Community-based Health Insurance And Household Welfare – Empirical Evidence from Burkina Faso

Master Thesis

Submitted in Partial Fulfilment of the Requirements for the Degree of

Master of Science

in Economics

of the Faculty of Economics and Social Sciences
at
Ruprecht-Karls-University Heidelberg

September 2013

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Born in Mannheim on 21 April 1988

Declaration

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List of abbreviations

CBHI	community-based health insurance
CFA	West African CFA (communauté financière africaine)
CMA	medical centre with a surgical branch (centre médical avec antenne chirurgicale)
CRSN	Nouna health research centre (le centre du recherche en santé de Nouna)
CSPS	primary health care facility (centre de santé et de promotion sociale)
CWR	community wealth ranking
e.g.	exempli gratia (for example)
et al.	et alii (and others)
etc.	et cetera
FE	fixed effects
FFS	fee-for-services
GDP	gross domestic product
HDSS	health and demographic surveillance system
HIV	human immunodeficiency virus
ILO	international labour organisation
ITT	intent-to-treat
IV	instrumental variables
km	kilometres
LATE	local average treatment effect
n.d.	no date
NGO	non governmental organisation
n.p.	no page
OOP	out-of-pocket
p.c.	per capita
PPP	purchasing power parity
RDD	regression discontinuity design
TPP	third-party payment
WHO	World Health Organization

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1 Introduction

Within the spectrum of shocks threatening individuals' well-being health shocks are among the most common and most severe. Given unhealthy working and living conditions poor people in low-income countries are especially exposed to the risk of ill health. Health shocks do not only threaten a person's life or lifetime physical well-being but also constitute a severe economic risk. Illness causes indirect costs by preventing individuals from engaging in income-earning activities while at the same time triggering high out-of-pocket (OOP) expenditures[1] for medical care, which can be catastrophic in nature.

Health insurance could reduce uncertainty by covering medical expenditures, thereby improving access to healthcare in case of a health shock. Yet, often neither the state nor the market provides health insurance for poor people in low-income countries. Therefore, poor people need to rely on informal insurance mechanisms to insure their consumption levels in the face of health shocks. These are not only insufficient to fully insure consumption but also come at high future economic costs by reducing investment in human and physical capital. Thus, without formal insurance health shocks are likely to increase poor individuals' vulnerability[2] to poverty. Poverty in turn can serve as a catalyst for illness. Therefore, the relationship between ill health and poverty is often described as mutually reinforcing.

The concept of community-based health insurance (CBHI) has been promoted as a strategy for closing the health insurance gap of poor people in low-income countries. By adapting insurance premiums and processes to poor individuals' ability-to-pay and needs they have the potential to provide risk pooling for individuals who do not have access to private or statutory health insurance. Given that most schemes cannot remain financially viable without external financial support it seems important to evaluate whether such an investment yields improvements of individuals' well-being.

The objective of this paper is to evaluate the impact of a particular CBHI in the North West of Burkina Faso not only on direct costs of illness in the form of OOP expenditures but also on indirect costs in the form of lost days due to illness. While many studies have been published providing anecdotal evidence rigour empirical evaluations on the impact of CBHI are scarce and almost exclusively focus on OOP expenditures. One important reason for this gap is the

[1] Household out-of-pocket expenditures are defined as "direct spending after deduction of third-party payments, such as insurance (Rannan-Eliya, 2010, p. 8).

2 According to Dercon (2007) a vulnerable household is "likely to fall below an agreed upon poverty line in the future with a particular probability" (p. 25).

methodological challenge of overcoming selection bias since enrolment in a CBHI is voluntary and thus driven by observable and unobservable characteristics. To address the problem of selection bias this paper relies on a sharp regression discontinuity design by exploiting the introduction of a discount on the insurance premium for poor households. The identification strategy relies on exogenous variation in exposure to this premium discount for individuals close around an eligibility threshold. Eligibility to receive a premium discount is then used as an instrument for enrolment in the insurance scheme. Conditional on individuals' inability to precisely sort around the eligibility threshold the effect of insurance on outcomes of interest can be estimated for the subgroup of poor individuals who enrolled in the CBHI scheme only because they received a premium discount (compliers).

Results suggest no significant reduction in OOP expenditures, which may be due to unfavourable incentive mechanisms between healthcare provider and CBHI scheme. In contrast, estimates show a significant negative effect on whether an individual lost at least one day due to illness. Hence, these findings emphasise the need for designing appropriate incentive structures between CBHI, healthcare provider, and insured individuals.

The remainder of the paper is organised as follows: chapter two first analyses why formal insurance mechanisms are often not available for poor households in low-income countries before examining the limitations of informal insurance mechanisms. Chapter three introduces the concept of CBHI and discusses its potential to close the insurance gap for poor households in low-income countries. Turning from theory to empirical work chapter four provides background information on poverty and health in Burkina Faso and describes the set-up as well as existing evidence of the evaluated CBHI in the Nouna health district in the North West of Burkina Faso. Chapter four concludes by stating the research objective and discussing predicted effects of enrolment in the CBHI on the outcomes of interest, OOP expenditures and days lost due to illness. Chapter five contains data and methodology and results are presented in chapter six. Chapter seven contains a discussion and points at limitations. Chapter eight concludes.

2 Health shocks and insurance mechanisms

2.1 Short and long-term economic costs of health shocks

Without neglecting that ill health reduces an individual's welfare due to a general preference for good health the following analysis focuses on the short and long-term economic costs of a health shock.

Short-term costs

Illness causes direct and indirect short-term costs. Direct costs consist of expenditures for medical consultations, prescribed drugs, and cost associated with transport to medical facilities. These reduce the income available for satisfying basic needs such as food or housing. Whether the financial burden of these so-called OOP expenditures is small or large depends on their relative share in household income. Especially for poor households using almost their entire income to satisfy their basic needs OOP expenditures can mean a severe reduction of consumption levels (Su, Kouyaté & Flessa, 2006, p. 21). Findings from a systematic review suggested that healthcare expenditures frequently exceed the threshold of 10 % of household income, which some authors regard as potentially catastrophic. The term 'catastrophic' implies that such expenditure levels force households to drastically reduce consumption of other basic needs, to sell productive assets, or to take high loans, which is likely to lead to impoverishment (McIntyre et al. 2006, p. 861). Other studies define catastrophic health expenditures as exceeding 40 % of household income, so no consensus on a threshold exists (Xu et al., 2003, p. 112). By analysing data from eleven low and middle-income countries in Asia van Doorslaet et al. (2006, p. 1359) estimated that poverty rates[3] would increase by 2.7 percentage points (or 78 million people) if health expenditures were taken into account when assessing households' financial resources. So, health expenditures can strongly reduce households' resources available for satisfying basic needs.

Illness does not only cause high expenditures but also indirect costs due to lost time. Sickness reduces the ability to work. If an individual cannot work due to a severe illness she experiences an income loss. This is particularly true for manual labour. Findings from a study in Indonesia suggested that moving from completely healthy to completely sick reduced hours worked per week by 84 % compared to baseline levels (Gertler & Gruber, 2002, p. 58). Even

[3] Based on the US$ 1 per day threshold used by the World Bank.

in less severe cases illness is likely to reduce productivity[4]. Income losses can also occur for individuals who themselves have not even fallen sick. For example, a family member might be forced to stay at home in order to care for a sick relative. Studies on low- and middle-income countries suggested that "indirect costs can be anything from 2 to 3.6 times greater than direct costs" (MyIntyre et al., 2006, p. 861).

The combination of reduced income and increased expenditures makes illness a great financial risk, especially for poor households. Since timing and magnitude of a health shock are unpredictable individuals face great uncertainty (Smith & Witter, 2004, p. 1). Therefore, illness threatens households' objective of smoothing consumption over time. For example, in Indonesia "illness was associated with a fall in consumption by 0.84 percent of baseline" (Gertler & Gruber, 2002, p. 67). In particular, high-cost low frequency events were found to be a greater threat to consumption smoothing than low-cost high frequency events[5].

Long-term economic costs

Given the financial burden of high treatment expenditures and lost labour income households are likely to reduce long-term investments (e.g. schooling, productive assets) when hit by a health shock. This lowers households' future income earning opportunities. Victims of bus accidents in India were found to reduce educational spending by 20 % (Mohanan, 2013, p. 677). Similarly, findings from Sub-Saharan Africa suggested that regional HIV prevalence reduced school attendance (Fortson, 2011, p. 1).

Even worse, if households are unable to afford high treatment expenditures they are likely to delay care or turn to options perceived as cheaper such as self-treatment or traditional medicine (Mugisha et al., 2002, p. 188). This is likely to reduce income in the long run via two channels. First, physical strength required for generating labour income continuously deteriorates causing labour income to decline in the future (Arhin-Tenkorang, 2004, p. 165). Second, childhood health is likely to influence the return to input factors for the production of human capital (e.g. schooling), which in turn is likely to affect future income (Bleakley, 2010, p. 6). Lower educational attainments were found for young children suffering from the Great Famine in China (Meng & Qian, 2006, p. 1). A nutrition experiment on young children in Guatemala suggested an increased likelihood of completing primary school and better reading

[4] For example, another study conducted in Indonesia reported that adult productivity increased after having distributed iron supplements reducing anemia (Thomas et al., 2003, cited in Bleakley, 2010, p. 19).

[5] For example, Gertler & Gruber (2002) reported that households in Indonesia could insure 71 % of the costs resulting from transitory health shocks (illnesses that moderately limited an individual's ability to function). Yet, they could only insure 38 % of the costs associated with severe illnesses (p. 67).

comprehension in adulthood for the treatment group (Maluccio et al., 2006, p. 31). Deworming drugs were found to reduce school absenteeism by one fifth in India (Bobomis, Miguel & Puri-Sharma, 2006, pp. 717-718). Some studies also find a positive relationship between adult height as a proxy[6] for health status during childhood and income (e.g. Deaton, 2008, p. 473).

Due to these long-term economic costs ill health can be a catalyst for poverty spirals. Since poverty can also cause and perpetuate ill health the relationship between illness and poverty is often described as bidirectional (Grant, 2005, p. 4).

2.2 Insurance mechanisms against health shocks

Poor people tend to be more than proportionally exposed to health shocks. Poor shelter and living conditions (e.g. poor water and waste management, cooking fires) increase the risk of diarrhoeal and respiratory diseases. Also, infections spread more easily in crowded conditions. Moreover, low-income segments of the population tend to face poor working conditions (e.g. unventilated factories, working with hazardous machinery or chemicals) with insufficient health and safety protection. For example, rickshaw pullers in Bangladesh reported that 70 % of their major health hazards are connected to their profession (Begum & Sen, 2004, p. 24). Finally, poor people are more likely to suffer from malnutrition reducing the effectiveness of their body's defences and making them more vulnerable to illnesses. Even worse, maternal ill-health can transfer to infants and reduce their lifetime resilience (Grant, 2005, p. 5, 14).

Poor households only have little means to ex-ante reduce the probability of a health shock by taking own action. Improvements of living and working conditions (e.g. enforcing safety regulations for the workplace, improving access to preventive healthcare) are likely to require action on community, regional, and also the national level (Jütting, 2005, p. 19). Poor households could, however, take up a less risky work. Yet, low-risk activities often yield lower returns. Therefore, income-skewing strategies often come at the cost of lower average incomes in the long run (Dercon, 2007, p. 18).

Poor households are not only more likely to experience a health shock but also tend to have a smaller set of feasible insurance mechanisms. These influence to which extent the growth rate of consumption is correlated with the size of the shock. With a perfect insurance mechanism

[6] However, it is difficult to say whether the influence of height on income can be truly attributed to the effect of childhood health on the returns to human capital. Results might equally be driven by labour market discriminations or the direct benefit of being physically stronger (Bleakley, 2010, p. 6).

the growth rate of consumption should be independent of any health shock affecting the resources of a household (Skoufias & Quisumbing, 2005, p. 26).

The following two sections discuss feasibility and effectiveness of different formal (section 2.2.1) and informal (section 2.2.2) insurance mechanisms for poor households in low-income countries.

2.2.1 Formal insurance mechanisms

Formal insurance mechanisms can either be provided by the market (private health insurance) or the state (statutory health insurance). Before turning to these mechanisms the following paragraph briefly explains the basic concept of health insurance.

A health insurance scheme collects premiums of all members to pay (parts of) the healthcare expenditures of those individuals that actually fall sick. Thereby, they apply risk pooling that is "the practise of bringing several risks together for insurance purposes in order to balance the consequences of the realisation of each individual risk" (Smith & Witter, 2004, p. 2). With risk pooling the financial risk associated with a health shock is shared with all members of the pool and is no longer borne by each member individually (efficiency issue). In addition, risk pooling also transfers resources from high-risk to low-risk individuals (equity issue), thereby separating utilisation of healthcare services from contribution. Risk-averse individuals[7] value insurance because it reduces uncertainty. By paying a premium when healthy for receiving financial protection when sick they transfer income from healthy states to sick states and thus insure consumption. The benefit of the insurance is the reduction in risk (Smith & Witter, 2004, p. 2). Risk sharing only works well across large pools as only then the average healthcare expenditures become predictable (law of large numbers) (Vaté & Dror, 2002, p. 130).

Formal private insurance

Although individuals value health insurance one major reason for incomplete markets or even market failure are information asymmetries between insurer and insured. Especially in low-income countries insurers find it very difficult to collect information about the health status of their applicants. If individuals are better able to judge their health risk than the insurer only high-risks individuals will buy insurance (adverse selection[8]). Since insurers suspect

[7] The utility of a risk-averse individual is increasing in consumption, yet at a declining rate (concave utility function) (Cutler & Zeckhauser, 1999, p. 11).

[8] Adverse selection is given when more high-risk people than low-risk people enrol in insurance (Acharya et al., 2010, p. 3).

increased enrolment of high-risk individuals they hesitate to offer insurance at a fair price. This makes low-risk individuals even less likely to buy insurance and increases adverse selection (Smith & Witter, 2004, p. 6). From a welfare point of view increased enrolment of high-risk individuals, which often happen to be poor individuals (as discussed in section 2.2), constitutes a positive development (Acharya et al., 2010, p. 5). Yet, insurance does not work if the risk is spread only across high-risk individuals. Therefore, given limited opportunities to overcome information asymmetries in low-income countries insurance markets often are incomplete or even absent despite existing demand for insurance (Dercon, 2002, p. 145).

Even if formal private insurance markets exist they often do not serve the low-income segment of the population for several reasons. First, poor people often live in remote areas only insufficiently geographically covered by private insurance companies. Second, since poor people are considered high-risk customers (as discussed in section 2.2) private insurers needed to charge poor people higher premiums given higher anticipated losses (Balkenhol & Churchill, 2002, p. 77). In addition, the low information environment causes high transaction costs (e.g. from assessing individual's health care risks, monitoring utilisation), which are added on top of the premium. Given their low purchasing power poor households are unable to afford such high premiums. Even if insurers are not allowed to charge risk-related premiums they nonetheless often find ways to "cream skim" the low-risk individuals (Smith & Witter, 2004, pp. 6-7). For example, insurers can discriminate against high-risk (poor) individuals by not adapting product design to the needs of the low-end market. High seasonal income fluctuations and insufficiently developed payment infrastructure make it difficult for poor households to regularly pay insurance premiums (Dror, Preker & Jakab, 2002, p. 38). Paying premiums in cash may also constitute a barrier for poor people engaged in cashless sharecropping work or barter economies. So, given lack of experience and low-attractiveness of poor (high-risk) households insurers often prefer not to serve the low-end market[9] (Balkenhol & Churchill, 2002, p. 77).

Apart from insufficient supply of health insurance products by formal insurers to poor households demand for formal insurance products often is low, too. This might seem paradoxical given the high need for insurance. But poor people often find it difficult to understand the concept and advantages of health insurance compared to spot payments. Given

[9] Apart from offering health insurance markets could theoretically also provide credit for covering medical expenditures. Yet again, due to inappropriate product design (e.g. large collateral, no flexible repayment schedules, complicated paper work) poor households often find it difficult to obtain credit for covering medical expenses. In addition, lenders might regard a loan for medical expenses as a too risky investment since recovery und thus repayment cannot be guaranteed (Balkenhol & Churchill, 2002, p. 76).

tight household budgets insurance might be perceived as a risky investment since the money is not refunded if no claim was made (Balkenhol & Churchill, 2002, p. 77). Evidence suggesting a positive relationship between utilisation and renewal rates (Dong et al., 2009, p. 178) supports this hypothesis.

Concluding, formal insurance markets are often incomplete in low-income countries and/or formal insurers operate hesitate to serve the low-end market. Therefore, poor people in low-income countries often have no access to private health insurance despite high need for insurance.

Statutory health insurance

Incomplete or even absent markets make governmental intervention necessary to provide formal health insurance. By enforcing mandatory enrolment governments can (ideally) create a unitary risk pool consisting of the entire population, thereby redistributing resources from high-risk to low-risk individuals at a large scale (Smith & Witter, 2004, p. 7). Additionally, richer households can cross-subsidise poor households and economically-active households can cross-subsidise non-productive households (children, elderly) (Preker, Langenbrunner & Jakab, 2002, p. 29). These redistribution mechanisms are essential since poor households and young and very old people can contribute less while at the same time being more exposed to health risks. The opportunity to redistribute resources across the entire population constitutes the key advantage of such statutory health insurance schemes. Therefore, they can provide a very effective tool for providing equitable access to healthcare services while reducing the financial risk associated with a health shock. Statutory health insurance schemes are either funded indirectly by general governmental revenues (national health insurance) or directly by firms, households, and the government (social health insurance[10]). In the latter case the government typically pays on behalf of households unable to afford contributions. In both systems governments use the funds to purchase or provide services from public as well as private providers (Acharya et al., 2010, pp. 2-3).

Mandatory enrolment can solve the problem of adverse selection but unitary risk pools are still vulnerable to moral hazard[11]. In low-income countries moral hazard from individual precaution (e.g. risky behaviour) and over-utilisation is less problematic given widespread

[10] Historically, social health insurance is rooted in voluntary worker cooperatives, which over time have taken on a state-mandated legislative character and were gradually expanded across different professional groups (Saltman & Dubois, 2004, p. 22).

[11] In the case of health insurance moral hazard usually refers to an increase in inappropriate utilisation of healthcare services or behavioural changes increasing the likelihood of a health shock (Acharya et al., 2010, p. 5).

under-utilisation of healthcare services. Yet, in order to limit supplier-induced moral hazard reimbursement mechanisms need to be carefully designed. With a fee-for-service (FFS) mechanism healthcare providers are remunerated for every service delivered. Therefore, medical staff is likely to incentivise patients to increase inappropriate utilisation. In contrast, when remunerating healthcare providers with a fixed amount per insured irrespective of actually delivered care (capitation payments) the financial risk is transferred from the insurance scheme to the provider. Yet, then health staff might be incentivised to suppress demand, e.g. by lowering quality of care (Smith & Witter, 2004, pp. 7-8).

Since low-income countries face multiple problems they often find it difficult to implement statutory health insurance. In particular, governments often struggle to collect revenues (1), pool the funds (2), and purchase health care services from public or private providers (3) (Preker, Langenbrunner & Jakab, 2002, p. 26).

Given large informal sectors and weak institutional capacities governments in low-income countries struggle to collect sufficient amount of taxes (1). Many low-income countries raise less than 20 % of GDP in public revenues. Macroeconomic instability (e.g. fluctuating exchange rates, inflation) further contributes to the unpredictability of governmental revenues. It is also difficult to link premium payment to employment since the income of many individuals seasonally varies and is generated in the informal sector (Preker, Langenbrunner & Jakab, 2002, pp. 27-29).

Regarding the pooling of funds (2) governments often fail to enforce compulsory membership for all, which makes cross-subsidising impossible. Even if enrolment is mandatory poor quality of the services provided incentivises households to circumvent the formal financing system (Preker, Langenbrunner & Jakab, 2002, pp. 29-30).

Given insufficient financial resources governments need to ration care (3), for example by excluding high-cost low frequency events. Since this requires difficult ethical and political decisions low-income countries often fail to develop a sustainable strategy resulting in continuous service quality deterioration (e.g. drug shortages, equipment breakdowns, low hygiene standards). Again, low quality standards reinforce households' attempts to bypass the public health care system (Preker, Langenbrunner & Jakab, 2002, p. 32).

Despite these outlined challenges, social health insurance has been introduced in parts of the developing world (e.g. Vietnam 1993, Nigeria 1997, Tanzania 2001, Ghana 2005) and countries with existing schemes seek to expand these to include the informal sector (e.g. Columbia, Mexico, Philippines) (Archarya et al., 2010, p. 3). Yet, even if statutory health insurance has been successfully implemented and thereby removed the economic barrier of the price mechanism to consumption care, indirect costs of health care consumption may still impose considerable barriers to access for poor individuals (Smith & Witter, 2004, p. 7). In remote areas the nearest healthcare facility might be too far away, illiteracy might prevent people from filing claims, and capitation payments may incentive doctors not to show up for work (Archarya et al., 2010, p. 5).

Concluding, statutory health insurance can provide a high degree of protection against health shocks by pooling risks across the entire population. But since many low-income countries face numerous problems statutory health insurance often is not available, especially for poor people working in the informal sector.

2.2.2 Informal insurance mechanisms

In the absence of formal health insurance mechanisms poor people typically are forced to rely on informal insurance mechanisms against health shocks. These mainly consist of ex-post risk coping mechanisms, ex-ante self-insurance using buffer stocks, and ex-ante informal risk-sharing arrangements.

Ex-post risk-coping mechanisms

Risk-coping mechanisms attempt to ex-post reduce the impact of the health shock without any risk-pooling. In order to insure consumption levels households often reallocate labour within the family. Studying the effects of malaria disease of male household members in Sudan Nur (1993, p. 1118) found increased labour supply of children and women to maintain productivity levels. Child labour was also found to play a significant role within the set of risk-coping strategies in rural India (Jacoby & Skoufias, 1997, p. 330) and Tanzania (Beegle, Dehejia & Gatti, 2006, p. 94). Despite calling children and retired people to the fields poor households could not avoid productivity losses in case of severe illness in Burkina Faso (Sauerborn, Adams & Hien, 1996, p. 297). The resulting under-investment (e.g. no schooling) in the human capital of the next generation has severe long-term impacts on expected future income and thus their vulnerability to poverty (Dercon, 2007, p. 16). Similarly, selling productive assets, cashing in life insurance or using savings provide some additional protection today while increasing vulnerability to poverty in the future (Skoufias & Quisumbing, 2005, p. 30). Finally, households may receive higher remittances from family members abroad or gifts and loans from neighbours and relatives (Wagstaff, 2007, p. 83). For example, gifts were found to smooth consumption in India (Townsend, 1994, p. 587), yet, gift giving breaks down in case of common shocks and its level of protection strongly depends on the average wealth level of the social network.

Concluding, ex-post risk coping strategies only provide little protection and potentially even increase future vulnerability to poverty. Therefore, they typically constitute strategies of last resort.

Ex-ante self-insurance using buffer stocks

In order to avoid such high future economic costs households try to plan ahead and ex-ante build up buffer stocks for times of crisis. This risk-mitigation mechanism is called self-insurance. Despite the term 'insurance' self-insurance does not constitute a means to pool risk across individuals. Regarding theory Deaton (1991) developed a model showing that assets serve well as buffer stock when incomes are stationary and independently and identically distributed. By saving and dissaving individuals smooth consumption in the face of income uncertainty. Yet, this strategy is not only less desirable but also less feasible if the income process is positively auto-correlated[12]. The strategy then becomes less desirable because it demands more sacrifice of consumption today to accumulate enough assets for smoothing consumption over long auto-correlated swings of income. The strategy then is also less feasible because once a minimum level of consumption has been reached no assets will be held even if the bad income shock that produced the situation is a signal that further bad draws are to follow. So, the model predicts that the buffer stock strategy fails to work in case of a series of bad draws since at one point all assets will be liquidated. But even without a series of bad draws buffer stocks are also assumed to imperfectly smooth consumption because (especially poor) households are impatient and prefer consumption today to consumption tomorrow. Consequently, asset stocks are not built up to sufficiently high levels (Deaton, 1991, pp. 1225-1233).

In reality, households were indeed found to practise self-insurance by piling up buffer stocks. Bullocks were found to serve as buffer stock in rural India (Rosenzweig & Wolpin, 1993, p. 241) and cattle was used as buffer stock in West Africa (Fafchamps, Udry & Czukas, 1998, p. 299). Yet, evidence from India also supports Deaton's hypothesis of households piling up too little assets to effectively protect consumption against health shocks. Despite the great value of bullocks for consumption smoothing and producing crops households significantly under-

[12] For example, income might be positively auto-correlated if a person could not work on her field due to illness resulting in a lower crop harvest tomorrow, thereby reducing the amount of income that can be reinvested into seeds for the next harvest.

invested in bullocks (Rosenzweig & Wolpin, 1993, p. 242). This may be due to the fact that assets are lumpy. For example, Dercon (1998, cited in Dercon, 2002, p. 149) found that only every second household owned cattle in a sample in Tanzania because buying livestock required a sizable financial surplus.

Further, Deaton's model assumed that investments in assets are safe. Yet, their value and thereby the level of protection they provide can easily change (Dercon, 2007, p. 15). For example, when a common negative shock occurs (e.g. epidemic) the terms of trade between goods for consumption and assets deteriorate since all households will attempt to cash-in their livestock causing the relative price for livestock to decline. Consequently, the value of assets might decrease just when they are needed most to insure consumption levels. Rahamto (1991, cited in Dercon, 2007, p. 15) showed that during the famine in Ethiopia in the mid 1980s terms of trade between livestock and food collapsed reducing the purchasing power of livestock by two thirds. Sauerborn, Adams & Hien (1996) found that during the dry season when most illnesses occur asset prices are substantially lower than in the rainy season in Burkina Faso (p. 294).

Moreover, accumulating buffer stocks also causes considerable economics costs. First, especially in remote areas transaction costs for livestock sales and purchases should not be underestimated (Kazianga & Udry, 2006, p. 444). Second, large buffer stocks tie up a large share of households' capital, which cannot be invested in human capital or physical capital. This makes the buffer stock very costly in terms of foregone future income opportunities. Third, when selling cattle to pay medical expenditures households also lose their value for agricultural production (Parmar et al., 2012b, p. 820).

Concluding, even if households can pile-up sufficient buffer stock self-insurance is not only an expensive means of insuring consumption against health shocks but also a risky strategy.

Ex-ante informal risk-sharing arrangements

Informal risk-sharing arrangements among small groups may also serve as an ex-ante insurance mechanism against health shocks. When engaging in an informal risk-sharing agreement, individuals commit themselves today to support each other in case of a potential future hardship. Theory predicts that with perfect information and perfect enforcement risk-averse members can completely insure idiosyncratic risks[13] by engaging in mutual insurance (Goldstein, de Janvry & Sadoulet, 2007, p. 217).

[13] Idiosyncratic risks only affect one household whereas covariant risks affect a whole community (Jütting, 2005, p. 16).

