole sample, rural-urban, female-head versus male-headed households, and poor versus non-poor sub-samples. Unlike other previous studies in Ethiopia, our outcome variables are in both adult equivalent and per capita terms (with no account of household size and composition effects). Converting household income and consumption into adult equivalent scales is useful to account for age-specific needs (household composition) and economies of scale resulting from the size of the household. We adapt the methodology used by Batana et al. (2013) and measure real adult equivalent income and consumption as follows.

$$\text{Adult equivalent income/consumption} = \frac{household\ income/consumption}{[\sum_i^{nm} a_i + \sum_j^{nf} b_j]^{\delta}} \quad (3)$$

Where,

- n_m – refers to the number of male members of the household,
- n_f – refers to the number of female members of the household,
- a_i – refers to discount factor for male household member composition,
- b_j – refers to discount factor for female household member composition,
- $\sum_i^{nm} a_i + \sum_j^{nf} b_j$ – is adult equivalent household size,
- δ – refers to the economies of the scale factor.

Both a_i and b_j vary with the age of male and female household members respectively. In

Ethiopia, a_i and b_j were estimated for thirteen ranges of ages for both male and female household members based on Calorie intakes of male and female household members at different ages. Adult equivalent household size of a particular household is simply the sum of male and female discount rates at various ages in the household. We found this measure of adult equivalent size in both surveys. The scale parameter (δ) refers to the intensity of income and consumption sharing among household members or economies of scale. If economies of scale are assumed to be lower, the value of δ becomes closer to 1. For developing countries, the most relevant and conservative measure of the economies of scale factor (δ) is suggested to be 0.78 (Batana et al., 2013). We take this factor for our purpose. In addition, our analysis considers also the per capita measure (with $a_i = b_{j=} \delta=1$) of household income and consumption for the sake of comparison.

1.4.2. Data

The source of data for our analysis is the Ethiopian Socioeconomic Survey (ESS), collected as part of a joint project between the Ethiopian Central Statistical Agency (CSAE) and the World Bank's Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). Currently, four waves (ESS1, ESS2, ESS3 and ESS4) of the ESS are available. ESS1 collects information from households that live in small towns and rural areas while the latest three waves cover households from rural areas, small towns, medium towns, and big cities. ESS2 and ESS3 are expanded versions of ESS1 and they can form a panel of small-town and rural households. ESS4 is different from previous surveys and it is a new independent baseline survey for the waves to follow. ESS1, ESS2, ESS3, and ESS4 were collected respectively in 2011/2012, 2013/2014, 2015/2016, and 2018/2019. ESS1 was collected from September 2011 to March 2012 while ESS2 was carried out from September 2013 to April 2014. ESS1, ESS2, and ESS4 were collected in three rounds. ESS3 was collected from September 2015 to April 2016 and was administered in two rounds. ESS4 was collected from September 2018 to August 2019.

The surveys used a two-stage sampling method to select enumeration areas, and households after enumeration areas are selected. In the first stage, enumeration areas were selected using simple random sampling from the sample of agricultural sample survey (AgSS) enumeration areas (for ESS1, ESS2, and ESS3) and an updated CSAE 2018 pre-census cartographic database of EAs (for ESS4). In the second stage, households were selected using simple random sampling (in ESS1, ESS2, and ESS3) and systemic sampling (in ESS4) from each enumeration area. The households sampled for ESS4 are representative not only at the country level like the previous

ESS waves but also at the regional, urban, and rural areas levels. In addition, ESS4 survey instruments were revised in collaboration with data users and development partners. In ESS1, a total of 333 enumeration areas from rural and small-town areas were selected in the first stage. In the second stage, 12 households from each enumeration area (and a total of 3996 households) were selected. Households successfully interviewed were 3969 in ESS1. In ESS2 and ESS3, 333 enumeration areas from the rural and small-town areas and 100 enumeration areas from the newly added urban areas were selected. In the second stage, 12 households were selected from each rural and small-town enumeration area while 15 households were selected from each enumeration area of urban areas. This gives a total representative sample of 5496 households at the country level in both ESS runs. However, the households successfully interviewed in ESS2 were 5262. In ESS3, 4954 households were interviewed again with an attrition rate of 5.85% between ESS2 and ESS3. Similarly, a total of 565 EAs (316 rural EAs and 219 urban EAs) were selected in ESS4 in the first stage. In the second stage, systematic sampling was used to select 10 agricultural and 2 non-agricultural households from each rural EA and 15 households from each urban EA. In ESS4, a total of 7527 households were picked, with 6770 of them successfully interviewed for both the agriculture and household module.

Our analysis in this chapter uses a panel of 4954 households that live in rural, small towns and medium and big cities in ESS2 and ESS3. We exclude ESS1 as it covers only rural and small-town (with a population of less than 10,000) households with the total exclusion of medium and big cities from the survey. Similarly, we don't use the fourth wave (ESS4) as we cannot build a panel with earlier waves because sampling in ESS4 is based on a different sampling frame. The attrition rate is 4.86% between ESS1 and ESS2 for small-town and rural households while it is slightly higher (5.85%) between ESS2 and ESS3 for households in all areas. To account for attrition bias, we use sample weights that are calculated by taking into account household non-response and attrition. As a robustness check, we use the first three waves (ESS1, ESS2 and ESS3) for the analysis of rural households.

The ESS collects detailed individual, household, and community-level information on a broad range of topics. Household consumption expenditures for three items (food, non-food purchases excluding health expenditures, and education expenses) were aggregated by the World Bank for each household using similar aggregation methodologies. The World Bank makes use of this aggregation to produce panel data allowing for dynamic analysis from the perspective of

consumption expenditures. Information on household food consumption was collected on a list of 25 food items consumed in the last 7 days before the surveys. Food consumption in the last 7 days may come from the aggregate of purchased food consumption, food consumption from own production, and food consumption from gifts and other sources. Then, the aggregated food consumption for the last week was annualized to give food consumption for one year.

Similarly, non-food consumption information was collected using a list of 11 basic household non-food items in the last four weeks before the surveys, and 12 additional non-food items including education for the last 12 months before the surveys. Then, the aggregated monthly non-food consumption was annualized to get the yearly non-food consumption. Though information on house rent is available in ESS3, the World Bank excluded it from the aggregate to make the analysis compatible with the earlier waves. Thus, house rents are not part of non-food consumption. Also, information on household health expenditure and health insurance is available since ESS3, and it was not available in ESS1 and ESS2. Due to incomplete information on health expenditure in both surveys, we are unable to assess the impact of health shocks on health expenditure, one of the channels through which health shocks impact consumption.

We compute aggregated income using the procedures devised by a joint project between the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), and the World Banks' Rural Livelihood Integrated System (RuLIS). RuLIS has devised a methodology to aggregate individual incomes from various sources of income in both ESS2 and ESS3. Total income components include wage income, income from self-employment (farm and non-farm income), social assistance, social insurance, private domestic transfers, international remittances, and other income.[14] We divide total income into earned and unearned income in our analysis. Unearned income is composed of annual social assistance, annual private domestic transfers, annual social insurance, and international remittances while earned income includes wage income, self-employment income, and other income.

The surveys also collect household-level information on whether any of the household members are affected by death and illness shocks during the last 12 months before the survey under the shocks section. We use the terminology health shocks (death and illness shocks) interchangeably with health problems (death and illness). However, it should be noted that the

[14] Other income refers income received from non-farm real estate assets and income received from savings and interest.

measures of death and illness shocks (as it appears in the surveys) may not be purely exogenous. ESS3 contains information on whether the household member who died is the head, children, or other members. Similarly, ESS2 has information on whether the death affected member is the head or other members of the household. Our analysis of the effect of death is both the aggregated measure of death and death disaggregated by the death of the head and death of other household members. However, illness was reported with no reference to which household member is sick in both waves. Thus, our analysis of illness is only on aggregately defined illness measures. Moreover, death information has another source of measure in the survey, i.e., whether an individual who was a member of the household in the previous survey has left the household in the current survey due to death. Though the timing of this death measure differs from the one defined above, we use this death information as a robustness check. The definition of variables is given in Table 1.1.

Table 1.1. Description of variables

Variable	Definition
Poor_dev	Dummy of 1 if the household is under the societal poverty line
Food_con	Real annual household food consumption in U.S. dollar
Nonfood_con	Real annual household non-food consumption in U.S. dollar
Educ_con	Real annual household education expenditure in U.S. dollar
Total_con	Real annual household total consumption in U.S. dollar
Unearned_inc	Real annual household unearned income in U.S. dollar
Earned_inc	Real annual household earned income in U.S. dollar
Total_inc	Real annual household total income in U.S. dollar
Death	Dummy of 1 if the household experiences the death of at least one member
Death_head	Dummy of 1 if the household experiences death of the head
Death_oth	Dummy of 1 if the household experiences the death of at least one member other than the head
Left_death [d]	Dummy of 1 if at least one member leaves the household due to death
Illness	Dummy of 1 if the household experiences illness of at least one member
Death_ill	Dummy of 1 if the household experiences death and illness of at least one member
HHsize	Household size
Fem_head	Dummy of 1 if the household head is female
Age_head	Age of household head
Educ_head	Years of education for the household head
Married	Dummy of 1 if the head of the household is married
Dependencyratio	The ratio of dependents in the household
Maleratio	The ratio of males in the household
Urban	Dummy of 1 if the household lives in small, medium or large cities
February	Dummy of 1 if the household is interviewed in February
Left_married [m]	Dummy of 1 if at least one member leaves the household for marriage
Left_follow [f]	Dummy of 1 if at least one member leaves the household following relatives
Left_work [w]	Dummy of 1 if at least one member leaves the household for work
Left_school [s]	Dummy of 1 if at least one member leaves the household for study purpose
Left_other [o]	Dummy of 1 if at least one member leaves the household for other reasons

Notes: d, m, f, w, s, & o refer variables are defined for households who live in rural areas and small towns.

1.5. Presentation of results

1.5.1. Descriptive Analysis

The descriptive statistics of adult equivalent income and consumption, death and illness, and household characteristics are reported separately for ESS2 and ESS3 in Table 1.2. Annual real adult equivalent household income and consumption are measured in terms of the United States Dollar (USD). Real adult equivalent income and expenditure are slightly higher in ESS2 than ESS3 except for expenditure on education. Food takes the highest share of total expenditure while earned income is the major component of total income for Ethiopian households. On average, more than 73% of total expenditure goes to food consumption while about 90% of total income comes from labor market earnings. Mean household real adult equivalent expenditure ranges from an annual education expenditure of US $5.258 to an annual food expenditure of US $234.691 in ESS2.

Table 1.2 also shows the death and illness experiences of at least one member for the two survey periods. Out of the total sampled, 3.1%, and 5.7% of households experienced the death of at least one member respectively in ESS2 and ESS3. Of the total surveyed households, about 1.4% and 2.2% of households reported the death of a household head in ESS2 and ESS3 respectively. More households (1.8% in ESS2 and 3.7% in ESS3) reported the death of at least one non-head household member. Of surveyed households, 10.3% in ESS2 and 23.8% in ESS3 reported illness experience of at least one member. More households experienced death and illness in ESS3 compared to ESS2. Only a few households (0.8% in ESS2 and 1.7% in ESS3) experienced both death and illness at the same time.

On average, Ethiopian households are characterized by a family size of more than 5 individuals, a dependency ratio of 44.5% in ESS2 and 51.4% in ESS3, and an average male-to-female ratio of 48.5% in ESS2 and 45% in ESS3. On average, the household head is about 45 years old and has an average of more than 3 years of education. Of the total surveyed households, about 25% in ESS2 and 30% in ESS3 are headed by women while more than 70% of household heads are married in both surveys.

Table 1.2. Descriptive statistics

	ESS2		ESS3	
	Mean	Std. Dev	Mean	Std. Dev
Poor_dev	.575	.494	.532	.499
Food_con	234.691	173.090	213.406	220.563
Nonfood_con	77.601	93.245	67.809	85.014
Educ_con	5.258	20.620	7.560	26.801
Total_con	317.551	226.045	288.774	268.773
Unearned_inc	12.147	41.170	11.788	38.567
Earned_inc	119.502	242.540	118.813	213.698
Total_inc	131.649	244.181	130.601	214.812
Death	.031	.174	.057	.233
Death_head	.014	.119	.022	.146
Death_oth	.018	.132	.037	.190
Illness	.103	.304	.238	.426
Death_ill	.008	.091	.017	.130
HHsize	5.335	2.518	5.675	2.646
Fem_head	.253	.435	.295	.456
Age_head	44.431	15.844	46.153	15.630
Educ_head	3.086	4.357	3.363	4.657
Married	.731	.444	.703	.457
Dependencyratio	.445	.243	.514	.242
Maleratio	.485	.227	.450	.224
Urban	.243	.429	.317	.465
February	.021	.142	.369	.482
Left_death [d]	.052	.223	.091	.287
Left_married [m]	.109	.311	.166	.373
Left_follow [f]	.102	.303	.165	.372
Left_work [w]	.089	.285	.150	.357
Left_school [s]	.090	.286	.114	.318
Left_other [o]	.075	.264	.126	.332

Notes: d, m, f, w, s, & o refer to values for households who live in rural areas and small towns. The mean and standard deviations are weighted.

Of sampled households, about 24% in ESS2 and 32% in ESS3 live in urban areas. Households are also characterized by members who had left the household for different reasons between ESS1 and ESS2, and ESS2 and ESS3 for small-town and rural households. The reasons members left their households include death, marriage, following a family or a relative living in a different location, work, education, and others like health reasons, search for better land, security reasons, and the like. About 9.1%, 16.6%, 16.5%, 15%, 11.4%, and 12.6% of households have at least one member who had left the household respectively to death, marriage, following the family, work, education, and other reasons in ESS3. The corresponding figures in ESS2 are 5.2%, 10.9%, 10.2%, 8.9%, 9%, and 7.5% respectively for death, marriage, family follow-up, work, education, and other reasons. Of surveyed households, 2.1% in ESS2 and 36.9% in ESS3 were interviewed in February.

It is also interesting to see how real adult equivalent income and consumption, and death and illness vary across different segments of households. The summary statistics of these variables are reported in Table 1.3 classifying households based on place of residence, gender of the head, and level of poverty. From Table 1.2, it is shown that 57.5% of households in ESS2 and 53.2% of households in ESS3 were found to be poor.[15]

Table 1.3. Mean real adult equivalent income and consumption, and death and illness across sub-samples over pooled data

	Urban versus rural		Female versus male head		Poor versus non-poor	
	Urban	Rural	Female	Male	Poor	Non-poor
Poor_dev	.421	.605	.513	.569	1	0
	(.494)	(.489)	(.500)	(.495)	(0)	(0)
Food_con	271.997	205.344	226.676	223.168	137.899	337.624
	(275.420)	(154.057)	(176.836)	(206.000)	(69.238)	(249.224)
Nonfood_con	127.320	51.309	77.534	70.905	40.413	115.297
	(126.992)	(56.264)	(96.657)	(86.364)	(32.005)	(118.204)
Educ_con	15.910	2.662	7.665	5.911	2.986	10.889
	(39.625)	(11.405)	(25.869)	(23.095)	(7.215)	(34.930)
Total_con	415.227	259.315	311.874	299.985	181.298	463.810
	(339.138)	(184.419)	(243.339)	(250.457)	(81.251)	(298.374)
Unearned_inc	25.398	6.747	22.407	8.029	8.440	16.345
	(62.813)	(24.059)	(52.582)	(33.032)	(26.083)	(51.836)
Earned_inc	190.857	91.289	113.454	121.313	84.964	161.588
	(340.355)	(157.338)	(228.699)	(228.49)	(141.666)	(298.200)
Total_inc	216.256	98.035	135.861	129.335	93.403	177.933
	(339.199)	(157.509)	(228.767)	(230.392)	(141.587)	(299.458)
Death	.057	.039	.065	.036	.045	.043
	(.232)	(.194)	(.246)	(.187)	(.208)	(.202)
Death_head	.023	.016	.038	.011	.019	.018
	(.150)	(.126)	(.192)	(.102)	(.135)	(.131)
Death_oth	.038	.024	.031	.026	.027	.028
	(.190)	(.152)	(.173)	(.160)	(.163)	(.164)
Illness	.205	.157	.166	.172	.169	.172
	(.404)	(.364)	(.372)	(.377)	(.375)	(.377)
Left_death [d]	.084	.070	.119	.056	.068	.077
	(.277)	(.255)	(.323)	(.230)	(.251)	(.266)

Notes: Numbers in the parenthesis are standard errors. [1] refers to the measures from households who live in rural and small urban areas. The mean and standard errors are weighted.

On average, urban and non-poor households earned more income and reported higher levels of consumption than poor and rural households over the two survey periods. Female-headed households' average unearned income and expenditures on food, nonfood, and education were higher than male-headed households over the periods covered ESS2 and ESS3 while average earned income is higher for male-headed households. The percentage of households who reported death is higher for urban and female-headed households compared to their rural and

[15] Level of Poverty is measured based on societal poverty line that is calculated by a national poverty threshold of USD 1 plus half of the median value of per capita expenditure in the country. The RuLIS team used this approach and derived whether a household is poor or not. We use RuLIS's measure for our purpose.

male-headed household counterparts. The percentage of death of at least one other member is greater than the percentage of the reported death of household head for all categories of households except for female-headed households. Percentages of households with the reported death of any member, death of household head and death of other members are more or less similar for the poor and non-poor subsamples. With the exception of urban households who reported slightly higher illness, the percentage reported illness is more or less similar for other categories of households. Compared to their counterparts, the percentage of households with at least one member left due to death is higher for urban (small towns in this case), female-headed and non-poor households.

1.5.2. Results from the fixed effects

1.5.2.1. Whole sample

In this section, we estimate the effects of death and illness on household real adult equivalent and per capita income and consumption on the whole sample using fixed effects. Regression results for equations 1 and 2 are reported in Table 1.4. Results for control variables except for community dummies, time dummies, and community-time interaction terms are put in Appendix 2. We skip coefficients of dummies of community, time, and community-time interaction terms for the sake of space.

For the whole sample, the death of at least one member in the household has a positive effect on real adult equivalent non-food and total consumption. In terms of magnitude, death increases adult equivalent non-food and total consumption respectively by 11.1% ($\exp^{0.105} - 1 = 0.111$) and 7.3% ($\exp^{0.070} - 1 = 0.073$). However, death appears to yield no statistically significant effect on adult equivalent expenditures on food and education, unearned, earned and total income. For per capita measures of all items of consumption and two components of income (unearned and earned income), death have no significant effect. We also disaggregate death into the death of the head and death of other non-head members to check whether the effect on consumption and income differs depending on whom in the household experiences death. Appendix 6 shows that adult equivalent total and non-food consumption increase following the death of the head and death of at least one other member respectively. Consistent with the effect of aggregate measure of death, death of the head and non-head members do not have a significant effect on per capita measures of consumption and adult equivalent and per capita income.

Table 1.4. The effect of death and illness on household real adult equivalent and per capita income and consumption (Whole sample)

	Adult equivalent measure		Per capita measure		Within R^2		Number of Obs.
	Death	illness	Death	illness	A	P	
Food_con	.033(.047)	-.076***(.024)	-.026(.046)	-.067***(.022)	0.447	0.523	9489
Nonfood_con	.105**(.048)	-.082***(.032)	.051(.049)	-.069**(.031)	0.605	0.657	9489
Educ_con	-.066(.069)	-.054(.045)	-.067(.057)	-.051(.037)	0.444	0.431	9489
Total_con	.070*(.042)	-.063***(.022)	.011(.042)	-.054***(.021)	0.512	0.601	9489
Unearned_inc	-.005(.094)	.185***(.062)	-.019(.076)	.175***(.052)	0.447	0.443	9908
Earned_inc	-.002(.005)	-.013***(.003)	-.001(.003)	-.010***(.002)	0.442	0.704	9908
Total_inc	-.002(.005)	-.011***(.003)	-.001(.003)	-.009***(.002)	0.474	0.735	9908

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

On the other hand, illness has a negative effect on adult equivalent and per capita food consumption, non-food consumption, total consumption, earned income, and total income, while its effect is positive on adult equivalent and per capita unearned income. Illness reduces adult equivalent food consumption, non-food consumption, total consumption, earned income and total income by about 7.3%, 7.9%, 6.1%, 1.3%, and 1.1% respectively, while it increases adult equivalent unearned income by 20.3%. In terms of magnitude, illness has a bigger impact on adult equivalent measures of consumption and income. Per capita food consumption, non-food consumption, total consumption, earned income and total income fall by 6.5%, 6.7%, 5.3%, 1%, and 0.9% respectively, while per capita unearned income increases by 19.1% following an illness. Though unearned income increases for households experiencing illness, it is not enough to fully compensate for the fall in earned income that total income is found to be negatively affected. Resuming in simple words and concerning the whole sample, the fixed effects estimation suggests that Ethiopian households did not experience adverse effects on their consumption and income following death while they could not manage to protect their consumption and income from adverse effects of illness. Ethiopian households as a whole ended up consuming more non-food and total consumption following death. We provide evidence that the negative effect of illness on earned (and total) income has repercussions on adult equivalent consumption of food and non-food items. The positive effect of death on adult equivalent non-food and total consumption indicates that the value of what the deceased members would consume was greater than the costs associated with the death event such as expenses on funeral costs, expenditures on medical care services during the illness spell, and income loss (Grimm, 2010). For the whole sample, the size and significance of coefficients of death and illness on income and consumption are sensitive to whether income and consumption are measured in per

capita terms or adult equivalent terms. Estimated coefficients of illness are higher on adult equivalent measures of income and consumption, while death has a significant positive effect only on adult equivalent measures of non-food and total consumption.

1.5.2.2. Sub-samples

To examine the differential effects death and illness might have on real adult equivalent and per capita income and consumption across different segments of households, we also run fixed effects estimation to our model conditioning on different subsamples of households. Disaggregated evidence for major social groupings is crucial to frame well-targeted policies. We thus repeat our analysis on urban versus rural subsamples, female-headed versus male-headed subsamples, and poor versus non-poor subsamples. Tables (1.5, 1.6, & 1.7) report the results. We put coefficients for other control variables in the Appendix (Appendix 3 to Appendix 5).

Table 1.5 shows that death has a negative significant effect on urban households' real adult equivalent and per capita expenditure on education, per capita food and total consumption, while its effect is positive on unearned income. Expenditure on education may fall for one or a combination of the following reasons. First, households experiencing death may use members at school to adjust for labor as a coping strategy so that expenditure on education may fall as individual members who were at school drop out of school to work for the household. Second, death may directly strike individuals at school so that education and expenditure on it are not required for the deceased individuals. Third, households with death experiences may use reducing expenditure on education as a coping strategy. For urban households, the positive effect on unearned income and less consumption requirement following a death could not compensate the negative economic effects of expenditures on funeral and medical services, and the loss in labor supply and associated fall in income. When significant, death has a larger impact on adult equivalent measures. However, the effect of death is not significant on rural households' consumption of all items and income.

Looking at the result by disaggregating death within the household, a household head's death has a negative significant effect (at 1%) on urban households' adult equivalent and per capita food consumption even though unearned income (of both measures) responds positively to urban household head's death (See Appendix 6). For urban households, the death of at least one other household member is negatively associated with adult equivalent and per capita education expenditure, and per capita non-food consumption, while its effect is positive on adult equivalent

food consumption and unearned income. But, the effects of the death of non-head members on food, non-food and education consumption are significant only at 10%. Consistent with the aggregate measure of death, heads and other household members' death do not affect consumption and income for rural households (see Appendix 6).

As concerns illness, it positively affects both per capita and adult equivalent measures of non-food consumption and unearned income, and per capita total consumption of urban households. It is not uncommon to find positive consequences of illness on non-food consumption. Porter (2012) and Wagstaff (2007) provide similar evidence respectively in Ethiopia and Vietnam. For rural households, illness negatively affects adult equivalent and per capita non-food, and total consumption with no effect on income. Unlike rural households, a positive effect on unearned income reduces the burden of illness on urban households' consumption. In this case, it can be said that social assistance and insurance programs and transfer payment systems may be more responsive for death and illness events for urban households compared to their rural counterparts. The effect of illness is higher on adult equivalent measures of non-food and total consumption of rural households, while the magnitude of the effect depends on the significant outcome for urban households. Illness has higher impact on per capita non-food consumption and adult equivalent unearned income of urban households.