Households are more likely to enter such an arrangement the more information they have since information reduces moral hazard and adverse selection (De Weerdt, 2007, p. 198). Information flows become less smooth and more costly the larger the network, therefore it is no surprise that networks in Tanzania (De Weerdt & Dercon, 2006, p. 350) and the Philippines (Fafchamps & Lund, 2003, p. 285) remained small both in terms of members and geographic coverage. Yet, such small, local risk pools do not only limit the scope for cross-subsidising from healthy to sick people but also are vulnerable to common shocks (Dercon, 2007, p. 21). Hence, there exists a trade off between geographic proximity fostering smooth information flows on the one hand and covariate income streams weakening the financial viability of the agreement on the other hand (De Weerdt, 2007, p. 198).

Apart from information requirements informal risk-sharing networks also require suitable enforcement mechanisms. Since no payments are made ex-ante enforcement mechanisms are essential to make the parties stick to their informal agreements. Kinship, clan membership, and religious affiliation are important in this respect by imposing strict norms on members (De Weerdt, 2007, p. 198). Such long-lasting relationships increase the probability that discounted expected future benefits from participating in the network will be perceived as greater than the one-time gains from defection. Evidence suggests that kinship and religion indeed positively influenced the creation of networks in Pakistan (Murgai et al., 2002, p. 265) and in Tanzania (De Weerdt, 2007, p. 208).

How robust are such networks? Risk-sharing arrangements may fail if participants' income levels profoundly change. A household with a series of lucky income draws might decide to invest its income instead of spending it to support others (Dercon, 2007, p. 21). Similarly, when an individual's income situation deteriorates she may prefer to hold onto what she has got left despite the promise to share with others (Morduch, 1999, p. 194).

Further, informal risk-sharing agreements may be crowded-out by the implementation of formal insurance mechanisms. For example, if an individual gets access to a social safety net[14] she is likely to defect the informal arrangement (Dercon, 2007, p. 21). In Cote d'Ivoire evidence for informal risk-sharing arrangements were indeed only found in areas without access to formal insurance (Grimard, 1997, p. 419).

Regarding equitable access poor individuals and marginalised groups have a lower chance of being integrated into an informal risk-sharing arrangement. For example, poor households in

[14] Social safety nets are „support systems designed to alleviate food and financial insecurity" (FAO, 2013, n.p.). This could be direct food or cash transfers from the government or indirect transfers (e.g. employment programmes) (FAO, 2013, n.p.).

Tanzania were found not only to have less dense but also less wealthy networks than richer households (De Weerdt, 2007, p. 213). Due to insufficient risk-sharing within the family an episode of illness was associated with a reduction of 1.6-2.3 % of body mass index for women in poor households in southern India (Dercon & Krishnan, 2000, p. 716).

Turning to the question of effectiveness unexpected health shocks in Tanzania were associated with a consumption decline of 7.7 % although people were engaged in informal insurance networks (De Weerdt & Dercon, 2006, p. 353). Similarly, networks of family and friends in the Philippines could not fully insure consumption in the case of mild or acute illnesses (Fafchamps & Lund, 2003, p. 284). Thus, the hypothesis of pareto-efficient risk-pooling within informal insurance networks against health shocks seems to be rejected, especially for poor households.

Concluding, informal risk-sharing arrangements are vulnerable to common shocks and to changes in the economic situation of one party. Evidence suggests that consumption cannot be fully insured and that poor people are less integrated in such risk-sharing networks.

2.3 Intermediate conclusion: health shocks and insurance mechanisms

Poor people are more than proportionally exposed to health shocks. These cause high direct and indirect economic costs in terms high healthcare expenditures and lost time, thereby threatening poor households' objective of consumption smoothing. Formal health insurance often is neither provided by the market (private health insurance) nor the state (statutory health insurance) for poor people in low-income countries. Therefore, they need to rely on informal insurance mechanisms to insure consumption against health shocks. Strategies of last resort typically include the sale of productive assets and intra-household labour substitution. Given sufficient means to pile up buffer stocks in good times and intact social networks households also engage in self-insurance and participate in informal risk-sharing arrangements. Evidence suggests that informal insurance mechanisms do not only fail to fully insure consumption against negative income shocks but can also increase vulnerability to poverty in the future. Thereby, health shocks can reinforce the mutual relationship between ill health and poverty. Closing this existing health insurance gap for poor households in low-income countries could thus yield significant welfare gains not only by insuring consumption levels but also by reducing future vulnerability to poverty.

3 Closing the gap? - The potential of community-based health insurance

3.1 The concept of community-based health insurance (CBHI)

Poor households need to rely on informal insurance mechanisms since they only have limited access to formal insurance mechanisms. In order to fill this health insurance gap community-based health insurance (CBHI) schemes have emerged in low-income countries (Preker, Langenbrunner & Jakab, 2002, p. 30). CBHI schemes pool risks across their members in order to eliminate or at least reduce payments associated with receiving care to a level with negligible impact on critical consumption (Arhin-Tenkorang, 2004, p. 164).

CBHI schemes are sometimes also called community health funds, mutual health organisations, or rural health insurance (Dror & Preker, 2002, p. 44) reflecting the great variety of schemes. Given this diversity it is no surprise that so far no universally accepted definition of CBHI exists. Bennett (2004) defines CBHI as „any scheme managed and operated by an organization, other than a government or private for-profit company, that provides risk pooling to cover all or part of the costs of health care services“ (p. 44). Wang et al. (2012) additionally stress the importance of the community by defining CBHI as a "not for profit private health insurance supported by an ethic of mutual aid among people in the informal sector and rural areas." (pp. 9-10).

Despite the inexistence of a clear-cut definition there seems to be a consensus with respect to certain common characteristics. First of all, CBHI schemes seek to insure people with no access to other collective financing arrangements to pay for health care (Dror & Preker, 2002, p. 45). Therefore, the target group consists of low-income households, which often are employed in the informal sector and which typically live in rural areas (Tabor, 2005, p. 13). Due to this focus on poor households CBHI could also be classified as belonging to the not-for-profit branch of health microinsurance[15]. Second, in order to reach this poor target group membership premiums are comparatively low. Consequently, even with subsidies from the government or donors the set of healthcare services included in the insurance package is rather limited (ILO, 2013, n.p.). Third, enrolment is voluntary and schemes are run with a spirit of self-help and an ethnic of mutual aid. This constitutes an important difference to

[15] "Microinsurance is the protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved. This definition is essentially the same as one might use for regular insurance except for the clearly prescribed target market: low-income people ... How poor do people have to be for their insurance protection to be considered micro? The answer varies by country, but generally microinsurance is for persons ignored by mainstream commercial and social insurance schemes, persons who have not had access to appropriate products" (Churchill & McCord, 2012, p. 8).

social health insurance with mandatory participation. Finally, CBHI schemes exhibit some degree of collective action in raising, pooling, and allocating the funds of the scheme (Dror & Preker, 2002, p. 45). According to a systematic review conducted by the International Labour Organisation (ILO) (2002) in one out of two schemes members had a say in benefit package design and premium setting. The degree to which the community is actually involved in scheme management is strongly influenced by the ownership structure. Local communities owned about one third and similarly governments ran another third of the schemes. About 17 %, were owned by non-community Non Governmental Organisations (NGO), and 9 % were owned by health care facilities (ILO, 2002, pp. 36-37).

Moreover, the ownership structure also determines the target group and influences the benefit package. Regarding the target group schemes may be organised geographically (e.g. villages, cities), cover members of certain professional bodies (e.g. cooperatives or trade unions), or religious groups (Tabor, 2005, p. 13). Turning to benefit packages hospital-owned CBHI schemes rather cover high-cost low frequency events (e.g. surgery) whereas community-owned schemes rather cover low-cost high frequency events (Jütting, 2005, p. 27). Yet, ILO (2002) reported that three out of four CBHI schemes offered a comprehensive benefit package consisting of inpatient care, outpatient care, and prescription of drugs (p. 30)[16]. So, while most benefit packages seem to include some inpatient as well as some outpatient healthcare services in any case the benefit package can only include what can be delivered by the cooperating healthcare facilities.

Finally, schemes do not only differ with respect to ownership, target group, and benefit package but also with respect to how they remunerate cooperating healthcare providers. In principle, schemes can choose between two provider payment systems, a third-party-payment (TPP) system and a remuneration system. If CBHI schemes apply a TPP mechanism, with the exception of cost-sharing (e.g. co-payment, deductible), insured patients do not need to make any OOP expenditure at the healthcare facility since the scheme directly reimburses the healthcare provider. Alternatively, with a reimbursement model insured patients pay for healthcare services at the point of delivery and are reimbursed after having filed a claim. The cashless TPP method might reduce incidences of people delaying or avoiding health care since they do not need to procure money first that is later then reimbursed (LeRoy & Holtz, 2012, pp. 134-137). Evidence from a CBHI in India suggests that poor households submitted

[16] Yet, only 36 % of these schemes fully financed the whole benefit package offered. The remaining 64 % only financed part of it but facilitated or acted as entry points to access larger package of benefits (ILO, 2002, p. 30).

significantly fewer reimbursement claims than richer households indicating that the reimbursement model indeed is burdensome for poor households (Ranson et al., 2007, p. 714).

As established in chapter two in many low-income countries neither the market nor the state provides health insurance for low-income segments of the population. Since CBHI attempts to fill this health insurance gap schemes have emerged in the developing world. On the African continent, owed to the strong francophone tradition of *mutuelles*, most schemes can be found in West and Central Africa (Tabor, 2005, p. 16). In 2006, there were more than 600 functional CBHI schemes in francophone West Africa (Ndiaye, Soors & Criel, 2007, p. 158). In contrast to the African continent schemes in Asia are older, larger, and involve more cost-sharing with the government. CBHI schemes have been established in Bangladesh, China, India, Nepal, and the Philippines. In Latin America, CBHIs are often linked to trade unions and social funds. For example, approximately 60 % of Argentina's population belong to non-profit insurance companies owned by labour unions. CBHI schemes also exist in Colombia, Ecuador, and Mexico (Tabor, 2005, p. 16).

3.2 Strengths of CBHI

The key advantage of CBHI schemes is that they provide a means to shift away from OOP expenditures to increasing prepayment and risk sharing for poor people that neither have access to private health insurance nor are covered by statuary health insurance (Preker et al., 2004, p. 28). In particular, CBHI schemes reach poor households with fluctuating income streams and low asset bases such as informal sector workers. Evidence from a systematic review suggests that CBHI schemes indeed "appear to extend coverage to many rural and low-income populations who would otherwise be excluded from collective arrangements to pay for healthcare" (Jakab & Krishnan, 2004, p. 27).

How do CBHI schemes manage to insure poor households with low ability to pay? Of course, low membership premiums are essential. Yet, CBHI schemes also have successfully adapted operational procedures to the needs of the low-income segment of the population. First of all, in order to improve affordability of membership enrolment periods typically are long and follow harvest times, thereby maximising the probability that households have cash available (ILO, 2013, n.p.). Some schemes allow for premium payment in small instalments or even in-kind, e.g. in the Yeshasvini scheme in India (Aggarwal, 2010). Experience from a CBHI in Ghana suggests that allowing for in-kind payment has increased enrolment rates since households could afford to pay in-kind but hesitated to spend their scarce cash resources

(Tabor, 2005, p. 28). Moreover, CBHI schemes offer simple products. Premiums tend to be flat and schemes often offer only one type of benefit package. Written contracts are kept brief if used at all. This simplicity makes it easier for poorly educated people to participate in a CBHI scheme (Tabor, 2005, p. 18).

Apart from these operational facets, CBHI schemes benefit from strong community networks inducing enrolment. By building upon social cohesion and solidarity within local communities schemes may be able to even attract individuals that are not fully convinced that the expected benefits of such a prepayment mechanism will exceed today's costs. Also, given low levels of trust in government authorities people have been found to rather prepay into a fund managed by their local community than by external authorities (Hsiao, 2004, pp. 124-126).

Once enrolled, thanks to risk pooling CBHI schemes can better insure households' consumption against health shocks than informal insurance mechanisms. Moreover, membership in CBHI schemes can avoid long-term economic costs of informal insurance mechanisms. In particular, since the insurance covers (parts of) their medical expenditures households are not forced to cut back on important investments in human and physical capital and can keep their productive assets in case of a health shock. Thereby, CBHI can avoid a reduction of future income-earning opportunities. Further, enrolment in a CBHI scheme can improve access to healthcare services since the insurance reduces the financial barrier to access care. Indeed, most empirical studies report increased utilisation of healthcare services of insured households (Aggarwal, 2010, p. 32; Chankova, Sulzbach & Diop, 2008, p. 269; Jütting, 2004, p. 280; Schneider & Diop, 2001, p. 14, among others; see table 4 in Appendix A for a comprehensive overview). By providing improved access to healthcare services households may no longer delay care and thus can avoid a reduction of their productivity levels. For these reasons, CBHI membership might not only improve access to healthcare but also has the potential to prevent poor households from becoming more vulnerable to poverty when hit by a health shock.

Finally, CBHI schemes do not only offer improved access to healthcare for poor people but may also improve the quality of care. By representing a group with some financial power scheme administrators possess bargaining power to demand better-quality services and more accountability from healthcare providers (Jacobs et al., 2008, p. 140; Ndiaye, Soors & Criel, 2007, p. 159). Yet, according to a systematic literature review there is weak positive evidence that CBHI indeed improves quality of care (Spaan et al., 2012, p. 687).

3.3 Weaknesses of CBHI

Despite these outlined potential advantages CBHI also exhibits three major weaknesses: They struggle to insure very poor households (1) and to increase their utilisation of healthcare services (2). Furthermore and most importantly, most CBHI schemes find it difficult to become financially sustainable in the long run (3).

Regarding insurance of very poor households (1) flat contribution rates, which are typically applied, constitute a relatively higher financial burden for poorer households. According to findings from a systematic literature review inability to afford the insurance premium was found to be the most cited reason for non-enrolment (Jakab & Krishnan, 2004, p. 75). The probability of enrolment was significantly higher for richer income strata compared to poorer income strata in Ghana, Mali and Senegal (Chankova, Sulzbach & Diop, 2008, p. 268; Jütting, 2004, p. 283; see overview in table 4 in Appendix A) as well as in Burkina Faso (Gnawali et al., 2009, p. 220).

Turning to utilisation of healthcare services (2) even if poorer households enrol they may not necessarily increase utilisation of healthcare services due to financial and non-financial barriers. Indeed, in Burkina Faso a positive impact of enrolment on utilisation was only found for the richest quartile (Gnawali et al., 2009, p. 220). Regarding remaining financial barriers to access care co-payments are likely to be one reason why very poor households still struggle to access healthcare despite being enrolled in an insurance scheme. These are often important to secure the financial sustainability of the schemes as they limit over-utilisation and provide additional financial resources. Co-payments were found to be present in 70 % of the reviewed CBHIs[17] (ILO, 2002, p. 27). This shows that CBHI often faces a trade-off between securing financial viability and equity objectives[18]. Moreover, reimbursement systems may also hinder poor households from utilising healthcare since they need to advance medical expenses. For example, in a CBHI scheme in India poor households were found to submit significantly fewer reimbursement claims (Ranson et al., 2007, p. 714). In addition, side-payments above official consultation fees also are a common phenomenon in many low-income countries. In Bangladesh unofficial payments were found to be on average 12 times higher than official fees. These amounted to almost three quarters of average monthly income of poor households and thus are likely to form a high barrier to utilising healthcare services despite insurance (McIntyre et al., 2006, pp. 861-862).

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[17] Evidence on co-payments was only available for 61 out of 258 schemes (ILO, 2002, p. 27).
[18] Similarly, schemes may be forced to exclude high-risk individuals (e.g. old people) (Bennett, 2004, p. 150).

Apart from financial barriers long distances to healthcare facilities may also pose a barrier to utilisation. Transport costs usually are not included in the benefit packages. Evidence suggests that these may account for one fifth of all direct costs of seeking healthcare (McIntyre et al., 2006, p. 862). In addition to travel costs lost time is likely to cause significant economic costs. Given poor transport infrastructure in rural areas travelling to healthcare facilities may take a long time, which may cause high opportunity costs in the form of foregone earned income. Such direct and indirect travel costs may form a high barrier to utilisation. For example, evidence from Burkina Faso suggests that insurance did not increase the probability of utilising healthcare services if the insured individuals lived more than 5 km away from a healthcare facility (Parmar et al., 2013, p. 5).

Apart from these problems CBHI schemes often fail to unfold their potential since they do not achieve financial sustainability (3) in the long run. The low financial viability is caused by several factors:

First, a homogenous membership base increases the likelihood of covariate health risks. If risks are not independent but correlated pooling will multiply these risks instead of diversifying them (Vaté & Dror, 2002, p. 130). For example, a scheme covering neighbouring villages is vulnerable to epidemics. In order to reduce the financial risk associated with common shocks some schemes exclude certain categories of diseases or impose limits on total pay-outs (Tabor, 2005, p. 30). Homogeneity of risk pools also refers to the income level. Since high-income groups are frequently underrepresented (Jakab & Krishnan, 2004, p. 68) CBHI schemes only can pool across rather poor households (Dror, Preker & Jakab, 2002, p. 48). Therefore, they can only mobilise limited amount of funding (Dror, 2002, p. 108) and have only little opportunities to cross-subsidise from relatively richer to ultra-poor households. Yet, without subsidies ultra-poor households are unable to afford enrolment.

Second, due to flat premiums irrespective of individuals' risk-profiles and voluntary enrolment schemes are vulnerable to adverse selection, which severely threatens their financial viability (Jakab & Krishnan, 2004, p. 87). High-risk households were found to be more than proportionally represented in CBHI schemes in Burundi (Arhin, 1994, p. 869), China (Wang et al., 2006, p. 1244), and Zaire (Notermann et al., 1995, p. 1244). Also, illness and handicap were associated with a higher probability to enrol in Senegal and Mali (Chankova, Sulzbach & Diop, 2008, p. 269; Franco et al., 2010, p. 833). In order to limit adverse selection most schemes introduce waiting periods and/or practise group enrolment (e.g. whole families) (Jakab & Krishnan, 2004, p. 87).

Third, CBHI schemes often fail to negotiate preferential contracts with healthcare providers. According to ILO (2002) over 80 % of reviewed schemes did not practise any strategic purchasing[19] of healthcare services (p. 33). Even if they negotiate a contract schemes often fail to develop appropriate incentive structures with respect to provider payment methods. Having conducted a systematic review Robyn, Sauerborn & Bärnighausen (2013) concluded that provider payment methods are a key determinant of performance and sustainability (p. 111). When opting for a fee-for-service (FFS) method, schemes become vulnerable to supplier-induced over-utilisation and thus suffer from cost-escalation since the provider maximises profit by maximising utilisation. Gatekeeping mechanisms (referral by a primary health care provider is required for hospital services), limitations and caps on utilisation, and cost-sharing (e.g. co-payments) can reduce the risk of supplier-induced over-utilisation. In contrast, a capitation method provides a strong incentive for healthcare providers to reduce care, especially for high-risk groups such as chronically ill, elderly or persons with HIV/AIDS (LeRoy & Holtz, 2012, pp. 141-144; Jakab & Krishnan, 2004, p. 87).

Fourth, since schemes entirely run by community members were found to suffer from managerial incompetence (De Allegri et al., 2009, p. 591) poor scheme management seems to be the downside of community involvement. Weak management and administrative skills constitute a major obstacle to financial sustainability (De Allegri et al., 2009, p. 591; Ndiaye, Soors & Criel, 2007, p. 159; Jakab & Krishnan, 2004, p. 88). In particular, most schemes do not use modern information systems (Preker et al., 2004, p. 30) and struggle with correct premium calculation, accounting, and bookkeeping. Without reliable book-keeping no effective monitoring systems can be implemented. Control systems are essential to reduce moral hazard and fraud. Especially when using a FFS mechanism schemes need to analyse claims and utilisation data in order to check whether the provision of services was appropriate and whether providers only charged for services actually delivered. In the case of capitation payment CBHI schemes rather need to monitor for under-service and low quality of care (LeRoy & Holtz, 2012, p. 144). Finally, weak managerial capacities contribute to high overhead costs, which usually vary between 10 % and 30 % of the revenues generated through premium collection (De Allegri et al, 2009, p. 592).

The discussed problems do not only threaten financial viability via the described channels but also constitute severe obstacles for schemes to grow in size: limits on total pay-outs to reduce the financial risk associated with common shocks and waiting periods to reduce adverse

[19] Strategic purchasing is defined as negotiating “with providers on the type, price, and/or quality of services to be provided (…), and/or to establish contracts (…)” (ILO, 2002, p. 33).

selection lower the attractiveness of schemes and thus are likely to negatively affect enrolment rates. Similarly, gate-keeping mechanisms, co-payments, and ceilings to reduce the risk of supplier-induced moral hazard also lower insurance benefits and thereby scheme attractiveness. Moreover, without opportunities to cross-subsidise the target group of ultra-poor households cannot be reached which reduces the size of the target group. Further, inability to negotiate favourable contracts with health care providers is likely to reduce the quality of care, which was found to be an important reason for non-enrolment (Jacobs et al., 2008, p. 141). Small risk pools in turn worsen the negotiating position vis à vis healthcare providers. Finally, since it was found that awareness has a strong impact on enrolment[20] (Aggarwal, 2010, p. 28; Donfouet & Makaudze, 2011, p. 12) badly organised social marketing campaigns are also likely to hinder enlargement of the membership base.

Indeed, leaving some prominent examples[21] of large CBHIs aside most CBHIs fail to enlarge their membership pool (Jacobs et al., 2008, p. 140) and often cover less than 10 % of their target group (Tabor, 2005, p. 15). ILO (2002) reported that 50 % of the schemes had less than 500 members (p. 31). Ndiaye, Soors & Criel (2007) analysed 580 CBHI schemes in Africa and concluded that 95 % had less than 1000 members (p. 159). In addition to low enrolment rates high fluctuation in membership is also a common phenomenon rendering long-term financial planning very difficult (De Allegri et al., 2009, p. 591).

The small size of schemes makes them financially vulnerable since risk pooling works the better the larger the scheme. Small risk pools limit the population across which risks can be spread. For very small pools a severe illness of few members can already threaten the financial viability of the entire scheme (Carrin, James & Evans, 2005, p. 4; Dror, 2002, p. 113). Moreover, small risk pools make it very difficult to calculate the actuarial premium required to maintain the financial viability of the fund. Finally, problems such as adverse selection and covariate shocks become a greater threat to the financial sustainability of schemes the smaller the risk pools are. In short, scheme attractiveness and size mutually reinforce each other. The only sustainable solution is to grow quickly in size.

[20] For example, 31 % of non-members in Senegal and even 71 % of non-members in Mali cited lack of information as one of the main reasons for not having enrolled in a local CBHI (Chankova, Sulzbach & Diop, 2008, p. 271).

[21] Tanzania's Community Health Fund had more than one million members in 2005 (Tabor, 2005, p.15), the Bwamanda scheme in the Democratic Republic of Congo had about 100,000 subscribers in 2005 (Health Market Innovations, 2013, n.p.) and the Nkoranza Health Insurance Scheme in Ghana had about 50,000 members in 2004 (Chankova, Sulzbach & Diop, 2008, p. 266). Yet, governments in Tanzania and Ghana strongly support CBHIs. The Bwamanda scheme has been supported by Belgian development cooperation and a local NGO (Criel, 1998, p. 6).

What does evidence tell us regarding the financial performance of CBHI schemes? Hardly any study analysed the financial performance of CBHI schemes, especially not over time (Jakab & Krishnan, 2002, p. 83; Dror, 2002, p. 110). Having conducted a systematic review ILO (2002) also concluded that the "existing literature is mostly focused on existing (surviving schemes) and not on the schemes that were not able to continue working" (p. 41). The lack of evidence regarding survival rates is not surprising given that most schemes are not registered[22]. Analysing the financial viability of 40 schemes in Senegal between 2000 and 2004 Atim, Diop & Bennett (2005, p. 11, 19) found that only 27 had been fully functional over this time period. Most schemes seemed to be very vulnerable as they had only sufficient reserves to cover nine months of scheme expenditures. Thus, the little evidence that exists indeed seems to hint at great financial vulnerability of schemes.

Moreover, despite a weak evidence base regarding survival rates there exists far-reaching consensus in the literature regarding the fact that the vast majority of (surviving) schemes are unable to operate without external support (De Allegri et al., 2009, p. 592; Ekman, 2004, p. 256; Carrin, Waelkens & Criel, 2005, p. 805; Preker et al, 2004, p. 61; ILO, 2002, p. 38). This might even hold true irrespective of scheme size since five out of six large schemes in Africa have also received government and/or donor support (Arhin-Tenkorang, 2004, p. 172). So, the concept of CBHI does not seem to work without external funding.

Having established that most schemes cannot survive without external funding it is no surprise that the concept of CBHI has not been hyped as the perfect solution to close the health insurance gap but is rather promoted as a strategy of last resort. For example, the WHO argues that CBHI schemes "have their place where is difficult to raise and pool funds for health in other ways" (WHO, 2010, p. 89) while at the same time stressing that „pool consolidation needs to be part of the strategy from the outset" (WHO, 2010, p. 89). Similarly, Carrin, Waelkens & Criel (2005) concluded their systematic literature review by stating that CBHI "still has a long way to go if it wants to strongly contribute to health system performance" (p. 809).

One potential solution to overcome the 'small size – low financial viability' dilemma may be to connect the schemes via a reinsurance system to enlarge the total risk pool (Carrin, James & Evans, 2005, p. 5). With such reinsurance systems losses can be balanced collectively over large groups that are united only through the reinsurance link. For example, reinsurance can secure financial viability against fluctuating number of claims, unexpected fluctuations in unit

[22] For example, Atim (1998) reviewed 50 CBHI schemes and found that 60 % were not registered with any authority (p. 11).

costs, and high-cost, low-probability catastrophes (Dror, 2002, pp. 115-120). Ideally, the next step would then be to gradually link these networks of the informal sector to existing insurance schemes of the formal sector. Thereby, the ultimate goal of a unitary risk pool shall eventually be achieved.

While pointing out that universal health coverage[23] in continental Europe also has its roots in community financing mechanisms CBHI is sometimes promoted as an intermediary step towards achieving this goal. Yet, supporters of this approach often forget to mention that such a transition requires economic growth in order to increase individuals' ability to pay, improved management and administrative capacity, and most importantly a strong political will (Gottred & Schieber, 2006, p. 20). In particular, strong governmental support and stewardship is imperative to turn the existing patchwork rug into a connected and thus sustainable insurance network (Carrin, James & Evans, 2005, p. 7; Wang et al., 2012, p. 14). Yet, having conducted a literature review De Allegri, et al. (2009) concluded that most countries so far lack the needed legislative, technical, and regulatory framework. Only four countries in Sub-Saharan Africa had implemented policies to support large-scale establishment of subsidised CBHI schemes by 2009 (p. 590).

Despite these challenges some countries have already made some steps on the long road from single CBHI schemes towards universal health coverage. In Senegal and Mali national platforms have helped schemes to gain professionalism by entrusting managerial and promotional tasks to shared central structures (Ndiaye, Soors & Criel, 2007, p. 160). Benin is already one step further since it has organised CBHI schemes in networks to increase the total risk pool, thereby reducing the financial risk of each individual CBHI. Currently, the government thinks about including the existing CBHI networks into the national health insurance system (Haddad et al., 2012, p. 2). Legal frameworks for CBHI have been developed in Ghana and Senegal. In Tanzania and Rwanda membership has even become mandatory (Ndiaye, Soors & Criel 2007, p. 159). Especially Rwanda is often cited as a role model since the government has managed to increase healthcare coverage to 74 % by strongly subsidising CBHI schemes (Saksena et al., 2010, p. 6).

[23] „Universal coverage of health care means that everyone in the population has access to appropriate promotive, preventive, curative and rehabilitative health care when they need it and at an affordable cost" (Carrin, James & Evans, 2005, p. 3).

3.4 Intermediate conclusion: community-based health insurance

In the absence of private health insurance and statutory health insurance CBHI schemes have mushroomed in low-income countries. Typically, CBHI schemes target low-income segments of the population that otherwise needed to rely on informal insurance mechanisms. Given low ability to pay premiums are low at the expense of rather limited benefit packages. Enrolment is voluntary and the community it to some extent involved in scheme management. By pooling risks across their members CBHI schemes can reduce OOP expenditures for health services. Thereby, they can not only contribute to insuring consumption in the face of a health shock and improve access to healthcare but also can avoid long-term economic costs associated with informal insurance mechanisms.

By adapting premium levels and product design to the needs of poor households CBHI schemes were indeed found to reach individuals not covered by formal health insurance. Evidence also suggests that enrolment seems to increase utilisation of healthcare services. Yet, CBHI schemes often fail to insure very poor households and to increase their utilisation rates. More importantly, measures taken to reduce financial risks associated with common shocks, adverse selection, and provider-induced moral hazard as well as low managerial capacities reversely affect enrolment rates. Therefore, schemes remain small and fail to become financially sustainable. Consequently, unless schemes are connected via a reinsurance system they do not seem to be able to strongly contribute to the performance of health systems. Since this requires strong political will only few low-income countries have yet managed to sustainably integrate CBHI schemes into their national health system.

4 The CBHI in the Nouna health district in Burkina Faso

Having discussed the strengths and weaknesses of CBHI in the previous chapter this chapter introduces a particular CBHI scheme situated in the Nouna health district in the North West of Burkina Faso. The first two sections provide background information on poverty and health in Burkina Faso (section 4.1) and in the Nouna health district (section 4.2). Section 4.3 then presents the technical set-up of the insurance scheme. Existing evidence of the Nouna health insurance is presented in section 4.4, thereby establishing that OOP expenditures and lost days due to illness have not yet been subject to empirical evaluation. Since this paper attempts to close this gap predicted effects of the following empirical analysis of the impact of the insurance scheme on OOP expenditures and lost days due to illness are discussed in section 4.5.

4.1 Background on poverty and health in Burkina Faso

With a GDP per capita (p.c.) of US$ 447 in 2013 Burkina Faso is classified as a low-income country (World Bank, 2013, n.p.). In 2009 42.6 % of Burkina Faso's 17 millions inhabitants were considered as poor according to the national poverty line of 103,139 CFA franc (about US$ 200) (Ministere de la Santé Burkina Faso, 2010a, p. 10)[24]. Almost the same share of people lived with less than US$ 1.25 a day in 2009 (World Bank 2013c, n.p.) (see figure 4 in Appendix B for overview of different poverty measures). Poverty is especially present in rural areas where 70 % of the inhabitants live. Turning to composite indices the Multidimensional Poverty Index (MPI)[25] indicates that 84 % of the population of Burkina Faso live in multidimensional poverty (based on 2010 data). This headcount ratio is almost twice as high as the share of people suffering from income poverty measured by the poverty headcount ratio at US$ 1.25 (PPP 2005). This indicates that income poverty only tells part of the story let alone that all these poverty measures do not take regional disparities and intra-household inequality into account. Given this high incidence of poverty it is no surprise that the country's Human Development Index (HDI)[26] is fifth to last and below average for countries

[24] The World Bank (2013c, n.p.) reports that 46.7 % of the inhabitants fall below the national poverty line.

[25] The MPI measures poverty for the same household in three dimensions also considered by the HDI: education, health, and standard of living. Education and health each have two indicators and standard of living is built from six indicators. Each dimension is equally weighted. A household is considered multi-dimensionally poor if it is deprived in one third of all indicators (UNDP 2013a, pp. 4-5).

[26] The Human Development Index combines indicators of life expectancy, educational attainment, and income into one single index. "The HDI sets a minimum and a maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts, expressed as a value between 0 and 1" (UNDP, 2013b).

in Sub-Saharan Africa. In particular, life expectancy at birth only is 55.9 years (UNDP, 2013a, pp. 2-5). Infant mortality remained particularly high with 91 deaths of 1000 births (Ministere de la santé Burkina Faso, 2011a, p. 2).

One major reason for the weak health indicators is insufficient access to healthcare, especially for poor households. Although healthcare contacts per inhabitant increased from 0.22 in 2001 to 0.56 in 2009 they remain at a low level[27] and exhibit great regional variation[28] (Ministere de la santé Burkina Faso, 2011a, p. 8). Weak health infrastructure (1) and high financial barriers to accessing care (2) are mainly responsible for low utilisation rates of healthcare services.

Burkina Faso's healthcare infrastructure (1) suffers from insufficient funding. Although governmental expenditures on health p.c. have strongly increased over the past 10 years total expenditures on health p.c. only amounted to US$ 40 in 2010[29] (see figure 5 in Appendix C). According to the WHO at least US$ 44 p.c. are required to provide essential services in low-income countries (Xu et al., 2010, p. 4). Therefore, health infrastructure remains weak, especially in rural areas. The average action radius of primary health centres (centre de santé et de promotion sociale, CSPS), which constitute the first contact points of the health system, is 7.2 km and large regional differences exist. On average a single CSPS is responsible for serving 10,000 inhabitants. While the share of professionally assisted births increased from 38 % in 2001 to 75 % in 2010 insufficient human resources still constitute the health system's Achilles verse. According to the latest available figures of the Ministry of Health Burkina Faso has one doctor for 14,000 inhabitants and one nurse for 3,600 inhabitants. Yet, more than 50 % of all doctors and one third of all nurses either work in the capital or in Bobo-Dioulasso, thereby serving 10 % of the population (Ministere de la Santé Burkina Faso, 2010a, pp. 21-24; Ministere de la Santé Burkina Faso, 2011a, p. 21). Thus, there is a strong urban bias to public spending on health. Absenteeism of medical staff leads to a further deterioration of the de facto coverage rate[30].

[27] According to Kloos (1990) less than 2.5 health visits per person per year indicate healthcare under-utilisation (p. 107).

[28] For example, the least developed district had a contact rate of 0.26 in 2009 (Ministere de la santé Burkina Faso, 2010a, p. 25).

[29] In order to get a feeling for magnitudes, total expenditures p.c. on health amounted to US$ 54 in Ghana, to US$ 521 in South Africa, and to US$ 4723 in Germany in 2009 (WHO, 2012, p. 10).

[30] According to Bodart et al. (2001) doctors in seven rural districts were absent on average 37 % of their work time in 1997 (p. 79).

Turning to financial barriers of accessing care (2) since the adoption of the Bamako initiative[31] in the early 1990s the population is charged for medical consultation and the supply of essential generic drugs[32]. No statutory health insurance has yet been implemented (Ministere de la Santé Burkina Faso, 2011a, p. 17) and in hindsight of the high poverty levels in Burkina Faso and the discussed challenges for private health insurance in low-income countries in section 2.2.1 it is no surprise that the share of inhabitants with private health insurance is negligible[33]. Consequently, in the absence of any pre-payment mechanism most inhabitants in Burkina Faso pay for healthcare at the point of service. Figure 6 in Appendix D shows that about three quarters of private health expenditures are indeed OOP expenditures. The lion's share of OOP expenditures is spent on drugs. This holds true both for inpatient as well as for outpatient OOP expenditures (Saksena et al., 2010, pp. 12-24).

The financial burden of OOP expenditures is severe for the inhabitants of one of the poorest countries in the world[34]. About one fifth of households experienced catastrophic health expenditures[35] in Burkina Faso in the period 2002/03. Among the subgroup of those households who had any health expenditures the share even amounted to almost 40 %. In particular, drug purchases were found to be one of the main drivers of catastrophic expenditures (Saksena, Xu, & Durairaj, 2010, p. 16). Thus, in the absence of formal health insurance there is a high chance that health shocks increase households' vulnerability to poverty.

Do CBHI schemes have the potential to close the health insurance gap in Burkina Faso? According to the Ministry of Health only 126 CBHI schemes operated in Burkina Faso in 2005 and had in total about 60,000 members which is little compared to 17 millions inhabitants (Ministere de la Santé Burkina Faso, 2005, p. 6). Regarding policy, the official strategy paper for the development of the health system 2001-2010 mentioned CBHI as a

[31] As a response to the financial problems of many health systems in Sub-Saharan Africa in the 1980s African Ministers of Health launched the Bamako Initiative in cooperation with the WHO and UNICEF in 1987. The overall aims were to improve quality and accessibility of health care services by implementing a self-financing mechanism at district level. Donors provided a stock of essential generic drugs. The profit from selling these drugs and user fees for consultations were used to buy back initial stock and to improve quality of services. The initiative has been highly debated regarding the impact of the introduction of user fees on the accessibility of services for the poor (Ridde, 2003, p. 532; Ridde, 2008, p. 1369).

[32] The government decided to exempt poor households from paying for services in CSPS but no exemption mechanism has been implemented to date (Ridde et al., 2010, p. 2).

[33] According to the WHO (2013, n.p.) the share of private insurance on total private health expenditures was 2 % in 2010.

[34] For example, a single purchase of the cheapest generic drug to treat diabetes or a respiratory disease costs the equivalent of a one-day salary of a person receiving the national minimum wage in 2009. However, these cheap generic drugs are often not available in hospitals (Ministere de la santé Burkina Faso, 2010b, pp. 9-10).

[35] Catastrophic health expenditures are here defined as exceeding 40 % of household's non-subsistence expenditure (Saksena, Xu & Durairaj, 2010, p. 5).

financing alternative while noting that these cover only a marginal share of the population (Ministere de la Santé Burkina Faso, 2001, p. 23). Ten years later the subsequent strategy paper for the period 2011-2020 (Ministere de la Santé Burkina Faso, 2011a) did not address CBHI anymore. Yet, the three-year plan (2011-2013) for the implementation of the national health strategy included the following objectives regarding CBHI: reinforcing the operational capacities and elaborating a national cartography of CBHI schemes (Ministere de la Santé Burkina Faso, 2011b, p. 126). These formulated policy objectives hint at operational difficulties of existing CBHI schemes and suggest that the government has only just begun analysing the CBHI landscape in Burkina Faso. Concluding, at the moment CBHI does not seem to play a major role for the health policy of Burkina Faso since the policy process of implementing a national strategy (and legislation) for CBHI seems to be in a very early stage.

4.2 The Nouna health district

The Nouna health district is situated in the Kossi region in the North West of Burkina Faso approximately 300 km from the Capital Ouagadougou (see map in Appendix E). It is a semi-urban area with poor roads and dry savannah vegetation. 65 % of the covered population live in rural villages and 35 % in and around Nouna town. The majority of inhabitants are subsistence farmers with harvest period lasting from November to January. Almost every second individual is younger than 15 years and illiteracy is extremely high, exceeding 80 % (Hounton, Byass & Kouyate, 2012, p. 2; Gnawali et al., 2009, pp. 214-215).

Turning to illness and healthcare the average distance to primary healthcare facilities is 9.56 km, which is even higher than the national average (Robyn et al., 2012b, p. 158). In the absence of any formal insurance mechanism illness was found to be a major cause of poverty in the region (Belem, Bayala & Kalinganire, 2011, p. 287). Regarding financial burden of illness Sauerborn, Adams & Hien (1996, p. 291) estimated that the financial costs of healthcare amount to 6.2 % of total annual household expenditures. Drug purchases were approximated to account for more than 80 % of OOP expenditures (Mugisha et al., 2002, p. 189). Given high OOP expenditures 6-15 % of total households in the Nouna region were found to experience catastrophic health expenditures even at low levels of healthcare utilisation (Su, Kouyate & Flessa, 2006, p. 23). Moreover, compared to OOP expenditures time costs represent more than two thirds of household costs of illness. In particular, time costs of family members caring for a sick person are about the same than those incurred by the sick member. Households were found to first use cash or savings and then to sell assets (mainly cattle) to meet healthcare expenditures. A vast majority also substituted lost labour within the household by calling children and retired people to the fields. Yet, the majority of households still lost production. Community support (e.g. gifts) and loans were generally not available for poor households (Sauerborn, Adams & Hien, 1996, pp. 291-298).

4.3 The CBHI scheme in the Nouna health district

As outlined in section 4.1 Burkina Faso does not have statutory health insurance and also the private insurance market is very small. Given this health insurance gap it is no surprise that illness has been found to cause high OOP expenditures in the Nouna health district, which are likely to increase individuals' vulnerability to poverty (see section 4.2). As an attempt to close this gap the Nouna health research centre (CRSN) implemented a CBHI scheme in the Nouna health district in cooperation with the university of Heidelberg. In particular, the objective of the CBHI scheme is to reduce the financial risk associated with health shocks and to improve access to healthcare facilities. Insurance has been offered in 41 villages and Nouna town since 2006[36]. These villages and the town have already been covered by a Health and Demographic Surveillance System (HDSS)[37] since 1992 (Hounton, Byass & Kouyate, 2012, pp. 2-3).

The scheme exhibits the typical characteristics of a CBHI. Members of the community strongly participate in decision-making and scheme management. For example, general assemblies serve as regular venues for all members to voice their concerns. Similarly, elected representatives of each village form a plenary, which votes on modifications of the benefit package and the premium level (De Allegri & Kouyate, n.d., pp. 1-6).

Enrolment is voluntary and takes place on the household level in order to limit adverse selection. Households have to a pay an enrolment fee of 200 CFA franc (about US$ 0.4) upon first enrolment. The annual flat premium for individuals of age 15 and older is 1,500 CFA franc (ca. US$ 3) and for children 500 CFA franc (ca. US$ 1) (De Allegri, Sanon & Sauerborn, 2006, p. 1521). Premiums were set according to findings of feasibility and willingness to pay studies (Dong et al., 2004; Dong et al., 2003) and did not intent to cover the costs of the insurance. In fact, in 2004 premiums covered only 53 % of the costs of the benefit package (Parmar et al., 2012b, p. 832) and the insurance has run into a deficit almost every year (Yemale, 2012, p. 12). Therefore, the insurance could not survive without external

[36] More precisely, the 41 villages and Nouna town were split into 33 clusters and the insurance was step-wise introduced between 2004 and 2006. In 2004 eleven randomly selected clusters were offered insurance, followed by an additional eleven clusters in 2005. From 2006 onwards insurance was offered in all 33 clusters (De Allegri et al., 2008, p. 3).

[37] Over time the HDSS was gradually expanded to 58 villages and the city of Nouna, thereby covering about 85,000 individuals. The HDSS is administered by the CRSN founded in 1999 (see map in Appendix E) (Sié et al. 2010, p. 2; Robyn et al., 2012b, p. 158).

donor support. Since the insurance does not have any re-insurance membership fees and 5 % of the premiums are earmarked for a contingency fund (De Allegri & Kouyate, n.d., p. 20).

Premiums are collected once a year during a long enrolment period (January – June) following the harvest period (Robyn et al., 2012a, p. 3). Thereby, the likelihood that households can afford enrolment shall be maximised. Yet, premiums cannot be paid in-kind or in instalments (De Allegri & Kouyate, n.d., p. 13). In order to limit adverse selection newly enrolled members need to wait three months until they are entitled to receive insurance benefits (Parmar et al., 2012a, p. 2).

The comprehensive benefit package includes consultations at the primary health care facilities (CSPS), prescribed essential and generic drugs, prescribed laboratory tests (also for antenatal care), inpatient hospital stays (up to 15 days per episode of care), x-rays, surgical processes that are offered by the district hospital (e.g. caesarean section, hernia, injuries), and ambulance transport from CSPS to the hospital (De Allegri & Kouyate, n.d., p. 15). Insurance does not cover family planning, HIV/AIDS, dental care, circumcision (Gnawali et al., 2009, p. 221), and maternity care (Robyn et al., 2013, p. 10). Members are pre-assigned at a CSPS and are referred to the hospital only if necessary (gate-keeping mechanism) (Parmar et al., 2012a, p. 2). At point of service insured patients do not need to make any co-payments and there is no limit to the number of times members can seek care at a CSPS/CMA. Given severe under-utilisation moral hazard is unlikely to become an issue (De Allegri & Kouyate, n.d., p. 16).

The insurance neither contracts with private providers nor traditional healers (Gnawali et al., 2009, p. 216) but only with the 14 public CSPS[38] and the district hospital in Nouna town (Yemale, 2012, p. 7). Since the scheme applies a third-party payment (TPP) system the healthcare facilities are directly reimbursed and no OOP expenditures occur for insured patients at the point of service. Healthcare facilities are remunerated on an annual capitation basis. After the enrolment period the total level of capitation payments is calculated for each CSPS according to the number of enrolled individuals in their catchment area. 10 % of the funds are set aside to cover operational costs of the scheme. The CSPS receives three quarters and the hospital receives one quarter of the remaining 90 % of the capitation payments. These payments are only intended to cover costs of drugs prescribed to insured patients[39]. The insurance does neither pay for medical supplies, medical equipment, nor consultation fees (Robyn et al., 2012a, pp. 3-5).

[38] The amount of primary health care facilities doubled from seven in 2007 to 14 in 2011.

[39] If drugs prescribed to insured patients exceed allocated funds, an external donor reimburses the deficit (Robyn et al., 2012a, p. 4).

4.4 Existing evidence of the insurance scheme

4.4.1 Enrolment and introduction of a premium discount for poor households

Enrolment increased from 5.2 % in 2004 to 11.8 % of the target population in 2010 (Souares, 2013, n.p.), yet, remained well below the pre-intervention estimate of 50 % (Dong et al., 2003, p. 655) (see figure 9 in Appendix F for absolute numbers). Applying logistic regression Gnawali et al. (2009, p. 220) found that education of the household head and use of curative care last year were significantly positively associated with enrolment. More importantly, households from the third and the fourth income quartile were significantly more likely to enrol than households from the poorest quartile. Similarly, estimating a FE linear probability model Parmar et al. (2012a) found that individuals from asset-poor households were less likely to enrol (p. 6). In qualitative studies affordability and low quality of care were found to be the major reasons for non-enrolment (De Allegri, Sanon & Suaerborn, 2006, p. 1522) and high drop-out rates (Dong et al, 2009, p. 176). In fact, in 2006 only 1.1 % of total poor households were enrolled in the insurance. Therefore, a 50 % discount[40] was introduced for poor households in 2007 (Souares et al., 2010b, p. 365).

In order to identify poor households a community wealth ranking (CWR) was conducted. The CWR method entailed three steps. First, key local criteria of poverty and wealth were obtained through focus group discussions. In the second step, villagers, community administrators, and traditional leaders chose three local key informants who had lived in the community for a long time. Each local key informant separately sorted cards with names of all household heads into piles of different wealth categories defined during the focus group discussion. Then, each household was ranked in each pile to determine its relative socio-economic position. In the third step local key informants reached a consensus by reviewing together the established rankings. No final rank was assigned until consensus was reached. The poorest 20 % identified with the CWR in each village were eligible for the insurance discount. Poor households received a letter and were visited by the local insurance scheme officer (Souares et al. 2010b, pp. 364-365). The CWR turned out to be a quick and cost efficient method to determine poor households. Moreover, the method is sensitive to local circumstances and actively involves the community. This might increase acceptability to target benefits for the poor. However, CWR are only rough approximates of socio-economic status and typically exhibit low correlation with standard poverty measures based on

[40] The subsidy reduced premiums for adults to 750 CFA franc and for children to 250 CFA franc (Souares et al., 2010b, p. 365).

monetary values of consumption or income. For example, in the Nouna region, social exclusion, followed by food insufficiency, disability, and age were found to be the dominant determinants of poverty. CWR turned out to be less applicable in Nouna town where community ties are weaker than in the rural villages and people do not know each other so well (Souares et al., 2010b, p. 366-367). Further, the CWR may be vulnerable to bias since the local key informants could have attempted to discriminate against certain households.

Since the introduction of the discount enrolment of poor households increased from 1.1 % in 2006 to 11.2 % in 2007, yet then slightly fell again to 7.7 % in 2008 and 9.1 % in 2009 (Souares, 2013, n.p.). Adverse selection increased with the introduction of the discount. Sick individuals eligible to receive the discount had a higher probability to enrol than sick people who were not eligible to receive a discount (Parmar et al., 2012a, p. 6).

4.4.2 Utilisation of healthcare services

Regarding utilisation estimates from a logistic regression suggested members were 2.23 times more likely to use healthcare services than non-members (Hounton, Byass & Kouyate, 2012, pp. 4-5). Yet, insurance does not seem to sufficiently remover barriers to utilisation for poor people. By applying logistic regression[41] Parmar et al. (2013, pp. 4-5) found no significant difference in utilisation for individuals living more than 5 km away from a healthcare facility[42]. This is problematic since poor people tend to be clustered in remote regions. In fact, the time cost of seeking care was estimated to be 34 % of total time cost per illness episode (Sauerborn et al., 1995, cited in Gnawali et al., 2009, p. 221). The hypothesis that indirect costs such as transport costs and opportunity costs of time spent for seeking care constitute severe barriers to utilising healthcare services for poor people is further supported by findings from Gnawali et al. (2009). Applying propensity score matching they found a significant increase in outpatient visits only for insured individuals of the richest quartile and no effect on hospitalisation for any wealth strata (p. 220). Indirect costs might also explain why Robyn et al. (2012b, pp. 160-161) could neither find a significant reduction in the probability of self-treatment nor of seeking a traditional healer for insured individuals. In fact, approximately two thirds of insured patients opted for self-care or a traditional healer as their first treatment choice. Apart from indirect costs a lack of understanding of the benefit package was also identified as a residual barrier to utilisation (Robyn et al., 2011, cited in Robyn et al., 2013, p. 10).

[41] Note that findings from Hounton, Byass & Kouyate (2013) and Parmar et al. (2013) may have failed to sufficiently account for selection bias.

[42] Note that the average distance to a healthcare facility in the Nouna region is 9.5 km (see section 4.2).

In short, although enrolment rates have slowly, yet, continuously increased evidence regarding utilisation of healthcare services remains mixed. Barriers to accessing care beyond user fees seem to hinder utilisation, especially for poor households.

4.5 Evaluating the effect on direct and indirect economic costs of illness

4.5.1 Research objective

Although the CBHI in Nouna has already been subject to many research projects (see section 4.4) the impact of the insurance on short-term economic costs of a health shock has not yet been analysed[43]. Evaluating the effect on direct (OOP expenditures) and indirect (lost time due to illness) costs of illness is important because one of the main objectives of the CBHI is to reduce the financial risk associated with health shocks. In other words, the evaluation can shed light on the question whether the insurance achieves one of its core goals. If the CBHI successfully cushions the economic impact of a health shock it can improve households' welfare not only by reducing today's economic costs but also by preventing households from becoming more vulnerable to poverty in the future. Therefore, evaluating the impact on OOP expenditures and days lost due to illness can contribute to determining the welfare impact of the CBHI. An evaluation may even help to assess whether the resources allocated to the CBHI can be considered as a meaningful investment in terms of their welfare enhancing impact.

Having stated that it is the goal of this analysis to evaluate the impact of the particular CBHI scheme in the Nouna health district on direct and indirect costs the next question that naturally comes to mind is what other evaluations have found out so far. The following paragraphs not only discuss existing evidence but also evaluate the scheme design of the CBHI in Nouna in order to formulate hypotheses about the predicted effects.

4.5.2 Predicted effects on OOP expenditures and days lost due to illness

OOP expenditures

What is the anticipated effect of enrolment in the CBHI in Nouna on OOP expenditures? In order to arrive at a thorough prediction existing evidence on CBHI (1) is summarised first before discussing the scheme design of the insurance in the Nouna health district (2).

[43] The only empirical study focusing on the economic impact of the CBHI estimated the effect of insurance on household assets. Applying IV and FE Parmar et al. (2012b) found a small, yet significant positive relationship between insurance and household assets and concluded that the CBHI seems to protect household assets (p. 829).

Regarding existing empirical evidence on OOP expenditures (1) it is difficult to derive a clear picture since many studies are of rather low quality[44] and report different effects. Table 4 in Appendix A provides an overview of the most rigour empirical studies[45]. Aggarwal (2010, pp. 25-33) studied the Yeshasvini health financing insurance programme targeting members of rural cooperatives in Karnataka, India. It covers only expenses for surgery and outpatient diagnostics. Findings suggested a significant reduction in the share of OOP expenditures in surgery expenses, a significant increase in the share of borrowing in expenditures for in-patient care other than surgery, and no significant reduction in the share of borrowing in expenditures for outpatient diagnostics. The latter two findings are explained by higher utilisation since the insurance offers better access to healthcare. Membership in CBHI schemes in Ghana and Senegal (Chankova, Sulzbach & Diop, 2008, p. 273) were associated with significantly lower OOP expenditures for inpatient care. While the CBHI schemes in Ghana, Senegal, and India do not demand any co-payments Jütting (2004, p. 281) reported significant reductions in OOP expenditures for inpatient care although the studied CBHI claims 50 % co-payment for surgery and a flat co-payment per visit. Yet, insured patients additionally benefit from a 50 % discount on tickets for consultation, daily costs for hospitalisation, and surgery granted by the hospital so the benefit package could still be classified as generous.

Turning to outpatient care, Chankova, Sulzabch & Diop (2008, p. 273) found no significant reduction of OOP expenditures for members of CBHI schemes in Ghana and Senegal probably due to high co-payments (25-50 %). In contrast, findings from Mali (Franco et al., 2008, p. 833) and Rwanda (Saksena et al., 2010, p. 12; Schneider & Diop, 2001, pp. 17-19) suggested significant reductions in OOP expenditures in more generous CBHI schemes. Further, by comparing the normalised poverty gaps before and after health care of insured and uninsured in Rwanda Schneider & Hanson (2006) reported that OOP expenditures marginally increased shortfall of income below the poverty line for both groups (pp. 26-28). So, the CBHI does not seem to provide sufficient protection against health shocks, yet, one needs to take into account that insured individuals reported higher utilisation rates.

Concluding, the majority of studies report significant reductions in OOP expenditures for insured patients. If CBHI schemes do not seem to financially protect their members these

[44] For example, having conducted a widely cited systematic review Ekman (2004) criticised that the majority of published evidence relied on descriptive statistics and concluded that the "evidence base is limited in scope and questionable in quality" (p. 249).

[45] The validity of presented results is still based upon the assumption that controlling for observables removes all bias between treatment and control group.

findings are explained with high co-payments (Chankova, Sulzbach & Diop, 2008, p. 273: Senegal and Mali) or higher utilisation of healthcare services of insured (Aggarwal, 2010, p. 25; Schneider & Hanson, 2006, p. 28).

The literature review already has revealed that the effect of insurance on OOP expenditures is influenced by the particular design of the benefit package. The CBHI scheme in the Nouna health district (2) is rather generous covering both out- as well as inpatient care. Moreover the insurance pays for essential generic prescribed drugs which is very important since these were found to account for 80% of OOP expenditures in the Nouna health district (see section 4.2). Moreover, the insurance also covers transportation from the CSPS to the district hospital and does neither demand any co-payments nor has imposed a limit as to how often insured patients can seek care. The only major weakness of the benefit package seems to be the exclusion of treatment of HIV/AIDS and maternal care. These are rarely covered by CBHI schemes but could nonetheless counter-balance a reduction of OOP expenditures. Nonetheless, the effect of enrolment in the CBHI on OOP expenditures is assumed to be negative.