Table 1.5. The effect of death and illness on adult equivalent and per capita income and consumption (Urban versus rural sample)

	Urban sample				Within R^2		Number of Obs.
	Adult equivalent measure		Per capita measure				
	Death	illness	Death	illness	A	P	
Food_con	-.107(.094)	-.028(.052)	-.200**(.097)	-.001(.049)	0.398	0.462	3315
Nonfood_con	-.087(.106)	.220***(.079)	-.176(.109)	.240***(.084)	0.526	0.622	3315
Educ_con	-.433*(.237)	.094(.146)	-.429**(.204)	.042(.135)	0.344	0.324	3315
Total_con	-.083(.071)	.061(.048)	-.174**(.076)	.086*(.049)	0.454	0.580	3315
Unearned_inc	.780***(.264)	.312*(.179)	.641***(.233)	.299*(.161)	0.375	0.393	3431
Earned_inc	-.004(.023)	-.006(.009)	.004(.018)	-.002(.007)	0.561	0.754	3431
Total_inc	-.002(.023)	-.002(.009)	.007(.019)	.000(.007)	0.572	0.742	3431
			Rural sample				
Food_con	.056(.050)	-.050(.034)	.015(.053)	-.044(.031)	0.463	0.496	6174
Nonfood_con	-.061(.072)	-.176***(.048)	-.099(.070)	-.162***(.046)	0.573	0.583	6174
Educ_con	-.048(.088)	-.076(.059)	-.053(.066)	-.072(.046)	0.458	0.425	6174
Total_con	.043(.048)	-.063**(.032)	.002(.050)	-.056*(.029)	0.497	0.528	6174
Unearned_inc	-.013(.121)	-.007(.073)	-.017(.093)	.010(.060)	0.492	0.483	6477
Earned_inc	.001(.004)	-.003(.003)	-.001(.003)	-.002(.002)	0.806	0.968	6477
Total_inc	.001(.004)	-.004(.003)	-.001(.002)	-.002(.002)	0.805	0.968	6477

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

Turning now to male versus female-headed households, Table 1.6 shows that death has a big negative impact on adult equivalent and per capita non-food consumption and education expenditure in female-headed households. For male-headed households, death has a positive effect on adult equivalent non-food and total consumption, while its effect is not statistically significant on other consumption items and income. It appears that female-headed households might use education expenditure as a coping strategy against death through the use of this coping is found to be unsuccessful in preventing the fall in non-food consumption. The reason for the fall in education expenditure following death may be the drop in education expenditure as a coping strategy and/or the use of children to adjust the labor supply void created by death. Another reason may be those affected by death are members who were at school that education and expenditure on it are not required anymore. Whatever is the reason, the clear implication is that human capital formation would be endangered for female-headed households following death. Death has a higher impact on per capita measure of non-food consumption and adult equivalent measure of education expenditure of female-headed households, while its impact is significant only on adult equivalent non-food and total consumption of male-headed households.

The result for the disaggregated measure of death shows that death of the head positively affects adult equivalent and per capita food and total consumption, while its effect is negative on the education expenditure of female-headed households. Death of the head does not have significant consequences on male-headed households' consumption and income (See appendix 6). Appendix 6 also shows that the death of a non-head member negatively affects adult equivalent and per capita non-food consumption and per capita total consumption of female-headed households, while its effect is positive on adult equivalent and per capita non-food consumption, per capita food and total consumption of male-headed households.

Table 1.6 shows, moreover, that female-headed households' adult equivalent and per capita non-food consumption, earned and total income fall following an illness with no meaningful compensation from unearned income. For male-headed households, adult equivalent and per capita non-food consumption, earned and total income fall while part of earned income is offset by an increase in unearned income (both adult equivalent and per capita) following an illness. Illness has larger consequences on male-headed households' adult equivalent measures of non-food, unearned income, earned income and total income compared to the per capita measures.

For female-headed households, the effect of illness is larger on per capita non-food and adult equivalent earned and total income.

Table 1.6. The effect of death and illness on adult equivalent and per capita income and consumption (Female-headed versus male-headed sample)

	Female-headed sample				Within R^2		Number of Obs.
	Adult equivalent measure		Per capita measure				
	Death	illness	Death	illness	A	P	
Food_con	.198(.169)	.084(.134)	.088(.164)	.049(.122)	0.802	0.844	2931
Nonfood_con	-.356**(.183)	-.580***(.179)	-.446***(.172)	-.600***(.169)	0.886	0.914	2931
Educ_con	-.548*(.300)	.012(.229)	-.477*(.263)	-.054(.203)	0.770	0.759	2931
Total_con	.088(.152)	-.061(.123)	-.022(.147)	-.096(.112)	0.824	0.873	2931
Unearned_inc	.355(.469)	.152(.285)	.301(.398)	.050(.252)	0.818	0.820	3006
Earned_inc	-.008(.015)	-.030*(.016)	-.022(.014)	-.026**(.012)	0.845	0.951	3006
Total_inc	-.010(.016)	-.030*(.016)	-.019(.014)	-.028**(.012)	0.860	0.958	3006
			Male-headed sample				
Food_con	.078(.057)	-.054(.040)	.022(.065)	-.053(.037)	0.565	0.616	6558
Nonfood_con	.173**(.072)	-.093**(.041)	.119(.078)	-.083**(.041)	0.702	0.738	6558
Educ_con	-.018(.098)	-.028(.069)	-.036(.076)	-.036(.055)	0.586	0.581	6558
Total_con	.113**(.050)	-.048(.034)	.057(.061)	-.046(.031)	0.626	0.690	6558
Unearned_inc	.042(.122)	.131*(.074)	.0246(.103)	.103*(.063)	0.535	0.531	6902
Earned_inc	.005(.010)	-.015**(.004)	.004(.006)	-.008***(.003)	0.512	0.710	6902
Total_inc	.005(.010)	-.012***(.004)	.004(.006)	-.007**(.003)	0.530	0.734	6902

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

For male-headed and female-headed households, the results suggest that the negative effect of illness on adult equivalent and per capita earned and total income has repercussions on adult equivalent and per capita non-food consumption. The increase in unearned income for male-headed households is not enough to compensate for their earned income that total income and non-food consumption fall following an illness.

Finally, Table 1.7 illustrates the results for poor and non-poor households. Surprisingly, death positively affects poor households' adult equivalent and per capita education expenditure, total income, and per capita earned income. In contrast, adult equivalent and per capita expenditure on education, earned, and total income fall with no significant contribution of unearned income following death for non-poor households. It is puzzling how poor households appear to increase education expenditure and income while non-poor households suffer from a fall in education expenditure and income following death. When significant, death has bigger consequences on adult equivalent measures of income and consumption for both poor and non-poor households. On the disaggregated measure, death of the head has a negative effect on adult equivalent and per capita non-food consumption and per capita total consumption, while its effect is positive on the unearned income of poor households (Appendix 6). Death of non-head members is positively

associated with adult equivalent and per capita expenditure on education, earned, and total income, and adult equivalent non-food and total consumption for poor households. On the other hand, death of the head negatively affects adult equivalent earned and total income, while the death of non-head members causes a fall in adult equivalent and per capita education expenditure, and adult equivalent earned and total income for non-poor households. In fact, compared to the death of other household members, the death of the head has a bigger negative impact on non-poor households' earned and total income (Appendix 6).

Table 1.7 also shows that illness has positive effects on per capita earned and total income of poor households while the effect is opposite for non-poor households' adult equivalent and per capita earned and total income. This is again contrary to our expectation that non-poor households ought to be better equipped to cope with the risk of illness. Comparatively, illness has larger consequences on adult equivalent measures of earned and total income for non-poor households, while it is significant only on per capita measures of earned and total income for poor households.

Table 1.7. The effect of death and illness on adult equivalent and per capita income and consumption (poor versus non-poor sample)

	Poor sample				Within R^2		Number of Obs.
	Adult equivalent measure		Per capita measure				
	Death	illness	Death	illness	A	P	
Food_con	.045(.051)	.001(.039)	-.023(.055)	.019(.041)	0.586	0.623	5037
Nonfood_con	.017(.074)	-.056(.047)	-.038(.078)	-.040(.047)	0.697	0.717	5037
Educ_con	.181**(.082)	.019(.052)	.138**(.066)	.004(.042)	0.669	0.668	5037
Total_con	.039(.048)	.008(.033)	-.026(.052)	.025(.035)	0.613	0.662	5037
Unearned_inc	.221(.145)	-.024(.085)	.151(.120)	-.013(.069)	0.653	0.650	5148
Earned_inc	.007(.005)	.004(.003)	.006***(.002)	.003*(.002)	0.867	0.983	5148
Total_inc	.008*(.005)	.004(.003)	.006***(.002)	.003*(.002)	0.869	0.984	5148
			Non-poor sample				
Food_con	-.054(.097)	-.035(.048)	-.069(.096)	-.031(.039)	0.583	0.617	4452
Nonfood_con	-.173(.129)	.002(.071)	-.187(.124)	.007(.074)	0.780	0.806	4452
Educ_con	-.578***(.206)	-.090(.147)	-.557***(.172)	-.132(.124)	0.596	0.580	4452
Total_con	-.061(.080)	-.039(.036)	-.076(.077)	-.035(.034)	0.661	0.711	4452
Unearned_inc	.002(.218)	-.092(.137)	-.079(.190)	-.048(.121)	0.627	0.622	4760
Earned_inc	-.039***(.012)	-.033***(.010)	-.023**(.011)	-.026***(.008)	0.578	0.742	4760
Total_inc	-.035***(.011)	-.034***(.009)	-.021**(.010)	-.026***(.007)	0.649	0.797	4760

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

Overall, our finding shows that death positively affects Ethiopian households' adult equivalent non-food and total consumption while its effect is not statistically significant on other consumption items and income. Despite having a positive effect on unearned income that

compensates for earned income, death negatively affects urban households' adult equivalent non-food consumption, education expenditure, and per capita food consumption. In this case, the negative consequence on consumption could come from expenditures on health care and funeral services as the effect is not significant on total income. Death is also negatively associated with nonfood consumption and education expenditure (adult equivalent and per capita measure) of female-headed households while its effect is opposite on adult equivalent non-food and total consumption of male-headed households. Unexpectedly, death positively affects poor households' adult equivalent and per capita expenditure on education, total income, and per capita earned income while its effect is negative on non-poor households' education expenditure, earned, and total income. This may be as a result of extra labor from the existing members of the household or other forms of support from relatives and other households like labor-sharing support for the poor who experience death. Still another possibility is that household members who were taking care of the ill member are now free to work after the ill-member dies. Our result of death on poor households' income confirms the result by Porter (2012), who finds a positive effect of death on rural households' wage income. In fact, Porter's result that death negatively affects rural households' self-employment income contrasts with our result of the effect of death on poor households' income, while it confirms the negative consequence of death on non-poor households' income. Of course, it is only the death of non-head members, not the death of the head, which is significantly associated with poor households' income. Death of poor households' heads has a negative significant effect on no-food consumption, while its effect is negative but insignificant on earned and total income.

When only the effect of death on rural households' income and consumption is considered, our results confirm the findings by Dercon and Krishnan (2000), Dercon et al. (2005), and Kadiyala et al. (2011). But, our result of no effect of death on rural households' income contrasts with the result by Porter (2012). Urban and female households struggle to prevent their expenditures on food, non-food, and education from adverse consequences of death. Similarly, our disaggregated measure of death shows that poor households' non-food consumption suffers from the death of household head. Even, non-poor households do not manage to insure their income and education expenditure against death. On urban, female-headed and non-poor households, the effect of death on education expenditure could affect future human capital investment.

Ethiopian households as a whole are not able to protect their adult equivalent and per capita food consumption, non-food consumption, total consumption, earned, and total income against illness. Illness has also negative effects on adult equivalent and per capita non-food and total consumption of rural households, adult equivalent and per capita non-food, earned and total income of female-headed and male-headed households, and adult equivalent and per capita earned and total income of non-poor households. In contrast, illness has positive effects on urban households' adult equivalent and per capita non-food consumption, and on poor households' per capita earned and total income. The positive response of unearned income following illness partially compensates for the negative effect on earned income for Ethiopian households as whole and male-head households, while it fully compensates for earned income for the urban sample. In general, our result on the effects of illness on household consumption confirms the findings of previous research on rural Ethiopia (no effect of illness on rural households' crop and self-employment income by Porter (2012), the negative effect of household head illness on purchased food and non-food consumption by Asfaw and Braun (2004), the negative effect of female adult illness on nutritional status of poor rural Southern Ethiopian households by Dercon and Krishnan (2000), the negative effect of serious illness of adults on consumption by Dercon (2004), and negative effect of illness on rural households as a whole, rich households and households headed by uneducated heads by Dercon et al. (2005)). In fact, our finding on the effect of illness on rural households' income and consumption contrasts with three studies in rural Ethiopia (no effect of illness on per capita food and non-food consumption by Skoufias and Quisumbing (2005), positive effect of illness on real adult equivalent consumption, non-crop and wage income by Porter (2012), and no effect of the four measures of illness on consumption Yilma et al. (2021)). Our results show that illness has more traumatic effects on rural and female-headed households as the size of the effect is bigger on their non-food consumption. A summary of results are presented in Table 1.8.

Table 1.8. Summary of results for different samples

	Sample	Adult equivalent (A) and per capita (P) income and consumption													
		Food_C		Nonfood_C		Educ_C		Total_C		Unearned_I		Earned_I		Total_I	
		A	P	A	P	A	P	A	P	A	P	A	P	A	P
Death	Whole_h	ns	ns	+	ns	ns	ns	+	ns	ns	ns	ns	ns	ns	ns
	Urban_h	ns	-	ns	ns	-	-	ns	-	+	+	ns	ns	ns	ns
	Rural_h	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	female_h	ns	ns	-	-	-	-	ns	ns	ns	ns	ns	ns	ns	ns
	male_h	ns	ns	+	ns	ns	ns	+	ns	ns	ns	ns	ns	ns	ns
	Poor_h	ns	ns	ns	ns	+	+	ns	ns	ns	ns	ns	+	+	+
	non-poor_h	ns	ns	ns	ns	-	-	ns	ns	ns	ns	-	-	-	-
illness	Whole_h	-	-	-	-	ns	ns	-	-	+	+	-	-	-	-
	Urban_h	ns	ns	+	+	ns	ns	ns	+	+	+	ns	ns	ns	ns
	Rural_h	ns	ns	-	-	ns	ns	-	-	ns	ns	ns	ns	ns	ns
	female_h	ns	ns	-	-	ns	ns	ns	ns	ns	ns	-	-	-	-
	male_h	ns	ns	-	-	ns	ns	ns	ns	+	+	-	-	-	-
	Poor_h	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+	ns	+
	non-poor_h	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-

Notes: + and – stands for positive significant and negative significant effects respectively.
ns stands for not significant.

1.6. Robustness checks

1.6.1. Taking advantage of one more survey run of rural households

We take advantage of three-wave data availability for rural households to estimate the impact of death and illness on household income and consumption. We use fixed effects again to analyze the effect. The results are also meant as robustness checks for those in Section 1.5.2.2 for the rural sample.

Table 1.9. The effect of death and illness on rural household real adult equivalent and per capita income and consumption (Three waves)

	Adult equivalent		Per capita measure		Within R^2		Number of Obs.
	Death	illness	Death	illness	A	P	
Food_con	.044(.048)	-.074***(.028)	-.025(.048)	-.084***(.027)	0.533	0.603	9290
Nonfood_con	.010(.057)	-.072*(.038)	-.041(.056)	-.081**(.035)	0.546	0.584	9290
Educ_con	-.027(.061)	-.018(.036)	-.021(.050)	-.013(.029)	0.409	0.377	9290
Total_con	.071(.045)	-.072***(.026)	.003(.046)	-.081***(.026)	0.548	0.621	9290
Unearned_inc	.095(.090)	.043(.064)	.065(.076)	.032(.052)	0.438	0.425	9499
Earned_inc	.001(.003)	-.002(.002)	-.005(.004)	-.002(.002)	0.891	0.994	9499
Total_inc	.002(.004)	-.001(.002)	-.005(.004)	-.001(.002)	0.891	0.994	9499

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form.*** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

Table 1.9 shows that death does not have a statistically significant effect on rural households' adult equivalent and per capita consumption of all items and the two measures of income. This is consistent with what we find in Section 1.5.2.2 for rural households using the two waves of data (ESS2 and ESS3).

Table 1.9 also shows that rural households who have reported illness of at least one member face a fall in adult equivalent and per capita food, nonfood, and total consumption. Despite the difference in the magnitude of effects on non-food and total consumption and the change in the effect of illness on food consumption from statistically insignificant to statistically significant, this result is also consistent with the result for rural households in the two waves of data (ESS2 and ESS3) (See Section 1.5.2.2). Again, the effect of illness is more or less robust to one more wave of data regardless of some differences in the size of the effect.

1.6.2. The effect of death measured between waves

Another source of death measurement is the death of any member of the household between the time intervals of two consecutive surveys. Given that we have three waves (ESS1, ESS2, and ESS3) that we can create a panel on rural and small-town households, this measure of death is available only for the two latest waves (ESS2 and ESS3) and for only rural and small-town households. There is a clear timing difference between this measure of death and the death measure considered in the previous sections. The result is reported in Table 1.10 separately for rural and small-town households.

Table 1.10. The effect of death between waves on adult equivalent income and consumption (small town versus rural sample)

	Rural subsample		Within R^2		Number of Obs.
	adult equivalent measure	per capita measure	A	P	
Food_con	.095**(.040)	-.057(.040)	0.463	0.497	6174
Nonfood_con	.259***(.062)	.106*(.061)	0.576	0.583	6174
Educ_con	-.284***(.062)	-.257***(.047)	0.463	0.432	6174
Total_con	.117***(.036)	-.034(.037)	0.499	0.528	6174
Unearned_inc	.101(.084)	.025(.067)	0.493	0.483	6477
Earned_inc	.007**(.004)	.002(.003)	0.807	0.968	6477
Total_inc	.008**(.004)	.002(.003)	0.806	0.968	6477
	Small town subsample				
Food_con	-.179(.319)	-.351(.346)	0.638	0.685	852
Nonfood_con	-.623***(.238)	-.777***(.269)	0.589	0.5988	852
Educ_con	.291(1.202)	.070(1.047)	0.537	0.518	852
Total_con	-.239(.306)	-.405(.334)	0.687	0.711	852
Unearned_inc	.835(.520)	.601(.440)	0.561	0.550	880
Earned_inc	.057(.047)	.037(.031)	0.777	0.897	880
Total_inc	.058(.049)	.035(.032)	0.755	0.873	880

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

Table 1.10 shows that following the death of at least one member between the two waves (ESS2 and ESS3) positively affects adult equivalent food and total consumption, adult equivalent and per capita non-food consumption, and adult equivalent earned and total income, while its

effect is negative on both adult equivalent and per capita expenditure on education for rural households. This result is not consistent with the effect of the measure of death considered in Section 1.5.2.2 on rural households' consumption and income. For small-town households, the death of at least one member between the two waves has a statistically significant negative effect on adult equivalent and per capita non-food consumption. This result on small-town households cannot be directly compared to the result on urban households in Section 1.5.2.2 as urban households also include households from medium and large towns.

1.7. Conclusion

In this study, we examine the consequences of death and illness on household income and consumption using two-year interval two waves of the Ethiopian Socioeconomic Survey. We exploit the panel nature of our data to estimate the effect of death and illness on real adult equivalent and per capita income and consumption for the entire sample, and across sub-samples using fixed effects.

For the whole sample, our result shows that death has a positive effect only on adult equivalent non-food and total consumption while illness negatively affects real adult equivalent and per capita food, non-food, and total consumption, and earned and total income. An increase in unearned income following illness provides partial compensation for the fall in earned income. This suggests that Ethiopian households as a whole could not able to insure their food and non-food consumption, and earned income against illness. However, the fall in consumption units following death overcompensates the costs associated with expenditures on medical and funeral services, and the loss in income that the survivors' adult equivalent non-food and total consumption increase for the whole sample. The positive association between death and non-food and total consumption is found to be significant only on adult equivalent measures. The evidence shows that the increase in non-food consumption is caused by the death of non-head members as the effect of head death is not significant on non-food consumption. On the other hand, compared with per capita measures, the effect of illness is found to be larger on adult equivalent measures of income and consumption.

The effects of death and illness on household income and consumption are mixed for sub-samples. The results indicate that death has negative effects on all of the following: adult equivalent and per capita education expenditure, per capita food and total consumption of urban households; adult equivalent and per capita non-food consumption and education expenditure of

female-headed households; and adult equivalent and per capita education expenditure, earned and total income of non-poor households. For urban households, the driver for the fall in food and total consumption is the death of the head, while the fall in education expenditure is caused by the death of other non-head members. Similarly, non-poor households' education expenditure falls due to the death of non-head members. Both deaths of the head and non-head members cause a fall in the earned and total income of non-poor households though the magnitude of the impact is more pronounced due to death of the head. In contrast, the fall in female-headed households' expenditure on education is brought by the death of heads while the fall in their non-food consumption is associated with the death of other non-head members.

Death has also a positive effect on adult equivalent and per capita unearned income of urban households, adult equivalent non-food and total consumption of male-headed households, adult equivalent and per capita education expenditure and total income, and per capita earned income of poor households. The positive effect of the death of both head and non-head members on unearned income fully compensates earned income for urban households. The increase in male-headed households' non-food and total consumption is caused by the death of non-head members. We can find a theoretical explanation for the positive effect of death on education expenditure and/or non-food consumption (Grimm, 2010). However, the effect of death on earned and total income of poor households is strange. This result is consistent with Porter (2012), who finds a positive association between death and rural households' wage income in rural Ethiopia. In fact, this unexpected increase in earned and total income is caused by the death of non-head members, not due to the death of the head. For poor households, not only income and education but also adult equivalent non-food and total consumption increase following the death of at least one non-head member of the household. Instead, when the head of poor households dies, their non-food consumption falls despite the increase in unearned income. When significant, death has larger impacts on adult equivalent measures of income and consumption on urban, poor and non-poor households. For male-headed households, death has significant effect only on adult equivalent measures of non-food and total consumption.

As to the effect of illness, the result shows that illness has negative effects on adult equivalent and per capita nonfood and total consumption of rural households; adult equivalent and per capita non-food consumption, earned and total income of female-headed and male-headed households; and adult equivalent and per capita earned and total income of non-poor households.

In addition, illness has positive effects on adult equivalent and per capita non-food consumption and unearned income and per capita total consumption of urban households, adult equivalent and per capita unearned income of male-headed households, and per capita earned and total income of poor households. The increase in urban households' non-food consumption following an illness is not uncommon in the literature as consumption of non-food items may be required of the ill member while convalescing or when the ill member is being treated at home rather than at health centers (Wagstaff, 2007). Even if illness affects non-poor households' income, they manage to insure their consumption against illness. We find evidence that illness has large negative consequences on rural and female-headed households' non-food consumption. It is clear from the results that one channel illness affects the non-food consumption of female-headed and male-headed households through the labor supply and the fall in earned and total income though male-headed households' earned income is partially compensated by increased unearned income following an illness. The effect of illness on income and consumption depends on whether income and consumption are measured in terms of per capita and adult equivalent terms and from subsample to subsample. For rural, male-headed, and non-poor households, illness has larger effects on adult equivalent measures of income and consumption. For urban and female-headed households, the magnitude of the effect of illness on per capita or adult equivalent measure depends on the outcome variable. Illness has a significant effect only on per capita measures of earned and total income of poor households.

One way or another, the majority of Ethiopian households couldn't manage to insure their income and consumption (of either measure) in the face of death and illness. Our results demonstrate that almost all groups of households suffer from a fall in consumption of one or more items and/or earned income following death or illness. The effect of death is more pronounced on urban and female-headed households' consumption. When looking at a disaggregated level, poor households suffer from a fall in food consumption following the death of the head. On the other hand, illness has larger adverse consequences on rural and female-headed households. The adverse consequence of death on urban, female-headed, and non-poor households' educational expenditure is alarming. This may affect human capital development, particularly when these groups of households use reduction of education expenditure or use of household members at school as coping strategies. Our results imply that the existing community-based health insurance should be expanded, and it is time to start the operation of the

legislated social health insurance program. And, both of these insurance programs should cover all of their target population and they should be accessible to all groups of households. Supplement to these insurance programs, a mechanism that incentives death-affected households with school-aged children not to withdraw their children out of school should be established.