Hypothesis one: Enrolment in the CBHI reduces OOP expenditures.

Days lost due to illness

Turning to indirect economic costs of illness days lost due to illness reflect the amount of foregone time that otherwise could have been invested in income or human capital generating activities. Most studies only concentrate on healthcare expenditures, yet, it is suggested that such indirect costs may account for the largest part of total economic costs for illness (as discussed in section 2.1), which is why they should not be neglected. Regarding existing evidence only Aggarwal (2010) estimated the effect of insurance on lost days (and on lost income) and did not find any significant effects (p. 33).

How does insurance influence the amount of days lost due to illness? The idea is that insurance reduces the financial barrier to access care, therefore individuals do no longer delay care or practise self-treatment and consequently recover more quickly. As discussed in section 4.4.2 in the Nouna region evidence suggests that insured individuals do not seem to reduce self-care or treatment at traditional healers but additionally seek care at modern health care facilities. Although seeking care at a healthcare facility might thus be a little delayed, eventual treatment in a healthcare facility might still reduce incidence and amount of days lost due to illness.

Hypothesis two: Enrolment in the CBHI reduces days lost due to illness.

5 Methodology

5.1 Data and variables

The empirical analysis combines two data sources. It draws on the 2008 and 2009 waves of the Nouna household survey and on data of the CWR[46] conducted in 2007. The Nouna household survey was renewed in 2003 in hindsight of the introduction of the insurance scheme in 2004. The household survey covers the same 33 clusters used for the step-wise role out of the CBHI scheme. Using the sampling frame of the HDSS already operating in the region a total of 990 households (30 households per cluster) were randomly selected, approximately 10 % of the population[47] (De Allegri et al., 2008, p. 3). Additionally, all households who were enrolled in the insurance at least once since 2004 have also been continuously interviewed since 2004. The sample thus consists of two groups, the 'original' randomly selected sample and 'insured' households. Sample weights are applied in order to discount the weights of the insured sample[48]. Data were collected between April and June in 2008 and between September and November in 2009. Since most people enrol at the end of the enrolment period in June insurance status of the year 2007 was matched to survey results of 2008. Results should not be biased by the three months waiting period since at the time of the survey people were already enrolled for at least three months in 2009 and for at least eight months in 2008. The final sample consists of 25,494 individuals.

Descriptive statistics of the full sample are presented in table 5 in Appendix G and a list of variables is provided in Appendix H. The recall period for illness related indicators is four months. Almost one fifth of the sample is enrolled in the CBHI and 11.9 % suffered from at least one episode of illness during the past four months.

Turning to outcomes of interest the **variable OOP expenditures** is constructed as the sum of transport costs, expenditures for drugs, material, and consultations[49], subsistence costs[50], and

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[46] Note that CWR score was missing for 2,903 individuals in 2008 and for 2,956 individuals in 2009. These were dropped from the sample.

[47] „The sample size was estimated in advance to have a 90 % power of detecting an increase in health service utilisation of one visit per year between insured and non-insured assuming 2-sided type 1 error probability of 0.05 and given enrolment rate of at least 50 %" (De Allegri et al., 2008, p. 3).

[48] The population enrolment rate was 9.1 % in 2007 (insurance status is lagged by one year for 2008) and 8.6 % in 2009 (Souares, 2013, n.p.). Weights are constructed as [(1/population enrolment rate)/(1/sample enrolment rate)].

[49] Consultation costs are defined as costs for consultation and payments to speed up medical examination or to improve quality of care.

[50] Subsistence costs both for the sick person as well as for accompanying individuals include costs for accommodation and meals and presents for the individual offering her place as accommodation.

hospitalisation costs. The variable is modelled in three different specifications in order to account both for incidence and depth of OOP expenditures: a binary variable indicating whether an individual has had any OOP expenditures, a continuous variable with the actual amount of OOP expenditures, and in the form of the share of OOP expenditures in total expenditures[51]. These specifications may overestimate the true burden of disease since they do not account for (in-kind or cash) transfers from other households (Sauerborn, Adams & Hien, 1996, p. 291). Only 2.5 % of individuals had any OOP expenditures associated with seeking care at a CSPS or CMA. On average OOP expenditures amounted to about 100 CFA franc (about US$ 0.2), therefore the share of OOP expenditures in total expenditures is very small.

The **variable days lost** is constructed as the total sum of days a person was prevented to work or go to school due to illness. These measures aim at providing a proxy for the opportunity costs of illness since during illness individuals cannot engage in well-being enhancing activities, e.g. generating today's income or investing in human capital for improving future income earning opportunities. Yet, it should be noted that since the variable does not take into account whether households substitute labour it is only an insufficient proxy for actually foregone income. Only 6 % of the sample could not go to school or work due to illness for at least one day and the mean amount of days lost due to illness is 0.32 days.

Regarding socio-economic covariates about 40 % of the individuals in the sample are younger than 16 years and almost two thirds are illiterate. Mean household size is 13.6 and the large size of some households can be explained with the local definition of a household including all individuals sharing resources to meet basic needs (Sié et al., 2010, p. 2). About one third of the sample lives in Nouna town and on average an individual spent in total about 17,780 CFA franc (about US$ 35,4) during the previous five months.

5.2 Identification problem and potential identification strategies

Impact evaluations aim at comparing the observed outcome to what would have happened without the intervention. Since each individual can either be insured (treatment D_i=1) or uninsured (treatment D_i=0) an individual has two potential outcome variables:

$$Potential\ outcome = \begin{cases} Y_{1i} & if \quad D_i = 1 \\ Y_{0i} & if \quad D_i = 0 \end{cases} \tag{1}$$

[51] Note that the recall period for total expenditures is five months but only four months for OOP expenditures. Thus, the time periods of the two variables are not completely similar. Yet, alternatively I could have only estimated the share of OOP expenditures of the past four months in total expenditures of the past four weeks. Moreover, it would have been better to use consumption expenditures instead of total expenditures but data quality on consumption expenditures was very low. Therefore, the variable may be suboptimal.

Y_{0i} represents the outcome if the individual had not been insured (counterfactual) and Y_{1i} is the individual's outcome if she is insured (factual). The causal effect of being insured thus can be expressed as the difference between Y_{0i} and Y_{1i}. The observed outcome can be written in terms of potential outcomes as

$$Y_i = Y_{0i} + (Y_{1i} - Y_{0i})D_i \tag{2}$$

However, the fundamental problem of causal inference is that the counterfactual is unobservable. Therefore, one needs a suitable control group. Comparing the outcomes of insured and uninsured individuals does not yield the true causal effect due to selection bias. Selection bias arises because treatment and control group are likely to differ in pre-intervention observable and unobservable characteristics. For example, insured individuals are more likely to seek care due to unobservable preferences for treatment at healthcare facilities. The selection bias can be formally derived as follows: The observable outcome for the insured is $E[Y_{1i} \mid D_i = 1]$ and $E[Y_{0i} \mid D_i = 0]$ for the uninsured. Adding and subtracting the unobservable counterfactual $E[Y_{0i} \mid D_i = 1]$, that is the outcome of the insured had they not been insured, to the simple difference of the observable outcomes yields

$$\begin{aligned} & E[Y_i|D_i = 1] - E[Y_i|D_i = 0] \\ &= E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 0] + E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 1] \\ &= E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1] + E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0] \end{aligned} \tag{3}$$

In the third line terms are rearranged. $E[Y_{1i} \mid D_i = 1]$ - $E[Y_{0i} \mid D_i = 1]$ equals $E[Y_{1i} - Y_{01} \mid D_i=1]$ and is the treatment effect, the average effect of the insurance on the insured. The difference $E[Y_{0i} \mid D_i = 1]$ -$E[Y_{0i} \mid D_i = 0]$ is the selection bias (Angrist & Piscke, 2009, pp. 13-15).

How can the problem of selection bias be tackled? Experiments are sometimes regarded as the gold standard of impact evaluations as randomisation is a very promising strategy to account for selection bias. By randomly assigning treatment experiments make treatment independent of potential outcomes. More precisely, if Y_{oi} is independent of D_i, $E[Y_{0i} \mid D_i = 1]$ is equal to $E[Y_{0i} \mid D_i = 1]$. In a large sample selection bias disappears and equation (3) reduces to

$$\begin{aligned} E[Y_i|D_i = 1] - E[Y_i|D_i = 0] &= E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1] \\ &= E[Y_{1i} - Y_{0i}|D_i = 1] \\ &= E[Y_{i1} - Y_{0i}] \end{aligned} \tag{4}$$

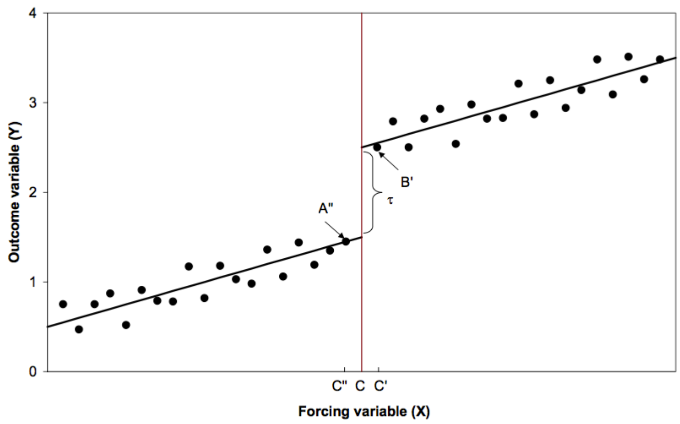
So, with perfect randomisation and a sufficiently large sample a comparison of the average outcome of insured and uninsured yields the treatment effect (Angrist & Piscke, 2009, pp. 13-15; Imbens & Wooldridge, 2008, p. 1; Khandker, Koolwal & Samad, 2010, p. 24). Despite its potential of accounting for selection bias randomisation is not always applied due to financial constraints and ethical concerns.

In the absence of experimental set-ups quasi-econometric methods can be applied as identification strategies. These create control groups that are valid under a set of identifying assumptions. Since these cannot be tested reliability of results depends on how convincing the assumptions appear. Moreover, not every identification strategy is feasible in all settings. Difference-in-difference estimates and fixed effects (FE) require data from at least two points in time. Estimates are valid under the assumption that outcomes of treatment and control group follow parallel time trends in the absence of the intervention (Duflo, Glennerster & Kremer, 2007, pp. 12-13). Matching based on observables is only valid on the strong assumption that controlling for observables removes all biases in comparisons of treatment and control group. (Imbens & Wooldridge, 2008, p. 2). Instrumental variables (IV) require rather strong exogeneity and exclusion restrictions but can produce consistent estimates with selection on unobservables. By exploiting an artificially introduced discontinuity in eligibility to treatment regression discontinuity designs (RDD) also yield consistent estimates with selection on unobservables, albeit under weaker conditions than IV. Therefore, RDD have become a popular design for programme evaluation. Lee & Lemieux (2009) even argued that "RD design is a much closer cousin of randomised experiment than other competing methods" (p. 10). Comparing randomised and non-randomised studies Cook, Shadish & Wong (2006), cited in Duflo, Glennerster & Kremer (2007, p. 13) indeed found that RDD estimates were similar to results obtained through experiments.

Hence, since RDD seems to be a promising approach and a discontinuity in eligibility to treatment can indeed be exploited in the setting of the CBHI in the Nouna health district a RDD is applied to evaluate the effect on OOP expenditures and days lost due to illness. Therefore, the idea of RDD is briefly illustrated in the next paragraph before explaining the details of the identification strategy in section 5.3.

Eligibility to treatment is determined by a forcing variable X, which is depicted on the x-axis in figure 1. If an individual's score is higher than the threshold c she is eligible to treatment. If her score is below c she is not eligible to treatment. Imagine an individual whose score X is exactly c. If it is reasonable to assume that all other factors determining the outcome evolve smoothly with respect to the forcing variable X, then, B' is a reasonable guess for the value of Y for an individual whose score is exactly c and hence receiving treatment. Similarly, A'' would also be a reasonable guess in the counterfactual state of not having received the treatment. Therefore, the difference between B' and A'' would be the causal estimate. Since in reality the counterfactual A'' is unobservable with RDD one instead compares outcomes of individuals close to the cut-off, at points c' and c'' (Lee & Lemieux, 2009, p. 7).

Figure 1: Simple (linear) RDD setup



Source: Lee & Lemieux, 2009, p. 85.

5.3 Applied identification strategy: sharp regression discontinuity design (RDD)

By applying RDD the following analysis aims at accounting for selection bias when estimating the effect of the CBHI on economic costs of illness. In particular, the sharp RDD exploits a discontinuity in the offer of a 50% discount on the insurance premium for poor households (section 5.3.1). After discussing its internal validity (section 5.3.2) the discontinuity is then used to construct an instrument for enrolment in the CBHI to estimate the effect on OOP expenditures and days lost due to illness (section 5.3.3).

5.3.1 Discontinuity in eligibility to premium discount

As described in section 4.4.1 a community wealth ranking (CWR) was conducted in order to determine the 20 % poorest households in each village. Each household received three independent scores, one from each local key informant, and by consensus the 20 % poorest households were determined. From 2007 onwards households determined as poor could enrol in the CBHI by paying only 50 % of the insurance premium. In order to construct a CWR variable the average of the three scores of the local key informants was calculated for each household. On the basis of these averages, households were ranked and a normalised CWR variable was constructed with values from -0.2 to +0.8 with the cut-off at zero. Households belonging to the 20 % poorest households have a negative value and are eligible to discount, the remaining 80 % of the households have a positive value and are not eligible to discount. This can be formalised as follows:

$$Z_i = \begin{cases} 1 \ \ if \ x_i < x_0 \\ 0 \ \ if \ x_i \geq x_0 \end{cases} \tag{5}$$

Z_i denotes eligibility status. Z_i=1 if the CWR score x_i is smaller than the cut-off x_0. If an individual's CWR score x_i is greater or equal x_0 she is not eligible to discount and Z_i=0.

Therefore, at the threshold there is a discontinuity in eligibility to discount, which can be used to estimate the effect on the outcome variables. The RDD is sharp since eligibility to discount is a deterministic and discontinuous function of the covariate x_i, the CWR score. It is a deterministic function because one can infer from the CWR score whether an individual is eligible to discount or not. There is no value of the CWR variable at which one observes both treatment and control observations. It is a discontinuous function because no matter how close one gets to the cut-off treatment is unchanged as long as it does not pass the threshold.

Let Y_i be the outcome of individual i. All individuals with a CWR score smaller than x_0 are eligible to treatment, thus one can only observe $E[Y_{1i}|x_i]$ to the left of the cut-off. Individuals to the right of the cut-off are not eligible to treatment so one can only observe $E[Y_{0i}|x_i]$ to the right of the cut-off. Comparing these observable average outcomes in a small neighbourhood around the cut-off then yields the average treatment effect at the cut-off x_0.

$$\lim_{\Delta\to 0} E[Y_i|x_0 \leq x_i < x_0 + \Delta] - E[Y_i|x_0 - \Delta < x_i < x_0] = E[Y_{1i} - Y_{0i}|x_i = x_0] \quad (6)$$

for some small positive number Δ.

The great advantage of RDD is that it requires relatively weak identifying assumptions. In particular, the average outcome of those above the cut-off (and thus not eligible to treatment) can be used as a valid counterfactual for those right below the cut-off (and thus eligible to treatment) if $E[Y_{0i}|x_i]$ is continuous. In other words, the identifying assumption is that “all other unobservable factors need to be ‘continuously’ related to the forcing variable” (Lee & Lemieux, 2009, p. 11). Continuity holds if individuals cannot manipulate the forcing variable, their CWR score. In particular, individuals must not be able to *precisely* sort around the discontinuity threshold. Then, the variation in the treatment in a neighbourhood of the threshold is ‘as good as randomised’ (Angrist & Pischke, 2009, pp. 251-256; Lee & Lemieux, 2009, pp. 7-12). This is an important difference to IV since inability to manipulate the forcing variables causes variation in treatment near the threshold to be as good as randomised whereas “when using IV for causal inference, one must assume the instrument is exogenously generated as if by a coin-flip” (Lee & Lemieux, 2009, p. 3).

Moreover, estimating the average treatment effect in a small area around the cut-off also yields the advantage that one can “estimate the treatment effects in a way that does not depend on the correct specification of a model for $E[Y_{0i}|x_i]$” (Angrist & Pischke, 2009, p. 152). In other words, it strongly reduces the probability that unaccounted nonlinearity in the counterfactual conditional mean is mistaken for a jump induced by treatment.

5.3.2 Internal validity

How valid is the assumption that individuals cannot manipulate the forcing variable with respect to eligibility to discount for the CBHI scheme in Nouna? The CWR determined the 20 % poorest households, hence there was no absolute poverty threshold but the CWR applied a relative concept of poverty. Thus, if households tried to appear poorer than they actually were in order to become eligible to discount they could only approximate how poor they need to appear for being allocated into the lowest wealth quintile. Moreover, the CWR applied a set of characteristics determining poverty and wealth. In order to manipulate their score households would thus have needed to manipulate an array of wealth determinants to significantly increase the probability of being allocated into the lowest wealth quintile. This makes it very unlikely that households were able to precisely sort around the cut-off. Yet, the three local key informants determining each household's score may constitute a potential source of fraud. For example, households might have been able to exploit strong personal relationships with one of the local key informants to influence their ranking score. Still, in order to precisely sort into the eligible group households would have needed to arrange for a preferential ranking with all three local key informants since final scores were determined by consensus. Consequently, despite this potential source of bias it nonetheless appears unlikely that households were able to precisely sort around the discontinuity cut-off.

As a robustness check for individual manipulation Lee & Lemieux (2009) propose to examine the density of the forcing variable in order to check for a suspicious high density on the eligible-side of the threshold (p. 17). Yet, the applied relative wealth measure predetermined a fixed number of eligible households, namely the poorest quintile in each village. Therefore, by construction there can be no bunching of households just below the cut-off.

Another recommended robustness check is to compare the subsamples below and above the threshold with respect to a number of demographic and socio-economic characteristics (Lee & Lemieux, 2009, p. 17; Imbens & Wooldridge, 2008, pp. 59-60). The idea is that since individuals are as good as randomly assigned at either side of the threshold they should be very similar in observed characteristics. Yet, since the CWR used a number of characteristics determining poverty it is hard to think of a covariate of which one can be sure that is has not been taken into account to determine individual's CWR score. Gender may be a potential candidate of a covariate that was determined before the introduction of the discount which cannot be affected by the insurance and which should play no role in determining individual wealth status. Indeed, means comparisons in table 7 in Appendix I suggest that the difference in means in the variable female is insignificant in a large and small window around the threshold. In general it is clearly visible that the difference in means of socio-economic covariates shrinks the further the sample is restricted to the area around the threshold. When taking observations from a small window around the cut-off only the sample means of the variables water inside home (d), age, and household size remain significantly different.

In addition to comparing the means of the covariates Lee & Lemieux (2009, p. 49) also propose to regress covariates on the variable eligibility to discount. If individuals are truly as good as randomised there should be no significant effects. Results presented in tables 8 and 9 in Appendix J only suggest a significant relationship for the covariates literate (d), animals, and water inside home (d). This is not too surprising since unlike gender, housing and animals are not strictly predetermined and may have been influenced by the introduction of the discount (via enrolment in the CBHI). While it would have been more reassuring to find no significant effects Lee & Lemieux (2009) reduce doubts by arguing that “if there are many covariates (…), some discontinuities will be statistically significant by random chance” (p. 49). Still, these results should be kept in mind during the further analysis.

Concluding, although the conducted robustness checks revealed that individuals on either side of the cut-off differ with respect to some covariates by construction the eligibility rule still should have made it sufficiently impossible for individuals to precisely sort around the cut-off. Therefore, the discontinuity is regarded as sufficiently valid to construct an instrument.

5.3.3 Instrumenting with eligibility to discount for enrolment

The final step is to use the discount as an instrument for enrolment in the CBHI. The discontinuity in eligibility to discount can be exploited to estimate the relationship between enrolment in the CBHI and outcome variables if eligibility to discount is a valid instrument for insurance status. The idea of using an instrument is initialising a causal chain. The instrument eligibility to discount (z_i) affects the variable of interest, enrolment in CBHI, which in turn affects the outcomes.

For estimating the population average treatment effect strong assumptions regarding the effect of the instrument on the endogenous regressor would need to hold (‘identification at infinity’, or under the constant treatment effect assumptions). Without such strong assumptions it is only possible to estimate the average effect for the subgroup of individuals whose behaviour is triggered by the instrument (Imbens & Wooldridge, 2007, p. 1). More precisely, the local average treatment effect (LATE) estimates the average effect for the subgroup of individuals that only enrol in the insurance because they are eligible to discount but who would not have enrolled if they had not been offered the discount (compliers). Internal validity of the LATE depends on three rather weak assumptions: the independence assumption, the exclusion restriction, and the monotonicity assumption.

Let D_{1i} be i's insurance status when Z_i=1, that is when the individual is eligible to discount. Let D_{0i} be i's insurance status when Z_i=0, that is when the individual is not eligible to discount. Only one of the potential treatment assignments can be observed for any one person – which one depends on the instrument Z_i. Despite some minor doubts discussed in section 5.3.2 the instrument eligibility to discount seems to be as good as randomly assigned in the area around the cut-off. Then, it is independent of both the vector of potential outcomes and potential treatment assignments. Formally, this can be written as

$$[\{y_i(d,z); \forall\, d,z\}, D_{1i}, D_{0i}] \perp\!\!\!\perp z_i \tag{7}$$

This *independence assumption* is sufficient for a causal interpretation of a regression of the outcome on eligibility to discount (reduced form).

$$\begin{aligned} &E[Y_i|Z_i = 1] - E[Y_i|Z_i = 0] \\ &= E[Y_i(D_{1i}, 1)|Z_i = 1] - E[Y_i(D_{0i}, 0)|Z_i = 0] \\ &= E[Y_i(D_{1i}, 1) - Y_i(D_{0i}, 0)] \end{aligned} \tag{8}$$

So, $E[Y_i(D_{1i}, 1) - Y_i(D_{0i}, 0)]$ is equal to the causal effect of the instrument on y_i.

The second key assumption is the *exclusion restriction* that is that the instrument operates only through one causal chain, enrolment in the CBHI. So, while eligibility to discount clearly affects enrolment in CBHI outcomes are assumed to be unchanged by eligibility status. This seems plausible given that the occurrence of health shocks (and thus associated expenditures and sickness days) can only be partly influenced by individual behaviour. It also seems unlikely that the mere (non-)eligibility to receive a discount changes behaviour in a way that affects healthcare expenditures or duration of illness via a channel other than membership in the CBHI.

Finally, the *monotonicity assumption* means that all individuals affected by the instrument are affected in the same way. This can be formally noted as either $D_{1i} \geq D_{oi}\ or\ D_{1i} \leq D_{oi}\ for\ all\ i$ (Angrist & Pischke, 2009, pp. 151-153). This seems plausible since a price reduction should not negatively affect an individual's enrolment decision. Thus, if there is any effect of the 50 % discount on enrolment it will be positive for all individuals.

Assuming the instrument is indeed as good as randomly assigned, only affects outcome through the channel of enrolment in the CBHI, and if so only affects the enrolment in one direction, then the instrument can be used to estimate the average causal effect on the affected group, the compliers. The LATE is not informative about those individuals who would have enrolled also without the discount offer (always-takers). Therefore, the LATE is not the same as the effect of treatment on the treated since the latter is a weighted average of effects on always-takers and compliers (Angrist & Pischke, 2009, pp. 155-159).

5.4 Empirical specification

As explained in the previous section eligibility to discount is used as an instrument for enrolment in the CBHI.

Instrument for insurance:

$$Insured_i = c + \alpha Discount_i + \eta_1 CWRscore_i + \eta_2 CWRscore_i^2 + \eta_3 CWRscore_i^3 + u_i \quad (9)$$

The variable $Insured_i$ is a binary variable taking on the value 1 if the person is enrolled in the CBHI and zero otherwise. $Discount_i$ is a binary variable denoting eligibility to discount taking on the value 1 if the person is eligible to discount and zero otherwise. $CWRscore_i$ is the CWR score of individual i. In order to account for different functional forms different polynomials of the CWR variable are included. c is the constant and u_i denotes the error term.

RDD cross-section regression equation:

$$Y_i = \beta_i Discount_i + \eta_1 CWRscore_i + \eta_2 CWRscore_i^2 + \eta_3 CWRscore_i^3 + \delta X_i + \varepsilon_i \quad (10)$$

The causal effect of interest on the outcome is β_i. As already state in section 5.3.3 it is the local average treatment effect (LATE) capturing the effect of enrolment in CBHI for those individuals that enrolled only because they were eligible to receive 50 % discount on the insurance premium. Since discount on insurance premium is only offered it is an intent-to-treat (ITT) effect. Finally, X_i is a vector of covariates consisting of different socio-economic indicators and ε_i denotes the error term.

As stated in section 5.3.2 comparisons of sample means around the threshold (shown in table 7 in Appendix I) revealed that the means of some covariates (e.g. age) remained significantly different even in a small neighbourhood around the cut-off. Further, some covariates turned out to be significant when regressing them on eligibility to discount. In order to account for this and to reduce sampling variability in the estimator covariates are included in the regressions although by design they should not be necessary for obtaining consistent estimates of the treatment effect [52] (Lee & Lemieux, 2009, p. 18).

[52] Hullegie & Klein (2010) and Bauhoff, Hotchkiss & Smith (2011) also included covariates when applying RDD to evaluate programme impacts.

6 Results

The following sections present first-stage results (section 6.1) followed by results for OOP expenditures (section 6.2) and days lost due to illness (section 6.3). As recommended by Lee & Lemieux (2009, p. 48) heteroskedasticity robust standard errors are applied[53]. Further, results are shown for two different window sizes around the cut-off and with different sets of covariates to check their robustness.

6.1 Eligibility to discount and enrolment (first stage)

The non-parametric plot depicted in figure 2 shows the relationship between eligibility to discount and enrolment in the CBHI for the full sample. The small circles denote the observations and the lines are lowess regression lines[54]. Since enrolment in the CBHI is a binary variable observations are either zero or one. The higher the CWR score the higher is the probability of enrolment, which is not surprising since wealth was found to be an important determinant of CBHI membership. Yet, it is clearly visible that that there is a jump where the CWR score equals zero. Individuals with a negative CWR score close to the cut-off seem to have a higher probability of enrolment than individuals to the right side of the cut-off with a small positive CWR score. Figure 3 shows the same relationship only for observations in a large and a small window around the cut-off. According to the plots the size of the jump is approximately 0.3 indicating that the probability of enrolment jumps by about 30 percentage points with eligibility to discount. The lowess lines approaching the cut-off from the right and the left are now flatter but still not fully horizontal. This might hint at some heterogeneity problems. Nonetheless, the graph supports confidence that eligibility to discount is a good predictor for enrolment in the CBHI. Moreover, graphs do not show any jumps other than at the cut-off. This is reassuring since at any other point of the CWR score treatment does not change and hence there should be no jump.

Further, regression estimates of the first stage shown in table 1 also suggest a significant positive relationship between eligibility to discount and enrolment. Irrespective of window sizes and degrees of polynomials of the CWR score the eligibility to discount variable remains positive significant at the 1 % level. Moreover, the value of the F-tests exceeds the rule-of-thump threshold of 10 and p-values are always 0.000. Taken together these statistics

[53] Results did not change when using ‘normal’ standard errors.

[54] Locally weighted scatterplot smoother (lowess) regression lines. This non-parametric method fits local polynomial regressions and joins them together while making no assumptions about the form of the relationship.

indicate that eligibility to discount is a valid instrument for enrolment in the CBHI. Turning to the size of the coefficients it varies between 0.21 and 0.27 in a small window around the cut-off (columns 5-8 of table 1) and between 0.16 and 0.25 when taking observations from a large window (columns 1-4 of table 1). Thus, according to the size of the coefficients the jump is slightly smaller than it appeared to be in the non-parametric plot. Taking the coefficient of column 3 of table 1 as an example, eligibility to discount is estimated to increase the probability of enrolment on average by 24.9 percentage points.

In order to further check the robustness of the first stage results are repeated while including controls (see table 10 in Appendix K). Coefficients do only slightly differ compared to estimations without controls presented in table 1. Covariates exhibit expected signs[55], for example, literacy, assets, and animals increase the probability of enrolment

Figure 2: Eligibility to discount and enrolment (non-parametric plot, full sample)

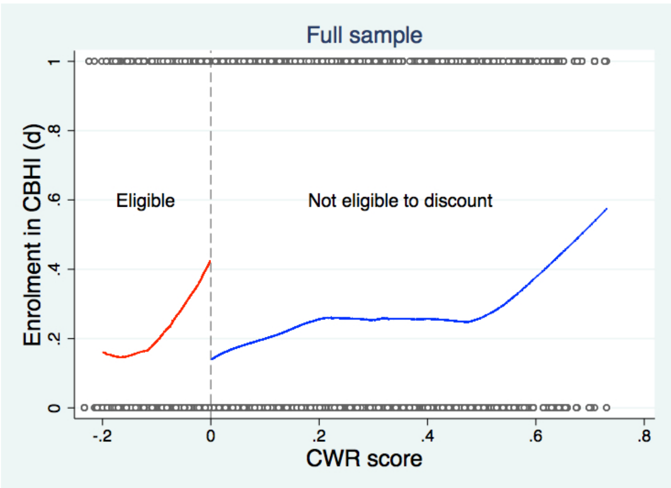
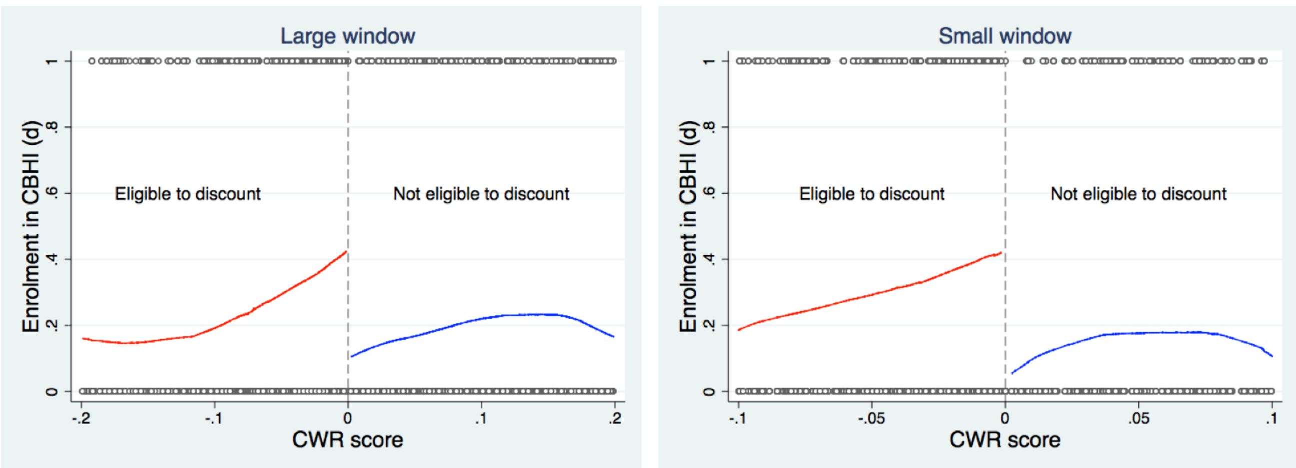


Figure 3: Eligibility to discount and enrolment (non-parametric plots, windows)



[55] The negative sign of the coefficient of the variable life-threatening illness is caused by correlation with the variable illness treated. I checked different specifications by dropping one or both of these variables. Results did not change.

Table 1: Insured (d) (first stage)

	Large window (-0.2 < CWR score < 0.2)				Small window (-0.1 < CWR score < 0.1)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Eligible to discount (d)[1]	0.158***	0.175***	0.249***	0.251***	0.215***	0.209***	0.272***	0.272***
	(0.014)	(0.014)	(0.018)	(0.018)	(0.019)	(0.019)	(0.024)	(0.024)
CWR score	0.688***	0.877***	1.773***	1.807***	1.165***	1.122***	2.555***	2.556***
	(0.061)	(0.062)	(0.156)	(0.157)	(0.166)	(0.163)	(0.383)	(0.385)
(CWR score)^2		-2.950***	-2.385***	-3.882***		-5.619***	-5.567***	-6.371
		(0.307)	(0.302)	(1.121)		(1.626)	(1.623)	(5.601)
(CWR score)^3			-27.210***	-28.552***			-165.067***	-165.253***
			(4.116)	(4.140)			(40.358)	(40.661)
(CWR score)^4				46.701				95.638
				(32.460)				(632.057)
Constant	0.082***	0.104***	0.062***	0.066***	0.071***	0.092***	0.059***	0.060***
	(0.008)	(0.008)	(0.010)	(0.010)	(0.010)	(0.011)	(0.013)	(0.013)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	12058	12058	12058	12058	7246	7246	7246	7246
R^2	0.0127	0.0197	0.0233	0.0234	0.0239	0.0256	0.0280	0.0280

p<0.10, ** p<0.05, *** p<0.01
Notes: Robust standard errors in parentheses; [1] reference group: individual not eligible to receive a 50% discount on the insurance premium; sample weights applied.

Finally a placebo test was conducted by estimating the relationship between eligibility to discount and enrolment prior to the introduction of the discount in 2007. The non-parametric plot as well as regression estimates of the placebo test in Appendix L do neither show a jump nor suggest a significant positive relationship between eligibility to discount and enrolment in the years 2004-2006. In particular, the regression coefficients either are insignificant or negative significant which increases confidence in the validity of the estimation strategy.

Regarding the included polynomials of the CWR score the first three polynomials are always significant at the 1 % level in all specifications presented in table 1 and table 10. When including the fourth polynomial it is never significant. Therefore, the following analysis will be carried out with three polynomials of the CWR score.

6.2 OOP expenditures

Before turning to results it should be noted that the sample was restricted to individuals older than 16 years as it was assumed that parents pay for the medical expenses of their children[56]. OOP expenditures were estimated in three different specifications, as a binary variable, a log-transformation, and as the share in total expenditures. The following regression results are compared with hypothesis one predicting a reduction in OOP expenditures.

First, table 2 shows results for the binary variable. The main finding is a small, yet not robust reduction in the probability whether an individual has had any **OOP expenditures (d)**. More precisely, when taking observations from a large window around the threshold (columns 1-5

[56] Bauhoff, Hotchkiss & Smith (2011) also excluded children when estimating the effect of a medical insurance for the poor on utilisation in Georgia.

of table 2) with the exception of column three[57] estimates suggest a negative significant relationship between enrolment in the CBHI, instrumented with eligibility to discount, and OOP expenditures (d). The size of the coefficient does only slightly decrease when adding further controls. This is comforting since adding covariates should not affect estimates but only reduce the standard errors. Taking column 5 of table 2 as an example, controlling for CSPS/CMA and further covariates eligibility to discount reduces the probability of having any OOP expenditures on average by 1.4 percentage points. Hence, the economic significance of the coefficient is rather small. Yet, when narrowing the window to a small area around the threshold (columns 6-10 of table 2) the coefficient loses its significance.

Table 12 in Appendix M contains further robustness checks. The amount of included polynomials is varied (columns 1-4 of table 12) and observations were further restricted to a very small neighbourhood around the threshold (columns 5-9 of table 12). The coefficient loses its significance with less than three polynomials or when taking observations only from a very small window around the threshold.

Regarding covariates illness and life-threatening illness positively influence the probability of having OOP expenditures. The coefficient of illness becomes negative once including the variable treatment, which seems to be driven by correlation between these two covariates[58]. As expected the coefficient of the binary variable CSPS/CMA, indicating whether an individual visited a CSPS or CMA, is large and positive significant. Literacy also seems to have a positive influence on the dependent variable but varies in its significance levels. Finally, estimations were also conducted at household level by creating a binary dependent variable, which is one if at least one family member had any OOP expenditures and zero otherwise. Yet, the coefficient did not suggest any significant effects.

Concluding, while some specifications suggest a significant reduction in the probability of having any OOP expenditures this result is not robust across different window sizes and small in terms of economic significance.

[57] Column three does not control for treatment but only for illness. Yet, these variables are correlated which may explain the sudden drop in the absolute magnitude of the coefficient in column three.

[58] Due to high correlation between illness (d) and life-threatening illness (d), illness treated (d), CSPS/CMA (d), and self-treatment (d) I also estimated further specifications with different combinations of these covariates. The coefficient is negative significant once controlling for illness treated (d) or CSPS/CMA (d) and does only slightly vary in size when including different covariates.

Table 2: OOP expenditures (d)

	Large window (-0.2 < CWR score < 0.2)					Small window (-0.1 < CWR score < 0.1)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Eligible to discount (d)[1]	-0.017*	-0.016*	-0.004	-0.014***	-0.014***	-0.002	-0.002	0.008	-0.006	-0.006
	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.011)	(0.011)	(0.011)	(0.006)	(0.006)
CWR score	-0.156*	-0.153*	-0.068	-0.143***	-0.133***	0.163	0.127	0.144	0.015	0.000
	(0.083)	(0.083)	(0.076)	(0.043)	(0.042)	(0.177)	(0.180)	(0.174)	(0.094)	(0.103)
(CWR score)^2	0.189	0.219	0.092	-0.028	-0.048	-0.272	-0.178	0.275	0.190	0.196
	(0.193)	(0.193)	(0.179)	(0.108)	(0.114)	(0.837)	(0.835)	(0.770)	(0.367)	(0.425)
(CWR score)^3	5.031**	4.932**	3.843*	3.902***	3.891***	-22.848	-18.153	-9.511	-6.860	-3.159
	(2.387)	(2.393)	(2.184)	(1.206)	(1.215)	(20.204)	(20.490)	(19.366)	(9.788)	(10.656)
Age (in years)	0.000***	0.000***	-0.000	0.000	0.000	0.000***	0.000**	-0.000	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (d)[2]	0.010**	0.013***	0.012***	0.002	0.001	0.007	0.009	0.009	-0.000	-0.000
	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.003)	(0.003)
Literate (d)[3]	0.016***	0.009*	0.006	0.001	0.001	0.017***	0.013**	0.010*	0.002	0.002
	(0.005)	(0.005)	(0.004)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)
HH size	-0.001**	-0.001**	-0.000*	0.000	0.000	-0.001*	-0.001**	-0.001**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp.[4] prev. 5 m. (log)		0.002***	0.000	0.000	0.000		0.001**	-0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.000)	(0.000)
Assets[5]		0.004	0.004*	0.001	0.000		0.001	0.004	0.001	0.001
		(0.003)	(0.003)	(0.001)	(0.001)		(0.003)	(0.003)	(0.002)	(0.002)
Animals[6]		-0.001*	-0.000	0.000	-0.000		-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
Water inside home (d)[7]		-0.006	-0.005	-0.000	-0.000		-0.020***	-0.017***	-0.011	-0.010
		(0.012)	(0.011)	(0.008)	(0.008)		(0.006)	(0.006)	(0.011)	(0.011)
Illness (d)[8]			0.109***	-0.011**	-0.012**			0.087***	-0.019***	-0.020***
			(0.014)	(0.005)	(0.006)			(0.016)	(0.007)	(0.007)
Life-threatening illness (d)[9]			0.150***	0.039*	0.039*			0.190***	0.073***	0.071***
			(0.032)	(0.020)	(0.020)			(0.043)	(0.027)	(0.027)
Illness treated (d)[10]				-0.073	-0.071				0.027	0.029
				(0.053)	(0.053)				(0.083)	(0.083)
CSPS/CMA (d)[11]				0.719***	0.718***				0.653***	0.651***
				(0.051)	(0.051)				(0.082)	(0.082)
Self treatment (d)[12]				0.077	0.076				-0.022	-0.023
				(0.054)	(0.053)				(0.084)	(0.083)
Traditional healer (d)[13]				0.057	0.055				-0.036	-0.040
				(0.049)	(0.049)				(0.080)	(0.080)
Ethnicity dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	No	No	No	Yes	No	No	No	No	Yes
Village dummies	No	No	No	No	Yes	No	No	No	No	Yes
Constant	0.003	-0.008	-0.003	0.002	0.686	-0.003	-0.010	-0.005	-0.002	-3.197
	(0.008)	(0.008)	(0.008)	(0.005)	(5.680)	(0.010)	(0.010)	(0.009)	(0.005)	(6.237)
p	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
N	6820	6820	6820	6820	6820	4051	4051	4051	4051	4051
R^2	0.0101	0.0137	0.1761	0.6624	0.6657	0.0133	0.0158	0.1897	0.6776	0.6807

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Second, turning to incidence of OOP expenditures due to the large variation in OOP expenditures the variable was log-transformed. Estimation results of the variable **OOP expenditures (log)** turned out to be insignificant across various specifications. Therefore, the main finding is that the CBHI does not seem to reduce the amount of OOP expenditures. In particular, columns 1 and 2 of table 13 in Appendix N suggest that eligibility to discount reduces OOP expenditures on average by about 23 percentage points. While this finding would be impressive given its economic significance, the coefficient loses its significance once controlling for illness (d) and further covariates (columns 3-5 of table 13). The coefficient remains insignificant also when reducing observations to a small neighbourhood around the cut-off and strongly reduces in size when adding further controls (columns 6-10 of table 13).

Applying further robustness checks also did not yield any significant results (see table 14 in Appendix N). The coefficient remains insignificant with varying degrees of CWR score polynomials (columns 1-4 of table 14) and when further restricting observations to a very small window around the cut-off (columns 5-9 of table 14).

Further reducing the sample to those individuals who actually had any OOP expenditures and then estimating the effect of eligibility to discount on OOP expenditures also did not produce any significant results. Finally, when aggregating OOP expenditures on household level the effect of eligibility to discount was never significant.

Third, in order to estimate the depth of OOP expenditures the **share of OOP expenditures in total expenditures** is estimated. Estimates presented in table 15 in Appendix O suggest no significant relationship between eligibility to discount and the depth of OOP expenditures. Regardless of window size, included polynomials, and covariates the coefficient is never significant. Similarly, no significant effects were found when reducing the sample to those individuals who had at any OOP expenditures or when aggregating OOP expenditures and total expenditures at household level.

In short, results of the three specifications of the variable OOP expenditures do not suggest a robust negative effect on OOP expenditures. Therefore, results do not support hypothesis one predicting that CBHI reduces OOP expenditures.

6.3 Days lost due to illness

The following section presents estimated effects of the CBHI, instrumented with eligibility to discount, on whether a person lost at least one day due to illness and the amount of days lost.

The variable **days lost due to illness (d)** is a dummy variable taking on the value 1 if an individual could not got to school or work for at least one day due to illness and zero otherwise. Table 3 presents estimation results. The main findings is a robust, yet, small reduction in the probability of losing at least one day due to illness. Irrespective of taking observations from a large or small window around the cut-off the coefficient is negative and significant though at varying significances levels. Taking column 4 of table 3 as an example estimates suggest that eligibility to discount reduces the probability that an individual has lost at least one day due to illness on average by 1.7 percentage points. The corresponding coefficient when taking observations from the small window around the cut-off is 0.035, about twice the size (column 9 in table 3). Coefficients are larger when taking observations only from a small window around the cut-off while varying less when including different covariates. This might hint at a higher credibility of the results from the small window. Coefficients are statistically significant across different specifications[59]; yet, their economic significance is small with an estimated reduction of the probability of losing time due to illness of less than 5 percentage points.

With respect to covariates unsurprisingly illness and life-threatening illness always have a positive significant effect. Interestingly, the variable CSPS/CMA also carries a positive sign. Maybe, the variable serves as a proxy for the severity of illness if individuals only visit a healthcare facility in severe cases.

Regarding further robustness checks the coefficient remains significant when varying the amount of included polynomials of CWR score (columns 1-4 of table 16 in Appendix P). Similarly, when taking observations from a very small window around the threshold the coefficient is significant once controlling for illness-related covariates (columns 5-9 of table 16).

Turning to the actual amount of days not able to work or go to school evidence is weaker. Results presented in table 17 in Appendix Q indicate that eligibility to discount has no significant effect on the **amount of lost days** when taking observations from a large window around the cut-off (columns 1-5 of table 17). Yet, in a small window around the threshold

[59] Since correlation between the pairs illness & treatment, illness & CSPS/CMA, and illness & life-threatening illness slightly exceeds the 0.5 threshold I also checked whether size and significance of the coefficient of eligibility to discount varies when including different combinations of these covariates. I found that the size of the coefficient does not vary or only very slightly and also significance levels remain stable.

eligibility to discount has a negative effect on days lost significant at the 5 % level[60] (columns 6-10 of table 17). When including further controls the coefficient slightly reduces in size but remains significant. Eligibility to discount seems to reduce the amount of lost days on average by about 0.3 days. Let statistical significance aside the economic significance of the reduction of days lost due to illness corresponds to about one tenth of the standard deviation of the full sample and thus is small. Regarding covariates, age has a positive effect on amount of day lost which makes sense given that elderly are more likely to suffer from illness.

Table 18 in Appendix Q consists of further robustness checks. When including different polynomials the coefficient varies considerably in size and even loses significance in one case (columns 1-4 in table 18). When restricting observations to a very small window around the cut-off (columns 5-9 in table 18) the coefficient is never significant. Moreover, it was not possible to estimate the effect for the subgroup of individuals who had at least one day lost due to too few observations.

Finally, two external effects of illness on family members were investigated. First, since Sauerborn, Adams & Hien (1996, pp. 291-298) found high time losses for individuals who cared for sick relatives in the Nouna health district it was estimated whether the CBHI reduces the probability that an individual could not work due to caring for a sick relative. Second, the effect of the CBHI on whether a child was taken out of school due to illness of a family member was estimated. Results neither suggest a significant reduction in the probability that a child was taken out of school nor a significant reduction in the probability that a family member needed to stay at home in order to care for a sick relative.

Concluding, estimates suggest a robust although economically small reduction in the probability of losing at least one day due to illness. Results also suggest that eligibility to discount reduces lost days due to illness by about 0.3 days but this result is not robust across different window sizes. Nonetheless, findings are broadly in line with hypothesis two predicting a reduction of days lost due to illness.

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[60] Again, in order to account for correlation between the pairs illness & treatment, illness & CSPS/CMA, and illness & life-threatening illness I also checked different combinations of included controls. I found that the size of the coefficient does not vary or only very slightly and also significance levels remained stable.

Table 3: Days lost due to illness (d)

	Large window (-0.2 < CWR score < 0.2)					Small window (-0.1 < CWR score < 0.1)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Eligible to discount (d)[1]	-0.026**	-0.026**	-0.016*	-0.017*	-0.019**	-0.037**	-0.036**	-0.034***	-0.035***	-0.038***
	(0.013)	(0.013)	(0.009)	(0.009)	(0.009)	(0.018)	(0.017)	(0.012)	(0.012)	(0.013)
CWR score	-0.209*	-0.208*	-0.145*	-0.159**	-0.172**	-0.312	-0.321	-0.478***	-0.495***	-0.474**
	(0.113)	(0.112)	(0.077)	(0.077)	(0.079)	(0.276)	(0.276)	(0.185)	(0.184)	(0.194)
(CWR score)^2	0.265	0.280	-0.018	0.006	-0.145	-0.757	-0.703	0.291	0.274	0.571
	(0.266)	(0.267)	(0.188)	(0.184)	(0.201)	(1.130)	(1.131)	(0.755)	(0.752)	(0.836)
(CWR score)^3	3.908	3.811	3.929*	4.078*	4.968**	-4.738	-2.908	30.793	30.988	27.558
	(3.149)	(3.147)	(2.194)	(2.160)	(2.227)	(28.605)	(28.742)	(19.223)	(18.988)	(19.910)
Age (in years)	0.001***	0.001***	-0.000	0.000	0.000	0.001***	0.001***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (d)[2]	0.001	0.004	-0.001	-0.003	-0.003	-0.000	-0.001	-0.002	-0.003	-0.003
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.006)	(0.007)	(0.005)	(0.005)	(0.005)
Literate (d)[3]	0.007	0.001	0.001	0.001	0.002	0.006	0.003	0.002	0.001	0.002
	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.007)	(0.008)	(0.005)	(0.005)	(0.005)
HH size	-0.001**	-0.001**	-0.000	0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp.[4] prev. 5 m. (log)		0.001*	-0.000	-0.000	-0.000		0.002*	-0.000	-0.000	-0.000
		(0.001)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.001)	(0.001)
Assets[5]		0.005	0.003	0.002	0.002		-0.002	-0.000	-0.001	-0.001
		(0.004)	(0.003)	(0.003)	(0.003)		(0.005)	(0.003)	(0.003)	(0.003)
Animals[6]		-0.001	-0.000	-0.000	-0.000		-0.001	-0.000	-0.000	-0.000
		(0.001)	(0.000)	(0.000)	(0.000)		(0.001)	(0.000)	(0.000)	(0.000)
Water inside home (d)[7]		-0.000	0.008	0.006	0.007		-0.015	0.002	0.001	0.001
		(0.017)	(0.012)	(0.011)	(0.011)		(0.020)	(0.015)	(0.015)	(0.015)
Illness (d)[8]			0.446***	0.284***	0.284***			0.447***	0.348***	0.345***
			(0.018)	(0.041)	(0.040)			(0.023)	(0.058)	(0.057)
Life-threatening illness (d)[9]			0.268***	0.249***	0.249***			0.262***	0.246***	0.248***
			(0.030)	(0.030)	(0.030)			(0.040)	(0.040)	(0.040)
Illness treated (d)[10]				0.105	0.095				0.070	0.062
				(0.072)	(0.072)				(0.101)	(0.101)
CSPS/CMA (d)[11]				0.110**	0.116**				0.090	0.096
				(0.055)	(0.055)				(0.078)	(0.077)
Self treatment (d)[12]				0.069	0.073				0.028	0.033
				(0.057)	(0.057)				(0.081)	(0.081)
Traditional healer (d)[13]				0.044	0.048				-0.013	-0.012
				(0.086)	(0.085)				(0.113)	(0.111)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	No	No	No	Yes	No	No	No	No	Yes
Village dummies	No	No	No	No	Yes	No	No	No	No	Yes
Constant	0.042***	0.040***	0.016**	0.015**	-28.738***	0.048***	0.047***	0.020**	0.018**	-14.357
	(0.011)	(0.010)	(0.007)	(0.007)	(9.669)	(0.013)	(0.013)	(0.009)	(0.009)	(12.619)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	12058	12058	12058	12058	12058	7246	7246	7246	7246	7246
R^2	0.0098	0.0108	0.5225	0.5319	0.5381	0.0102	0.0110	0.5190	0.5235	0.5317

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

7 Discussion and limitations

7.1 Discussion of the results

Regarding OOP expenditures results do not suggest a robust negative effect of enrolment in the CBHI on OOP expenditures. Why does enrolment in the CBHI not seem to significantly reduce OOP expenditures? Of course, short recall periods may be responsible for why results did not suggest any significant effects. Moreover, as already mentioned in the literature review in section 4.5.2 studies usually point at increased healthcare utilisation or unfavourable benefit packages (e.g. high co-payments) to explain why they did not find any significant reduction in OOP expenditures. Since the benefit package of the CBHI in Nouna is generous and does not include co-payments the latter explanation can be ruled out.

With respect to increased healthcare utilisation table 7 in Appendix I shows mean comparisons of the variable CSPS/CMA by eligibility status. In a large window around the cut-off the mean of eligible individuals having visited at least once a CSPS/CMA is significantly lower than the mean of non-eligible individuals. This is the case despite no difference in the means of the binary variables illness, life-threatening illness, and illness treated. Although the difference is no longer statistically significant when restricting observations to a small window around the threshold this might nonetheless support the hypothesis, already established in section 4.4.2, that for poor people CBHI my have failed to remove barriers to accessing a CSPS or CMA beyond user fees. For example, long distances to the nearest CSPS/CMA may cause high costs in terms of foregone labour income and travel costs. Alternatively, lack of understanding of the benefit package may also explain low utilisation rates. In any case, while having established that eligible households are significantly more likely to enrol in the CBHI descriptive statistics do not hint at strongly increased utilisation rates for eligible households[61]. Therefore, increased healthcare utilisation does not seem to be the main driver for not finding a robust reduction in OOP expenditures.

While the non-reduction in OOP expenditures does not seem to be demand-side driven (higher utilisation rates) the supply side may provide an explanation for this surprising result.

By applying FE and IV Wagstaff & Lindelow (2008) analysed OOP expenditures of insured individuals in citywide insurance pools across work units in China. They found a significant positive effect of insurance on OOP expenditures. Although the authors did not analyse a

[61] When estimating the effect of eligibility to discount on utilisation the coefficient is not constantly significant across different window sizes and the size of the coefficient is small (between 0.017 and 0.042).

CBHI the provider incentive structures of the insurance in China and the CBHI in the Nouna health district are comparable. Both schemes apply a prospective payment system[62], which means that the healthcare provider earns a fixed amount per insured individual irrespective of delivered care. As an explanation for the increase in OOP expenditures Wagstaff & Lindelow (2008) suggested that since insurers have shifted from FFS to prospective payment "providers are likely to look for ways to recoup the lost revenues by inducing demand for uncovered services or by engaging in extra-billing" (p. 1004). 'Red envelope' payments were also found to be persistent in Japan and Taiwan, both countries with prospective payment systems (Gertler & Solon, 2002, p. 31). Could side-payments also explain why the CBHI in the Nouna health district did not seem to reduce OOP expenditures?

As already pointed out the applied capitation payment system incentivises health staff to reduce supply of services for insured patients. In fact, health staff maximises profits by minimising treatment. Therefore, insured patients may need to make side-payments in order to motivate health staff to deliver treatment. While this holds true for all schemes applying a capitation payment system the design of the CBHI scheme in the Nouna health district is particularly likely to lower the motivation of health staff as the benefit package does not cover consultation fees. In particular, capitation fees are only intended to cover drugs. "Fees for consultations and services consumed by enrolees are not covered by the annual capitation (...) and are not paid by CBI enrolees" (Robyn et al., 2012a, p. 4). Yet, usually, one fifth of the service fees are reserved for health worker bonuses, which constitute a high share of their income. Therefore, the insurance reduces the income of health workers who are employed in healthcare facilities approached by many insured patients. Consequently, health staff in the Nouna health district is likely to prefer visits of insured patients to visits of uninsured patients. Unpublished interviews with health staff actually revealed resistance to provide friendly, comprehensive, and high quality care for insured patients[63]. Similarly, an unpublished study found that community members had the perception that insured people received lower quality of care (Robyn et al., 2012a, pp. 3-5). Indeed, findings from randomly conducted post-treatment interviews suggested that diagnostic care provided for insured patients was significantly less comprehensive than for non-insured patients (Robyn et al, 2013, pp. 5-7). Low quality of care was also found to be one of the main reasons for high

[62] Capitation payment is one special type within the family of prospective payment.