Chapter 2

Death and illness coping strategies: Evidence from Ethiopian households

2.1. Introduction

Ethiopian households frequently experience death and illness. Like many households in developing countries, Ethiopian households suffer from adverse economic consequences of these health problems (Asfaw & Braun, 2004; Dercon, 2004; Dercon et al., 2005; Dercon & Krishnan, 2000). Death and illness may have devastating consequences on household welfare. Households may lose welfare from the deterioration in the health state of the household, lack of time spent on leisure, and/or fall in consumption of non-health goods and services following death and illness (WHO, 2009). Health shock consequences may be more severe in a low-income country where credit markets and health insurance mechanisms are absent (Dabla-Norris & Gündüz, 2014). This is the case in Ethiopia where access to credit and health and life insurance programs is limited. Households may suffer from the negative consequences of death and illness shocks in the short run and the long run. A full understanding of the consequence of death and illness shocks on both short-run and long-run welfare requires a knowledge of which coping strategies are used by households following these shocks (Khan et al., 2015). This is because the use of some coping strategies to protect the negative consequence of death and illness on current welfare may lead to negative consequences on long-run welfare (Dabla-Norris & Gündüz, 2014).

For households in low-income countries in general and Sub-Saharan Africa in particular, formal mechanisms are absent and households in these countries rely heavily on informal networks and self-insurance mechanisms to protect themselves against shocks (European Report on Development, 2010). In Ethiopia, households largely use self-insurance mechanisms and support from informal social networks such as relatives, friends, and neighbors to protect against the negative consequences of health shocks (Woldemichael & Gurmu, 2018). The use of informal networks and self-insurance mechanisms such as selling assets and child labor provide insufficient protection and may lead to negative long-run welfare effects by disrupting physical and human capital accumulation (Carter et al., 2007; Dabla-Norris & Bal Gündüz, 2014; Duryea et al., 2007; Flores et al., 2008). Stressing the importance of coping mechanisms, Khan et al. (2015), and Yilma et al. (2014) claim that current consumption insurability against any shock with no further analysis of how the protection is undertaken is misleading. The main objective of

this chapter is to comprehensively discuss how Ethiopian households cope with death and illness using large data set from two rounds of the Ethiopian Socioeconomic Survey.

The chapter proceeds as follows. Section 2.2 discusses the theoretical literature related to the topic. Data and methodology are discussed in Section 2.3. Section 2.4 presents the results. The chapter is concluded in Section 2.5.

2.2. Literature review

2.2.1. General literature

In developing countries where formal insurance and credit markets are imperfect, health shocks can impact households' labor supply and income, expenditure on health care, and eventually their consumption (for example see Asfaw & Braun, 2004; Dercon, 2004; Dercon et al., 2005; Dercon & Krishnan, 2000; Genoni, 2012; Islam & Maitra, 2012; Wagstaff, 2007). In their intent to maintain consumption intact, households may respond to health shocks by adopting feasible coping strategies that can be internal or external to the household. Copying strategies internal to the households may include depleting savings, selling assets, reducing or switching consumption, and labor adjustment by other members not affected by health shock, while borrowing from financial institutions or individuals, inter-household labor support, relying on the social security system and financial support from relatives or other household members of the social network are examples from the coping strategies external to households (Morduch, 1995; Yilma et al., 2014). Testing full consumption insurance or full consumption risk sharing involves testing the overall insurance mechanisms consisting of formal market mechanisms, informal (non-market mechanisms), and self-insurance mechanisms. Without distinguishing the effect of these different insurance mechanisms, any empirical work tests the hypothesis of complete consumption insurance (Dercon, 2002; Mu, 2006; Sawada, 2017). This justifies the need for analyzing coping strategies adopted by households experiencing health shock.

If they exist, well-functioning insurance markets and financial markets help households to better cope with the health shocks. Insurance institutions (formal or informal) help share the health shock risk across households. Health risks can be lowered ex-ante via formal health insurance coverage or ex-post through government transfer programs or informal remittances or gifts. The financial institutions also play their role in spreading the risk over time as households can save by anticipating potential health shocks ex-ante, or borrow and/or dissave once health shocks occur *ex-post.* However, credit and formal insurance markets are less unconstrained,

especially for poor households with low resource endowments. Informal risk management mechanisms may be available to poor households to protect against a fall in consumption even with constrained formal credit and insurance markets (Morduch, 1995). In many developing countries including Ethiopia, formal insurance markets are generally limited to protecting households against health shocks (Dercon, 2002; Heltberg et al., 2015; Woldemichael & Gurmu, 2018). In addition, tax-based public insurance systems and social protection programs are not accessible to the majority of people in developing countries where households tend to absorb health shocks themselves[16] and use informal risk-sharing strategies (like unconditional help from different sources, credit with low or high interest) from social networks such as relatives, friends, neighbors, and members of informal savings, credit and funeral associations (Dercon, 2002; Heltberg et al., 2015; Woldemichael & Gurmu, 2018). Households may use multiple coping strategies in response to a single shock and coping strategies may complement or substitute each other (Skoufias, 2003).

Levy (2002) summarizes how households cope with health shocks using mechanisms ranging from informal insurance arrangements and formal health insurance contracts to "self-insurance" by accumulating assets and by adjusting labor supply. Due to the existence of imperfections in insurance markets, households may choose informal insurance arrangements or "self-insurance" mechanisms. However, the role of the formal insurance mechanism should not be overstated in providing a buffer zone for the affected households. For reasons of not having full health insurance coverage for all health expenses or only small health expenses compared to the income loss, both households with and without insurance may be vulnerable to the economic risks associated with poor health (Levy, 2002). Therefore, entirely relying on formal health insurance is not always enough to protect households from health risks as it is a necessary but not sufficient mechanism to cope with such risks.

Available means of coping with health shock can be very costly in low-income countries as access to formal health insurance and credit institutions are not well-developed. Even if households' short-term consumption may be protected against health shocks by the use of coping strategies, at least partially, some coping mechanisms may have negative consequences on long-term consumption (Carter et al., 2007; Dabla-Norris & Bal Gündüz, 2014; Flores et al.,

[16] The reallocation of households' resources such as depleting own savings, selling durable and productive assets, using child labor and intra-household labor adjustments are termed self-insurance strategies (Nguyen et al., 2020).

2008). Households with no access to either informal support networks or formal credit and insurance markets may tend to reduce current consumption or use children or other members of the family as labor to cope with health shocks (Dhanaraj, 2016; Mitra et al., 2016; Quintussi et al., 2015). Quintussi et al. (2015) report that households in northern rural India use coping strategies that have long-term consequences such as the sale of assets and borrowing from moneylenders. Households in Vietnam adopt vulnerability-enhancing coping strategies such as loans, asset sales, and decreased education expenditures while they were able to smooth out total non-health expenditure against disability and morbidity shocks in the short run (Mitra et al., 2016). In Pradesh, India, households use borrowing (largely from informal credit), reducing consumption, and sending children to work as coping strategies against health shocks (Dhanaraj, 2016). However, using children as labor compromises human capital formation and capability for future consumption. Using data from rural Madagascar, Senne (2014) reports negative effects of adult mortality on children's educational outcomes over the short and the long run, which in turn affect the human capital accumulation and long-run earnings prospects for future generations. In addition, other self-insurance mechanisms to health shocks such as selling productive assets and borrowings could lead to a substantial fall in future earnings. Islam and Maitra (2012) report the sale of assets as a coping strategy for rural Bangladesh households experiencing adverse health shocks. Highlighting the importance of microcredit, Islam and Maitra (2012) report a lower likelihood of using productive assets against health shocks for those households who have access to microcredit. Using similar data from rural Bangladesh, Mirelman et al. (2018) report that households with adult non-communicable disease death are more likely to adopt reducing basic expenditures, depleting assets and savings, and high-interest loans- strategies that have long-term impacts on wellbeing and increase vulnerability to future shocks. Similarly, Damme et al. (2004) report that households use a combination of savings, selling consumables, selling assets, and borrowing money to finance out-of-pocket health expenditures following a dengue epidemic in Cambodia. Most households who used borrowing to finance health expenditures were found unable to settle the debts one year later and continued to pay high-interest rates (Damme et al., 2004).

Earlier evidence indicated the frequent applicability of informal insurance over market and state for coping with shocks. According to Morduch (1995), it is neither the state nor the market, but the informal insurance arising between individuals and communities on a personalized basis

that provides the bulk of coping mechanisms in developing countries. These informal and "self-insurance" mechanisms include drawing down savings, engaging reciprocal needs based on gift exchange, selling physical assets, and diversifying crop and income-generating activities. The author further argued that even if informal mechanisms are effective in reducing vulnerability, they can retard economic growth and social mobility. These types of strategies are costly for households as they may push households to vulnerability in the future.

The choice of a particular coping strategy depends on household characteristics, the characteristics of the shock-affected member, and the severity and duration of health shocks (De Weerdt & Dercon, 2006; Gertler & Gruber, 2002; Islam & Maitra, 2012; Mirelman et al., 2018; Sparrow et al., 2014). Following non-communicable death in the household, poor households are most likely to take out high-interest institutional loans in rural Bangladesh (Mirelman et al., 2018). Following one year after adult death in rural Madagascar, school-aged (6-18 years) orphans are 10 percentage points less likely to attend school than non-orphans, and this effect is more serious on girls, young orphans, and children from poor households (Senne, 2014). Once they develop new severe chronic health conditions, African-Americans deplete their wealth with a probability of 14%, while white-Americans wealth depletion is only 7% (Kim & Lee, 2005). Similarly, Kim (2006) using American data on elderly women report, that unmarried women deplete wealth more than married women once they experience new severe chronic health conditions. Using American data, Kim et al. (2012) report that new severe health events increase debt for middle-aged Americans (50-64 years), but not for Americans aged 65^{+} years. Shocks in general and health shocks, in particular, may force especially the poor to activate 'bad' coping responses that may perpetuate vulnerability (Heltberg et al., 2015). Higher-income households tend to use their savings in the event of adverse health shocks while households with little or no savings and income may use more diverse coping strategies (Semyonov et al., 2013; Leonard et al., 2017). Bardhan and Udry (1999) argue that poor households are likely to suffer the most because they do not have sufficient savings or their self-insurance coverage is inadequate to cope with the bad times. Dhanaraj (2016) reports that health shocks have the worst effects on households having elderly and disabled members, households with female heads, and poor and rural households in Pradesh, India.

Examining the mechanisms households use to cope with health shocks is important for policy. It helps to understand whether households facing the risk of health shocks use costly coping

strategies-strategies that increase their vulnerability to poverty in the future- or not. In cases where evidence of costly strategy usage is found, the policy prescription is clear- create a supportive environment for households to get access to affordable formal credit and health insurance (for example, microcredit and social security schemes by Dhanaraj, 2016; microcredit by Islam & Maitra, 2012). In line with this, in their theoretical framework Chetty and Looney (2006) argue that even if consumption is insured (or the drop in consumption is not much) against idiosyncratic shocks, welfare gain from access to insurance could be substantial for risk-averse households in developing countries. Risk-averse households could be already at the subsistence level of consumption and resist any further fall by adopting costly consumption coping mechanisms such as withdrawing children from school (Chetty & Looney, 2006).

2.2.2. The evidence for Ethiopia

There are few empirical studies in Ethiopia addressing how households cope with multi-shocks (Yilma et al., 2014), idiosyncratic income shocks (Alvi & Dendir, 2009), covariate, and idiosyncratic income shocks (Pan, 2009), and idiosyncratic health shocks (Woldemichael & Gurmu, 2018; Yilma et al., 2021). Refer to Section 1.3.3 for the categorization of shocks as a covariate and idiosyncratic. Yilma et al. (2014) examine how rural households of Ethiopia cope with covariate and idiosyncratic multi-shocks using cross-sectional data from Ethiopian Rural Household Survey and event history interviews. Households affected by relatively covariate natural and economic shocks resort to a reduction in saving and food consumption as a coping strategy, while households affected by relatively idiosyncratic health shocks (such as death, illness, and disability shocks) use savings, sale of assets, and borrowings to cope with (Yilma et al., 2014). Yilma et al. (2014) also find that transfers from families and friends play some role in insuring health but not other shocks. This finding refutes the risk-sharing hypothesis for idiosyncratic shocks, and that rural households absorb health shocks themselves.

By using three rounds of Ethiopian Urban Socio-economic Surveys data, and investigating whether urban households use private transfers and informal loans as risk-sharing instruments, Alvi and Dendir (2009) report that only private transfers respond to income risk proxies and serve the risk-sharing purpose, while informal loans fail to serve the risk-sharing purpose.[17] Even if both private transfers and informal loans augment low and uncertain incomes, these authors

[17] Alvi and Dendir (2009) consider unemployment of household head, and illness of household head as proxies of household income shock.

find that informal loans are largely dictated by household demand (proxied by household size) and household resources (proxied by household income). They view informal loans as a means to achieve the desired consumption goals of households with a tight budget and liquidity constraints, rather than serving as insurance or risk-sharing.

Pan (2009) uses panel data from Ethiopian Rural Household Survey to investigate the risk-sharing role of two types of transfers (transfers from government and NGOs, and transfers from relatives and friends including funeral associations) against covariate and idiosyncratic income shocks in rural Ethiopia.[18] Though the impact is limited, transfers from government or NGOs partially insure the effect of covariate but not idiosyncratic income shocks, while neither covariate nor idiosyncratic income shocks are insured through transfers from relatives, friends, and mutual supports such as funeral associations (Pan, 2009). In addition, Pan (2009) reports the redistribution role of transfers from both sources.

Using four rounds of Ethiopian Rural Household Surveys data and investigating informal risk-sharing against the health shocks in the presence of multiple risk-sharing networks, Woldemichael and Gurmu (2018) find no evidence of insurance from transfers of networks such as friends, neighbors, and members of informal associations against short-term and long-term health shocks for households in rural Ethiopia. However, transfers from other networks-networks along bloodlines such as extended family members are found to be serving the role of risk-sharing against long-term health shocks such as disabilities, but not against transitory health shocks like illnesses (Woldemichael & Gurmu, 2018).[19] Yilma et al. (2021) find that rural households smooth out current consumption against ill-health by using intra-labor substitution, borrowing, and depletion of assets as coping strategies.

2.2.3. Contributions of this chapter

Despite the five papers reviewed above, there is insufficient evidence of how Ethiopian households cope with death and illness. Our study contributes to filling existing gaps in the following ways:

1. Most studies analyze coping strategies following generic health shocks with no disaggregation into death and illness and other non-health shocks. In this study, we separately treat coping

[18] In Pan (2009), idiosyncratic health shocks are not explicitly discussed rather implicitly as components of idiosyncratic shocks that cause idiosyncratic income shocks.

[19] Woldemichael and Gurmu (2018) define the number of physical disabilities of household heads as long-term health shock, and the number of days the household head was unable to work due to illness as short-term health shock.

strategies for death and illness.

2. In addition to the overall sample, our study analyzes coping mechanisms across different sub-samples: urban and rural; female-headed versus male-headed; and poor versus non-poor. The studies in Ethiopia focus exclusively on households in rural areas except for Alvi and Dendir (2009) who study households from urban areas
3. Our study also differs from previous studies in Ethiopia as we consider a more comprehensive list of coping strategies households employ against death and illness. With the exception of Yilma et al. (2014), the literature on Ethiopia focuses on transfers as risk pooling devices. But the choice of risk pooling devices and coping strategies is not independent. As Pan (2009) convincingly argues, there is still a need for investigating comprehensive coping strategies against covariate and idiosyncratic income shocks in general, and idiosyncratic health shocks in particular.
4. Methodologically, Yilma et al. (2014) and others use univariate probit or logit to analyze coping strategies separately. Our analysis employs a multivariate probit model to account for the correlation among coping strategies.
5. Finally, our study differs from previous research as we examine the disaggregated components of help and sale of assets as coping strategies. We disaggregate help by the source of support, and sale of assets into the sale of productive and unproductive assets.

In short, this chapter seeks to answer the following questions:

1. What type of coping mechanisms are chosen by Ethiopian households as a whole against idiosyncratic death and illness?
2. Do these coping mechanisms by households against death and illness differ along sub-samples?
3. How are household and household head level characteristics associated with the probabilities of using coping strategies?

2.3. Data and methodology

2.3.1. Methodology

Households' decisions to employ one or more of the six coping strategies as a result of death and illness may be interdependent. Considering the five widely chosen active coping strategies and one aggregate coping strategy, we analyze what determines households' choice of coping strategies. Greene (2003) shows, that in this type of analysis, using univariate probit estimation

for each type of coping strategy produces biased and inefficient estimates due to the inability to control for unobserved factors and correlation of error terms of coping strategies. The error terms correlate when the choice of one coping strategy depends on the choice of the other. And, this dependence is likely as households could use a mix of coping strategies simultaneously following the risk of death and illness. For this reason, we use the seemingly unrelated multivariate probit model that takes into account the correlation of error terms across coping strategies (Arinloye et al., 2015; Goshu et al., 2013; Mehar et al., 2016; Nguyen et al., 2020).

The J (j=1…J=6) equation multivariate probit model is written as latent variable model:

$$Y_j^* = \propto_j + \theta_j' H_j + \beta_j' X_j + \varepsilon_j \quad (4)$$

$Y_j = 1$ if $Y_j^* > 0$ and 0 otherwise

Where,

- Y_j refers to the choice of strategy j by death and/or illness-affected households among the six choices of coping strategies. j stands for the six coping strategies, i.e., j=1 for using own savings, j=2 for using the sale of assets, j=3 for using unconditional help from different sources, j=4 for using credit, j=5 for using more labor, and j=6 for the aggregate measure of other coping strategies.
- H_j is a dummy for whether any household member experiences death or illness.
- X_j refers to household head and household-level characteristics.
- $\propto_j$, θ_j, and β_j are respectively constant, coefficients of death and illness, and coefficients of household level and household head level characteristics for each coping strategy.
- ε_j is a vector of error terms that are assumed to be multivariate normally distributed with mean zero, unit variance, and allowed to be correlated across alternative coping strategies in our multivariate probit model.

Evaluation of the cumulative probability for the multivariate probit model is difficult to solve analytically. Due to the high dimensionality of integration of the multivariate probit model, we resort to a numerical procedure to calculate the cumulative normal probability that involves solving integration of higher-order. A simulated maximum likelihood estimator (SML) is used to estimate the multivariate probit model following Cappellari and Jenkins (2003) and Roodman (2011). Estimation is carried out on the subsample of households reporting either death or illness. The simulation is conducted using a method called the Geweke–Hajivassiliou–Keane (GHK)

smooth recursive conditioning simulator using Stata version 14.2. Specifically, the simulation is carried out by using 1000 draws of the Halton sequence. Cappellari and Jenkins (2003) suggest the square root of the number of observations for which the simulation is needed as the length of the sequence to be drawn, while Roodman (2011) suggests twice the square root of the number of observations. We try both and the difference in the estimated coefficients is trivial.

To counter the potential challenge of heteroscedasticity, we cluster the standard errors at the community level. As a justification for the use of the multivariate probit model, we test the overall significance of the pair-wise correlation of error terms associated with households' choice of coping strategies. The rejection of the null hypothesis that all pair-wise correlation of error terms equals zero signifies that the multivariate probit model that takes into account the correlation between the error terms produces consistent and efficient estimates compared to alternatives like a multinomial model. Besides, estimation of the multivariate model requires no correlation among explanatory variables. This requirement is met if the value of the condition index is less than 30 (Belsley et al., 1980).

2.3.2. Data

The data used for our analysis comes from two rounds of the Ethiopian Socioeconomic Survey (ESS), collected as part of a joint project between the Ethiopian Central Statistical Agency (CSAE) and the World Bank's Living Standards Measurement Study- Integrated Surveys on Agriculture (LSMS-ISA). Our analysis in this chapter is based on 4954 households in the two waves (ESS2 and ESS3) of the ESS. Estimations are made conditional to households experiencing death or illness since our analysis involves households' decisions related to the choice of death and/or illness coping strategies. We restrict the sample to households with death and/or illness experience because households with no death and/or illness experience are not required to make any choice of coping strategies in the first place. A total of 1934 households experienced either death or illness in either wave. The attrition rate is 5.85% between ESS2 and ESS3. To counter attrition bias, our estimation is weighted. Refer to Section (1.4.2) for a detailed description and sampling procedures.

The ESS collects detailed individual, household, and community-level information on a broad range of topics. The information contained in each survey which is of special interest for this study includes different characteristics of the household head and the household, death and illness shocks experienced by any member of the household during the last year before each

survey, and the coping strategies adopted by households against death and illness ranked in order of importance from one to three. In the surveys, households were asked to indicate which coping strategy they have adopted following death and/or illness choosing from a total of twenty coping strategies suggested in the questionnaire. The questionnaire is flexible enough to allow households to choose three coping strategies in order of their importance following death and illness. We condense the twenty coping strategies into twelve and their description is given in Table 2.1. For the description of other variables (death, illness, and other covariates), refer Table1.1.

Table 11. Description of self-stated coping strategies against death and illness

Coping Strategy	Description
saving	Use of own saving
asset	Use of sale of agricultural, durable, land/building, crop stock, and livestock assets
help	Use of unconditional help from relatives/friends, government, and NGOs/religious institutions
credit	Use of borrowing from unspecified various sources
labour	Use of extra work from employed members and adults who were not working previously
educhealth	Use of reduction of expenditure on health and education
eatingpat	Use of changing eating patterns
migrate	Use of migration of household members
fishing	Use of intensified fishing
child_l	Use of sending children to live elsewhere
others	The use of other strategies
nothing	Use of spiritual efforts (such as prayer, sacrifices, and diviner consultations), and do nothing

Table 2.2 separately reports the distribution of self-stated coping strategies to cope with death and illness for the whole sample and subsamples. A considerable number of households did not use any active coping strategy or resorted to spiritual activities following death and illness. Among active coping strategies, many households facing death and illness used their savings, sale of assets, help from different sources, extra labor work, and borrowings. Coping strategies not frequently used include migration, intensive fishing, sending children to live elsewhere, changing eating patterns, and reduction of expenditure on health and education. Use of savings is reported by a large percentage of households that experience either death or illness, especially for urban, male-headed, and non-poor households. Even if all categories of households mostly reported the use of help from different sources following death and illness, female-headed households reported it more frequently than other groups of households. A higher percentage of poor, female-headed, and rural households reported the use of the sale of assets to cope with death. The use of credit is more frequently reported to cope with illness than death while the use of extra labor is more frequently reported to cope with death than illness.

Table 12. Coping strategies conditional to death and illness experience (% distribution)

Variable	Whole	Urban	Rural	Female	Male	Poor	Non-poor
	Coping strategies conditional to death experience						
saving	.265(.442)	.247(.433)	.275(.447)	.214(.411)	.299(.459)	.230(.422)	.311(.464)
asset	.220(.415)	.117(.322)	.279(.449)	.247(.433)	.202(.402)	.245(.431)	.187(.391)
help	.132(.339)	.105(.308)	.148(.355)	.175(.381)	.103(.305)	.106(.308)	.167(.374)
credit	.027(.162)	.022(.148)	.030(.170)	.017(.129)	.034(.181)	.018(.133)	.039(.194)
labor	.100(.301)	.141(.349)	.077(.268)	.144(.352)	.071(.257)	.089(.285)	.115(.320)
educhealth	.011(.107)	.002(.044)	.017(.129)	.019(.138)	.006(.079)	.013(.115)	.009(.094)
eatingpat	.022(.147)	.029(.167)	.018(.134)	.022(.148)	.022(.146)	.018(.132)	.028(.164)
migrate	.026(.160)	.055(.228)	.010(.102)	.035(.184)	.021(.143)	.031(.174)	.020(.142)
fishing	.000(.000)	.000(.000)	.000(.000)	.000(.000)	.000(.000)	.000(.000)	.000(.000)
child_l	.026(.159)	.033(.179)	.022(.146)	.019(.136)	.030(.172)	.032(.177)	.017(.131)
others	.056(.229)	.040(.197)	.064(.246)	.060(.238)	.052(.223)	.044(.204)	.071(.258)
nothing	.569(.496)	.671(.471)	.511(.501)	.567(.497)	.570(.496)	.572(.496)	.564(.497)
	Coping strategies conditional to the illness experience						
saving	.395(.489)	.479(.500)	.353(.478)	.361(.481)	.408(.492)	.320(.467)	.488(.500)
asset	.265(.441)	.102(.303)	.348(.476)	.173(.378)	.299(.458)	.290(.454)	.234(.423)
help	.172(.377)	.136(.344)	.190(.392)	.252(.435)	.143(.350)	.185(.388)	.156(.363)
credit	.076(.266)	.055(.228)	.087(.283)	.072(.258)	.078(.269)	.099(.299)	.049(.216)
labor	.057(.232)	.067(.251)	.052(.222)	.057(.232)	.057(.232)	.059(.236)	.055(.228)
educhealth	.023(.150)	.020(.139)	.025(.155)	.009(.094)	.028(.165)	.029(.169)	.015(.122)
eatingpat	.013(.114)	.008(.087)	.016(.125)	.014(.118)	.013(.113)	.016(.125)	.010(.099)
migrate	.005(.068)	.008(.091)	.003(.052)	.002(.042)	.006(.075)	.006(.076)	.003(.057)
fishing	.002(.041)	.000(.000)	.003(.051)	.002(.044)	.002(.041)	.000(.018)	.003(.058)
child_l	.006(.074)	.002(.044)	.007(.086)	.004(.061)	.006(.079)	.005(.073)	.006(.076)
others	.052(.223)	.072(.258)	.042(.202)	.060(.238)	.050(.217)	.046(.210)	.060(.238)
nothing	.443(.497)	.497(.500)	.415(.493	.505(.500)	.420(.494)	.460(.499)	.422(.494)

Note: the numbers in the bracket are standard errors. The summary for coping strategies is conditional upon the household facing either death or illness. The mean values and standard errors are weighted.