[63] As a consequence of health staff expressing fear of bankruptcy due to treatment of insured patients from 2011 onwards premium for children were subsidised so that healthcare facilities now receive the same amount of capitation payments for children and adults. Also, consultation fees are now fully reimbursed (Robyn et al., 2012a, p. 18). Since the sample draws on data from 2008 and 2009 estimates do not take these improvements into account.

drop-out rates (see section 4.4.1). Moreover, the household survey in the Nouna region explicitly asks for ‘payments required to speed up and improve quality of care’ when assessing consultation fees so the phenomenon seems to be well known to the researchers having designed the questionnaire. Finally, according to Transparency International (2012) the public sector of Burkina Faso is perceived as relatively corrupt[64] (p. 21). Concluding, side-payments for uncovered services may explain why results did not show a robust significant negative relationship between enrolment in the CBHI and OOP expenditures.

In hindsight of these findings policy makers should pay great attention to the incentive structures between healthcare providers and CBHI. Although a capitation payment system may appear favourable at first sight since it shifts the financial risk to the healthcare provider this may cause negative effects such as side-payments or low quality of care. These may constitute a severe barrier to accessing care and hence can hinder welfare improvements. Combining a capitation payment system with additional incentives for health workers to deliver high quality of care may be a potential solution. For example, with a results-based premium based on treatment outcomes healthcare provider would still bear the lion’s share of the financial risk while at the same time the quality of care could be improved. This in turn may increase the attractiveness of the scheme and thus contribute to long-term financial sustainability of the CBHI by increasing the risk pool.

Turning from direct costs of illness to indirect costs of illness in the form of lost time evidence seems to be broadly in line with hypothesis two. Results suggest a robust significant reduction in the probability that an individual lost at least one day due to illness. Yet, since the estimated reduction is smaller than five percentage points the estimated improvement in well-being can be called moderate at best. No robust result was found for the effect on the actual amount of days lost. Again, the short recall period may be one reason for why the estimated reductions of lost time are so small or even insignificant. Similarly, the small size of the effect may also be driven by the slow increase in utilisation rates. If the poor individuals around the cut-off still face indirect barriers to accessing care such as side-payments or long distances they may still delay visits or only approach a CSPS or CMA in severe cases. Indeed, since the coefficient of CSPS/CMA carried a positive sign in table 3 it may be a proxy for severity of illness. Therefore, policy makers should carefully investigate other barriers to accessing care beyond user fees, especially for poor people.

[64] With a score of 38 on a scale from 0 (highly corrupt) to 100 (very clean) Burkina Faso ranks 83 out of total 174 countries (Transparency International, 2012, p. 21).

7.2 Limitations

By applying RDD and estimating the effect of the CBHI in a small neighbourhood around the eligibility threshold the probability that results suffer from selection bias was strongly reduced. However, few covariates differed in their means even in a small window around the threshold and coefficients sometimes changed in size when adding further controls. Thus, although further controls were included, even year and village dummies to account for differences over time and across villages, the internal validity may be impaired.

Further, internal validity might be reduced by low data quality. In particular, drop-outs of the sample were not replaced and respondents became increasingly unwilling to participate in the yearly survey (Souares et al., 2010a, p. 5). If those who dropped out of the survey are significantly different from those who remained the sample might be biased. Second, many households had missing information regarding the CWR score[65]. Again, if the pattern of missing values is not random, selection bias might have been reintroduced.

Turning from internal to external validity reveals the trade-off of RDD. While estimating effects in a close neighbourhood around an eligibility threshold is likely to yield high internal validity results cannot be generalised to individuals further away from the cut-off since these may systematically differ from individuals close the cut-off. For the CBHI scheme in the Nouna health district this means that results only shed light on the impact for poor individuals who enrolled only because they were offered a 50 % discount on the insurance premium. Therefore, findings do not make a statement about the effect of the CBHI on the average CBHI member let alone they are transferable to different settings.

Nonetheless, evaluating the impact for those individuals whose enrolment decision has been triggered by the discount is very interesting from a policy perspective. Estimating the effect on compliers sheds light on the question whether the introduction of the discount has made a difference in terms of OOP expenditures and days lost due to illness. Since the discount has been financed with external funding there should be an interest in evaluating the welfare impact of this investment. Unfortunately, results only suggest a rather moderate effect. If future evidence should confirm this result despite a modification of the contract with the healthcare provider in 2011, policy makers should carefully compare investments with the estimated benefits.

[65] See section 5.1 for details.

8 Conclusion

By triggering high economic costs health shocks severely threaten poor households' objective of consumption smoothing and can increase their vulnerability to poverty. Despite this great risk in many low-income countries often neither the state nor the market offers formal health insurance for poor households. Since such an insurance gap also exists in Burkina Faso a community-based health insurance (CBHI) has been established in the Nouna health district in the North West of the country in 2004. The objective of this paper was to evaluate whether the insurance can truly cushion the economic costs of health shocks. In particular, this paper estimated the effect on OOP expenditures and days lost due to illness. In order to account for selection bias a RDD was applied by exploiting a discontinuity in the offer of a 50 % discount on the insurance premium for poor households. The forcing variable was a community wealth ranking determining eligibility to discount. First stage estimates as well as a placebo test suggest that the discontinuity in eligibility to receive the premium discount is a valid instrument for enrolment in the CBHI scheme. Then, by taking observations close around the eligibility cut-off the impact on OOP expenditures and days lost due to illness was estimated. Results suggest no robust reduction in OOP expenditures but a significant, yet, small decrease in the probability of losing at least one day due to illness. This finding is robust to taking observations from different window sizes around the threshold, to including different covariates, and polynomials of the forcing variable. While this result is contrary to most existing evidence on CBHI one possible explanation for finding no significant reduction in OOP expenditures may be unfavourable incentive structures between the CBHI scheme and the health care provider. Since the CBHI applies capitation payments and does not reimburse healthcare providers for consultation fees, constituting an important share of health staff's earnings, health workers were found to be less willing to deliver high-quality and friendly service to insured patients. Consequently, insured patients may have felt obliged to make side-payment to increase speed and improve quality of care. Therefore, capitation payment systems may not be the optimal solution for CBHI schemes unless they are combined with further incentives for health workers to deliver services of high quality.

Due to the identified problems regarding the incentive structures the provider payment system of the CBHI in Nouna was modified in 2011. Amongst others, providers are now reimbursed for consultations and receive the same capitation payment for children as for adults. As a future research project it would be very interesting to evaluate the impact on OOP expenditures before and after these modifications. Such an analysis could provide further insight on whether indeed unfavourable incentive structures have contributed to finding no reduction in OOP expenditures. Moreover, it would be interesting to learn more about long-term consequences of membership in the CBHI since most studies – including this one – only focus on short-term economic costs. For example, analysing school careers of children whose family has been constantly enrolled in a CBHI might shed light on whether insurance can contribute to increasing long-term investments in human capital.

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Appendix

Appendix A: Overview of existing evidence of CBHI schemes

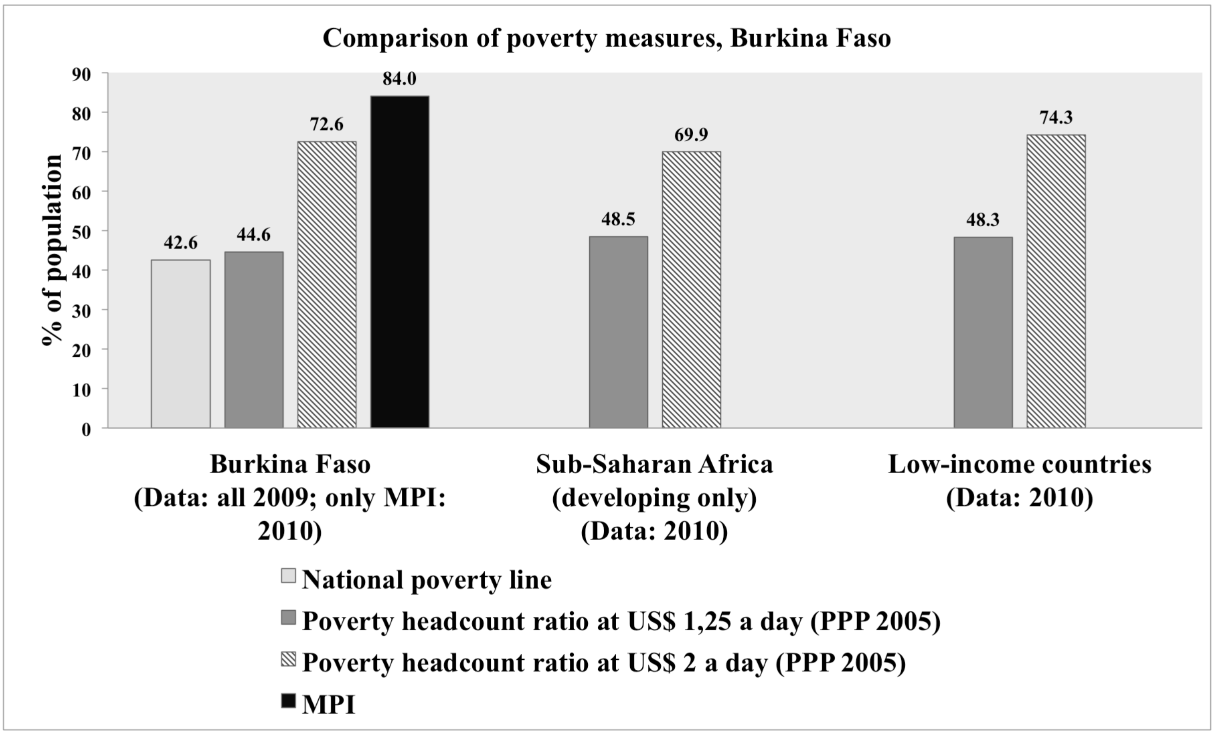
Table 4: Overview of existing evidence of CBHI schemes

Author(s), year & region	Data & methodology	Benefit package includes…	Factors influencing enrolment in CBHI	Impact of membership on: Utilisation of healthcare	Impact of membership on: OOP expenditures	Impact of membership on: Days lost
Aggarwal (2010), India	4109 HH (2007-2008); propensity score matching[1]	Only inpatient surgeries (maximum ceiling) & out-patient diagnostics (OPD)	/	Frequency of surgery (+***), frequency of OPD (+*), frequency of hospitalisation (+)	OOP/surgery expenses (-***), borrowing/in-patient expenses (other than surgery) (+*), borrowing/OPD expenses (+)	Days lost per episode of illness (+)
Chankova, Sulzbach & Diop (2008), Ghana, Mali, Senegal	>9000 individuals each in Ghana, Mali & Senegal (2004) in regions with long tradition of CBHI; comparing insured and uninsured while only controlling for observables[2]	Ghana: only inpatient; Mali: only outpatient (25-50% co-payments); Senegal: outpatient (25-50% co-payments) & inpatient (max. hospital days)	Senegal: chronic illness (+***) Mali: handicap (+***); all countries: HH head at least secondary education (+***), richest 20% (+***) (comp. to poorest 20%)	Seeking care: Ghana & Mali (+**), Senegal (+); hospitalisation: Senegal (CBHI with high inpatient coverage)(+***); all countries: no different effects for different income strata;	OOP for outpatient: Senegal (-), Mali (+) (but high co-payments); OOP for inpatient: Ghana & Senegal (CBHIs with high inpatient coverage)(-***)	/
Franco et al. (2008), Mali	2280 HH (2003-2004); comparing insured and uninsured while only controlling for observables[2]	Outpatient (25% co-payments), drugs (20-25% co-payments), normal delivery (25% co-payments), complicated delivery	HH wealth (+***); distance to facility (-***); education of HH head (+***), female-headed HH (+***), HH with chronically ill and/or handicapped (+***)	Fever treatment in modern health facility (+*), seeking care f. children with diarrhoea (+*)	OOP for fever treatment (-***); share of health expenditure in annual cash expenditure (-***)	/
Jütting (2004), Senegal	2860 individuals (346 HH) (2000); comparing insured and uninsured while only controlling for observables[2]	Only inpatient (flat co-payment per consultation, 50% co-payment for surgery, max. hospital days)	Income (+***), in particular: lower terzile (-*) and upper terzile (+**) (comp. to average income group)	Hospitalisation (+**)	OOP (-**)	/
Saksena et al. (2010), Rwanda	6800 HH; comparing insured and uninsured while only controlling for observables[2]	Outpatient (flat co-payment per outpatient visit) & inpatient (10% co-payment of costs)	/	Utilisation (+**), no different effects for different income strata	OOP as share of capacity to pay (=non-subsistence spending) (-*)	/
Schneider & Diop (2001), Rwanda	2500 HH in three rural districts of Rwanda (2000); comparing insured and uninsured while only controlling for observables[2]	Outpatient (flat co-payment per visit) and inpatient (with gate-keeping mechanism)	HH head attended school (+***), < 30min to facility (+***), radio (information campaign)(+***); wealth (-) (premium payment in instalments possible)	Visits of modern healthcare facility (+***)	OOP per episode of illness (-***); OOP per episode of care within subgroup of sick people (-***)	/
Schneider & Hanson (2006), Rwanda	3139 HH in three rural districts; binary choice model estimating individuals' need-adjusted visit probability by insurance status[2]	Outpatient (flat co-payment per episode of illness) and inpatient (only consultations and C-sections)	/	Need-adjusted visit probability sign. higher for insured than for non-insured; poor insured more visits than poor non-insured	OOP increased avg. shortfall of income below PL by 1,2% for insured, by 2% for uninsured → small, similar impact (but insured more visits)	/

Notes: *, **, *** represent statistical significance at the 1 percent, 5 percent and 10 percent level; [1] validity of estimation depends on plausibility of assumption that matching on observables removes all selection bias; [2] estimation is likely to suffer from selection bias; HH = households; OOP = OOP expenditures; PL=poverty line.

Appendix B: Poverty measures, Burkina Faso

Figure 4: Comparison of poverty measures, Burkina Faso, 2009/2010

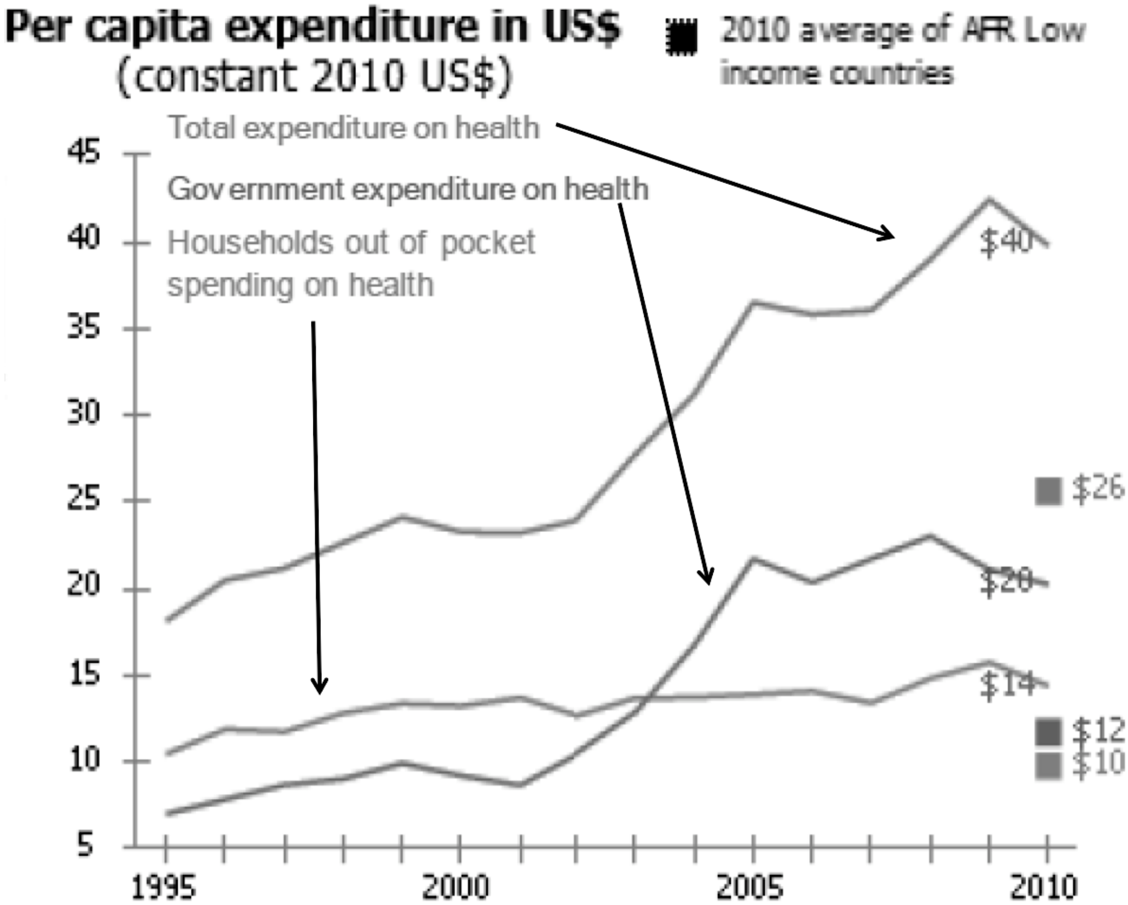


Source: Ministere de la Santé Burkina Faso (2010a), World Bank (2013c), UNDP (2013a)

Graph: own elaboration

Appendix C: Government and private health expenditures, Burkina Faso

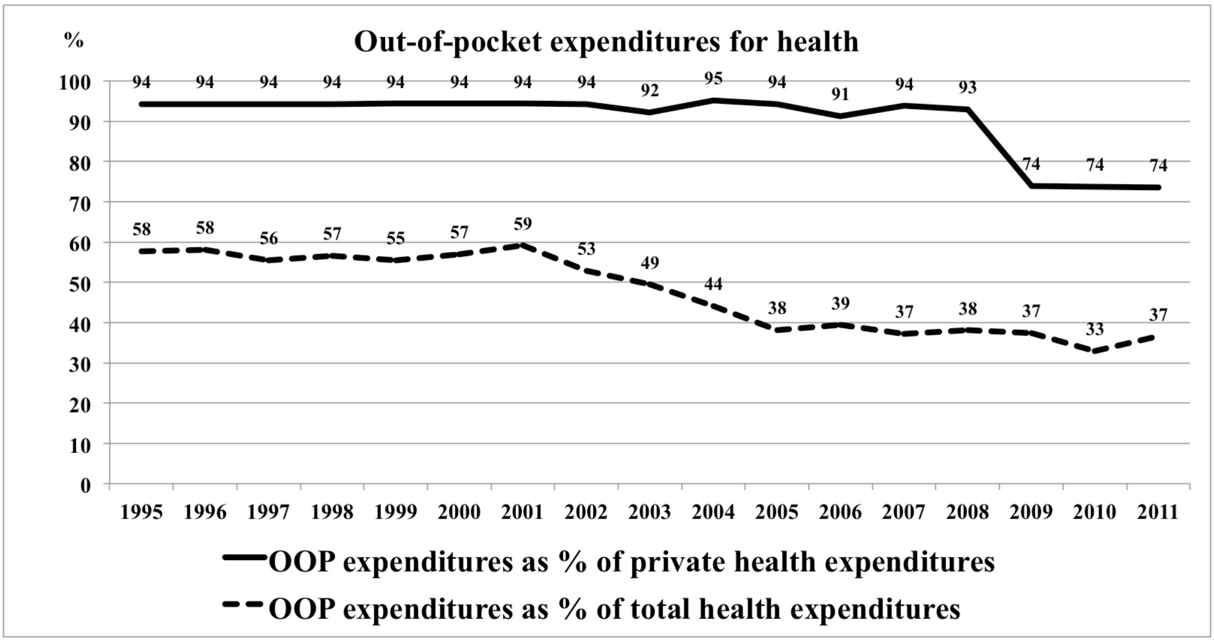
Figure 5: Government and OOP health expenditures p.c., Burkina Faso, 1995-2010



Source: WHO 2012, p. 18

Appendix D: OOP expenditures on health, Burkina Faso

Figure 6: OOP expenditures for health, Burkina Faso, 1995-2011



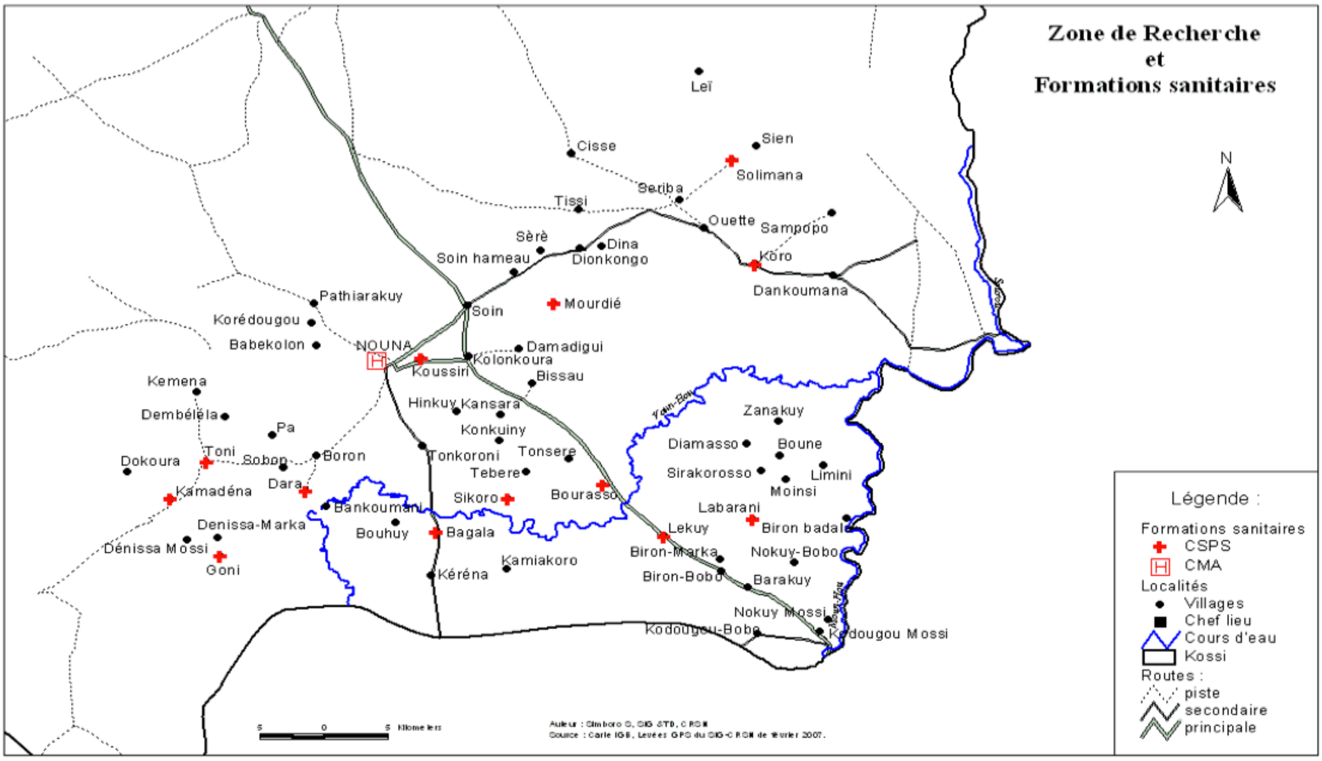
Source: WHO 2013 | Graph: own elaboration

Appendix E: Maps of the Nouna region, Burkina Faso

Figure 7: Map oft Burkina Faso and the Kossi province

Note: The Health and Demographic Surveillance System (HDSS) is situated in the Kossi Province, in the North West of Burkina Faso. | Source: Sié et al., 2010, p. 3.