For the sake of our empirical analysis, we regroup the twelve coping strategies described in Table 2.1 into six (five coping strategies with a high frequency of usage and one aggregate coping strategy). The five active coping strategies with a high frequency of usage are own saving, sale of assets, unconditional help (from the government, individuals, NGOs, and religious institutions), credit, and extra labor work. The sixth aggregate coping strategy consists of low-frequency responses (reduction in expenditure on health/education, change in eating patterns, migration, intensive fishing, sending children elsewhere, and other unspecified responses) and doing nothing including spiritual activities. The source of credit is mainly informal in Ethiopia. According to ESS3, about 23% of surveyed households received credit during the last year of the survey period. Of all households who took credit during the survey, about 43%, 27%, and 9.5% of households reported that the source of their credit is relatives, microfinance, and neighbors respectively. In addition, respectively about 5% and 3% of households borrowed from local merchants and moneylenders (ESS3 report, 2017). Few households borrowed from commercial banks, religious institutions, and employers. Informal

credit sources are highly expensive. The next major source of credit comes from microfinance institutions that also charge higher interest rates compared to other commercial banks in Ethiopia as they serve the high-risk market segment. Additional labor hours come from extra labor work of the existing working members of the household, and when adults who were not working start working.

2.4. Presentation of results

2.4.1. Coping strategies for the whole sample

As noted, households may use one or a combination of coping strategies to avoid or reduce the adverse effects of death and illness once they experienced them. The choice and effectiveness of coping strategies depend on the resource endowment of households. These resources can be human and physical capital (Gertler & Gruber, 2002), access to financial markets (Islam & Maitra, 2012), and social capital or networks of family, friends, and the like (De Weerdt & Dercon, 2006). The choice of the available coping strategies, in turn, could have consequences on the long-term welfare of households (Carter et al., 2007; Dabla-Norris & Bal Gündüz, 2014; Flores et al., 2008). Table 2.3 shows the estimated likelihoods of the six coping strategies used following death and illness. The death of at least one household member is significantly associated with the use of three coping strategies. These three coping strategies jointly used are the sale of assets, extra labor from currently working members and adult members who were not previously working, and others (aggregated coping strategies). For the sample as a whole, the death of at least one member jointly increases the probabilities of using the sale of assets, extra labor employment, and others as coping strategies by 10.1, 6.2, and 19.3 percentage points respectively. The death of at least one member does not have a statistically significant effect on the probabilities of using savings, help, and credit.

Table 2.3 also shows that three coping strategies are significantly associated with the experience of the illness of at least one member. The prominent coping strategy following an illness is the sale of assets. Illness increases households' propensity to use the sale of assets as a coping strategy by 12.9 percentage points. In addition to the sale of assets, households try to cope with illness using credit and help from different sources: illness increases the probabilities of using help and credit as coping strategies by 8.8 and 8.2 percentage points respectively. Households resort to using the three illness coping strategies simultaneously because one type of strategy is insufficient to provide enough protection. Illness does not have a statistically

significant effect on the probabilities of using saving, labor, and others as coping strategies.

As a coping strategy, the use of help from various sources and precautionary saving is preferable as their use does not have much consequence on long-term welfare (Binnendijk et al., 2012). Help from the government or other private sources is preferable because it does not affect households' long-term welfare as the terms of help are unconditional supports from individuals (relatives and friends), the government and NGOs, or religious institutions. Households who are beneficiaries of unconditional help do not have the obligation to pay back the support in any form once the risks of death and illness are over. Heltberg and Lund (2009) argue that savings, labor markets, social assistance, and access to formal non-exploitative sources of credit are better ex-post coping strategies. Conditional to the hours worked by adults who are currently working and the type of employment, extra labor work as a coping strategy is acceptable in terms of its effect on welfare (Heltberg & Lund, 2009). For households as whole, households experiencing death and/or illness simultaneously adopt three coping strategies, although the combination of strategies differs between death and illness. The result indicates that regardless of how effective the coping strategies are against death and illness to maintain current consumption, households experiencing either death or illness may suffer from loss of long-term consumption. In this regard, our evidence indicates that the use of assets and credit (with a relatively high-interest rate in Ethiopia) as coping strategies may cause loss of welfare in the future. Our results are similar to other studies such as Dhanaraj (2016), Heltberg et al. (2015), and Islam and Maitra (2012).

Table 13. Marginal effects of death and illness on the choice of coping strategies (Whole sample) [20]

	Coping strategies against death and illness					
	saving	asset	help	credit	labor	Others
Death	-.034(.058)	.101*(.053)	.023(.040)	.003(.033)	.062***(.024)	.193***(.066)
illness	.096(.066)	.129**(.053)	.088*(.045)	.082**(.040)	.043(.028)	.032(.067)
Sample size	1934					
No. of draws	1000					
Wald chi2	425.52					
Prob>chi2	0.000					

*Note: The values in parenthesis are standard errors. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.*

Our analysis so far uses aggregated measures of help from different sources and the sale of different assets. To get a clear picture of which types of assets are widely utilized as a coping strategy against death and illness, we classify assets used as coping strategies into productive

[20] The effects are calculated for each observation in the data and then averaged. Thus, the estimated effects are average marginal effects.

assets (such as agricultural assets, land/building, and livestock) and unproductive assets (durable assets and crop stocks). A separate analysis of productive and unproductive assets tells us how large the indirect effect of death and illness is on households' long-term welfare. In addition, a separate analysis of help strategy from three sources of support- relatives and friends, government, and non-governmental and religious institutions, is important to know the role played by each source of support to cope with death and illness. Univariate probit is used for estimation, and the marginal effects are estimated in Table 2.4. We cannot estimate the multivariate probit model due to the difficulty of computing probabilities for additional dimensions.

Table 14. Marginal effects of death and illness on different components of assets and help as coping strategies (Whole sample)

	death	illness	Obs.	Pseudo R^2	Wald chi2	Prob>chi2
Productive asset	.076*(.045)	.084(.054)	1934	0.087	74.88	0.000
Unproductive asset	.017(.040)	.005(.047)	1934	0.044	27.91	0.003
Individuals help	.033(.032)	.079**(.038)	1934	0.074	59.56	0.000
Government help	-.044(.030)	-.008(.034)	1934	0.070	30.68	0.001
NGO/ religious inst. help	.010(.012)	.043**(.018)	1934	0.0544	41.16	0.000

*Note: The values in parenthesis are standard errors. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.*

Table 2.4 shows that households experiencing death use the sale of productive assets as a coping strategy while support from individuals (relatives and friends) and NGO/religious institutions, is used to cope with illness. For the group of households with death experience, the option of support from individuals, government and NGOs, or religious institutions does not achieve statistical significance. Households with an illness experience do not appear to use help from the government. Contrary to the effect on the sale of aggregated assets, illness does not have a significant effect separately on the sale of productive and unproductive assets. What is worrying for households' long-term welfare is their use of productive assets to cope with death. The result shows the scant importance of support from the government, NGOs, and religious institutions to death-affected households while support from individuals, NGOs, and religious institutions respond positively to illness events.

2.4.2. Coping strategies for subsamples

To examine whether households experiencing death and/or illness choose different coping strategies depending on their characteristics, we extend the analysis by classifying households based on their place of residence, relative economic status, and gender of the household head.

The marginal effects of death and illness are reported in Table 2.5. The marginal effects of additional covariates are annexed (Appendix 7, 8, & 9). We label these covariates 'control covariates' to distinguish them from the main determinants of interest, namely the occurrence of death and illness.

Table 15. Marginal effects of death and illness on the choice of coping strategies (subsamples)

	Urban		Rural		Female_h		Male_h		Poor		Non-poor	
	death	illness	death	illness	death	illness	death	illness	death	illness	death	illness
Saving	-.086	.086	.015	.107*	-.050	.093	-.010	.089	.039	.093	-.105*	.097
	(.056)	(.063)	(.061)	(.063)	(.060)	(.061)	(.062)	(.066)	(.062)	(.063)	(.060)	(.065)
Asset	.177***	.092**	.012	.110*	.128***	.117***	.082	.140***	.085	.129**	.102**	.127***
	(.048)	(.043)	(.061)	(.058)	(.051)	(.046)	(.058)	(.056)	(.054)	(.055)	(.052)	(.049)
Help	.037	.071*	.012	.091**	-.000	.088*	.027	.083**	.006	.089**	.032	.081**
	(.042)	(.040)	(.044)	(.046)	(.054)	(.047)	(.038)	(.042)	(.041)	(.045)	(.042)	(.042)
Credit	-.001	.070	-.000	.082**	-.014	.069**	.022	.081**	-.012	.092**	.020	.060**
	(.032)	(.035)	(.033)	(.040)	(.029)	(.034)	(.033)	(.041)	(.037)	(.045)	(.023)	(.028)
Labor	.074**	.051*	.050***	.031	.091***	.046	.050**	.043	.056**	.043	.068***	.046
	(.036)	(.032)	(.020)	(.024)	(.033)	(.030)	(.025)	(.030)	(.025)	(.029)	(.027)	(.030)
Others	.136*	.023	.233***	.041	.173***	.023	.204***	.036	.163***	.025	.233***	.032
	(.075)	(.068)	(.068)	(.068)	(.068)	(.063)	(.063)	(.067)	(.061)	(.064)	(.070)	(.065)
Sample	971		1402		880		1493		1240		1133	
Draws	120		1000		1000		1000		1000		1000	
Wald chi2	346.59		596.76		301.96		361.63		300.04		306.88	
Prob>chi2	0.000		0.000		0.000		0.000		0.000		0.000	

*Note: The values in parenthesis are standard errors. *** Significant at 1%. ** Significant at 5%. * Significant at 1%.*

To cope with death, urban households simultaneously activate three coping strategies - the sale of assets, employing extra labor, and other aggregated strategies. The death of at least one member for these households increases the probability of using the sale of assets, extra labor employment, and other strategies by 17.7, 7.4, and 13.6 percentage points respectively. Similarly, death increases female-headed households' likelihood of using asset sales, extra labor, and other strategies. Death has similar effects on the probabilities of choosing these three strategies for non-poor households. In fact, death lowers non-poor households' likelihood of using savings by 10.5 percentage points. Rural, male-headed, and poor households jointly activate only the use of extra labor employment and other strategies following death. Besides, Table 2.5 shows that households in all subsamples activate neither credit nor help to cope with death. The results in Table 2.3 and Table 2.5 also show that the remaining coping strategies named others- including lowering education/health expenditure, changing the pattern of consumption, migration of adults and children, intensive fishing, spiritual activities, and doing nothing respond positively to death events for the whole sample and all subsamples. These strategies are mostly passive. Lokshin and Yemtsov (2004) argue that strategies such as do nothing and change in consumption patterns are passive, and may lead to marginalization and

enhance poverty. The result for control covariates (reported in Table 2.6) shows that the poor and households who live in urban areas are more likely to adopt these passive strategies.

On the other hand, illness increases the likelihood of using the sale of assets, help, and extra labor employment as a coping strategy for urban households. Female-headed, male-headed, poor, and non-poor households with illness experience resorting to the joint use of the sale of assets, help, and credit. Moreover, illness-affected rural households use saving in addition to those three strategies. With the exception of the use of saving by rural households and extra labor employment by urban households, illness does not have a significant effect on the likelihood of using savings, extra labor, and other strategies. The use of assets and credit as a coping strategy by illness-affected households is concerning for future welfare. The likelihood of using credit to cope with illness is particularly higher for rural and poor households. As formal credit for consumption smoothing is scant in Ethiopia, the source of credit to be used as a coping strategy against illness would be largely from informal expensive sources.[21] Indeed, government-affiliated formal microfinance institutions charge high-interest rates, and they usually give micro-credit for developmental purposes, not for consumption smoothing. Like the sale of assets, informal expensive credit may affect the future welfare of rural and female-headed subsamples of households. Borrowing and the sale of assets are forms of distress financing that multiply the impact of suffering from the health shock (Kruk et al., 2009). The welfare of households adopting these types of strategies is impacted via changes in consumption patterns, loss of income earning due to loan repayment with interest rates, and loss of productive capacity due to the sale of assets (Dilip & Duggal, 2002). The joint use of help from different sources- a coping strategy with minimal negative effect on the future welfare of households- is jointly activated by all groups of households experiencing illness. However, with the exception of urban households, households in other subsamples experiencing illness do not activate extra labor work as a coping strategy despite its minimal adverse consequence with conditions.

The use of saving, sale of assets, extra labor employment, and credit as illness coping strategy by rural households is largely consistent with the study by Yilma et al. (2014), and Yilma et al. (2021). However, contrary to the study by Yilma et al. (2014), we do not find evidence of the use of help as a coping strategy by illness-affected rural households. Our finding of no role of help

[21] Yimer (2019) classify the informal credit sources in Ethiopia into three: credits from friends and families; credits from moneylenders and; credits from traditional financial institutions such as Eqqub and Iddir.

from various sources to cope with death and illness of rural households is also in line with the study by Woldemichael and Gurmu (2018), which reports no role of transfers from bloodline and non-bloodline networks on transitory health shock. The finding of Pan (2009) on the role of transfers from different sources on idiosyncratic income shocks of rural households is also similar to our finding. Concerning urban settings, the study by Alvi and Dendir (2009) is in line with our finding of no role of credit as a coping strategy. Similarly, the result that urban households' use of help to cope with illness confirms Alvi and Dendir (2009) who report the use of private transfers to cope with income shock proxies for urban households.

2.4.3. The role of control covariates

Table 2.6 shows the marginal effects of control covariates on the probability of using the six coping strategies for the whole sample. The probability of using own saving strategy is higher for households whose heads are married and more educated. This is not surprising as the income earning and the tendency to save is higher for households with married and educated heads compared to households with unmarried and less-educated heads. Poor households and households characterized by a more male-to-female ratio and aged heads are less likely to use saving as a coping strategy. This is because poor households and households with aged heads have lower income earnings to save in the first place. However, it is not clear why male-dominated households have a lower probability of using saving strategies.[22]

Table 16. Marginal effects of control covariates on the choice of coping strategies (Whole sample)

Control covariate	saving	asset	help	credit	labor	others
hhsize	.010(.007)	.017***(.005)	-.010**(.005)	.006*(.004)	.011***(.003)	-.014**(.006)
educ_h	.008*(.004)	-.007**(.003)	-.008*(.004)	-.003(.003)	.001(.002)	-.001(.005)
age_h	-.002***(.001)	.000(.001)	.002**(.001)	-.000(.001)	.000(.000)	.001(.001)
female_h	-.004(.042)	-.005(.038)	.014(.038)	.027(.021)	.005(.020)	-.002(.043)
married	.111***(.043)	.061(.046)	-.053(.035)	.025(.020)	-.039**(.018)	-.036(.046)
urban	.070(.044)	-.217***(.053)	-.018(.036)	-.007(.030)	.009(.023)	.098*(.057)
Poor-dev	-.133***(.034)	.004(.031)	-.003(.023)	.032*(.018)	-.000(.013)	.071**(.035)
dependencyratio	.059(.065)	-.166**(.071)	.111**(.051)	-.043(.036)	-.095***(.037)	.081(.078)
maleratio	-.223***(.077)	-.027(.075)	-.027(.051)	.055(.043)	.055*(.030)	.069(.078)
No. of obs.	1934					
Draws	1000					
Wald chi2	425.52					
Prob>chi2	0.000					

*Note: The values in parenthesis are standard errors. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.*

[22]For the pooled sample, male-dominated households are associated with less dependency ratio. It could be the case that these groups of households choose to have extra labor work rather than deplete savings as coping strategy.

Households who live in urban areas, and have more dependency ratio and educated heads are less likely to use assets as a coping strategy. However, large size households are more likely to use the sale of assets as a coping strategy. The probability of using help from various sources as a coping strategy increases with the age of household heads and dependency ratio, while this probability is lower for households headed by educated heads and households with large family sizes. Households with educated heads are aware that using the sale of assets as a coping strategy has consequences on long-term welfare that the probability to pursue this strategy is lower. Besides, households with educated heads do not ask for help because it could take away their experienced autonomy (Bonfrer & Gustafsson-Wright, 2017). The probability of using credit as a coping strategy is higher for poor households and large size households. Households that have a large family size and a higher male-to-female ratio are more likely to use extra labor employment to cope with death and illness. The likelihood to use more extra labor employment is lower for households with married heads and a high dependency ratio.

2.5. Conclusion

In a developing country like Ethiopia, with limited formal health insurance and financial markets, households mostly rely on costly coping strategies to cope with the consequences of death and illness. In this study, we examine how Ethiopian households cope with death and illness using two rounds of Ethiopian Socioeconomic Survey data. We estimate the multivariate probit model and show that households experiencing either death or illness jointly activate a combination of two or more of the six possible coping strategies. Sampled households as whole, urban, female-headed and non-poor households jointly use the sale of assets, extra labor employment, and other aggregated strategies as a coping strategy following death while rural, male-headed, and poor households jointly activate the use of extra labor employment and other strategies. Common for all households with death experience is the use of extra labor employment and other coping strategies mostly consisting of spiritual activities and doing nothing. The sale of assets is also more frequently used by urban, female-headed, and non-poor households experiencing death. In fact, death does not have a significant effect on the likelihood of using savings (with the exception of non-poor households), credit, and help as coping strategies. Use of saving (precautionary saving), unconditional help, and extra labor work are accepted to be coping strategies with no severe consequences on the long-term welfare of households (Binnendijk et al., 2012; Heltberg & Lund, 2009). However, support from

individuals and NGOs/ religious institutions, not from the government plays some role in combination with other coping strategies to cope with illness.

On the other hand, households as a whole, and female-headed, male-headed, poor, and non-poor households jointly activate three illness coping strategies- sale of assets, help from different sources, and credit, while urban households use the sale of assets, help, and extra labor employment instead of credit. Rural households use saving in addition to the three illness coping strategies (sale of assets, help, and credit). In general, illness coping strategies common to all groups of households include the sale of assets, help, and credit (with the exception of urban households). In comparative terms, death generally leads to the use of extra labor work and other coping strategies such as spiritual activities and doing nothing, while illness leads to the use of the sale of assets, help, and credit as coping strategies.

Our study mostly confirms previous studies in Ethiopia i.e., Pan (2009), Woldemichael and Gurmu (2018), Yilma et al. (2014) and Yilma et al. (2021) in rural Ethiopia, and Alvi and Dendir (2009) in urban Ethiopia. The use of coping strategies such as the sale of assets and expensive credit to protect against the negative consequences of death and illness in the short-term could have repercussions on long-term welfare as the use of these strategies may damage households' capability to generate future income (Damme et al., 2004; Flores et al., 2008; Mirelman et al., 2018; Sparrow et al., 2014). The evidence shows that Ethiopian households use the productive type of assets for coping purposes. Our findings, therefore, ring an alarm bell, namely that households experiencing either death or illness may struggle in the long term following the use of the sale of assets as a coping strategy. In addition, the use of credit may also lead to negative consequences on households' long-term welfare. This is a possibility as the source of credit for Ethiopian households is largely informal and the credit terms are in favor of the lenders. In this respect, with the exception of urban households, other groups of households experiencing illness use credit and may suffer in the long term.

Protecting households against welfare-impeding consequences of using costly coping strategies against death and illness should feature high on the policy agenda. As a policy option, we suggest that expanding the existing community-based health insurance and rolling out the legislated social health insurance program should be the priority in Ethiopia's health system. As a complement to health insurance, the provision of affordable micro-credit services from government-affiliated microfinance institutions to households in need of credit could protect

households from exploitative informal lenders, particularly in the occurrence of illness. Finally, the government could play its part by strengthening the social protection program, particularly for vulnerable households during bad health events.

Chapter 3

Disability and its consequence on consumption and the decision to join community-based health insurance: Evidence from Ethiopian households

3.1. Introduction

The prevalence of health shocks in general and disabilities, in particular, have consequences on households' economic wellbeing (Asfaw & Braun, 2004; Dercon, 2004; Dercon & Krishnan, 2000; Genoni, 2012; Islam & Maitra, 2012; Mitra et al., 2017; Simeu & Mitra, 2019; Wagstaff, 2007; WHO, 2009). Disability has a more severe impact on households in developing countries where there are insufficient health insurance and social protection programs (Dabla-Norris & Bal Gündüz, 2014). Not only higher health expenditure and a fall in labor supply or productivity, households with disabled members particularly in the least and middle-income countries face expenditures on accessing information and extra costs on items commonly consumed by both disabled and non-disabled members of the household (Zaidi & Burchardt, 2005). The economic repercussions of disability get worse with the severity of the disability (Loyalka et al., 2014; Mitra, 2018; United Nations, 2019).

To reduce out-of-pocket health expenditure and increase health service utilization for citizens in the informal and agriculture sectors, the government of Ethiopia piloted the Community Based Health Insurance (CBHI) program in 2011, as noted in the previous chapters. Recall that the program started as a pilot in 13 Woredas (districts) in four regions, and the CBHI was expanded to other Woredas in 2014. By 2020, it covered about 75% of the 1100 estimated Weredas in the country. About 37% of households in the informal sector are enrolled in the CBHI in 2020 (EHIA, 2020). CBHI is a publicly subsidized scheme, and participation in the program by households is voluntary. Member households pay a premium that varies from region to region to get inpatient and outpatient health care services at local health centers and referral hospitals. Average household monthly premium contributions are about 2-3% of household monthly income, and the central government subsidizes a quarter of the premium while regional and district governments contribute to cover the costs of insuring 10% of the poorest populations to become members of the scheme with no premium payment (EHIA, 2020; Mebratie et al., 2015).

Covering the fee waiver for the growing poor without premium contribution, low premium payment compared to schemes in other African countries, and a less than full enrollment in the program are challenges threatening the scheme's financial sustainability. The financial sustainability of the CBHI scheme also hinges on the quality or health state of households who have joined the program. In other words, the possibility of adverse selection needs to be assessed to restructure the scheme sustainably. Our aim in this chapter is to examine if there is a disability-induced adverse selection in the CBHI.

We use the Ethiopian Socioeconomic Survey disability data defined and measured following the recommendations from the Washington Group's Disability Statistics to analyze the impact of having disabled members in a household on consumption and the choice of the CBHI scheme. The rest of the chapter is organized as follows. Section 3.2 discusses the literature related to the topic. Data and methodology are discussed in Section 3.3. Section 3.4 presents the results. The chapter is concluded in Section 3.5.

3.2. Literature Review

3.2.1. Conceptualizing disability

Disability is a complex occurrence to define and measure (Altman, 2016; Mitra, 2008). There are two popular models for conceptualizing disability- the medical model and the social model. The medical model conceptualizes disability as a physical, mental, or psychological condition that limits a person's activities (Mont, 2007). In the recent literature, the more comprehensive and widely accepted social model replaces the medical model. The social model defines disability as the outcome of the interaction of one's functional status with the physical, cultural, and policy environments (Braithwaite & Mont, 2009; Mont, 2007).

Drawing upon the social model, the International Classification of Functioning, Disability, and Health (ICF) of the WHO conceptualizes disability as an outcome of activity limitations and restrictions placed upon participation that originates from the interaction between body structure, functional limitations, and an unaccommodating environment (WHO, 2001; WHO & WB, 2011). The Washington Group on Disability Statistics of the United Nations Statistical Commission uses an operational proxy to practically implement the conceptualization of disability outlined by the ICF. The Group recommends activity limitations to the presence of

difficulties in a core set of basic activities (Mont, 2007; Trani & Loeb, 2012).[23] The six core sets of basic activities included in the measure of disability are seeing, hearing, mobility, cognition, self-care, and communication. In this sense, disability is defined as activity limitation in basic actions due to functional limitations associated with an individual's physical, mental or sensory impairment, and the non-enabling physical, cultural, and policy environments.

3.2.2. Disability and household consumption

The prevalence of health shocks in general, and disabilities in particular, has consequences on households' economic wellbeing through its effect on household income and additional costs of living including extra health expenditures (Asfaw & Braun, 2004; Dercon, 2004; Dercon & Krishnan, 2000; Genoni, 2012; Islam & Maitra, 2012; Mitra et al., 2017; Simeu & Mitra, 2019; Wagstaff, 2007; WHO, 2009; Yilma et al., 2021). As documented in chapter one for illness, households' earned income decreases when the disabled and the caregivers are working-age household members. The drop in earned income due to disability may be compensated by an increase in unearned income when other households help the household with disabled member(s) (Wagstaff, 2007). The fall in labor force participation and employment of the disabled and their caregivers may affect household income especially when there are no disability benefits to compensate for reduced labor market activity (Wagstaff, 2007; WHO & WB, 2011).

In addition to the fall in earned household income, households with disabled members allot additional expenditures to diagnostic and health care services, purchase of assistive devices or opportunity cost of personal assistance, modified residences, dietary requirements for the disabled, and transportation costs (Asuman et al., 2020; Mont & Nguyen, 2013; Minh et al., 2015; Mitra et al., 2017; United Nations, 2019). Households with disabled members particularly in the least and middle-income countries also face expenditures on accessing information and extra costs on consumption items commonly consumed by both disabled and non-disabled members of the household (Zaidi & Burchardt, 2005). The consequence of economic outcomes

[23] The Washington Group's Short Set of questions on the six core functional domains adapted by the Ethiopian socio-economic survey questionnaire are as follows: 1. Do you have difficulty seeing, even if wearing glasses? 2. Do you have difficulty hearing, even if using a hearing aid? 3. Do you have difficulty walking or climbing steps? 4. Do you have difficulty remembering or concentrating? 5. Do you have difficulty with self-care (such as washing all over or dressing, feeding, toileting etc)? 6. Do you have difficulty communicating such as understanding or being understood? A four-level scale (no difficulty, some difficulty, a lot of difficulty and cannot perform activity at all) is used to answer these six questions to capture individuals' degree of functional difficulty in the six domains.

of disability gets worse with the severity of disability (Loyalka et al., 2014; Mitra, 2018; United Nations, 2019).

Households with disabilities may suffer welfare losses both in the short run and long run due to the fall in household income, extra expenditures, and costly coping strategies employed associated with disability. Eventually, the state of disability may expose households to poverty. A disability may also affect human capital accumulation as schooling opportunities are limited for children with disabilities (El-Saadani & Metwally, 2019; Filmer, 2008; Lamichhane & Kawakatsu, 2015; Mizunoya et al., 2018). Limited schooling and human capital in turn affect productivity, earning, and employment opportunities at the adulthood stage (Filmer, 2008; Mitra, 2018; Mitra & Sambamoorthi, 2009; Mitra et al., 2013). Individuals with disabilities are usually stigmatized and discriminated against so that their participation in economic, social, and political activities is limited (Groce et al., 2011; Yeo & Moore, 2003). As a result, persons with disabilities face the danger of multiple economic deprivations compared with persons without a disability due to the many systemic factors including institutional, cultural, and environmental barriers that could inhibit the participation of disabled persons (Asuman et al., 2020; Mitra et al., 2013).

The evidence is mixed worldwide concerning the effect of disability on household assets, living conditions, employment status and wage difference, income, and consumption. Data from different countries show that persons with disabilities and their households are more likely to be food insecure, poor (in traditional poverty measures such as income, expenditure, and assets), multidimensionally poor, and bear extra costs, and the likelihood increases with the severity of difficulty (Mitra, 2018; Mitra & Yap, 2021; United Nations, 2019). Using males with and without disability data from rural India, Mitra and Sambamoorthi (2008) find that persons with disabilities are less likely to be employed than non-disabled persons, while there is no wage gap between the two groups. Kvist et al. (2013) find that the presence of disabled children with an attention-deficit disorder in Danish households reduces parental socioeconomic status by lowering their labor supply and earnings. Similarly, Zhu (2016) finds that mothers of disabled toddlers and infants face employment disadvantages relative to mothers of non-disabled children in Australia. Meyer and Mok (2019) find that ten years after the onset of disability for male household heads aged 22 to 61 years, earnings, family food, and housing consumption falls for those with chronic and severe disability in the U.S. Analysis of the world health survey data for

15 developing countries shows that disability is associated with higher multidimensional poverty, lower educational attainment, lower employment rates, and higher medical expenditures (Mitra et al., 2013). Mitra et al. (2013) also find that among the disabled persons, those aged 40 and above and those with multiple disabilities are more likely to be multi-dimensionally poor. Similarly, Mont and Nguyen (2011) find that disability is correlated with poverty and lower educational attainment in Vietnam. Using South African data, Loeb et al. (2008) document that households with disabled members have a higher income than households without disabled members primarily due to the allocation of disability grants, while households without disabled members are better in terms of educational and employment outcomes. Similarly, mean monthly salary, education, and employment outcomes are lower for persons with disabilities in Malawi (Loeb & Eide, 2004). At the household level, households with disabilities have lower employment, household income, housing standard, and access to information in Malawi (Loeb & Eide, 2004). Mitra (2008) finds lower employment and labor participation of persons with disabilities in South Africa. In Zambia, the mean monthly salaries of persons with disabilities are not statistically different from persons with no disabilities, while education attendance and employment are lower for persons with disabilities (Eide & Loeb, 2006). In Zimbabwe, lower education attendance is found for disabled persons, while there is no statistically significant difference between persons with disabilities and without in terms of employment and mean monthly salary (Eide et al., 2003). However, Eide et al. (2003) report that households with disabled members score lower than households without in terms of housing standards, access to information, and in terms of some measures. Palmer et al. (2018) find that having a member with disabilities has an estimated direct cost of about 19% of the monthly household consumption, and considering this direct cost of disability doubles the poverty rate amongst households with disabled members (from 18% to 37%), and increases the poverty gap from 3% to 8% in Cambodia. Evidence from Zambia and Afghanistan shows that people with disability have lower access to health care, education, and labor market participation (Trani & Loeb, 2012).

In Ethiopia, about 15 million individuals (17.6% of the population) consisting of children, adults, and the elderly are estimated to be disabled (WHO & WB, 2011). Few studies investigate the impact of disability (measured in various forms) on household income, consumption, and wealth in Ethiopia. Using activity limitations (without relating to any functional domain) of the daily living (ADL) index, Yilma et al. (2021) find that households in rural Ethiopia face

increased health care expenditure and a fall in agricultural productivity but no change in current consumption following activity limitations. Hailemichael et al. (2019) use data from Sodo district of Ethiopia and find that households with members having a severe mental disorder or depression have lower income, consumption, and asset compared to households with no severely mentally disordered or depressed members. Mitra and Yap (2021) use the third wave Ethiopian socioeconomic data (ESS3) and show that disabled adults aged 15 and above have a higher multidimensional poverty headcount, a higher share of less than primary school, a lower employment-population ratio, lower safely managed drinking water and sanitation, and lower assets compared to adults with no disabilities. Similarly, Mitra (2018) uses first-wave socioeconomic survey data (ESS1) from rural Ethiopia and finds that households with at least an adult with a severe or moderate difficulty tend to have worse living conditions, own fewer assets, prone to economic insecurity (in terms of the experience of food insecurity and recent shock experience), lower educational expenditure and higher multidimensional headcount, while total expenditure does not differ based on functional status. Mitra and Yap (2021) also calculate the household prevalence rates for functional difficulties in the six functional domains. The household prevalence rates are 25.75% and 7.2% respectively for any difficulty and at least a lot of difficulty in any of the six functional domains (Mitra & Yap, 2021). The authors also calculate prevalence rates for urban and rural households, and they find that prevalence rates are 25.41% and 7.37% for rural households, and 26.66% and 6.75% for urban households respectively for any difficulty and at least a lot of difficulties. Similarly, Mitra (2018) calculates the rural prevalence rates for any difficulty and at least a lot of difficulties to be 26.42% and 8.06% respectively. Lewis (2009) finds that quality inclusive or segregated education is delivered only for very few disabled children in Ethiopia, and most of the provisions are in urban areas. Using data from Eastern Ethiopia, Geda et al. (2016) find that more than half of disabled children do not attend education for reasons of bullying and lack of resources. Tamrat et al. (2001) study the prevalence and characteristics of physical disability and sensory disabilities using data from Northern Ethiopia. These authors conclude that the overall prevalence of disability is 4.9% out of 4214 individual samples, and the disability is characterized by the early onset due to perceived causes of injury and infection.

3.2.3. Adverse selection in community-based health insurance

Community-based health insurance is widely practiced in low and middle-income countries to

improve health service utilization and reduce out-of-pocket expenditures for groups that earn predominantly low income in the informal sector, as well as for socially excluded groups with no advantage from government and market-based health financing arrangements (Jakab & Krishnan, 2004). However, the CBHI is threatened by asymmetric information between the insured and the insurer, generating what is known as adverse selection (Atim, 1998; Wang et al., 2006). In presence of adverse selection, the enrollees would be mostly high health risk people; hence the health insurance provider who sets a premium based on the average health risk in the population will make a loss (Morris et al., 2012). In addition, given the availability of different insurance plans by the insurer and conditional on having health insurance, the high-risk enrollees sort themselves into more generous offers compared to the less risky enrollees (Doiron et al., 2008; Geruso & Layton, 2017). Setting insurance premiums based on the average risk of the general population without accounting for adverse selection makes the CBHI program financially unsustainable (Pauly & Nicholson, 1999). Taking into account the disability status, functional health status, perceived health status and chronic medical condition of the enrollees in setting the premium is therefore important to reduce selection problems (Trujillo, 2003). Morris et al. (2012) suggest two approaches to prevent the problem of adverse selection in insurance schemes; first, replacing community rating premium with experience rating, namely different premiums based on different risk groups in the population; second, making the health insurance scheme compulsory for all so that both the low risk and the high-risk people participate in the scheme.

Empirical findings from contributions testing the theory of adverse selection are mixed in the context of CBHI in developing countries. In Burundi, Arhin (1994) finds that the performance of the national health card insurance scheme (CAM) is poor because of low membership (about 23% of eligible households), and 'adverse household selection' making the risk pooling of the scheme sub-optimal. The presence of adverse selection is shown by the existence of significantly greater illness episodes per household for the households in the scheme compared with households not in the scheme. However, the scheme addresses the need for social equity and it empowers women to decide the need and timing of health care consumption without consulting the male household head (though the revenue from the premiums covers only 34% of the outpatient drug costs: Arhin, 1994). In their review of 82 health insurance schemes for people outside the formal sector employment, Bennett et al. (1998) find that many voluntary insurance

schemes are beset by substantial adverse selection problems and all of them depend on some form of external subsidy. They also find that only a few of these schemes reach the poorest households. By assessing community and employment-based mutual health organizations (MHOs) in Western and Central Africa Atim (1998) finds that some MHOs based on professions, enterprises, and trade unions tend to have mandatory design features to avoid adverse selection altogether, while many MHOs with no mandatory enrolment require waiting period for new members and making membership collective.[24] Out of the case studies included in the author's assessment for which data is available (six MHOs excluding those based on some form of mandatory or automatic membership), only one scheme in Mali does not feature a waiting period for new members. This scheme without mandatory membership and a waiting period may face some degree of adverse selection (Atim, 1998). In addition, out of the case studies for which data is available and excluding those with compulsory family membership and compulsory target membership, four MHO schemes in Benin with no mandatory family membership are subject to adverse selection (Atim, 1998).

Other studies reporting the presence of adverse selection include Noterman et al. (1995) in a prepayment scheme for hospital care in Zaire, Wang et al. (2006) in the Rural Mutual Health Care in China, and Parmar et al. (2012) in a rural CBHI scheme in Burkina Faso. Studies such as Dror et al. (2005) in Micro Health Insurance Units in the Philippines, De Allegri et al. (2006) in the CBHI scheme in Burkina Faso, and Resende and Zeidan (2010) in the Brazilian individual health insurance market find no adverse selection. In Ethiopia, Mebratie et al. (2015) uncover no evidence that illness, chronic disease, and self-stated health status influence enrollment into the community-based health insurance scheme. The previous literature generally assesses the situation of adverse selection problem using the percentage of enrolment from eligible households and comparing illness between households enrolled in the scheme and households who are not enrolled in the scheme. To the best of our knowledge, there is no evidence for Ethiopia that examines whether the willingness of households to join voluntary CBHI is driven by the disability state of households. Yet, this evidence is relevant for ensuring financial sustainability when designing community-based insurance.

[24] In case where MHO schemes are not compulsory for all target groups, they use other alternative design features to reduce the problem of adverse selection. These designs are waiting period for new members and making family membership compulsory once a member joins (Atim, 1998). In waiting period requirement, new members are required to pay contributions without benefiting from the scheme for some time period.

3.2.4. Contributions of this chapter

Our research differs in four ways from the existing contribution to Ethiopia. First, we use bigger and country-wise representative survey data compared to the above-mentioned studies. Second, previous studies in Ethiopia (such as Mitra (2018) and Mitra & Yap (2021)) that use a similar measure of disability like ours (limitations in at least one of the six functional domains), analyze the effect of difficulties in the functional domains using cross-sectional data and mostly on rural households. Specifically, Mitra (2018) and Mitra and Yap (2021) mostly use single surveys, ESS1 and ESS3 respectively, while our analysis uses ESS2, ESS3, and ESS4. Third, unlike previous studies in Ethiopia, we analyze the impact of disability of any difficulty, some difficulty, and severe difficulty in any of the six functional domains on all consumption items for the whole sample and along urban versus rural subsamples. Fourth, unlike previous studies in Ethiopia to the best of our knowledge, we examine whether disability-induced adverse selection characterizes the CBHI in rural Ethiopia for the first time.

Specifically, this chapter aims to seek answers to the following questions:

1. What is the level of disability prevalence in the surveyed households?
2. To what extent does disability affect a household's major items of non-health consumption, and how does the effect vary with the severity of disability?
3. How does the presence of disabled members influence the household decision to join CBHI scheme?
4. How is the decision to join the scheme influenced by the severity of the disability?

3.3. Data and Methodology

3.3.1. Methodology

We employ two empirical strategies in our analysis. First, we use the fixed effects technique to examine whether households with at least one disabled member record a lower welfare measured by consumption compared with households with no disabled member. Second, we use the multivariate probit model to analyze whether households with a disability of at least one member self-select into the CBHI scheme.

3.3.1.1. The fixed effects method

We use the fixed effects specification to analyze the consequences of disability on different items of household consumption, the choice of the fixed over the random effects specification being

based on the results of the Hausman test.[25] Our model is specified separately as follows for overall disability (disability) and disability defined as a three-level categorical dummy (disability0, disability1, and disability2):

$$\ln C_{it} = \alpha_i + \beta_0 \text{ disability}_{it} + \boldsymbol{\beta_3} \mathbf{X_{it}} + \alpha_t + \alpha_v + \theta_{vt} + \varepsilon_{it} \quad (5)$$

$$\ln C_{it} = \alpha_i + \beta_1 \text{disability1}_{it} + \beta_2 \text{disability2}_{it} + \boldsymbol{\beta_3} \mathbf{X_{it}} + \alpha_t + \alpha_v + \theta_{vt} + \varepsilon_{it} \quad (6)$$

where, the subscripts i, v, and t refer to households, communities, and survey periods, respectively, in both equations (equation 5 and equation 6). The dependent variable– lnC - stands for the natural logarithm of a set of non-health consumption items (food, nonfood, education, and total consumption). In equation 5, our covariate of interest (disability) is a binary dummy that equals 1 if there is at least one disabled member in the household where 'disabled' stands for any degree of difficulty in any of the six functional domains. Equation 6 aims to gauge the differential impact of disability on consumption depending on the severity of disability: The latter is gauged by three-category dummies measuring increasing levels of disability. The first level (disability0) is assigned to households where no member suffers from disabilities and it is the reference category (hence it is excluded from the equation). The second level (disability1) is assigned to households where at least one member of the household suffers from some difficulties in any of the six domains. The third level (disability2) applies where at least one member of the household faces a lot of difficulties in any of the six functional domains and/or cannot perform the related activities at all. Note that the third category consolidates the two highest levels of difficulties reported in the survey into one, the main reason for this being the paucity of observations for the top-level (incapacity). Household and household head level control variables are included in vector X in both equations. The time-invariant household fixed effects, survey period fixed effects, and community level fixed effects are represented by α_i, α_t, and α_v respectively in equations 5 and 6. To account for community-level aggregate risks and socioeconomic changes over the survey periods, we interact the survey dummy with community dummies, and the interaction term is represented by θ_{vt} in both specifications. ε_{it} is the idiosyncratic error term representing the unobserved time-varying household-level covariates. The coefficients of disability, disability1, and disability2 are represented by β_0, β_1, and β_2 respectively while β_3 represents a vector of coefficients of household head and household-level

[25] Using the Hausman test, we reject the null hypothesis (that the preferred model is random effect) at 1% significance level for all the settings with the exception of the setting on education expenditure for which the null hypothesis is rejected at 5% level of significance for the whole sample and 10% for urban subsample.

covariates in both equations.

Let's now go back to the problem of endogeneity. The estimated results may be biased due to simultaneity between consumption and disability, unobserved time-invariant and time-varying heterogeneity among households, and systematic (constant over time) and random (variable over time) measurement errors (Genoni, 2012; Gertler & Gruber, 2002; Mitra et al., 2016; Simeu & Mitra, 2019). Given the two-year panel structure, we use the fixed effects specifications of equations 5 and 6 to deal with most of these identification problems. In particular, systematic measurement errors and observed and unobserved time-invariant household characteristics are addressed by our fixed effects specification. In addition, our specification also deals with the biases due to survey period fixed effects and aggregate community-wide time-invariant and time-varying factors that could be correlated with consumption and disability. Though we could not trace the onset and recovery time of disability in the surveys, disability is more likely to occur before the outcome variables are recorded in the survey. In this case, simultaneity-induced endogeneity may not be a serious problem. We, therefore, assume that unobserved time-varying household-level factors included in ε_{it} to are uncorrelated with both disability and consumption measures.

3.3.1.2. The multivariate probit model

Households may enroll in three types of insurance schemes in Ethiopia. These are the voluntary CBHI scheme, insurance benefits provided by employers (EHI), and private health insurance (PHI) schemes. The voluntary CBHI targets households in rural areas and workers who are engaged in the informal sector in urban areas. As noted, however, our survey offers incomplete information about the sector of employment in urban areas. As a result, we cannot include households with at least one member in the informal sector in the urban areas in our analysis, and we exclusively focus on rural households who are eligible for CBHI as a whole.

In principle, households' decision to enroll in the voluntary CBHI may not be independent of enrollment in the PHI and EHI. The decision to join the CBHI is made at a household level as a unit, and this decision could be influenced by the availability of other insurance schemes to any member of the household. On the one hand, if some members of the household are covered by PHI or EHI schemes, the household as a unit may still decide to join the CBHI for the rest of the members. The availability of the CBHI as a health insurance alternative may also influence the decision to enroll in the PHI and the choice of some household members to find employment that

provides EHI. Hence, the choices over the three insurance schemes may be interdependent. Estimating separate univariate probit models for interdependent choices produces biased and inefficient results (Greene, 2003). To counter this problem, we use the multivariate probit model that takes into account interdependence.

A multivariate probit model specified as a latent variable model (Y*) is written as I (i=1, 2, 3) equations model as follows:

$$Y_i^* = \alpha_i + \theta_i\text{'disability}_i + \boldsymbol{\beta_i'X_i} + \delta_{ir} + \lambda_{iv} + \varepsilon_i \quad (7)$$

$$Y_i^* = \alpha_i + \theta_{1i}\text{'disability1}_i + \theta_{2i}\text{'disability2}_i + \boldsymbol{\beta_i'X_i} + \delta_{ir} + \lambda_{iv} + \varepsilon_i \quad (8)$$

$Y_i = 1$ for $Y^* > 0$, and $Y_i = 0$ otherwise for i=1, 2, 3.

where,

- i refers to the choice among the three insurances schemes i.e., i=1 for CBHI, i=2 for PHI, and i=3 for EHI.
- 'disability' in equation 7 is a binary dummy capturing disability of any degree for at least one member of the household. θ_i is the related coefficient.
- 'disability1' and 'disability2' in equation 8 are the two top categories of the tripartite disability dummy defined in Section 3.3.1.1, with 'disability0' as the omitted, reference category and θ_{1i} and θ_{2i} as respective coefficients.
- X is a vector of household and household head level covariates, and β_i is a vector of coefficients for these covariates.
- δ_{ir} and λ_{iv} are coefficients for regional and community level dummies respectively. These are region and community-level factors that might affect a household's decision to enroll in the insurance scheme.
- α_i is a constant term.
- ε_i denotes a vector of error terms. We assume the error terms to be multivariate normally distributed with mean zero and unit variance. In our multivariate probit model, the error terms are allowed to be correlated across the three insurance choices.

Estimation of multivariate probit models (models with dimensions of order 3 and above) requires simulation-based methods to evaluate cumulative normal distribution functions of higher order. As discussed in chapter two (Section 2.3.1), we specifically use simulated maximum likelihood estimation following Roodman (2011) and employ for simulation purposes-

the smooth recursive conditioning simulator called the Geweke-Hajivassiliou- Keane (GHK) using Stata version 14.2 and 120 draws for the urban sample and 1000 draws for other samples of the Halton sequence. We check the stability of our results using different draws and verify that the results do not change. Standard errors are clustered at the community level to control for the potential challenge of heteroscedasticity.

3.3.2. Data

The data used for our analysis is drawn from three rounds of the Ethiopian Socioeconomic Survey (ESS), collected as part of a joint project between the Ethiopian Central Statistical Agency (CSAE) and the World Bank's Living Standards Measurement Study- Integrated Surveys on Agriculture (LSMS-ISA). Our analysis in this chapter is based on panel data of ESS2 and ESS3 (consisting of 4954 households) and ESS4 with 6770 households. Attrition rate is 5.85% between ESS2 and ESS3, and we weight estimations to counter the problem of attrition bais. ESS4 is not a follow-up on previous surveys and it is a new independent baseline survey for the waves to follow. Our analysis of the effect of disability on household consumption is based on balanced panel data from ESS2 and ESS3. ESS4 is used to analyze the effect of disability on voluntary community-based health insurance enrolment by rural households. The community-based health insurance targets rural households and individuals in the informal sectors in urban areas. However, we cannot trace the informal sector employees in urban households in the survey. Hence, our analysis is based on only 3115 rural households in ESS4. For information about the sampling procedure of the surveys refer to Section (1.4.2).

As repeatedly noted in the previous chapters, the ESS collects detailed individual, household, and community level information on a broad range of topics. Of special interest to this study is the fact that each survey records household non-health consumption disaggregated by major consumption items, individual difficulties to perform activities along with the six functional domains, and other characteristics of households and household heads. ESS4 also includes information on whether households are members of community-based voluntary health insurance, private health insurance, or employer-provided health insurance. Table 3.1 contains the description of variables included in this chapter. The definition of covariates is as defined in Table 1.1.