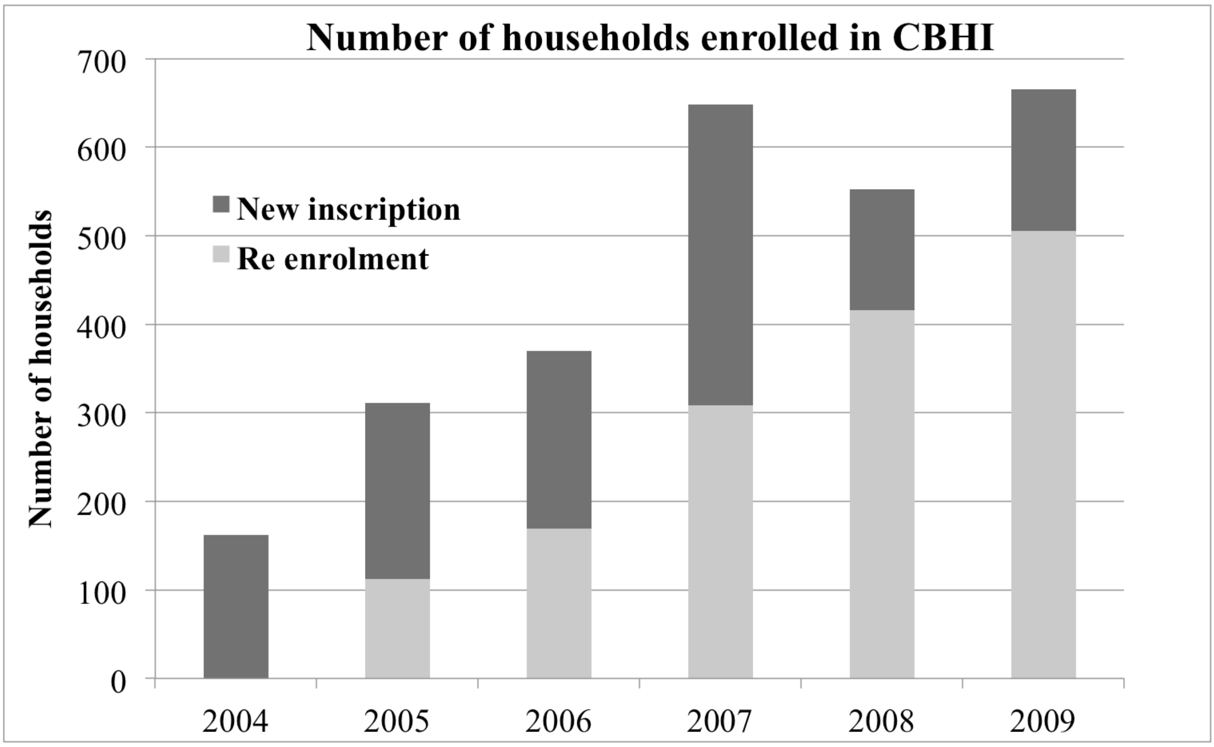
Figure 8: Area covered by the Health and Demographic Surveillance System (HDSS)



Source: Souares et al., 2010a, p. 8

Appendix F: Enrolment rates of the CBHI scheme in Nouna, 2004 – 2009

Figure 9: Enrolment rates of the insurance scheme in the Nouna health district, 2004-2009



Source: Souares, 2013, n.p. | Graph: own elaboration

Appendix G: Descriptive statistics (full sample)

Table 5: Descriptive statistics (full sample)

	Mean	Std. Dev.	Min	Max
Insurance & illness				
Insured (d)	0.198	0.398	0	1
Eligible to discount (d)[1]	0.220	0.414	0	1
Illness (d)[2]	0.119	0.323	0	1
Life threatening illness (d)[3]	0.038	0.190	0	1
Illness treated (d)[4]	0.105	0.307	0	1
CSPS/CMA (d)[5]	0.040	0.195	0	1
Self treatment (d)[6]	0.069	0.253	0	1
Traditional healer[7]	0.004	0.063	0	1
Individual outcomes				
OOP expenditures[8] (d)	0.025	0.158	0	1
OOP expenditures[8] (thousand)	0.099	1.546	0	96
OOP exp. [8] / exp.[9] of prev. 5 m.	0.006	0.103	0	4.5
Days lost due to illness (d)[10]	0.060	0.237	0	1
Days lost due to illness[10]	0.327	2.591	0	168
Socio-economic covariates				
Age (in years)	23.644	18.977	0.110	97.643
• Age < 16 years	0.423	0.494	0	1
• Age 16-60 years	0.509	0.500	0	1
• Age > 60 years	0.067	0.251	0	1
Female (d)	0.499	0.500	0	1
Literate (d)[11]	0.297	0.457	0	1
Religion[12]				
• Muslim (d)	0.616	0.486	0	1
• Catholic (d)	0.279	0.449	0	1
• Animist (d)	0.054	0.226	0	1
• Protestant (d)	0.046	0.210	0	1
Ethnicity[12]				
• Bwaba (d)	0.234	0.423	0	1
• Dafin (d)	0.197	0.398	0	1
• Mossi (d)	0.159	0.365	0	1
• Samo (d)	0.084	0.278	0	1
• Peulh (d)	0.048	0.214	0	1
HH size	13.637	9.410	1	80
Nouna town (d)	0.351	0.477	0	1
Exp.[9] last m. (thousand)	5.721	23.420	0	1242.95
Exp.[9] prev. 5 m. (thousand)	17.782	89.380	0	9510
Assets[13]	0.558	1.051	0	7
Animals[14]	1.470	6.751	0	581
Water inside home (d)[15]	0.026	0.159	0	1
N	25494			

Notes: [1]eligible to receive a 50% discount on the insurance premium; [2] at least one illness; [3] at least one illness that was perceived as life-threatening; [4] at least one illness treated [5] at least one visit of a primary health care facility (CSPS) or hospital (CMA); [6] at least one episode of self-treatment [7] at least one visit at a traditional healer; [8] sum of costs associated with seeking care at CSPS/CMA; [9] sum of total expenditures; [10] days an individual could not go to school or work due to illness; [11] at least one year of education or literate; [12] subgroups do not add up to 100% since category ‘other’ left out; [13] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [15] sum of sheep, goats, bullocks, donkeys & horses; [16] water source inside home; sample weights applied.

Appendix H: List of variables

Table 6: List of variables

Variable name	Description	Reference group for binary variables
Insurance & illness		
Insured (d)	Individual is enrolled in the CBHI	Individual is not enrolled in the CBHI
Eligible to discount (d)	Individual is eligible to receive a 50% discount on the insurance premium	Individual is not eligible to receive a discount
Illness (d)	Individual has suffered from at least one illness during past four months	Individual has not suffered from any illness during past four months
Life threatening illness (d)	Individual suffered from at least one illness she perceived to be life-threatening during the past four months	Individual has not suffered from any illness she perceived to be life-threatening during the past four months
Illness treated (d)	Individual treated at least one illness during past four months (e.g. by visiting a CSPS/CMA, self-treatment, traditional healer etc.)	Individual has not treated any illness during past four months
CSPS/CMA (d)	Individual visited primary healthcare facility (CSPS) or district hospital (CMA) for at least one episode of illness during past four months	Individual has not visited CSPS or CMA during past four months
Self treatment (d)	Individual applied self-treatment for at least one episode of illness during past four months	Individual has not self-treated any illness during past four months
Traditional healer (d)	Individual visited a traditional healer to seek care for at least one episode of illness during past four months	Individual has not visited traditional healer to seek care during past four months
Individual outcomes		
OOP expenditures (d)	Individual has had some OOP expenditures due to seeking care at a CSPS/CMA during past four months	Individual has not had any OOP expenditures during past four months
OOP expenditures	Sum of individual's costs associated with seeking care at CSPS/CMA during past four months: transport costs, subsistence costs, and costs for drugs, material, consultations, and hospitalisation in franc CFA	
OOP exp. / exp. of prev. 5 m.	Share of OOP expenditures in total expenditures of previous five months	
Days lost due to illness (d)	Individual could not work of go to school for at least one day due to illness during past four months	Individual did not lost any day due to illness during past four months
Days lost due to illness	Amount of days an individual could not go to work or school due to illness	
Socio-economic covariates		
Age (in years)	Age in years	
Female (d)	Individual is female	Individual is male
Literate (d)	Individual is literate or has at least one year of schooling	Individual did not have at least one year of schooling
HH size	Amount of household members (Note: In the region a household is defined as the sum of people sharing resources. Therefore, household size can be very large)	
Nouna town (d)	Individual lives in Nouna town	Individual lives in a village
Exp. last m.	Sum of individual's total expenditures of the last month (e.g. shelter, food, education, clothes, transport) in CFA franc	
Exp. prev. 5 m.	Sum of individual's total expenditures of the previous five months (e.g. shelter, food, education, clothes, transport) in CFA franc	
Assets	Amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which an individual possesses at least one item	
Animals	Absolute sum of sheep, goats, bullocks, donkeys, and horses	
Water inside home (d)	Individual has a water source inside her home	Individual does not have a water source inside her home

Appendix I: Descriptive statistics (by eligibility status)

Table 7: Descriptive statistics (by eligibility status)

	Full sample (-0.2 < CWR score < 0.8)			Large window (-0.2 < CWR score < 0.2)			Small window (-0.1 < CWR score < 0.1)		
	Eligible[1]	Not eligible	p-value of t-test	Eligible[1]	Not eligible	p-value of t-test	Eligible[1]	Not eligible	p-value of t-test
	Mean	Mean		Mean	Mean		Mean	Mean	
Insurance & illness									
Insured (d)	0.185	0.202	0.008	0.189	0.153	0.000	0.229	0.131	0.000
Illness (d)[2]	0.122	0.118	0.387	0.121	0.115	0.302	0.115	0.117	0.763
Life-threatening illness (d)[3]	0.037	0.038	0.694	0.036	0.033	0.483	0.032	0.033	0.859
Illness treated (d)[4]	0.105	0.106	0.883	0.104	0.103	0.867	0.101	0.106	0.464
CSPS/CMA (d)[5]	0.029	0.043	0.000	0.029	0.036	0.033	0.030	0.031	0.755
Self treatment (d)[6]	0.074	0.067	0.080	0.073	0.071	0.713	0.071	0.077	0.278
Traditional healer (d)[7]	0.006	0.003	0.016	0.006	0.004	0.213	0.006	0.005	0.673
Individual outcomes									
OOP expenditures[8] (d)	0.019	0.027	0.001	0.019	0.024	0.088	0.018	0.020	0.614
OOP expenditures[8] (log)	0.276	0.337	0.006	0.274	0.344	0.008	0.288	0.310	0.506
OOP exp.[8] /exp.[9] prev. 5 m.	0.004	0.007	0.061	0.004	0.005	0.430	0.004	0.003	0.594
Days lost due to illness (d)[10]	0.062	0.059	0.373	0.062	0.061	0.905	0.060	0.061	0.777
Days lost due to illness[10]	0.346	0.322	0.526	0.317	0.342	0.635	0.262	0.386	0.021
Socio-economic covariates									
Age (in years)	25.840	23.024	0.000	25.798	23.385	0.000	25.035	23.430	0.000
Female (d)	0.489	0.502	0.09	0.488	0.488	0.932	0.485	0.485	0.95
Literate (d)[11]	0.251	0.310	0.000	0.248434	0.301	0.000	0.279	0.284	0.594
HH size	9.894	14.694	0.000	9.958	12.307	0.000	9.958	12.307	0.000
Exp.[9] last month (log)	4.165	4.147	0.779	4.164	4.166	0.978	4.204	4.134	0.474
Exp.[9] prev. 5 months (log)	4.829	4.774	0.437	4.827	4.799	0.741	4.869	4.761	0.326
Assets[12]	0.466	0.584	0.000	0.469	0.534	0.000	0.516	0.513	0.912
Animals[13]	0.855	1.644	0.000	0.833	0.961	0.044	0.902	0.883	0.828
Water inside home (d)[14]	0.020	0.028	0.003	0.021	0.015	0.014	0.028	0.007	0.000
N	5358	20136		5257	6801		3884	3362	

Notes: [1]eligible to receive a 50% discount on the insurance premium; [2] at least one illness; [3] at least one illness that was perceived as life-threatening; [4] at least one illness treated [5] at least one visit of a primary health care facility (CSPS) or hospital (CMA); [6] at least one episode of self-treatment [7] at least one visit at a traditional healer; [8] sum of costs associated with seeking care at CSPS/CMA; [9] sum of total expenditures; [10] days an individual could not go to school or work due to illness; [11] at least one year of education or literate; [12] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [13] sum of sheep, goats, bullocks, donkeys & horses; [14] water source inside home; sample weights applied.

Appendix J: Covariates robustness checks

Table 8: Socio-economic covariates robustness check I (large window)

	Large window (-0.2 < CWR score < 0.2)								
	Age	Female (d)	Literate (d)	HH size	Exp. Last m. (log)	Exp. Prev. 5 m. (log)	Assets	Animals	Water inside home (d)
Eligible to discount (d)[1]	0.761	0.031	0.048**	0.202	-0.177	0.064	0.034	0.545***	0.019***
	(0.980)	(0.026)	(0.022)	(0.257)	(0.211)	(0.239)	(0.044)	(0.158)	(0.004)
CWR score	-7.342	0.285	0.639***	12.114***	-2.322	0.478	0.399	5.498***	-0.030
	(8.763)	(0.226)	(0.195)	(2.565)	(1.853)	(2.099)	(0.402)	(1.380)	(0.038)
(CWR score)^2	83.210***	0.146	-0.686	-47.319***	3.996	5.003	-1.180	-0.949	-0.067
	(21.528)	(0.508)	(0.421)	(4.592)	(4.049)	(4.606)	(0.829)	(2.585)	(0.095)
(CWR score)^3	-254.891	-6.163	-2.648	209.186***	66.754	-24.210	10.997	-92.307**	5.923***
	(251.497)	(6.281)	(5.428)	(70.986)	(51.232)	(58.071)	(11.379)	(37.557)	(1.240)
Constant	23.520***	0.470***	0.251***	11.283***	4.207***	4.732***	0.487***	0.606***	0.007***
	(0.593)	(0.016)	(0.013)	(0.163)	(0.128)	(0.146)	(0.027)	(0.080)	(0.002)
p	0.000	0.771	0.000	0.000	0.473	0.862	0.000	0.000	0.000
N	12058	12058	12058	12058	12058	12058	12058	12058	12058
R^2	0.0066	0.0002	0.0076	0.0497	0.0004	0.0001	0.0031	0.0022	0.0070

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1] reference group: individual not eligible to receive a 50% discount on the insurance premium; sample weights applied.

Table 9: Socio-economic covariates robustness check II (small window)

	Small window (-0.1 < CWR score < 0.1)								
	Age	Female (d)	Literate (d)	HH size	Exp. Last m. (log)	Exp. Prev. 5 m. (log)	Assets	Animals	Water inside home (d)
Eligible to discount (d)[1]	1.010	0.097***	0.063**	3.042***	0.125	0.352	0.122**	0.778***	-0.022***
	(1.297)	(0.034)	(0.029)	(0.373)	(0.283)	(0.320)	(0.058)	(0.247)	(0.004)
CWR score	-4.006	1.607***	0.954*	73.619***	4.443	8.151	2.473**	10.030**	-0.935***
	(21.371)	(0.561)	(0.491)	(6.524)	(4.619)	(5.224)	(0.993)	(4.449)	(0.118)
(CWR score)^2	141.695	3.436	5.452***	251.267***	31.375*	29.602	11.626***	10.282	1.458***
	(89.116)	(2.307)	(2.061)	(32.925)	(18.899)	(21.398)	(4.170)	(13.000)	(0.513)
(CWR score)^3	-463.195	-130.338**	-55.975	-6051.485***	-809.205*	-1180.292**	-265.278**	-497.719	100.373***
	(2278.446)	(59.136)	(52.861)	(713.408)	(482.294)	(546.105)	(104.815)	(427.701)	(12.978)
Constant	23.270***	0.424***	0.231***	9.115***	4.001***	4.536***	0.413***	0.458***	0.025***
	(0.791)	(0.021)	(0.018)	(0.223)	(0.173)	(0.198)	(0.034)	(0.125)	(0.003)
p	0.013	0.031	0.012	0.000	0.081	0.076	0.005	0.002	0.000
N	7246	7246	7246	7246	7246	7246	7246	7246	7246
R^2	0.0024	0.0019	0.0022	0.0354	0.0014	0.0015	0.0022	0.0021	0.0154

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1] reference group: individual not eligible to receive a 50% discount on the insurance premium; sample weights applied.

Appendix K: First stage estimates (robustness checks)

Table 10: Insured (d) (first stage robustness check)

	Large window (-0.2 < CWR score < 0.2)				Small window (-0.1 < CWR score < 0.1)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Eligible to discount (d)[1]	0.130***	0.141***	0.232***	0.233***	0.200***	0.190***	0.292***	0.290***
	(0.014)	(0.014)	(0.018)	(0.018)	(0.020)	(0.020)	(0.025)	(0.025)
CWR score	0.490***	0.642***	1.730***	1.745***	1.241***	1.158***	3.472***	3.463***
	(0.063)	(0.065)	(0.153)	(0.155)	(0.180)	(0.177)	(0.416)	(0.416)
(CWR score)^2		-2.283***	-1.478***	-2.163*		-7.111***	-6.717***	-9.828*
		(0.314)	(0.319)	(1.157)		(1.910)	(1.906)	(5.789)
(CWR score)^3			-33.161***	-33.778***			-268.423***	-267.950***
			(4.036)	(4.124)			(45.607)	(45.582)
(CWR score)^4				21.297				366.512
				(33.256)				(655.744)
Female (d)[2]	0.045***	0.045***	0.044***	0.044***	0.040***	0.041***	0.039***	0.039***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.010)	(0.010)
Literate (d)[3]	0.077***	0.077***	0.076***	0.076***	0.067***	0.069***	0.069***	0.069***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)	(0.011)
Age (in years)	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HH size	-0.003***	-0.003***	-0.003***	-0.003***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Illness (d)[4]	0.030	0.033	0.033	0.033	0.078**	0.078**	0.077**	0.077**
	(0.029)	(0.028)	(0.029)	(0.029)	(0.039)	(0.039)	(0.039)	(0.039)
Life-threatening illness (d)[5]	-0.048**	-0.048**	-0.048**	-0.048**	-0.039	-0.040	-0.040	-0.040
	(0.023)	(0.023)	(0.023)	(0.023)	(0.030)	(0.030)	(0.030)	(0.030)
Illness treated (d)[6]	0.019	0.013	0.010	0.010	-0.085	-0.087	-0.089	-0.089
	(0.058)	(0.057)	(0.058)	(0.058)	(0.079)	(0.079)	(0.078)	(0.078)
CSPS/CMA (d)[7]	0.231***	0.235***	0.235***	0.235***	0.280***	0.280***	0.281***	0.281***
	(0.049)	(0.048)	(0.048)	(0.048)	(0.067)	(0.067)	(0.067)	(0.067)
Self treatment (d)[8]	-0.081	-0.078	-0.074	-0.074	-0.040	-0.037	-0.036	-0.036
	(0.050)	(0.050)	(0.050)	(0.050)	(0.069)	(0.069)	(0.069)	(0.069)
Traditional healer (d)[9]	-0.054	-0.052	-0.040	-0.040	0.025	0.028	0.037	0.037
	(0.054)	(0.053)	(0.052)	(0.052)	(0.067)	(0.067)	(0.068)	(0.068)
Exp.[10] prev. 5 m. (log)	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Assets[11]	0.018***	0.018***	0.018***	0.018***	0.014**	0.015**	0.014**	0.014**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
Animals[12]	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Water inside home (d)[13]	0.172***	0.179***	0.183***	0.184***	0.204***	0.207***	0.226***	0.227***
	(0.039)	(0.038)	(0.038)	(0.038)	(0.053)	(0.054)	(0.053)	(0.053)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-6.213	-4.489	-8.381	-8.485	77.886***	77.141***	77.415***	77.008***
	(19.267)	(19.220)	(19.123)	(19.110)	(25.291)	(25.180)	(24.897)	(24.800)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	12058	12058	12058	12058	7246	7246	7246	7246
R^2	0.1465	0.1501	0.1550	0.1550	0.1730	0.1752	0.1804	0.1805

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] reference group: individual did not suffer from any illness; [5] reference group: individual did not suffer from any illness she perceived to be life-threatening; [6] reference group: individual did not treat any illness; [7] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [8] reference group: individual did not apply self-treatment; [9] reference group: individual did not visit a traditional healer; [10] sum of total expenditures; [11] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [12] sum of sheep, goats, bullocks, donkeys & horses; [13] reference group: individual has no water source inside home; sample weights applied.

Appendix L: Placebo test

Figure 10: Placebo test (full sample)

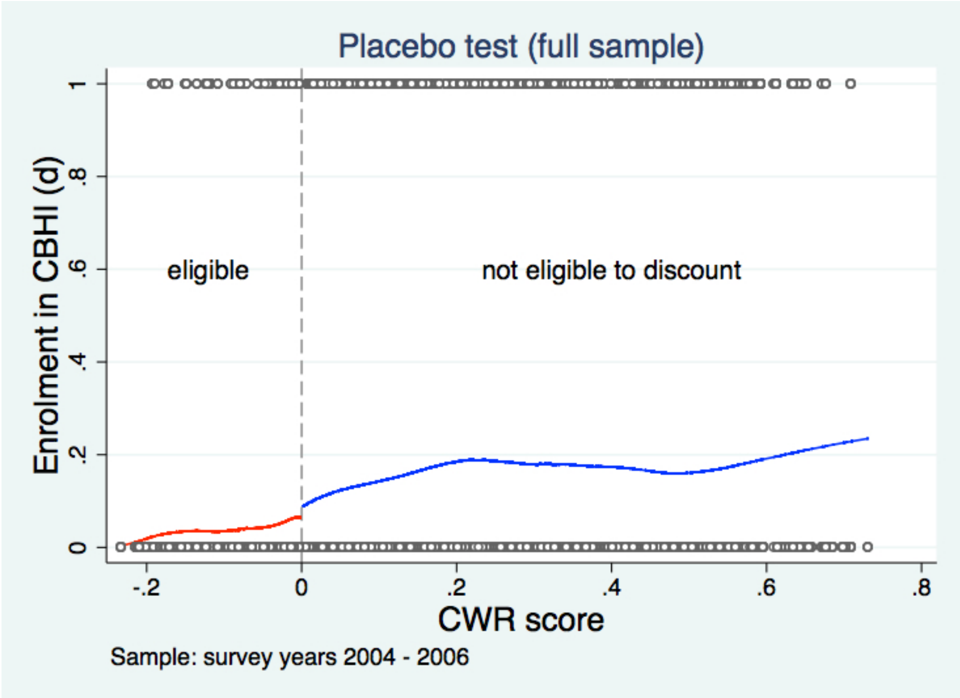
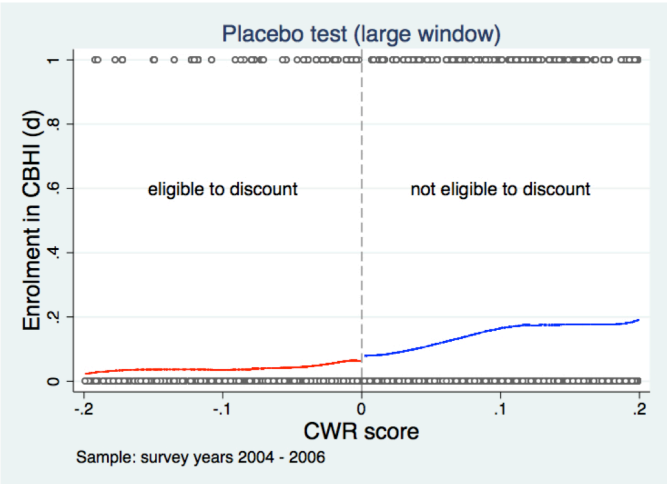


Figure 11: Placebo test (large and small window)



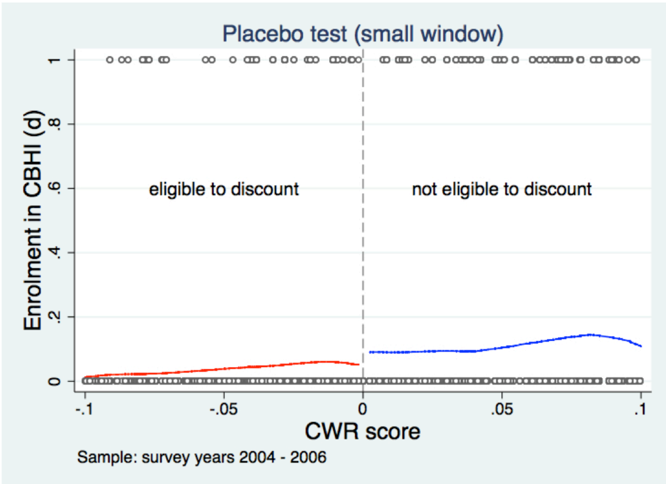


Table 11: Placebo test (eligibility to discount and enrolment, years 2004-2006)

	Large window (-0.2 < CWR score < 0.2)			
	(1)	(2)	(3)	(4)
Eligible to discount (d)[1]	-0.024***	-0.029***	0.007	0.005
	(0.008)	(0.008)	(0.010)	(0.010)
CWR score	0.467***	0.407***	0.834***	0.791***
	(0.036)	(0.038)	(0.087)	(0.089)
(CWR score)^2		1.094***	1.374***	2.801***
		(0.188)	(0.194)	(0.629)
(CWR score)^3			-12.963***	-11.333***
			(2.390)	(2.485)
(CWR score)^4				-44.492**
				(18.653)
Constant	0.100***	0.091***	0.070***	0.067***
	(0.005)	(0.005)	(0.006)	(0.006)
p	0.000	0.000	0.000	0.000
N	22131	22131	22131	22131
R^2	0.0367	0.0382	0.0395	0.0397

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1] reference group: individual not eligible to receive a 50% discount on the insurance premium.

Appendix M: OOP expenditures (d) (robustness checks)

Table 12: OOP expenditures (d) (robustness checks)

	Large window (-0.2 < CWR score < 0.2)				Very small window (-0.05 < CWR score < 0.05)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible to discount (d)[1]	-0.002	-0.002	-0.014***	-0.013***	0.025**	0.025**	0.032**	-0.001	-0.005
	(0.004)	(0.004)	(0.005)	(0.005)	(0.012)	(0.012)	(0.014)	(0.006)	(0.009)
CWR score	-0.000	-0.003	-0.133***	-0.124***	1.474***	1.463***	1.233**	0.156	0.024
	(0.023)	(0.023)	(0.042)	(0.042)	(0.514)	(0.519)	(0.482)	(0.274)	(0.336)
(CWR score)^2		0.039	-0.048	-0.587*	0.421	0.095	-0.635	-1.966	-1.529
		(0.109)	(0.114)	(0.356)	(4.396)	(4.380)	(3.972)	(2.644)	(2.993)
(CWR score)^3			3.891***	3.486***	-535.494**	-534.527**	-388.291*	5.914	45.091
			(1.215)	(1.202)	(235.437)	(235.860)	(200.846)	(136.177)	(148.543)
(CWR score)^4				16.548					
				(10.195)					
Age (in years)	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (d)[2]	0.001	0.001	0.001	0.001	0.013*	0.017*	0.015*	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)	(0.009)	(0.008)	(0.005)	(0.005)
Literate (d)[3]	0.001	0.001	0.001	0.001	0.028***	0.023**	0.024***	0.006	0.006
	(0.003)	(0.003)	(0.003)	(0.003)	(0.010)	(0.010)	(0.009)	(0.005)	(0.005)
HH size	0.000	0.000	0.000	0.000	-0.001*	-0.001*	-0.002**	-0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Exp.[4] prev. 5 m. (log)	0.000	0.000	0.000	0.000		0.002**	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.000)	(0.000)
Assets[5]	0.000	0.000	0.000	0.000		0.002	0.003	0.004	0.004
	(0.001)	(0.001)	(0.001)	(0.001)		(0.004)	(0.004)	(0.003)	(0.003)
Animals[6]	-0.000	-0.000	-0.000	-0.000		-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.000)	(0.000)
Water inside home (d)[7]	0.000	0.000	-0.000	0.000		-0.008	-0.003	0.003	-0.008
	(0.008)	(0.008)	(0.008)	(0.008)		(0.008)	(0.009)	(0.004)	(0.013)
Illness (d)[8]	-0.012**	-0.012**	-0.012**	-0.012**			0.085***	-0.015*	-0.017*
	(0.006)	(0.006)	(0.006)	(0.006)			(0.023)	(0.009)	(0.009)
Life-threatening illness (d)[9]	0.039*	0.039*	0.039*	0.039*			0.182***	0.081**	0.081**
	(0.020)	(0.020)	(0.020)	(0.020)			(0.056)	(0.039)	(0.039)
Illness treated (d)[10]	-0.072	-0.071	-0.071	-0.071				-0.155	-0.153
	(0.053)	(0.053)	(0.053)	(0.053)				(0.115)	(0.115)
CSPS/CMA (d)[11]	0.719***	0.719***	0.718***	0.718***				0.781***	0.778***
	(0.051)	(0.051)	(0.051)	(0.051)				(0.107)	(0.107)
Self treatment (d)[12]	0.077	0.077	0.076	0.076				0.155	0.153
	(0.053)	(0.053)	(0.053)	(0.053)				(0.116)	(0.116)
Traditional healer (d)[13]	0.057	0.057	0.055	0.055				0.107	0.109
	(0.049)	(0.049)	(0.049)	(0.049)				(0.099)	(0.098)
Ethnicity dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Village dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Constant	0.173	0.131	0.686	0.648	-0.011	-0.020	-0.011	0.001	-3.625
	(5.648)	(5.662)	(5.680)	(5.677)	(0.015)	(0.015)	(0.015)	(0.009)	(8.634)
p	0.000	0.000	0.000	0.000	0.110	0.150	0.004	0.000	0.000
N	6820	6820	6820	6820	2063	2063	2063	2063	2063
R^2	0.6652	0.6652	0.6657	0.6658	0.0217	0.0246	0.1893	0.6698	0.6764

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Appendix N: OOP expenditures (log)

Table 13: OOP expenditures (log)