Table 17. Description of variables

Variables		Description
Outcome variables	Food_con	Real annual adult equivalent household food consumption in U.S. dollar
	Non-food_con	Real annual adult equivalent household non-food consumption in U.S. dollar
	Educ_con	Real annual adult equivalent household expenditure on education in U.S. dollar
	Total_con	Real annual adult equivalent household total consumption in U.S. dollar
	CBHI	Dummy of 1 if any member of the HH is a member of community-based health insurance
	PHI	Dummy of 1 if any member of the HH is a member of private health insurance
	EHI	Dummy of 1 if any member of the HH is a member of employer health insurance
Independent variables of our interest	Seeing	Dummy of 1 if any HH member above the age of 5 years experiences the seeing difficulty
	Hearing	Dummy of 1 if any HH member above the age of 5 years experiences hearing difficulty
	Mobility	Dummy of 1 if any HH member above the age of 5 years experiences mobility (walking/climbing) difficulty
	Remembering	Dummy of 1 if any HH member above the age of 5 years experiences remembering/concentrating difficulty
	Self-care	Dummy of 1 if any HH member above the age of 5 years experiences self-care difficulty
	Communicating	Dummy of 1 if any HH member above the age of 5 years experiences communicating difficulty
	Disability	Dummy of 1 if any HH member above the age of 5 years experiences difficulty in any of the six functional domains
	Disability0	Dummy of 1 if there is no member above the age of 5 years in the HH with difficulty experience of any degree in any of the six functional domains
	Disability1	Dummy of 1 if any HH member above the age of 5 years experiences some difficulty in any of the six functional domains
	Disability2	Dummy of 1 if any HH member above the age of 5 years experiences severe difficulty in any of the six functional domains (a lot of difficulties and/or cannot perform any activity in any of the six functional domains)

3.4. Presentation of results

3.4.1. Disability prevalence

To get an idea of which core activity (functional domain) of surveyed households in Ethiopia is affected, we calculate the household prevalence of disability for difficulties in each of the six functional domains at different threshold levels. Table 3.2 shows that the household disability prevalence rate is highest for the seeing functional domain across all levels of difficulties and all the surveys. It is second highest for the mobility functional domain (except wave2) followed by the hearing functional domain. For at least some difficulty, remembering, self-care, and communicating functional domain disabilities take the next highest prevalence rates respectively. The prevalence rate in household disability peaks for the wider inclusion of disability prevalence i.e., for at least some level of difficulty in each of the six functional domains, while decreasing with increasing severity. Concerning differences among waves, disability prevalence is highest in wave3 (17.6%) for at least some difficulty in the seeing functional domain, and lowest in wave3 (0.1%) for inability to communicate.

Table 18. Household disability Prevalence rate by functional domain and degree of difficulty

Functional domain	Degree of difficulty in each wave								
	at least some			at least a lot			cannot perform at all		
	wave2	wave3	wave4	wave2	wave3	wave4	wave2	wave3	wave4
seeing	.166	.176	.145	.044	.038	.038	.005	.007	.015
hearing	.089	.093	.090	.023	.022	.030	.002	.003	.009
mobility	.069	.096	.137	.021	.027	.040	.004	.004	.015
remembering	.046	.074	.094	.013	.021	.030	.002	.002	.008
self-care	.027	.049	.071	.011	.015	.026	.002	.003	.010
communicating	.021	.038	.061	.009	.010	.027	.002	.001	.012

Note: The prevalence rates are weighted.

Table 3.3 shows household disability prevalence rates for at least one functional domain and more than one functional domain at various cut-off points (degrees of difficulty) for the three waves of surveys. In calculating disability prevalence, one can get different prevalence measures by combining information on the problems of the six functional domains and degrees of difficulties therein (Loeb et al., 2008). For comparison, we calculate the four measures of disability prevalence proposed by the Washington Group. Disability prevalence rate shows a marked increase in the recent wave (wave4) for all functional domains, with the exception of at least some and at least a lot of difficulties in seeing functional domain and at least some difficulties in hearing functional domain. The rise in prevalence rates compared with earlier waves is especially prominent for problems in the mobility functional domain.

Table 19. Household disability prevalence for multi-dimensional functional domains at various degrees of difficulty by type of sample for three waves of data

Sample type	Disability prevalence in a multidimensional functional domain	W2	W3	W4
Whole sample	at least one domain has at least some difficulty	.243	.261	.304
	at least one domain has at least a lot of difficulties	.079	.077	.108
	at least one domain is unable to do it at all	.010	.012	.039
	more than one domain has at least some difficulty	.101	.125	.143
Urban subsample	at least one domain has at least some difficulty	.204	.249	.274
	at least one domain has at least a lot of difficulties	.050	.070	.092
	at least one domain is unable to do it at all	.011	.009	.031
	more than one domain has at least some difficulty	.074	.114	.127
Rural subsample	at least one domain has at least some difficulty	.256	.266	.319
	at least one domain has at least a lot of difficulties	.089	.080	.116
	at least one domain is unable to do it at all	.010	.013	.043
	more than one domain has at least some difficulty	.110	.130	.150

Note: The prevalence rates are weighted.

When disability is defined at the lowest cut-off ('at least some difficulty') in at least one functional domain, the country-wise prevalence rates range from 24.3% in the second wave to 30.4% in the fourth wave. When the cut-off changes (to at least a lot of difficulties), the overall disability prevalence rate falls to the range of 7.7% and 10.8% in wave3 and wave4, respectively.

When the cut-off point becomes more conservative, the prevalence rate becomes lower. Disability prevalence rates of 9.8%, 12.6%, and 13.3% are observed, respectively, for wave2, wave3, and wave4 for more than one domain at the lower cut-off for the overall sample. It is apparent from these figures that the prevalence rate measured in this way reflects households' experience of multiple difficulties in core functional domains and the rising trend over consecutive waves.

As for different household types, disability prevalence rates are higher for rural households than urban households in all the waves and prevalence measures except for at least one domain in any of the six functional domains unable to do it at all in wave2. In particular, the rate for at least some difficulty in any of the six functional domains is by far greater than the 4.9% individual disability prevalence rate estimated by Tamrat et al. (2001) for Northern Ethiopia. However, this difference is not surprising as we consider households rather than individuals and the prevalence rates are higher at the household level than at the individual level (Mitra & Yap, 2021). Our disability prevalence rate calculations for the three waves are not far away from the median household level prevalence rate of 27.8% for 41 countries by Mitra and Yap (2021). Using the third wave Ethiopian socioeconomic survey (ESS3), Mitra and Yap (2021) calculate the overall household disability prevalence rate for any difficulty and at least a lot of difficulties to be 25.76% and 7.37% respectively. As seen in Table 3.3, these figures in our calculation are 26.1% and 7.7% respectively. Indeed, the true prevalence of disability could be much higher than our calculations if all the household members were considered in the surveys. Unfortunately, the surveys collect disability information only for individuals above the age of five years old.

3.4.2. Impact on consumption

Our fixed effects estimation entails two separate fixed effect estimations of equation 5 and equation 6 to analyze the impact of disability. As in Section 3.3.1.1, two measures of disability are used, respectively inclusive of any degree of difficulties (disability), and broken down by degrees (disability0, disability1, and disability2)[26] in any of the six functional domains. The results are reported in Table 3.4.

[26] We also check the result for four level categorical dummies (the third level dummy being only households with a lot of difficulties in any of the six functional domains, and the fourth level dummy being households who suffers from severe disability that they cannot perform activities at all), and the result is mostly the same. However, the number of households with the fourth level dummy is so small that we prefer to merge the third and fourth level dummies together to get advantage of enough variation.

Table 20. The effect of disability on non-health consumption (whole sample)

Non-health consumption	Aggregate disability			Disability by severity			
	Disability	Within R^2	No. of Obs.	Disability1	Disability2	Within R^2	No. of obs.
Food_con	-.028(.020)	0.654	9489	.006(.018)	-.072**(.033)	0.654	9489
Non-food_con	-.090***(.029)	0.658	9489	-.012(.029)	-.226***(.056)	0.659	9489
Educ_con	-.088***(.033)	0.444	9489	-.024(.034)	-.128*(.073)	0.444	9489
Total_con	-.035**(.018)	0.717	9489	.009(.017)	-.098***(.029)	0.717	9489

Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form.
**** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Disability inclusive of all degrees of difficulty for at least one member of the household significantly affects real adult equivalent non-food, education, and total consumption. Specifically, disability in at least one functional domain causes a fall of 8.6%, 8.4%, and 3.4% in adult equivalent non-food, education, and total consumption, respectively.[27] Looking at the impact by severity level, disability1 has no significant effect on all non-health consumption items. In contrast, disability2 significantly affects all non-health consumption items (recall that this is a third level dummy for households with at least one member experiencing a lot of difficulties or the most severe difficulty). Disability2 causes a fall in food consumption, non-food consumption, education expenditure, and total consumption by about 6.9%, 20.2%, 12%, and 9.3%, respectively. As can be seen, this type of disability has a much bigger impact on education and non-food consumption. Consistently to the literature, the effect of disability on consumption worsens with its severity as moderate disability has no statistically significant effect on consumption.

To see whether the effect of disability differs by household residence, we estimate its effect separately for urban and rural subsamples, and the results are reported in Table 3.5. In the urban subsample, disability of any degree of difficulty, and disability of some degree of difficulty do not have a significant effect on all consumption items. However, when distinguished by severity, disability of severe difficulty significantly affects education expenditure. Urban households' education expenditure falls by about 35.9% following disability of severe difficulty in at least one functional domain.

[27] To calculate the percentage changes in the level of the outcome variable to a change in the disability dummy variables, we use the formula $[EXP^{coefficient}-1]*100$.

Table 21. The effect of disability on non-health consumption (subsamples)

Subsample	Non-health consumption	Aggregate disability			Disability by severity			
		Disability	Within R^2	No. of Obs.	Disability1	Disability2	Within R^2	No. of obs.
Urban	Food_con	-.008(.041)	0.561	3315	-.046(.041)	-.090(.073)	0.562	3315
	Non-food_con	-.057(.061)	0.598	3315	-.070(.060)	.004(.107)	0.599	3315
	Educ_con	-.134(.123)	0.343	3315	.034(.140)	-.445*(.249)	0.345	3315
	Total_con	-.001(.032)	0.643	3315	-.033(.035)	-.042(.060)	0.644	3315
Rural	Food_con	-.024(.027)	0.676	6174	.030(.025)	-.111***(.043)	0.677	6174
	Non-food_con	-.079**(.040)	0.611	6174	.010(.042)	-.316***(.072)	0.614	6174
	Educ_con	-.046(.047)	0.459	6174	.021(.043)	-.026(.087)	0.459	6174
	Total_con	-.029(.024)	0.711	6174	.030(.022)	-.139***(.037)	0.714	6174

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Focusing on rural households, we note that disability affects non-food consumption of rural households while disability1 has no effect on all consumption items at all. In contrast, disability2 impacts all rural households' non-health consumption items except for education expenditure. To be explicit, it causes a fall in rural households' adult equivalent food, non-food and overall consumption by about 10.5%, 27%, and 13% respectively. In comparative terms, disability of severe difficulty has a more damaging effect on rural households' non-food consumption. The effect of disability (both aggregated and disaggregated by the severity of difficulty) does not affect rural households' expenditure on education, while disability of severe difficulty affects urban households' expenditure on education. This contrasting effect of disability on urban and rural households' expenditure on education may not be surprising as rural households' education expenditure is so low in absolute terms compared to urban households that the impact of disability on rural households' education is not significant despite keeping the negative sign.[28]

Overall, Ethiopian households experiencing disability of severe degree of difficulty in at least one of the six functional domains do not have the means to avoid a fall in their non-health consumption items. Experience of disability of at least one member in any of the six functional domains affects the consumption of non-health items through the channel of either reduction in household income or enhanced health expenditure or both. Our results are consistent with

[28] Schools available in rural areas are free public schools for some grades. So, one cannot expect big expenditure on education by rural households. The expenses may be for stationary materials and school uniforms. Even if free public schools are available in urban areas, households in urban areas may opt to send their children to private schools that deliver relatively quality education but charge education fees. Over the two survey periods (wave2 and wave3), households in rural areas spent only 1% of the average total adult equivalent expenditure on education while urban households spent about 4.5% of their average total adult equivalent expenditure on education. If students cannot pass the national exam at grade 12, they would enroll into private or public universities with fees. In this case, households from urban and rural areas pay fees for the college or university education.

previous literature in Ethiopia. Disability is likely to have not only a short-term impact on welfare but also a long-term impact. This is because it affects expenditure on education which, in turn, impacts future income earning capability and consumption. All this is consistent with Lewis (2009) and Geda et al. (2016) who find that education is delivered only to a few disabled children and mostly in urban areas. The alleged reason is bullying and lack of resources (Geda et al., 2016). In fact, our finding that disability does not have a significant effect on rural households' expenditure on education contrasts Mitra (2018) who finds a significant effect of both moderate and severe difficulties in at least one of the functional domains on rural households' expenditure using cross-sectional data. In all the settings, the impact on consumption gets worse with disability of difficulties peaking at top of the severity scale while the impact of disability from moderate difficulty lacks statistical significance on all consumption items. Our results are also consistent with Hailemichael et al. (2019) who estimate lower-income, consumption, and assets for households experiencing severe mental disorders or depression.

3.4.3. Adverse selection in community-based health insurance

3.4.3.1. Disability and community-based health insurance

Out of all surveyed eligible rural households for the CBHI scheme (3115 households), about 57.9% report at least one member enrolled in at least one of the three insurance schemes (Table 3.6). About 49.1% of rural households have at least one member enrolled only on CBHI. Of the total surveyed rural households, 2.3% report enrolment of at least one member in PHI. Similarly, about 2.2% have at least one member enrolled only in EHI. In some households, we find households enrolled in more than one insurance scheme. About 2% of households have at least one member enrolled in both CBHI and PHI. Similarly, 2.3% of households have at least one member enrolled in both CBHI and EHI.

Table 22. Enrolment in three insurance schemes in the eligible rural households

Type of Insurance	The number and percentage of HHs enrolled
Only community-based health insurance	1,530.170 (.491)
Only private health insurance	70.168(.023)
Only employer health insurance	69.751(.022)
Community-based and private health insurance only	61.177(.020)
Community-based and employer health insurance only	72.167(.023)
Private and employer health insurance only	.268(.0001)
At least one insurance scheme	1,803.701(.579)

Note: Numbers in the bracket are percentages compared to the total eligible rural households. The number and percentage of households enrolled are weighted.

To test whether adverse selection exists in the voluntary CBHI scheme, we separately estimate the multivariate probit model of equations 7 and 8 above (Section 3.3.1.2) using simulated maximum likelihood and the results are reported in Table 3.7. Results from the multivariate probit model are confirmed to be similar to the results of the univariate probit model for the probability of enrolling into the CBHI (Appendix 10). If the effect of disability on the choice of CBHI is not positively significant, then the theory of adverse selection is rejected, and conversely.

Table 23. Average marginal effects of disability on the decision to join CBHI

Disability type	Three insurance schemes			No. of Obs.	No. of draws	Wald chi2	Prob > chi2
	CBHI	PHI	EHI				
Disability	.100***(.030)	.008(.009)	-.010(.011)	3115	1000	328.86	0.000
Disability1	.076**(.032)	.018(.011)	-.007(.013)	3,115	1000	334.80	0.000
Disability2	.108**(.049)	-.025(.018)	-.049**(.022)				

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Table 3.7 shows that disability of any difficulty, disability from some difficulty, and disability of severe difficulty in at least one of the six functional domains significantly affect households' decision to enroll on the CBHI. The probability of joining the CBHI scheme increases by about 10.5, 7.9, and 11.4 percentage points respectively for disability of any difficulty, some difficulty, and severe difficulty in at least one functional domain. This means that there is adverse selection as households experiencing disability of any level of difficulty in any of the six functional domains are more likely to enroll in the CBHI scheme compared with those households with no disability experience. The likelihood to join CBHI is higher for disability of severe difficulty compared to disability of some difficulty in at least one of the six functional domains. Table 3.7 also shows that disability (of any difficulty, some difficulty, and severe difficulty) has no statistically significant effect on enrolling in the PHI, while disability of severe difficulty has a negative significant effect on the likelihood of enrollment in EHI schemes.

In sum, there is adverse selection in the CBHI scheme in rural Ethiopia. Hence, the theory of adverse selection is confirmed in our data given that households with at least one member disabled (of any difficulty, some difficulty, and severe difficulty) are more likely to enroll in the CBHI scheme compared to households with no disability. Households experiencing disabilities may find it difficult to pay the annual premiums required to be a member of the CBHI scheme. Persons with disabilities and their households are, in fact, more likely to be poorer than persons without disabilities and their households (Mitra, 2018; Mitra & Yap, 2021; Mitra et al., 2017;

United Nations, 2019). It may be the case that subsidies from the government for households with disabled persons may contribute to a high probability of enrolment into the CBHI scheme by households with disabled members compared with households with no disabled members.[29] Households with disability experience may be forced to live in destitute conditions unless the government grants them an adequate subsidy to be a member of the CBHI and get access to health care services. The higher likelihood that disability-affected households enroll on the CBHI may be due to the government's subsidy program for the poor. Hence, both the voluntary nature of the CBHI scheme and the government's subsidy incentive for the poor to join the scheme may contribute to the presence of adverse selection.

Our study thus challenges the finding by Mebratie et al. (2015) that adverse selection is not present in the CBHI. In fact, their study does not directly examine the effect of disability on enrollment into CBHI nor does it consider disability-induced adverse selection in CBHI. Rather, they examine the effect of self-assessed health status, chronic diseases, and the incidence of illness on enrollment into the CBHI scheme as a test of the adverse selection hypothesis. Disability, self-assessed health status, chronic diseases, and illnesses are distinct health problems. Chronic diseases, poor self-assessed health, and illnesses might antecede and lead to disability or vice versa (Dixon-Ibarra & Horner-Johnson, 2014; Hung et al., 2012; Froehlich-Grobe et al., 2016).

3.4.3.2. Control covariates and community-based health insurance

It is also interesting to discuss which covariates are important in enrolling in the CBHI. Table 3.8 reports the average marginal effects of these covariates. To see the impact of household size on the decision to enrolment in the scheme, we create three variables of household size. These variables are household members below the age of 15 years (hhsize15), household members between the age of 16 and 64 years of age (hhsize1664), and household members above the age of 65 years (hhsize65).

Table 3.8 shows that households with a large number of members between the age of 16 and 64 years are more likely to join the scheme while households with a large number of members above 65 have a lower probability of joining the CBHI scheme. However, the probability of

[29] Regional and district level governments subsidize indigenous populations to be member of the CBHI and get access to health care for free. These people (poorest 10% in the district) are identified in each district, where the community based health insurance is pooled, and gets the free access. But, households with severely disabled members may not be lucky enough to be part of the subsidy program.

enrolment into the scheme is not significantly affected by the size of young members. In addition education of the head, the male-to-female ratio, marital status, gender, age, and age square of the household head do not significantly affect the decision to be a member of CBHI.

Table 24. The average marginal effects of control covariates on the decision to join CBHI

Covariate	Enrollment into CBHI
hhsize15	.003(.015)
hhsize1664	.057***(.012)
hhsize65	-.067*(.040)
maleratio	-.035(.059)
educyear	.003(.002)
married	.034(.041)
Female-head	-.020(.041)
age	-.003(.005)
age2	.000(.000)
cons_quint(1st quintile reference)	
2	.047(.035)
3	-.036(.039)
4	-.010(.037)
5	.026(.044)
No. of obs.	3115
No. of draws	1000
Wald chi2	328.86
Prob > chi2	0.000

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

To check whether resource endowment is important to enroll in CBHI, we, finally, include the adult equivalent consumption quintile for rural households in our regression. Consistently to Mebratie et al. (2015), consumption quintiles (from 2nd to 5th) are not statistically significant in affecting households' decision to enroll in the CBHI scheme.

3.5. Conclusion

We exploit three waves of the Ethiopian Socio-Economic Survey data to examine the prevalence of disability and its effect on consumption and enrolment into the community-based health insurance scheme. The overall household disability prevalence rate is found to be in the range of about 24% in wave2 to 30% in wave4. Given that disability information is recorded only for subpopulations (for households whose members are above five years old in the surveys), the true national household disability prevalence rate might be much higher than the one this research finds. Disability prevalence rates are higher in rural households compared to their urban counterparts. Looking at each specific functional domain, household disability prevalence rates are more pronounced in seeing, mobility, and hearing functional domains.

For the overall sample, the fixed effect estimates show that disability of all degrees of difficulties in at least one functional domain affects households' adult equivalent non-food, education, and total consumption. When the effect is separately estimated by degrees of severity of the disability, disability as a result of a lot of difficulties and the most severe difficulty in at least one functional domain has a bigger impact on consumption of all items including food consumption, while disability entailing some difficulty does not have a significant effect on all non-health consumption items for the whole sample. Concerning subsamples, disability of all degrees of difficulty in any of the six functional domains significantly affects non-food consumption while disability consisting of some degrees of difficulty in any of the six functional domains does not have a significant effect at all on non-health consumption items of rural households. However, disability of severe degree of difficulties in at least one of the six domains impacts all rural households' non-health consumption items except for expenditure on education. The consequence on rural households' non-food consumption is particularly huge. On the other hand, it is only urban households' education expenditure that is impacted by the more severe type of disability while disability consisting of all degrees of difficulties and some degree of difficulties in any of the functional domains do not have significant effects on urban households' non-health consumption items. Viewed from the severity angle, disability resulting from a lot of or the most severe difficulties affects all items of consumption for the whole sample and all consumption items but education for rural households while its effect is significant only on education expenditure of urban households. However, disability entailing some difficulties in at least one of the six functional domains has no statistically significant effect on the non-health consumption of households for the whole sample and the two subsamples (urban and rural households). Hence, Ethiopian households manage to keep their non-health consumption intact against disability of less severe types while they could not protect their non-health consumption in the face of disability of the severe types of difficulties in any of the six functional domains.

In effect, disability has both short-term and long-term consequences on household welfare. As a policy suggestion, investigating the causes of disability is as important as examining its impact. Though this study could not investigate the root causes of disability (as data is not available for this purpose in the surveys used) previous studies like Tamrat et al. (2001) found that the causes of disability mainly originate from injury or infection which is preventable and treatable. Therefore, programs such as health campaigns to prevent injuries and accidents, and

immunization against any pandemic or non-pandemic diseases or infections can be as effective as a direct treatment after injury, infectious or chronic disease occurs, provided they are sustained by community-based health insurance or potentially with social health insurance. It is also important to create and support operationally accommodative institutions, cultural contexts, and physical environments so that persons with disabilities have the opportunity to participate in every dimension of life including education and work without any discrimination. Moreover, well-targeted support of any kind in favor of households with disabilities and school-aged children may prevent impoverishment in the short run and long run.

To reduce out-of-pocket expenditure and increase access to health care services, the government of Ethiopia is scaling up the voluntary community-based health insurance scheme which was started in 2011 in a few districts as a pilot. One challenge to the voluntary nature of this type of scheme is adverse selection as it threatens the financial sustainability of the program. We test the possibility of adverse selection in the presence of a high prevalence of disability in Ethiopia by estimating the multivariate probit model. The result shows that disability-induced adverse selection exists in the community-based health insurance scheme for the target rural households. In fact, selection into the scheme by disability-affected households may be enhanced by the government's subsidy program for poor households. Households with disability experience are more likely to be poor and eligible for the government's subsidy (in the form of paying for premiums to the indigent). Indeed, the government's subsidy program may be enough only for households affected by a disability of severe degree of difficulty. However, adverse selection is observed for households experiencing disability of some degree of difficulty as well. This evidence shows that the design of the community-based health insurance scheme needs to be revisited in a way that prevents or reduces adverse selection for the sake of its sustainability. One option in this regard is to make community-based health insurance mandatory for all targeted households. Making the household rather than the individual the unit of insurance is not sufficient to avert the adverse selection.

Chapter 4
Main findings and policy implications

4.1. Main findings

Health problems such as death, disability, and illness are prevalent in Ethiopia. Examining the consequences of these health problems on household welfare is important for policy. We analyze the consequences of death, disability, and illness on the current consumption and income of Ethiopian households as a whole, and subsamples. In addition, we also examine the long-term welfare implication of death and/or illness by analyzing the coping strategies death and/or illness experiencing households use in an attempt to insure their current income and consumption. In Ethiopia, the formal insurance market in general, and the health insurance market in particular, is at an infant stage. It is only after the piloting of a community-based health insurance scheme that health insurance coverage is slightly improved. Assessing the situation of adverse selection in community-based health insurance is important to revise its design. To this end, we also examine whether the voluntary community-based health insurance scheme is successful in attracting members with no self-selection from households experiencing disability of any (moderate or severe) degree of difficulty in at least one of the six functional domains.

There are two channels (health expenditure and loss of income) through which death, illness, and disability impact household consumption in the short term (Asfaw & Braun, 2004; Dercon, 2004; Dercon & Krishnan, 2000; Genoni, 2012; Gertler & Gruber, 2002; Simeu & Mitra, 2019; Wagstaff & Lindelow, 2014; Yilma et al., 2021). Even if we find no adverse consequence of death in the whole sample, rural, poor, and male-headed households, its negative effect on urban, female-headed, and non-poor households is concerning. Still, when death is disaggregated into the death of the head and death of non-head members, we find poor households victims of the fall in food consumption following the death of the head. For urban, female-headed, non-poor, and poor (in case of death of the head) households, the costs associated with death outweighs the values of consumption from reduced units of consumption as Grimm (2010) claims. Not only households as a whole, but also rural, female-headed, male-headed, and non-poor households are adversely affected following the illness of at least one member. Non-poor, female-headed and male-headed households face a fall in income due to illness, while rural, female-headed, and male-headed households also suffer from a fall in non-food consumption following illness experience. The fall in income does not have a repercussion effect on consumption of non-poor

households that non-poor households' consumption remains unaffected following illness. The size of the effect of illness is particularly larger on female-headed and rural households. Turning to disability, disability of any degree of difficulty in at least one of the six functional domains reduces expenditures on all consumption items with the exception of food for the whole sample, and non-food consumption for the rural sample, while its effect is not significant at all on urban households' consumption of all items. When disaggregated by the degree of difficulty, disability of severe difficulty affects all consumption items for the whole sample, all consumption items but education for the rural households, and education expenditure for the urban sample, while disability of moderate difficulty does not have a significant effect on all consumption items, and on all samples. Not only the prevalence rates are larger, but also the adverse consequence of disability is found to be severe on the welfare of rural households. However, protecting current consumption against disability may involve costly coping strategies for urban households as well.

Analyzing the effect of death and illness on current consumption and income does not give the full picture of the consequences of death and illness as it lacks information about their effect on households' long-term welfare (Dabla-Norris & Bal Gündüz, 2014; Khan et al., 2015). To this end, we analyze coping strategies households use once they experience death and/or illness. For all households experiencing death and/or illness, our results indicate that death increases the likelihood of using the sale of assets, extra labor employment, and other aggregate coping strategies, while illness leads to the joint use of the sale of assets, help, and credit. Similarly, rural, male-headed, and poor households' likelihood of the joint use of labour and other aggregate coping strategies increases following death. In addition to these two coping strategies, urban, female-headed, and non-poor households' likelihood of using the sale of assets tends to increase following death. Illness induces female-headed, male-headed, poor, and non-poor households' tendency to jointly use the sale of assets, help, and credit. Moreover, urban households cope against illness using the sale of assets, help, and labor, while rural households jointly use savings, assets, help, and credit as a coping strategy. The use of coping strategies such as the sale of productive assets and expensive credit could lead to household deprivation in the long term.

Combining information from the consequences of death and illness on current income and consumption, and coping strategies, we show that households suffer from the fall of welfare in

the short-term (fall of current consumption) or in the long-term (using costly coping strategies), or both in the short-term and long-term. The fall in food consumption and education expenditure for urban households, and the fall of non-food consumption and education expenditure for female-headed households, combined with the use of the sale of assets as a coping strategy following death make urban and female-headed households victims of death both in the short-term and long-term. Similarly, the negative consequence of non-food consumption and illness for rural, female-headed, and male-headed households and the joint use of the sale of assets and credit as coping strategies against illness shows that these groups of households suffer from a fall in welfare both in the short-term and long-term.

The implication of the consequences of health problems on household income, consumption, and coping strategies is clear. It calls for installing health insurance schemes and enhancing coverage for all households. However, the health insurance scheme must be sustainable to achieve its objective. One parameter to such sustainability is financial sustainability. We examine this element of sustainability by analyzing whether disability-induced adverse selection exists in community-based health insurance in Ethiopia. Our result indicates that, indeed, adverse selection characterizes the community-based health insurance scheme in Ethiopia. Households experiencing disability of any (moderate or severe) degree of difficulty in at least one of the six functional domains are more likely to join the scheme. This is clear evidence that the scheme's financial sustainability is threatened by the attraction of a large pool of members experiencing disability in at least one of the six functional domains. If premiums are set based on average risk, and there is no adequate subsidy that accounts for adverse selection, the existence of adverse selection may cause a financial loss, and eventually the closure of the scheme (Morris et al., 2012; Pauly & Nicholson, 1999).

4.2. Policy implication

Our results show that households in Ethiopia suffer from experiences of death, disability, and illness problems. As a policy recommendation, we suggest the following interventions under the headings of formal health insurance and other interventions.

4.2.1. Formal health insurance

We suggest improving the enrolment of households in Woredas (the fourth lower level of government administrative unit in Ethiopia) in which the community-based health insurance starts operating, and expanding the scheme to all other Woredas in Ethiopia for people in the

informal sector. And, a quick launch of the legislated social health insurance (SHI) for people employed in the formal sector would protect households from adverse consequences of health problems, and improve the work towards the attainment of the UHC. With the adoption of the Sustainable Development Goals (SDGs) in 2015, countries need to attain the universal health coverage (UHC) target by 2030. This requires the commitment to avail quality health services (promotive, preventive, curative, rehabilitative, and palliative) needed to all individuals and communities without financial hardship (WHO, 2020). Given its potential of reducing out-of-pocket expenditure and financing healthcare, many view health insurance as an important component of UHC strategies (Lagomarsino et al., 2012). However, Ethiopia achieves neither the provision of quality essential health services to all the people nor protection of people from financial hardship due to out-of-pocket expenditure to pay for health care services. The consequence is shown from the results of our study, that households experience a fall in consumption and income in the short-term, and face potential adverse consequences from the use of costly coping strategies following health problems. One solution to this problem is to make the existing community-based health insurance reachable for all the target people in the informal sector and start rolling out the social health insurance for people in the formal sector. However, our results indicate that disability-induced adverse selection characterizes the existing voluntary community-based health insurance scheme. Adverse selection threatens the sustainability of the scheme. The scheme's financial viability hinges on large enrolment as a percentage of the eligible population and low indigent members as a percentage of those enrolled in the scheme (Lavers, 2021). In this regard, to sustain the scheme, either the government needs to increase the subsidy to the scheme or the design of the scheme needs to be mandatory for all the target population. However, given that the federal government is subsidizing 25% of the premiums for all the members of the scheme and lower-level governments subsidizing the full premiums for indigent populations, further increases in the subsidy may not be feasible as there are also other pressing priorities. As a result, to keep the community-based health insurance, and achieve the UHC, we suggest a mandatory revisit of the design of the scheme. Moreover, starting social health insurance for formal sector employees would be one- step forward in an attempt to achieve the UHC in Ethiopia.

4.2.2. Other interventions

One of the costly coping strategies used by households to cope with the risk of illness is credit whose source is mostly informal in Ethiopia. The use of expensive credit as a coping strategy is a form of distress financing as it may lead to long-term indebtedness, and affect welfare in the long term (Damme et al., 2004; Kruk et al., 2009). Access to an alternative cheap source of credit could protect households from pursuing costly coping strategies including expensive informal credit (Islam & Maitra, 2012). In this regard, the government-affiliated microfinance institutions in Ethiopia could play a complementary insurance role for households experiencing health problems.

The government could play its part by strengthening the social protection programs, particularly for vulnerable households experiencing health problems. Our analysis of coping strategies reveals that the government is not providing enough support for households affected by death and illness and in need of help. Stepping up the social protection programs that target households with bad health events in general, and households consisting of school-aged members and experiencing death and disability, in particular, would help contain deprivations in the short-run and long-term. Equally important in curbing the adverse consequence of disability is, creating accommodative institutions, cultural contexts, and physical environments so that persons with disabilities have the opportunity to participate in every dimension of life including education and work without any discrimination.

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Appendices

Appendix 1. The theoretical model of complete consumption insurance

The theoretical model of complete consumption insurance developed by a group of authors (for example, Deaton, 1997; Islam & Maitra, 2012; Mace, 1991; Mu, 2006) is reproduced. Consider a central planner in an economy inhabited by 'n' households. The central planner maximizes the expected value of the sum of Pareto-weighted lifetime utilities of these 'n' households given resource endowments. The problem is set as

$$Max \sum_{i=1}^{n} \omega_i \sum_{t=0}^{\infty} \beta^t \sum_{s=1}^{H} \pi(H_{st})[U_i(C_{it}(H_{st}), p_{it}(H_{st})) + V_i(l_{it}(H_{st}), p_{it}(H_{st}))] \quad (1)$$

Subject to

$$\sum_{i=1}^{n} C_{it}(H_{st}) \leq \tilde{C}(H_{st}), \quad C_{it}(H_{st}) \geq 0 \quad (2)$$

$$\sum_{i=1}^{n} l_{it}(H_{st}) \leq \tilde{l}(H_{st}), \quad 0 \leq l_{it}(H_{st}) \leq T_{it}(H_{st}) \quad (3)$$

where,

- ω_i is time-invariant i^{th} household Pareto-weight with requirement condition $0 \leq \omega_i \leq 1$, and $\sum_{i=1}^{n} \omega_i = 1$,
- β^t is household time preferences over time,
- $\pi(H_{st})$ is the probability that state s occurs at time t with the condition $\sum_{s=1}^{H} \pi(H_{st}) = 1$ for each time t,
- $p_{it}(H_{st})$ is i^{th} household's preference shock at time t,
- $\tilde{C}(H_{st})$ and $\tilde{l}(H_{st})$ are aggregate consumption and leisure endowments,
- $C_{it}(H_{st})$ and $l_{it}(H_{st})$ are i^{th} household's consumption and leisure at time t,
- $U_i(.)$ and $V_i(.)$ are the i^{th} household's utility functions respectively for consumption and leisure. We assume both utility functions to be differentiable and additive across states and over time.

Maximization of a weighted sum of household utilities (equation 1) with respect to consumption and leisure subject to the two constraints (equations 2&3) gives the following first-order conditions.

$$w_i U_c[C_{it}(H_{st}), p_{it}(H_{st})] = \lambda_c(H_{st}) / \beta^t \pi(H_{st}) \quad (4)$$

$$w_i V_c[l_{it}(H_{st}), p_{it}(H_{st})] = \lambda_l(H_{st}) / \beta^t \pi(H_{st}) \quad (5)$$

where λ_c and λ_l are Lagrangian multipliers for consumption and leisure constraints respectively.

Assume utility function for consumption ($U(c_{it}, p_{it})$) to take the form of the power utility function with multiplicative preference shocks,i.e., [30]

$U[C_{it}(H_{s_t}), p_{it}(H_{s_t})] = \frac{1}{\rho} (C_{it}(H_{it}))^{\rho} e^{\rho P_{it}(H_{st})}$ where, $\rho<1$ for $U(c_{it}, p_{it})$ to be strictly concave.

Now, equation (4) becomes,

[30] In addition to power utility function, earlier studies considered other forms of utility (e.g., Asfaw & Braun, 2004; Cochrane, 1991; Mace, 1991). We chose power utility function because we found the theoretical specification appropriate for our data.

$$\omega_i(C_{it}(H_{st}))^{\rho-1} e^{\rho P_{it}(H_{st})} = \lambda \quad (6)$$

Where, $\lambda = \lambda_c(H_{st}) / \beta^t \pi(H_{s_t})$.

Applying log transformation on both sides of equation (6), and aggregating over n households, the i^{th} household's consumption in terms of aggregate consumption in a village in equation (7).

$$\log C_{it} = \log\overline{C_t} + \frac{\rho}{1-\rho}[p_{it} - \overline{p}] + \frac{1}{1-\rho}[\log \omega_i - \overline{\omega}] \quad (7)$$

where,

$\log\overline{C_t} = \frac{1}{n}\sum_{i=1}^{n} \log C_{it}(H_{st})$, $\overline{\omega} = \frac{1}{n}\sum_{i=1}^{n} log\ \omega_i$, $\overline{p} = \frac{1}{n}\sum_{i=1}^{n} log\ p_{it}$

Our theoretical model (equation 7) tells us that consumption for household 'i' is linearly and positively related to aggregate consumption in a village. This is the result of complete consumption insurance or full risk-pooling against idiosyncratic income shocks in general, and idiosyncratic health shocks in particular. Given the power utility function, the consumption net of preference shocks is equalized across households in a village. Put another way, household-level consumption is not determined by idiosyncratic income or health shocks, but it is determined by community-level consumption.

In setting our empirical specification to test the theory of complete consumption insurance, we modified the theoretical model in equation (7) in the following way. First, we replace the consumption aggregate term ($\log\overline{C_t}$) by community-level dummies ($\propto_v$). Many researchers claim that controlling for community dummies is more flexible than using consumption aggregate. Second, to test the hypothesis of complete consumption insurance, we add idiosyncratic death and illness shocks (H_{it}) on the right-hand side of equation (7). Third, time-varying household level preference shifters (p_{it}) are functions of observed and unobserved household and head-level characteristics, and the observed characteristics are included in $X_{it.}$ Fourth, we also include household fixed effects ($\propto_i$) and error terms (ε_{it}) to control for unobserved household fixed effects and time-varying unobserved household characteristics respectively. Aggregated characteristics like aggregate preference shifters are unobserved and are part of the error term (ε_{it}). Lastly, we included time dummies ($\propto_t$) and community-time interaction terms (δ_{vt}).

Appendix 2. The effect of other covariates on real adult equivalent and per capita income and consumption (Whole sample)

Adult equivalent measure							
	food_ con	Nonfood_ con	Educ_ con	Total_ con	Unearned_ inc	Earned_ inc	Total_ inc
agehead	-.003(.003)	-.011***(.004)	.025***(.007)	-.007***(.003)	-.044***(.008)	.001**(.001)	.001*(.000)
agehead2	.000(.000)	.000**(.000)	-.000***(.000)	.000***(.000)	.001***(.000)	.000*(.000)	-.000(.000)
educhead	.021***(.002)	.046***(.003)	.051***(.005)	.032***(.002)	.018***(.006)	.005***(.000)	.005***(.000)
hhsize	-.005(.005)	.018***(.006)	.141***(.008)	-.001(.005)	-.012(.010)	-.002***(.001)	-.003***(.001)
maleratio	-.112***(.040)	-.007(.055)	.125(.077)	-.071**(.035)	-.168*(.097)	.010(.010)	.007(.009)
Dependency	.004(.041)	-.323***(.051)	-.018(.080)	-.073**(.037)	-.022(.103)	-.011*(.007)	-.012*(.007)
femhead	.047(.029)	.057*(.035)	.159***(.050)	.036(.026)	.458***(.066)	-.004(.004)	-.003(.004)
married	.106***(.029)	.145***(.034)	-.057(.055)	.087***(.024)	-.071(.062)	-.002(.004)	-.004(.004)
february	.061*(.032)	.005(.039)	.031(.063)	.041(.029)	-.023(.060)	-.012***(.005)	-.013***(.005)
Per Capita Measure							
agehead	-.000(.003)	-.008**(.004)	.020***(.006)	-.004(.003)	-.038***(.007)	.001*(.000)	.001(.000)
Agehead2	.000(.000)	.000(.000)	-.000***(.000)	.000*(.000)	.000***(.000)	-.000(.000)	-.000(.000)
educhead	.021***(.003)	.045***(.003)	.047***(.004)	.032***(.002)	.017***(.005)	.004***(.000)	.004***(.000)
hhsize	-.060***(.005)	-.035***(.006)	.089***(.006)	-.055***(.005)	-.024***(.009)	-.003***(.001)	-.003***(.000)
maleratio	.028(.041)	.121**(.055)	.140**(.067)	.067*(.036)	-.143*(.084)	.021**(.009)	.019**(.009)
Dependency	-.341***(.044)	-.637***(.050)	-.104(.067)	-.411***(.040)	-.158*(.089)	-.018***(.006)	-.022***(.006)
femhead	.019(.029)	.026(.035)	.111***(.043)	.008(.026)	.374***(.057)	-.008**(.003)	-.007**(.003)
married	.164***(.030)	.188***(.035)	-.052(.049)	.142***(.026)	-.069(.054)	-.008**(.004)	-.009***(.004)
february	.079**(.032)	.019(.040)	.010(.054)	.057*(.031)	-.018(.051)	-.011**(.005)	-.011***(.004)

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are changes in log form, and all independent variables are in changes. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 3. The effect of other covariates on real adult equivalent and per capita income and consumption (Urban and rural subsamples)

	food_ con	Nonfood_ con	Educ_ con	Total_ con	Unearned_ inc	Earned_ inc	Total_ inc
Urban subsample (Adult equivalent measure)							
agehead	.031***(.007)	-.006(.008)	.061***(.022)	.013***(.005)	-.050***(.017)	.002**(.001)	.002*(.001)
agehead2	-.000***(.000)	.000(.000)	-.001**(.000)	-.000***(.000)	.001***(.000)	-.000*(.000)	-.000(.000)
educhead	.028***(.007)	.043***(.007)	.086***(.011)	.035***(.005)	.084***(.018)	.005***(.001)	.006***(.001)
hhsize	-.023*(.012)	-.024(.015)	.247***(.030)	-.018*(.011)	-.076**(.038)	-.003(.002)	-.005**(.002)
maleratio	-.417***(.100)	-.193*(.107)	-.036(.313)	-.273***(.078)	-.551(.342)	.052***(.021)	.042**(.018)
Dependency	.184**(.088)	-.178*(.099)	.183(.210)	.064(.083)	.276(.266)	-.033**(.016)	-.032**(.016)
femhead	-.154**(.079)	-.006(.056)	.422**(.189)	-.107**(.052)	.702***(.242)	.003(.016)	.008(.015)
married	-.012(.064)	.069(.064)	-.127(.173)	-.004(.050)	-.138(.151)	.005(.009)	.005(.009)
february	.250***(.078)	-.009(.105)	-.082(.253)	.169**(.080)	-.143(.203)	-.022(.017)	-.025(.016)
Urban subsample (Per Capita Measure)							
agehead	.033***(.007)	-.004(.008)	.055***(.020)	.015***(.005)	-.043***(.016)	.002**(.001)	.001(.001)
Agehead2	-.000***(.000)	.000(.000)	-.000***(.000)	-.000***(.000)	.001***(.000)	-.000*(.000)	-.000(.000)
educhead	.029***(.008)	.043***(.007)	.081***(.009)	.036***(.005)	.079***(.016)	.004***(.001)	.005***(.001)
hhsize	-.088***(.013)	-.087***(.015)	.176***(.026)	-.082***(.012)	-.088***(.035)	-.005***(.002)	-.006***(.002)
maleratio	-.282***(.102)	-.058(.105)	.037(.293)	-.139*(.075)	-.530*(.308)	.063***(.017)	.054***(.015)
Dependency	-.146(.091)	-.485***(.110)	.046(.187)	-.263***(.092)	.118(.239)	-.047***(.014)	-.048***(.015)
femhead	-.176**(.085)	-.029(.057)	.378**(.177)	-.128**(.057)	.571***(.209)	-.005(.013)	-.002(.013)
married	.009(.060)	.084(.061)	-.089(.164)	.016(.047)	-.156(.137)	-.006(.009)	-.007(.008)
february	.245***(.088)	-.013(.115)	-.109(.229)	.164*(.091)	-.106(.177)	-.016(.016)	-.017(.016)
	Rural subsample (Adult equivalent measure)						
agehead	-.016***(.004)	-.013**(.006)	.019***(.007)	-.016***(.004)	-.011(.009)	-.000(.001)	-.000(.001)
Agehead2	.000***(.000)	.000*(.000)	-.000(.000)	.000***(.000)	.000***(.000)	.000(.000)	.000(.000)
educhead	.025***(.005)	.055***(.006)	.047***(.008)	.037***(.004)	.011(.008)	.002***(.000)	.002***(.000)
hhsize	-.012(.008)	.022***(.009)	.124***(.009)	-.006(.007)	-.052***(.011)	-.002***(.001)	-.003***(.001)
maleratio	-.059(.057)	-.010(.10)	.250***(.089)	-.073(.053)	.053(.125)	-.003(.007)	-.003(.007)
Dependency	-.035(.057)	-.388***(.080)	-.241**(.112)	-.126**(.052)	.086(.147)	-.016***(.006)	-.015**(.007)
femhead	.038(.045)	.120**(.057)	.192***(.056)	.049(.039)	.492***(.087)	-.008*(.004)	-.006(.004)
married	.058(.047)	.186***(.058)	-.016(.052)	.069*(.042)	.205**(.086)	-.004(.004)	-.003(.004)
left_marriage	.085**(.040)	.105**(.049)	-.247***(.043)	.084**(.037)	.058(.055)	.003(.003)	.003(.003)
left_follow	.084**(.039)	.145***(.050)	-.144**(.060)	.099***(.034)	-.129*(.072)	.005*(.003)	.004(.003)
left_work	.164***(.032)	.005(.043)	-.135***(.044)	.133***(.028)	-.060(.085)	-.000(.003)	.000(.003)
left_school	.277***(.044)	.262***(.059)	.072(.055)	.261***(.038)	.190**(.087)	-.005(.006)	-.003(.006)
left_other	.183***(.045)	.188***(.045)	-.106**(.047)	.189***(.039)	.148*(.081)	-.002(.004)	-.001(.004)
february	.058(.049)	-.027(.062)	.026(.089)	.048(.046)	-.069(.079)	.002(.004)	.000(.004)
	Rural subsample (Per Capita Measure)						
agehead	-.012**(.005)	-.009(.007)	.013**(.006)	-.012**(.005)	-.010(.008)	-.000(.000)	-.000(.000)
Agehead2	.000***(.000)	.000(.000)	-.000(.000)	.000***(.000)	.000***(.000)	.000(.000)	.000(.000)
educhead	.027***(.005)	.056***(.006)	.043***(.007)	.039***(.004)	.009(.007)	.002***(.000)	.002***(.000)
hhsize	-.044***(.008)	-.009(.008)	.079***(.007)	-.037***(.007)	-.050***(.009)	-.002***(.000)	-.003***(.000)
maleratio	.065(.058)	.094(.098)	.224***(.074)	.048(.056)	.070(.106)	.006(.005)	.006(.005)
Dependency	-.334***(.059)	-.653***(.072)	-.282***(.092)	-.418***(.052)	-.015(.126)	-.019***(.004)	-.020***(.005)
femhead	.016(.046)	.095*(.056)	.155***(.044)	.027(.041)	.407***(.070)	-.006*(.003)	-.004(.003)
married	.073(.049)	.191***(.058)	-.005(.042)	.082*(.045)	.163**(.070)	-.004(.003)	-.003(.003)
left_marriage	-.095**(.040)	-.064(.045)	-.224***(.032)	-.093***(.037)	.004(.043)	-.001(.002)	-.001(.002)
left_follow	-.115***(.038)	-.041(.047)	-.139***(.050)	-.097***(.033)	-.177***(.058)	-.000(.001)	-.001(.001)
left_work	-.029(.032)	-.170***(.040)	-.145***(.034)	-.057**(.028)	-.087(.067)	-.003(.002)	-.003*(.002)
left_school	.145***(.046)	.126**(.055)	-.008(.042)	.129***(.039)	.143**(.070)	-.003(.003)	-.002(.003)
left_other	-.090*(.049)	-.065(.044)	-.103***(.033)	-.079*(.043)	.053(.063)	-.006**(.003)	-.006**(.003)
february	.071(.050)	-.015(.062)	.002(.075)	.059(.047)	-.059(.065)	-.001(.002)	-.002(.002)

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are changes in log form, and all independent variables are in changes. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 4. The effect of other covariates on real adult equivalent and per capita income and consumption (Female-headed and male-headed subsamples)