	Large window (-0.2 < CWR score < 0.2)					Small window (-0.1 < CWR score < 0.1)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Eligible to discount (d)[1]	-0.236**	-0.225**	-0.042	-0.076	-0.058	-0.085	-0.083	0.036	0.005	0.029
	(0.113)	(0.113)	(0.088)	(0.076)	(0.077)	(0.145)	(0.144)	(0.118)	(0.099)	(0.102)
CWR score	-1.873*	-1.815*	-0.512	-0.773	-0.698	2.270	2.055	1.301	1.005	1.065
	(0.970)	(0.967)	(0.772)	(0.652)	(0.654)	(2.273)	(2.270)	(1.860)	(1.562)	(1.609)
(CWR score)^2	-1.852	-1.322	-3.382**	-3.543**	-2.319	-9.840	-8.980	-1.879	-2.986	2.570
	(1.983)	(1.982)	(1.696)	(1.455)	(1.551)	(9.514)	(9.481)	(7.275)	(6.169)	(6.447)
(CWR score)^3	63.532**	60.343**	44.394**	40.497**	37.701**	-443.423*	-403.915*	-151.233	-155.218	-132.033
	(26.245)	(26.122)	(21.171)	(17.766)	(18.034)	(240.089)	(240.325)	(187.685)	(160.056)	(169.698)
Age (in years)	0.006***	0.005***	-0.002*	-0.000	-0.000	0.006***	0.005***	-0.002	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Female (d)[2]	0.098**	0.156***	0.117***	0.043	0.029	0.058	0.085	0.075	0.021	0.009
	(0.043)	(0.051)	(0.040)	(0.034)	(0.033)	(0.057)	(0.067)	(0.052)	(0.044)	(0.044)
Literate (d)[3]	0.226***	0.099*	0.039	-0.008	-0.031	0.198***	0.097	0.023	-0.047	-0.063
	(0.053)	(0.055)	(0.044)	(0.038)	(0.039)	(0.067)	(0.072)	(0.056)	(0.050)	(0.051)
HH size	-0.007**	-0.007**	-0.002	0.001	0.002	-0.006	-0.006	-0.004	-0.002	0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Exp.[4] prev. 5 m. (log)		0.025***	-0.002	-0.002	-0.001		0.031***	-0.000	0.000	0.002
		(0.006)	(0.004)	(0.004)	(0.004)		(0.007)	(0.005)	(0.005)	(0.005)
Assets[5]		0.083**	0.087***	0.062***	0.054***		0.024	0.062**	0.047*	0.037
		(0.033)	(0.025)	(0.020)	(0.020)		(0.039)	(0.030)	(0.026)	(0.026)
Animals[6]		-0.014***	-0.007**	-0.006**	-0.006**		-0.011**	-0.003	-0.004	-0.003
		(0.004)	(0.003)	(0.003)	(0.003)		(0.005)	(0.003)	(0.003)	(0.003)
Water inside home (d)[7]		0.067	0.053	0.069	0.032		0.068	0.065	0.075	0.051
		(0.139)	(0.101)	(0.098)	(0.097)		(0.158)	(0.114)	(0.134)	(0.132)
Illness (d)[8]			2.448***	-0.017	-0.045			2.432***	-0.139	-0.180*
			(0.148)	(0.065)	(0.067)			(0.191)	(0.089)	(0.093)
Life-threatening illness (d)[9]			0.846***	0.204	0.189			1.312***	0.608*	0.577*
			(0.290)	(0.248)	(0.246)			(0.380)	(0.345)	(0.342)
Illness treated (d)[10]				1.412***	1.464***				2.484***	2.538***
				(0.495)	(0.493)				(0.732)	(0.732)
CSPS/CMA (d)[11]				3.598***	3.577***				2.758***	2.749***
				(0.458)	(0.456)				(0.692)	(0.689)
Self treatment (d)[12]				0.843*	0.811*				-0.003	-0.040
				(0.487)	(0.484)				(0.718)	(0.716)
Traditional healer (d)[13]				2.386***	2.419***				1.676*	1.711*
				(0.790)	(0.791)				(1.014)	(1.019)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	No	No	No	Yes	No	No	No	No	Yes
Village dummies	No	No	No	No	Yes	No	No	No	No	Yes
Constant	0.011	-0.177*	-0.105	-0.109	-433.878***	-0.030	-0.201	-0.108	-0.128	-493.956***
	(0.099)	(0.098)	(0.080)	(0.068)	(79.808)	(0.124)	(0.125)	(0.101)	(0.086)	(101.097)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	6820	6820	6820	6820	6820	4051	4051	4051	4051	4051
R^2	0.0202	0.0292	0.3646	0.5139	0.5210	0.0231	0.0302	0.3966	0.5242	0.5333

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Table 14: OOP expenditures (log) (robustness checks)

	Large window (-0.2 < CWR score < 0.2)				Very small window (-0.05 < CWR score < 0.05)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible to discount (d)[1]	0.045	0.051	-0.058	-0.054	0.136	0.150	0.198	0.097	0.089
	(0.060)	(0.060)	(0.077)	(0.077)	(0.188)	(0.189)	(0.167)	(0.132)	(0.159)
CWR score	0.475	0.569*	-0.698	-0.609	13.050**	13.323**	7.321	2.718	0.746
	(0.301)	(0.308)	(0.654)	(0.656)	(6.492)	(6.467)	(5.347)	(4.602)	(5.546)
(CWR score)^2		-1.479	-2.319	-7.164	19.195	8.547	-14.129	-31.874	-31.436
		(1.487)	(1.551)	(4.837)	(52.759)	(52.260)	(42.234)	(37.700)	(40.689)
(CWR score)^3			37.701**	34.059*	-4932.081*	-5063.906*	-1792.273	355.793	1481.441
			(18.034)	(18.260)	(2742.717)	(2724.195)	(2115.344)	(1950.918)	(2263.611)
(CWR score)^4				148.733					
				(143.838)					
Age (in years)	-0.000	-0.000	-0.000	-0.000	0.006**	0.004	-0.002	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Female (d)[2]	0.029	0.029	0.029	0.029	0.020	0.079	0.042	-0.054	-0.054
	(0.033)	(0.033)	(0.033)	(0.033)	(0.085)	(0.094)	(0.074)	(0.059)	(0.061)
Literate (d)[3]	-0.032	-0.032	-0.031	-0.031	0.135	0.033	0.021	-0.061	-0.088
	(0.039)	(0.039)	(0.039)	(0.039)	(0.104)	(0.110)	(0.085)	(0.073)	(0.074)
HH size	0.003	0.003	0.002	0.002	-0.004	-0.005	-0.007	-0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.006)	(0.005)	(0.007)
Exp.[4] prev. 5 m. (log)	-0.001	-0.001	-0.001	-0.001		0.037***	0.004	0.002	0.006
	(0.004)	(0.004)	(0.004)	(0.004)		(0.011)	(0.008)	(0.007)	(0.007)
Assets[5]	0.054***	0.054***	0.054***	0.054***		0.049	0.062	0.042	0.034
	(0.020)	(0.020)	(0.020)	(0.020)		(0.055)	(0.042)	(0.037)	(0.038)
Animals[6]	-0.006**	-0.006**	-0.006**	-0.006**		-0.016	-0.005	-0.008	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)		(0.012)	(0.008)	(0.008)	(0.007)
Water inside home (d)[7]	0.032	0.036	0.032	0.033		-0.142	-0.072	-0.061	-0.112
	(0.097)	(0.097)	(0.097)	(0.097)		(0.110)	(0.151)	(0.149)	(0.151)
Illness (d)[8]	-0.047	-0.044	-0.045	-0.045			2.273***	-0.169	-0.244**
	(0.067)	(0.067)	(0.067)	(0.067)			(0.255)	(0.103)	(0.106)
Life-threatening illness (d)[9]	0.190	0.190	0.189	0.190			1.474***	0.665	0.670
	(0.247)	(0.247)	(0.246)	(0.246)			(0.502)	(0.465)	(0.460)
Illness treated (d)[10]	1.460***	1.457***	1.464***	1.465***				0.818	0.937
	(0.493)	(0.493)	(0.493)	(0.493)				(0.903)	(0.883)
CSPS/CMA (d)[11]	3.579***	3.581***	3.577***	3.575***				3.877***	3.827***
	(0.455)	(0.456)	(0.456)	(0.455)				(0.784)	(0.756)
Self treatment (d)[12]	0.816*	0.817*	0.811*	0.808*				1.670*	1.570*
	(0.484)	(0.485)	(0.484)	(0.484)				(0.872)	(0.851)
Traditional healer (d)[13]	2.436***	2.437***	2.419***	2.416***				3.283***	3.208***
	(0.791)	(0.791)	(0.791)	(0.791)				(1.114)	(1.087)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Village dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Constant	-440.833***	-439.256***	-433.878***	-434.221***	-0.137	-0.357**	-0.160	-0.137	-572.563***
	(79.902)	(79.882)	(79.808)	(79.790)	(0.168)	(0.175)	(0.141)	(0.119)	(164.306)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	6820	6820	6820	6820	2063	2063	2063	2063	2063
R^2	0.5206	0.5206	0.5210	0.5211	0.0277	0.0379	0.3968	0.5275	0.5427

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Appendix O: Share of OOP expenditures in total expenditures

Table 15: Share OOP expenditures in total expenditures

	Large window (-0.2 < CWR score < 0.2)					Small window (-0.1 < CWR score < 0.1)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Eligible to discount (d)[1]	-0.007	-0.006	-0.006	-0.002	-0.005	-0.002	-0.002	-0.002	0.002	-0.001
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
CWR score	-0.101*	-0.096*	-0.091*	-0.069	-0.083*	-0.016	-0.010	-0.039	0.005	-0.009
	(0.056)	(0.056)	(0.050)	(0.052)	(0.050)	(0.100)	(0.101)	(0.092)	(0.098)	(0.093)
(CWR score)^2	0.023	0.019	-0.056	-0.020	-0.024	-0.233	-0.204	-0.068	-0.045	-0.138
	(0.111)	(0.110)	(0.100)	(0.107)	(0.119)	(0.496)	(0.496)	(0.440)	(0.491)	(0.461)
(CWR score)^3	3.584*	3.567*	3.232**	3.213*	3.000*	-1.190	-1.391	1.492	0.545	-1.662
	(1.859)	(1.862)	(1.638)	(1.769)	(1.626)	(8.043)	(8.161)	(7.554)	(8.074)	(8.005)
Age (in years)	0.000**	0.000**	0.000*	0.000	0.000**	0.000**	0.000**	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (d)[2]	0.003	0.001	-0.003	0.000	-0.003	0.002	-0.000	-0.003	0.000	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Literate (d)[3]	0.005**	0.005*	0.003	0.005*	0.003	0.005*	0.006*	0.002	0.005*	0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
HH size	0.000	0.000	0.000**	0.000	0.000**	-0.000	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exp.[4] prev. 5 m. (log)		0.000***	0.000	0.000	0.000		0.000**	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
Assets[5]		-0.002	-0.003**	-0.002	-0.003**		-0.002*	-0.002**	-0.001	-0.003**
		(0.002)	(0.001)	(0.002)	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
Animals[6]		-0.000**	-0.000	-0.000*	-0.000		-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
Water inside home (d)[7]		-0.005*	-0.003	-0.005	-0.005		-0.005**	-0.002	-0.004	-0.003
		(0.003)	(0.003)	(0.003)	(0.004)		(0.003)	(0.004)	(0.003)	(0.004)
Illness (d)[8]			-0.009	0.027***	-0.009			-0.013**	0.020***	-0.013**
			(0.006)	(0.008)	(0.006)			(0.006)	(0.007)	(0.006)
Life-threatening illness (d)[9]			0.030	0.063***	0.030			0.044**	0.082***	0.044**
			(0.020)	(0.023)	(0.020)			(0.022)	(0.029)	(0.022)
Illness treated (d)[10]			-0.023		-0.022			0.035		0.037
			(0.066)		(0.066)			(0.066)		(0.066)
CSPS/CMA (d)[11]			0.214***		0.214***			0.192***		0.190***
			(0.065)		(0.065)			(0.054)		(0.053)
Self treatment (d)[12]			0.024		0.024			-0.035		-0.036
			(0.067)		(0.067)			(0.065)		(0.065)
Traditional healer (d)[13]			0.017		0.017			-0.031		-0.032
			(0.049)		(0.049)			(0.076)		(0.075)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	No	No	No	Yes	No	No	No	No	Yes
Village dummies	No	No	No	No	Yes	No	No	No	No	Yes
Constant	-0.004	-0.005	-0.002	-0.003	2.633	-0.006	-0.006	-0.004	-0.005	-2.265
	(0.005)	(0.005)	(0.004)	(0.005)	(4.835)	(0.007)	(0.007)	(0.006)	(0.007)	(6.968)
p	0.050	0.001	0.000	0.000	0.000	0.207	0.172	0.008	0.037	0.000
N	6820	6820	6820	6820	6820	4051	4051	4051	4051	4051
R^2	0.0055	0.0065	0.1628	0.0510	0.1661	0.0091	0.0103	0.2127	0.0699	0.2191

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Appendix P: Days lost due to illness (d) (robustness checks)

Table 16: Days lost due to illness (d) (robustness checks)

	Small window (-0.1 < CWR score < 0.1)				Very small window (-0.05 < CWR score < 0.05)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible to discount (d)[1]	-0.028***	-0.027***	-0.038***	-0.038***	-0.036	-0.031	-0.045***	-0.052***	-0.034*
	(0.010)	(0.010)	(0.013)	(0.013)	(0.024)	(0.024)	(0.016)	(0.016)	(0.020)
CWR score	-0.243***	-0.236***	-0.474**	-0.478**	0.100	0.234	-0.973*	-1.112**	-0.215
	(0.083)	(0.084)	(0.194)	(0.195)	(0.825)	(0.834)	(0.555)	(0.555)	(0.668)
(CWR score)^2		0.611	0.571	-0.856	-1.175	-1.856	-3.437	-3.546	-2.769
		(0.830)	(0.836)	(2.593)	(5.983)	(6.050)	(4.368)	(4.320)	(4.789)
(CWR score)^3			27.558	27.775	-289.646	-326.810	240.446	265.926	-9.980
			(19.910)	(19.897)	(344.707)	(346.892)	(235.047)	(232.681)	(270.957)
(CWR score)^4				168.135					
				(283.400)					
Age (in years)	0.000	0.000	0.000	0.000	0.001**	0.001	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (d)[2]	-0.003	-0.004	-0.003	-0.003	0.001	-0.002	-0.011	-0.010	-0.012*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.009)	(0.010)	(0.007)	(0.007)	(0.007)
Literate (d)[3]	0.002	0.002	0.002	0.002	0.001	-0.004	0.001	0.001	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)	(0.010)	(0.011)	(0.008)	(0.008)	(0.008)
HH size	0.000	0.000	0.000	0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Exp.[4] prev. 5 m. (log)	-0.000	-0.000	-0.000	-0.000		0.003*	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)		(0.002)	(0.001)	(0.001)	(0.001)
Assets[5]	-0.001	-0.001	-0.001	-0.001		-0.005	-0.009*	-0.008	-0.008
	(0.003)	(0.003)	(0.003)	(0.003)		(0.007)	(0.005)	(0.005)	(0.005)
Animals[6]	-0.000	-0.000	-0.000	-0.000		-0.003**	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.001)	(0.001)
Water inside home (d)[7]	0.003	0.003	0.001	0.001		0.007	0.032	0.032	0.044**
	(0.015)	(0.015)	(0.015)	(0.015)		(0.037)	(0.022)	(0.022)	(0.020)
Illness (d)[8]	0.345***	0.345***	0.345***	0.345***			0.437***	0.446***	0.433***
	(0.057)	(0.057)	(0.057)	(0.057)			(0.031)	(0.078)	(0.077)
Life-threatening illness (d)[9]	0.248***	0.248***	0.248***	0.248***			0.262***	0.250***	0.249***
	(0.040)	(0.040)	(0.040)	(0.040)			(0.053)	(0.056)	(0.055)
Illness treated (d)[10]	0.061	0.062	0.062	0.062				0.056	0.061
	(0.101)	(0.101)	(0.101)	(0.101)				(0.150)	(0.149)
CSPS/CMA (d)[11]	0.096	0.096	0.096	0.096				0.020	0.020
	(0.078)	(0.078)	(0.077)	(0.077)				(0.123)	(0.123)
Self treatment (d)[12]	0.033	0.033	0.033	0.033				-0.083	-0.078
	(0.081)	(0.081)	(0.081)	(0.081)				(0.124)	(0.124)
Traditional healer (d)[13]	-0.011	-0.011	-0.012	-0.012				-0.220	-0.223
	(0.112)	(0.112)	(0.111)	(0.111)				(0.155)	(0.151)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Village dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Constant	-14.393	-14.329	-14.357	-14.544	0.052**	0.047**	0.033**	0.034**	-26.335
	(12.626)	(12.626)	(12.619)	(12.645)	(0.020)	(0.020)	(0.014)	(0.014)	(19.085)
p	0.000	0.000	0.000	0.000	0.064	0.087	0.000	0.000	0.000
N	7246	7246	7246	7246	3801	3801	3801	3801	3801
R^2	0.5315	0.5316	0.5317	0.5317	0.0108	0.0131	0.5124	0.5183	0.5287

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Appendix Q: Days lost due to illness

Table 17: Days lost due to illness

	Large window (-0.2 < CWR score < 0.2)					Small window (-0.1 < CWR score < 0.1)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Eligible to discount (d)[1]	-0.195	-0.187	-0.126	-0.121	-0.080	-0.357**	-0.345**	-0.310**	-0.310**	-0.290**
	(0.164)	(0.164)	(0.154)	(0.159)	(0.203)	(0.148)	(0.148)	(0.127)	(0.122)	(0.120)
CWR score	-0.202	-0.134	0.305	0.347	0.403	-2.972	-2.820	-3.290	-3.234	-2.863
	(1.994)	(1.998)	(1.935)	(1.968)	(2.088)	(2.552)	(2.581)	(2.290)	(2.173)	(2.184)
(CWR score)^2	6.552	6.524	4.898	4.977	4.395	-9.593	-8.998	-2.600	-2.615	2.672
	(8.429)	(8.431)	(8.078)	(8.155)	(7.967)	(11.548)	(11.753)	(10.682)	(10.623)	(11.723)
(CWR score)^3	-44.419	-45.187	-46.601	-48.291	-46.933	148.113	140.573	292.459	279.374	245.218
	(91.385)	(91.549)	(88.757)	(89.076)	(86.377)	(296.169)	(297.382)	(265.480)	(264.302)	(288.326)
Age (in years)	0.013***	0.012***	0.008***	0.008***	0.009***	0.014***	0.014***	0.011***	0.011***	0.011***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Female (d)[2]	-0.013	-0.027	-0.056	-0.059	-0.068	-0.055	-0.090	-0.101*	-0.103*	-0.114*
	(0.060)	(0.062)	(0.057)	(0.058)	(0.052)	(0.063)	(0.066)	(0.061)	(0.062)	(0.064)
Literate (d)[3]	0.024	0.011	0.024	0.021	0.037	-0.050	-0.049	-0.047	-0.048	-0.053
	(0.046)	(0.051)	(0.046)	(0.047)	(0.044)	(0.057)	(0.060)	(0.053)	(0.053)	(0.057)
HH size	0.002	0.002	0.006*	0.006*	0.004	0.002	0.003	0.005	0.005	0.003
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Exp.[4] prev. 5 m. (log)		0.009	0.001	0.001	0.002		0.011	0.000	0.000	0.000
		(0.011)	(0.010)	(0.010)	(0.011)		(0.009)	(0.008)	(0.008)	(0.008)
Assets[5]		-0.010	-0.016	-0.021	-0.032		-0.059	-0.040	-0.043	-0.050
		(0.044)	(0.039)	(0.038)	(0.042)		(0.059)	(0.052)	(0.052)	(0.053)
Animals[6]		-0.015***	-0.011**	-0.011**	-0.009**		-0.011*	-0.007	-0.008	-0.007
		(0.005)	(0.005)	(0.005)	(0.004)		(0.006)	(0.005)	(0.005)	(0.004)
Water inside home (d)[7]		-0.041	0.028	0.032	-0.040		-0.068	0.044	0.050	-0.027
		(0.097)	(0.088)	(0.087)	(0.079)		(0.117)	(0.100)	(0.103)	(0.117)
Illness (d)[8]			1.746***	1.480***	1.530***			1.842***	2.055***	2.065***
			(0.120)	(0.514)	(0.510)			(0.162)	(0.718)	(0.717)
Life-threatening illness (d)[9]			3.509***	3.498***	3.527***			3.184***	3.061***	3.106***
			(0.737)	(0.775)	(0.775)			(0.741)	(0.719)	(0.731)
Illness treated (d)[10]				-0.557	-0.645				-1.366	-1.381
				(0.836)	(0.828)				(1.252)	(1.248)
CSPS/CMA (d)[11]				0.705	0.771				1.482*	1.504*
				(0.650)	(0.631)				(0.873)	(0.868)
Self treatment (d)[12]				0.860	0.849				0.954	0.951
				(0.652)	(0.648)				(0.998)	(0.991)
Traditional healer (d)[13]				0.765	0.777				0.977	0.932
				(0.903)	(0.882)				(1.213)	(1.194)
Ethnicity dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	No	No	No	Yes	No	No	No	No	Yes
Village dummies	No	No	No	No	Yes	No	No	No	No	Yes
Constant	-0.077	-0.088	-0.184	-0.187	333.284	0.096	0.086	-0.029	-0.035	353.242*
	(0.191)	(0.196)	(0.186)	(0.185)	(235.845)	(0.135)	(0.132)	(0.114)	(0.114)	(212.532)
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	12058	12058	12058	12058	12058	7246	7246	7246	7246	7246
R^2	0.0118	0.0122	0.1505	0.1514	0.1581	0.0178	0.0187	0.2065	0.2099	0.2145

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.

Table 18: Days lost due to illness (robustness checks)

	Small window (-0.1 < CWR score < 0.1)				Very small window (-0.05 < CWR score < 0.05)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible to discount (d)[1]	-0.202*	-0.198	-0.290**	-0.293**	-0.216	-0.181	-0.246	-0.244	-0.092
	(0.119)	(0.130)	(0.120)	(0.124)	(0.203)	(0.201)	(0.168)	(0.151)	(0.160)
CWR score	-0.784	-0.749	-2.863	-2.882	5.146	6.287	-0.003	0.220	6.085
	(1.098)	(1.208)	(2.184)	(2.224)	(6.597)	(6.597)	(5.526)	(5.365)	(6.213)
(CWR score)^2		3.032	2.672	-3.715	20.499	11.441	3.530	6.340	10.633
		(11.934)	(11.723)	(29.206)	(65.809)	(64.655)	(58.539)	(58.022)	(61.809)
(CWR score)^3			245.218	246.189	-3841.865	-4225.876	-1171.179	-1249.923	-2872.834
			(288.326)	(290.583)	(3159.300)	(3151.987)	(2818.813)	(2847.270)	(3037.363)
(CWR score)^4				752.438					
				(3428.477)					
Age (in years)	0.011***	0.011***	0.011***	0.011***	0.013***	0.012**	0.009**	0.009**	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Female (d)[2]	-0.116*	-0.116*	-0.114*	-0.114*	-0.102	-0.098	-0.153**	-0.151**	-0.165**
	(0.064)	(0.065)	(0.064)	(0.064)	(0.086)	(0.075)	(0.071)	(0.073)	(0.079)
Literate (d)[3]	-0.051	-0.052	-0.053	-0.053	-0.034	-0.075	-0.040	-0.034	-0.059
	(0.056)	(0.057)	(0.057)	(0.057)	(0.090)	(0.102)	(0.088)	(0.088)	(0.097)
HH size	0.002	0.002	0.003	0.003	0.001	0.002	0.004	0.004	0.006
	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)
Exp.[4] prev. 5 m. (log)	-0.000	-0.000	0.000	0.000		0.014	0.002	0.002	0.001
	(0.008)	(0.008)	(0.008)	(0.008)		(0.015)	(0.013)	(0.013)	(0.013)
Assets[5]	-0.051	-0.051	-0.050	-0.050		0.044	0.025	0.031	0.027
	(0.052)	(0.053)	(0.053)	(0.053)		(0.082)	(0.075)	(0.074)	(0.071)
Animals[6]	-0.007	-0.007	-0.007	-0.007		-0.032***	-0.024**	-0.024**	-0.024**
	(0.004)	(0.004)	(0.004)	(0.004)		(0.012)	(0.011)	(0.011)	(0.010)
Water inside home (d)[7]	-0.009	-0.010	-0.027	-0.025		0.088	0.227	0.231	0.208
	(0.122)	(0.122)	(0.117)	(0.119)		(0.318)	(0.250)	(0.257)	(0.192)
Illness (d)[8]	2.064***	2.064***	2.065***	2.065***			1.994***	2.445***	2.420**
	(0.717)	(0.717)	(0.717)	(0.717)			(0.263)	(0.947)	(0.949)
Life-threatening illness (d)[9]	3.105***	3.106***	3.106***	3.105***			2.522***	2.442***	2.483***
	(0.731)	(0.731)	(0.731)	(0.731)			(0.833)	(0.810)	(0.818)
Illness treated (d)[10]	-1.383	-1.382	-1.381	-1.382				-0.121	-0.077
	(1.250)	(1.250)	(1.248)	(1.249)				(1.549)	(1.566)
CSPS/CMA (d)[11]	1.504*	1.504*	1.504*	1.505*				-0.024	-0.034
	(0.869)	(0.869)	(0.868)	(0.867)				(0.964)	(0.968)
Self treatment (d)[12]	0.953	0.951	0.951	0.951				-0.518	-0.523
	(0.993)	(0.993)	(0.991)	(0.992)				(1.187)	(1.201)
Traditional healer (d)[13]	0.941	0.940	0.932	0.933				0.274	0.044
	(1.197)	(1.198)	(1.194)	(1.195)				(1.966)	(1.928)
Ethnicity dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Village dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Constant	353.174*	353.492*	353.242*	352.405*	0.091	0.045	-0.006	-0.011	129.895
	(212.342)	(212.334)	(212.532)	(214.070)	(0.160)	(0.160)	(0.137)	(0.130)	(281.001)
p	0.000	0.000	0.000	0.000	0.154	0.080	0.000	0.000	0.000
N	7246	7246	7246	7246	3801	3801	3801	3801	3801
R^2	0.2144	0.2144	0.2145	0.2145	0.0182	0.0201	0.2163	0.2182	0.2273

p<0.10, ** p<0.05, *** p<0.01

Notes: Robust standard errors in parentheses; [1]reference group: individual not eligible to receive a 50% discount on the insurance premium; [2] reference group: male individual; [3] reference group: individual without at least one year of schooling; [4] sum of total expenditures; [5] amount of asset categories (bicycle, motorbike, car, radio, TV, phone, fridge, solar panel) in which individual possesses at least one item; [6] sum of sheep, goats, bullocks, donkeys & horses; [7] reference group: individual has no water source inside home; [8] reference group: individual did not suffer from any illness; [9] reference group: individual did not suffer from any illness she perceived to be life-threatening; [10] reference group: individual did not treat any illness; [11] reference group: individual did not visit a primary health care facility (CSPS) or hospital (CMA); [12] reference group: individual did not apply self-treatment; [13] reference group: individual did not visit a traditional healer; sample weights applied.