Female-headed subsample (Adult equivalent measure)							
	food_ con	Nonfood_ con	Educ_ con	Total_ con	Unearned_ inc	Earned_ inc	Total_ inc
agehead	.013(.013)	-.058***(.019)	-.002(.028)	-.003(.012)	-.108***(.042)	.002(.002)	.001(.002)
agehead2	-.000(.000)	.001***(.000)	.000(.000)	.000(.000)	.001***(.000)	-.000*(.000)	-.000(.000)
educhead	.028**(.012)	.042***(.014)	.038(.028)	.035***(.011)	.025(.034)	.003*(.001)	.003**(.002)
hhsize	-.009(.027)	.110***(.038)	.122***(.037)	.009(.027)	.008(.074)	.004(.004)	.002(.003)
maleratio	-.072(.183)	-.065(.278)	.565*(.297)	-.088(.181)	-1.215**(.584)	-.078***(.025)	-.081***(.023)
Dependency	.086(.209)	-.374(.212)	.130(.386)	.022(.185)	.002(.600)	-.031(.022)	-.043*(.023)
married	.063(.146)	.068(.116)	-.019(.205)	.070(.124)	-.102(.286)	-.022(.016)	-.017(.017)
february	-.032(.169)	.170(.144)	-.089(.283)	.016(.150)	.679(.46)	-.008(.018)	-.001**(.019)
Female-headed subsample (Per Capita Measure)							
agehead	.011(.014)	-.056***(.018)	-.004(.025)	-.004(.013)	-.100***(.036)	.002(.002)	.000(.002)
Agehead2	-.000(.000)	.001***(.000)	.000(.000)	.000(.000)	.001***(.000)	-.000(.000)	-.000(.000)
educhead	.028***(.011)	.043***(.012)	.038(.024)	.036***(.010)	.027(.030)	.003**(.001)	.004***(.001)
hhsize	-.074***(.027)	.035(.032)	.074**(.032)	-.055**(.026)	-.025(.060)	.003(.004)	.001(.004)
maleratio	.170(.185)	.164(.258)	.475*(.251)	.146(.176)	-.890*(.500)	-.055**(.024)	-.056***(.021)
Dependency	-.257(.207)	-.655***(.195)	.036(.338)	-.316*(.188)	-.233(.520)	-.037**(.015)	-.050***(.016)
married	.182(.135)	.176(.109)	-.063(.181)	.184(.114)	-.038(.262)	-.031**(.016)	-.027*(.014)
february	-.159(.161)	.056(.136)	-.187(.251)	-.107(.145)	.615(.385)	-.009(.019)	-.003(.019)
	Male-headed subsample (Adult equivalent measure)						
agehead	-.008(.005)	-.002(.006)	.026***(.009)	-.007*(.004)	-.038***(.009)	.003***(.001)	.003***(.001)
Agehead2	.000*(.000)	.000(.000)	-.000**(.000)	.000*(.000)	.000***(.000)	.000***(.000)	.000***(.000)
educhead	.018***(.004)	.045***(.005)	.047***(.007)	.029***(.003)	.015**(.007)	.006***(.001)	.006***(.001)
hhsize	-.000(.008)	.010(.008)	.127***(.010)	.003(.007)	.002(.010)	-.005***(.001)	-.005***(.001)
maleratio	-.049(.079)	-.063(.089)	-.001(.119)	-.022(.067)	.207(.150)	-.007(.014)	-.004(.013)
Dependency	.038(.086)	-.469***(.095)	-.029(.139)	-.062(.075)	-.365**(.151)	-.003(.010)	-.005(.010)
married	.203***(.055)	.172***(.062)	-.090(.089)	.134***(.047)	-.230**(.098)	.003(.009)	-.001(.009)
february	.056(.048)	-.103(.065)	-.024(.090)	.028(.046)	-.091(.085)	-.018***(.006)	-.018***(.006)
	Male-headed subsample (Per Capita Measure)						
agehead	-.005(.005)	.001(.006)	.021***(.007)	-.004(.004)	-.033***(.008)	.002***(.000)	.002***(.000)
Agehead2	.000(.000)	-.000(.000)	-.000**(.000)	.000(.000)	.000***(.000)	-.000***(.000)	-.000***(.000)
educhead	.020***(.004)	.046***(.005)	.043***(.006)	.030***(.004)	.013**(.006)	.004***(.001)	.004***(.001)
hhsize	-.050***(.008)	-.037***(.007)	.080***(.008)	-.046***(.007)	-.007(.009)	-.004***(.001)	-.004***(.001)
maleratio	.207**(.076)	.186**(.088)	.047(.097)	.229***(.065)	.233*(.134)	.016(.012)	.020*(.012)
Dependency	-.275***(.090)	-.747***(.094)	-.107(.115)	-.369***(.077)	-.410***(.132)	-.014*(.008)	-.017**(.008)
married	.299***(.056)	.246***(.061)	-.075(.074)	.225***(.048)	-.202**(.086)	-.002(.008)	-.005(.008)
february	.075(.048)	-.089(.063)	-.024(.074)	.045(.046)	-.052(.075)	-.013***(.005)	-.013***(.005)

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are changes in log form, and all independent variables are in changes. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 5. The effect of other covariates on real adult equivalent and per capita income and consumption (Poor and non-poor subsamples)

poor subsample (Adult equivalent measure)							
	food_ con	Nonfood_ con	Educ_ con	Total_ con	Unearned_ inc	Earned_ inc	Total_ inc
agehead	-.003(.005)	-.015**(.008)	.001(.009)	-.007(.005)	-.026*(.016)	.001(.000)	.001(.000)
agehead2	.000(.000)	.000(.000)	.000(.000)	.000(.000)	.000**(.000)	.000(.000)	.000(.000)
educhead	.010**(.004)	.028***(.007)	.042***(.009)	.018***(.004)	.005(.010)	.001**(.001)	.001*(.001)
hhsize	.001(.006)	.040***(.010)	.102***(.009)	.007(.006)	-.034**(.014)	-.001**(.001)	-.002***(.001)
maleratio	.040(.065)	.134(.102)	.206*(.109)	.071(.062)	.319**(.159)	-.001(.006)	-.003(.006)
Dependency	.154***(.061)	-.202**(.098)	-.499***(.097)	.078(.056)	-.411**(.175)	-.006(.008)	-.007(.008)
Female_head	.039(.044)	.025(.071)	.151**(.065)	.022(.042)	.605***(.125)	-.010**(.005)	-.008(.005)
married	.139***(.043)	.216***(.075)	-.080(.068)	.120***(.038)	.077(.115)	-.006(.005)	-.006(.005)
february	.014(.042)	.088(.080)	.115(.072)	.045(.038)	-.032(.088)	-.006(.006)	-.007(.006)
poor subsample (Per Capita Measure)							
agehead	.004(.005)	-.009(.008)	-.001(.007)	.000(.005)	-.021*(.013)	.000(.000)	.000(.000)
Agehead2	-.000(.000)	.000(.000)	.000(.000)	.000(.000)	.000**(.000)	-.000*(.000)	-.000(.000)
educhead	.013***(.005)	.030***(.007)	.037***(.007)	.021***(.005)	.007(.008)	.001*(.000)	.001**(.000)
hhsize	-.054***(.007)	-.012(.009)	.057***(.008)	-.046***(.007)	-.041***(.012)	-.002***(.000)	-.002***(.000)
maleratio	.154**(.068)	.229**(.097)	.202**(.090)	.180***(.065)	.237*(.135)	.006(.004)	.005(.004)
Dependency	-.189***(.062)	-.496***(.095)	-.483***(.082)	-.255***(.059)	-.421***(.147)	-.011**(.005)	-.013***(.005)
Female_head	.018(.044)	-.007(.067)	.092*(.054)	.000(.042)	.467***(.108)	-.007**(.003)	-.006**(.003)
married	.183***(.046)	.226***(.071)	-.081(.059)	.158***(.041)	.056(.097)	-.004(.003)	-.004(.003)
february	.061(.042)	.130*(.074)	.089(.058)	.089**(.037)	-.008(.076)	-.002(.003)	-.002(.003)
	Non-poor subsample (Adult equivalent measure)						
agehead	.018**(.009)	-.012(.010)	.032(.020)	.008(.007)	-.052***(.020)	-.002(.001)	-.002*(.001)
Agehead2	-.000**(.000)	.000(.000)	-.000(.000)	-.000(.000)	.001***(.000)	.000*(.000)	.000**(.000)
educhead	.005(.007)	.040***(.006)	.064***(.014)	.017***(.005)	.010(.013)	.007***(.001)	.007***(.001)
hhsize	.015(.010)	.000(.015)	.205***(.022)	.013(.008)	-.064**(.028)	-.003*(.002)	-.005***(.002)
maleratio	-.272***(.085)	.006(.111)	.002(.281)	-.100(.066)	-.388(.249)	.038*(.021)	.028(.018)
Dependency	.348***(.088)	-.007(.105)	.274(.217)	.228***(.067)	.107(.276)	-.030*(.018)	-.028(.018)
Female_head	-.070(.053)	.215***(.085)	-.021(.155)	-.011(.044)	.673***(.163)	.002(.011)	.006(.011)
married	.103*(.056)	.207***(.068)	-.087(.194)	.120***(.044)	-.039(.156)	-.013(.010)	-.013(.009)
february	.250***(.074)	-.164(.101)	.022(.174)	.132**(.063)	.255(.197)	-.015(.010)	-.014(.009)
	Non-poor subsample (Per Capita Measure)						
agehead	.017**(.008)	-.013(.011)	.026(.018)	.007(.007)	-.044**(.018)	-.001(.001)	-.001(.001)
Agehead2	-.000*(.000)	.000(.000)	-.000(.000)	-.000(.000)	.001***(.000)	.000(.000)	.000*(.000)
educhead	.008(.007)	.041***(.007)	.059***(.013)	.019***(.006)	.012(.011)	.007***(.001)	.007***(.001)
hhsize	-.040***(.011)	-.052***(.014)	.144***(.019)	-.041***(.009)	-.064***(.025)	-.004**(.002)	-.005***(.002)
maleratio	-.127(.096)	.142(.118)	.020(.252)	.044(.080)	-.333(.217)	.053***(.020)	.045***(.018)
Dependency	-.125(.100)	-.466***(.101)	.156(.190)	-.240***(.077)	-.055(.232)	-.043***(.014)	-.043***(.014)
Female_head	-.124**(.060)	.161*(.091)	-.060(.139)	-.064(.055)	.551***(.143)	.001(.009)	.002(.009)
married	.140**(.062)	.237***(.072)	-.104(.177)	.155***(.054)	-.061(.143)	-.017(.010)	-.019**(.009)
february	.212***(.069)	-.197*(.105)	-.049(.155)	.094(.065)	.231(.170)	-.010(.008)	-.008(.008)

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are changes in log form, and all independent variables are in changes. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 6. The effect of the death of household head and non-head members on adult equivalent and per capita income and consumption (Whole and subsamples)

	Whole sample				Within R^2		Number of Obs.
	Adult equivalent measure		Per capita measure				
	Death_head	Death_oth	Death_head	Death_oth	A	P	
Food_con	.077(.063)	.023(.061)	-.018(.064)	-.026(.058)	0.447	0.523	9489
Nonfood_con	.068(.074)	.121**(.057)	-.013(.069)	.073(.059)	0.606	0.657	9489
Educ_con	-.025(.105)	-.135(.097)	-.050(.095)	-.104(.077)	0.444	0.431	9489
Total_con	.118**(.058)	.049(.051)	.024(.058)	.001(.050)	0.513	0.601	9489
Unearned_inc	.161(.180)	-.136(.103)	.127(.147)	-.128(.086)	0.448	0.444	9908
Earned_inc	-.003(.009)	-.000(.006)	-.005(.005)	.003(.004)	0.442	0.704	9908
Total_inc	-.002(.008)	-.002(.006)	-.005(.005)	.002(.004)	0.474	0.735	9908
	Urban subsample						
Food_con	-.368***(.143)	.194*(.114)	-.442***(.146)	.097(.122)	0.405	0.467	3315
Nonfood_con	.022(.192)	-.178(.134)	-.048(.198)	-.272*(.147)	0.526	0.623	3315
Educ_con	-.322(.367)	-.515*(.300)	-.367(.330)	-.462*(.259)	0.344	0.244	3315
Total_con	-.154(.121)	.035(.090)	-.226*(.128)	-.062(.107)	0.455	0.580	3315
Unearned_inc	.766**(.329)	.773**(.390)	.649**(.281)	.634*(.351)	0.376	0.393	3431
Earned_inc	.028(.020)	-.028(.032)	.023(.019)	-.009(.024)	0.563	0.754	3431
Total_inc	.027(.020)	-.022(.033)	.022(.020)	-.003(.025)	0.573	0.742	3431
	Rural subsample						
Food_con	.013(.072)	.096(.065)	-.050(.079)	.065(.069)	0.463	0.496	6174
Nonfood_con	-.113(.112)	-.016(.084)	-.161(.100)	-.054(.081)	0.573	0.583	6174
Educ_con	-.027(.118)	-.122(.120)	-.038(.086)	-.104(.089)	0.458	0.426	6174
Total_con	-.002(.068)	.082(.062)	-.06(.073)	.050(.065)	0.497	0.529	6174
Unearned_inc	.127(.209)	-.154(.115)	.113(.163)	-.135(.089)	0.493	0.483	6477
Earned_inc	.003(.006)	-.001(.006)	.003(.003)	-.002(.003)	0.806	0.968	6477
Total_inc	.007(.005)	-.003(.006)	.004(.003)	-.003(.003)	0.805	0.968	6477
	Female headed subsample						
Food_con	.762***(.221)	-.078(.198)	.668***(.212)	-.267(.186)	0.811	0.851	2931
Nonfood_con	.190(.333)	-.477*(.291)	.098(.273)	-.639**(.278)	0.886	0.915	2931
Educ_con	-1.147***(.393)	-.230(.390)	-.973***(.343)	-.192(.336)	0.774	0.763	2931
Total_con	.712***(.185)	-.197(.194)	.613***(.159)	-.381**(.181)	0.833	0.880	2931
Unearned_inc	.890(.719)	.217(.678)	.837(.579)	.073(.580)	0.820	0.822	3006
Earned_inc	.003(.023)	.001(.019)	-.030(.023)	-.008(.013)	0.844	0.951	3006
Total_inc	.004(.025)	-.000(.023)	-.026(.022)	-.005(.016)	0.859	0.958	3006
	Male headed subsample						
Food_con	-.053(.103)	.133**(.065)	-.148(.107)	.082(.075)	0.566	0.617	6558
Nonfood_con	.105(.135)	.201***(.078)	.026(.142)	.148*(.083)	0.702	0.738	6558
Educ_con	-.080(.157)	-.015(.111)	-.107(.132)	-.026(.085)	0.586	0.581	6558
Total_con	.039(.081)	.147***(.057)	-.054(.095)	.095(.069)	0.626	0.690	6558
Unearned_inc	.086(.238)	.015(.129)	.025(.196)	.018(.111)	0.535	0.531	6902
Earned_inc	.014(.016)	.001(.012)	.000(.011)	.004(.007)	0.512	0.710	6902
Total_inc	.013(.017)	.001(.011)	-.000(.011)	.004(.007)	0.530	0.734	6902
	Poor subsample						
Food_con	-.021(.071)	.080(.071)	-.075(.078)	.005(.0712)	0.586	0.624	5037
Nonfood_con	-.371***(.106)	.221***(.088)	-.387***(.116)	.146(.092)	0.701	0.720	5037
Educ_con	.184(.152)	.179**(.091)	.115(.127)	.149**(.070)	0.669	0.668	5037
Total_con	-.093(.066)	.109*(.063)	-.145*(.079)	.036(.063)	0.614	0.663	5037
Unearned_inc	.669***(.252)	-.012(.170)	.516***(.197)	-.039(.143)	0.655	0.652	5148
Earned_inc	-.006(.008)	.014*(.008)	-.003(.005)	.011***(.004)	0.868	0.983	5148
Total_inc	-.004(.007)	.015*(.008)	-.002(.004)	.011***(.003)	0.870	0.984	5148
	Non-poor subsample						

Food_con	-.072(.261)	-.048(.095)	-.101(.253)	-.057(.090)	0.583	0.617	4452
Nonfood_con	-.127(.211)	-.190(.157)	-.158(.191)	-.199(.157)	0.780	0.806	4452
Educ_con	.138(.473)	-.849***(.199)	-.141(.451)	-.715***(.163)	0.597	0.581	4452
Total_con	.013(.192)	-.090(.076)	-.016(.182)	-.098(.072)	0.661	0.712	4452
Unearned_inc	-.485(.537)	.209(.204)	-.496(.489)	.098(.173)	0.627	0.623	4760
Earned_inc	-.057*(.030)	-.031**(.013)	-.035(.029)	-.018(.011)	0.578	0.742	4760
Total_inc	-.052**(.026)	-.028**(.013)	-.033(.023)	-.015(.011)	0.649	0.797	4760

*Notes: Numbers in the parenthesis are standard errors. All dependent variables are in log form. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level. A and P stand for within R^2 for adult equivalent and per capita specifications respectively.*

Appendix 7. Marginal effects of other covariates on households' coping strategies (Urban versus rural subsample)

Covariate	Urban subsample					
	saving	asset	help	credit	labor	others
hhsize	.012(.008)	.016**(.007)	-.002(.006)	.006(.004)	.014***(.005)	-.022***(.008)
educ_h	.007*(.004)	-.010***(.003)	-.007(.005)	-.005*(.002)	.002(.003)	.002(.006)
age_h	-.001(.001)	-.001(.001)	.000(.001)	-.001**(.001)	.000(.001)	.002(.001)
female_h	.006(.050)	-.002(.039)	.004(.039)	-.013(.023)	.017(.028)	.010(.054)
married	.164***(.052)	-.005(.042)	-.052(.034)	.010(.017)	-.048*(.027)	-.035(.052)
Poor-dev	-.150***(.045)	.028(.031)	-.029(.033)	.032(.025)	-.008(.021)	.093*(.049)
depend	-.046(.090)	-.065(.064)	.030(.062)	-.006(.033)	-.099*(.056)	.070(.08119
maleratio	-.184**(.087)	-.025(.067)	-.073(.059)	.012(.037)	.057(.043)	.108(.106)
No. of obs.	971					
Draws	120					
Wald chi2	346.59					
Prob>chi2	0.000					
	Rural subsample					
hhsize	.008(.008)	.016**(.008)	-.005(.007)	.006*(.004)	.010***(.003)	-.012(.008)
educ_h	.008(.006)	-.003(.007)	-.005(.005)	.000(.001)	.003(.003)	-.004(.007)
age_h	-.002*(.001)	.001(.001)	.002***(.001)	.000(.001)	.000(.001)	.000(.001)
female_h	-.017(.052)	-.024(.051)	.047(.046)	.066***(.027)	.010(.024)	-.014(.048)
married	.114**(.052)	.065(.062)	-.051(.045)	.048*(.027)	-.046**(.022)	-.019(.055)
Poor-dev	-.108***(.042)	-.002(.039)	-.013(.027)	-.048(.043)	.006(.014)	.036(.038)
depend	.098(.074)	-.169*(.093)	.170***(.064)	-.048(.043)	-.094***(.038)	.074(.105)
maleratio	-.293***(.100)	-.030(.099)	.030(.068)	.093*(.056)	.049(.039)	.043(.096)
left-marriage	.001(.041)	.035(.044)	-.001(.038)	.025(.027)	-.002(.021)	-.063(.047)
left-follow	-.101**(.042)	.069(.054)	-.032(.039)	.046**(.021)	-.038*(.023)	.048(.055)
left-work	.029(.045)	-.057(.062)	-.038(.039)	-.036(.028)	.080***(.019)	.052(.053)
left-school	.058(.051)	.091(.072)	-.058(.047)	-.022(.032)	-.033(.028)	-.100(.075)
left-other	.008(.055)	-.039(.047)	-.032(.042)	.016(.032)	-.052**(.027)	-.102(.073)
No. of obs.	1402					
Draws	1000					
Wald chi2	596.76					
Prob>chi2	0.000					

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 8. Marginal effects of other covariates on households' coping strategies (Female-headed versus male-headed subsample)

Covariate	Female-headed subsample					
	saving	asset	help	credit	labor	others
hhsize	.002(.009)	.009(.007)	-.013(.009)	.008**(.004)	.020***(.006)	-.016*(.010)
educ_h	.009*(.005)	.002(.005)	-.003(.005)	-.002(.002)	.004(.003)	-.010(.008)
age_h	-.001(.001)	-.001(.001)	.001(.001)	-.001(.001)	.001(.001)	.001(.001)
married	.144***(.044)	-.003(.043)	-.071**(.036)	-.004(.019)	-.091***(.027)	.020(.047)
urban	-.004(.056)	-.184***(.050)	-.062(.042)	-.038(.024)	.011(.027)	.167***(.063)
Poor-dev	-.126***(.039)	.011(.032)	-.030(.032)	.037*(.022)	-.010(.020)	.003(.044)
depend	.020(.079)	-.081(.061)	.071(.068)	-.067(.045)	-.100**(.047)	.121(.080)
maleratio	-.212**(.095)	.001(.086)	.023(.083)	.057(.048)	.001(.047)	.116(.106)
No. of obs.	880					
Draws	1000					
Wald chi2	301.96					
Prob>chi2	0.000					
	Male-headed subsample					
hhsize	.013*(.007)	.017***(.006)	-.006(.005)	.006(.004)	008**(.003)	-.016**(.008)
educ_h	.009**(.005)	-.006(.004)	-.007*(.004)	-.004(.003)	.000(.002)	-.000(.005)
age_h	-.002**(.001)	.001(.001)	.001*(.001)	.000(.001)	-.000(.001)	.000(.001)
married	.171***(.046)	.021(.049)	-.049(.034)	.065**(.029)	-.053**(.022)	-.018(.049)
urban	.060(.049)	-.253***(.064)	-.001(.035)	.012(.035)	.012(.027)	.079(.062)
Poor-dev	-.122***(.038)	.016(.037)	-.004(.025)	.017(.020)	.010(.015)	.093**(.039)
depend	.015(.075)	-.214**(.104)	.134**(.057)	.001(.050)	-.113**(.049)	.069(.095)
maleratio	-.225**(.094)	-.107(.094)	-.049(.061)	.046(.057)	.044(.037)	.076(.096)
No. of obs.	1493					
Draws	1000					
Wald chi2	361.63					
Prob>chi2	0.000					

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 9. Marginal effects of other covariates on households' coping strategies (Poor versus non-poor subsample)

Covariate	Poor subsample					
	saving	asset	help	credit	labor	others
hhsize	.010(.008)	.019***(.007)	-.008(.006)	.004(.005)	.013***(.004)	-.011(.008)
educ_h	.007(.006)	.003(.007)	-.001(.004)	-.003(.003)	.004(.003)	-.004(.007)
age_h	-.002(.001)	.001(.001)	.002*(.001)	-.001(.001)	-.000(.001)	.001(.001)
Female-head	-.010(.050)	-.026(.044)	.038(.042)	.035(.030)	.002(.026)	-.004(.051)
married	.123**(.053)	.018(.053)	-.059(.041)	028(.029)	-.059**(.025)	.016(.051)
urban	.014(.053)	-.228***(.051)	-.041(.037)	.001(.039)	-.003(.027)	.162***(.060)
depend	-.045(.075)	-.151**(.078)	.130**(.066)	-.039(.046)	-.110**(.050)	.160*(.087)
maleratio	-.263***(.097)	-.076(.093)	.054(.065)	.073(.060)	.039(.044)	.122(.104)
No. of obs.	1240					
Draws	1000					
Wald chi2	300.04					
Prob>chi2	0.000					
	Non-poor subsample					
hhsize	.005(.008)	.011(.007)	-.008(.006)	.009**(.004)	.011***(.004)	-.023***(.008)
educ_h	.013***(.005)	-.008**(.003)	-.007(.005)	-.003(.002)	.001(.002)	-.005(.005)
age_h	-.002(.001)	.000(.001)	.001(.001)	.000(.001)	.001(.001)	.000(.001)
Female-head	.019(.051)	.029(.046)	.012(.041)	.0160(.020)	.031(.025)	-.015(.050)
married	.137***(.049)	.070(.051)	-.049(.038)	.028(.019)	-.034(.023)	-.048(.051)
urban	.056(.064)	-.233***(.069)	-.015(.043)	-.012(.021)	.015(.026)	.076(.061)
depend	.087(.092)	-.169**(.081)	.059(.055)	-.043(.035)	-.101**(.047)	.050(.087)
maleratio	-.242***(.085)	-.010(.095)	-.097(.071)	.026(.038)	.064*(.038)	.060(.100)
No. of obs.	1133					
Draws	1000					
Wald chi2	306.88					
Prob>chi2	0.000					

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*

Appendix 10. Marginal effect of disability on community based health insurance enrolment (probit model)

	Aggregate disability	Disability by severity	
	disability	Disability1	Disability2
CBHI	.100***(.030)	.076**(.032)	.108**(.049)
No. of Obs.	3115	3115	
Pseudo R^2	0.079	0.077	
Wald chi2	161.80	159.82	
Prob> chi2	0.000	0.000	

*Notes: Numbers in the parenthesis are standard errors. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.*