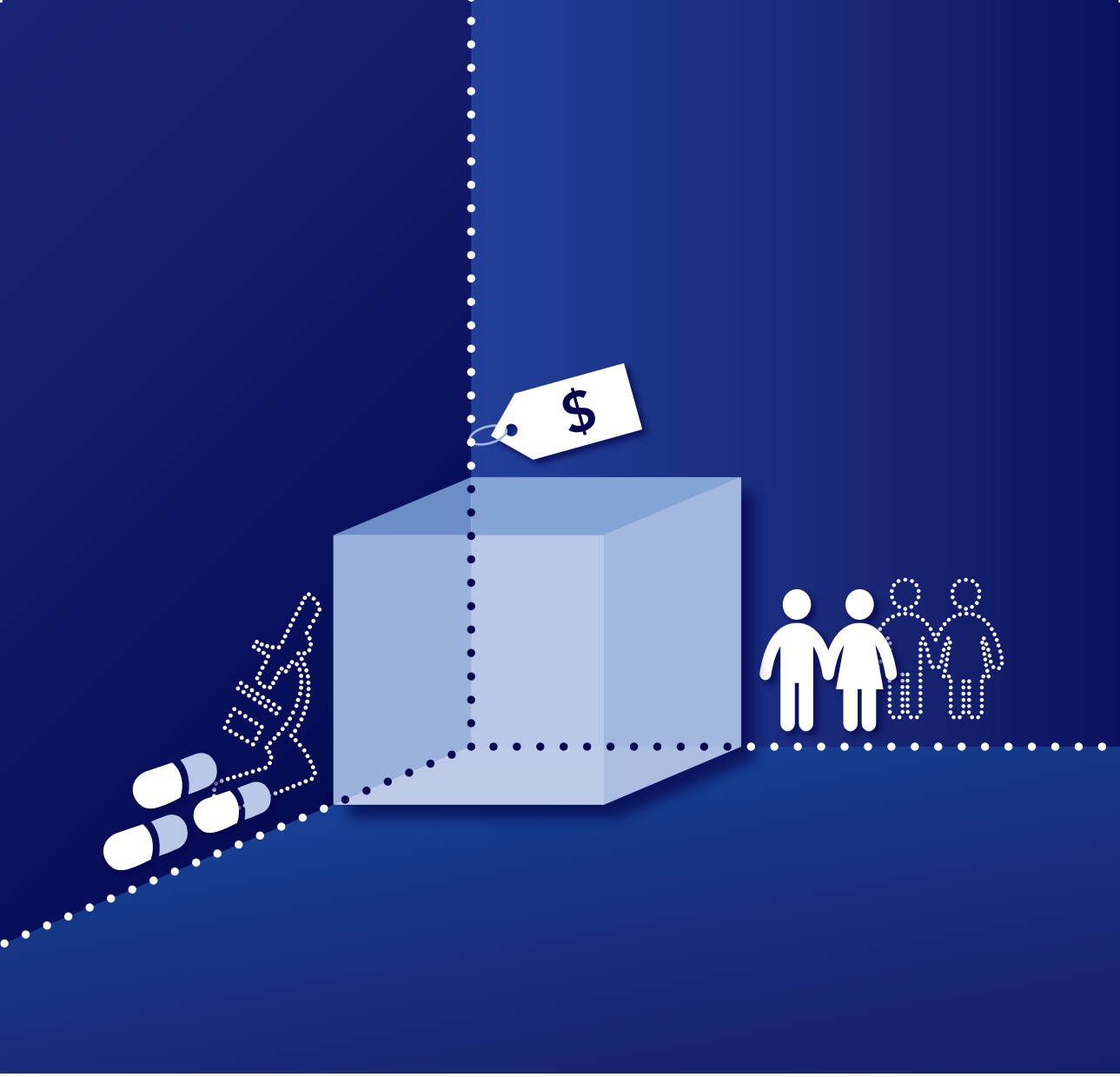


# Evaluating Health Care Financing Reforms in Africa

Igna Bonfrer

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## Het evalueren van hervormingen in de financiering van de gezondheidszorg in Afrika

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ISBN: 978-94-6259-643-6

Cover design: Ellen Gerrits and Martien Bonfrer
Photographic images: Igna Bonfrer
Design and layout: Legatron Electronic Publishing, Rotterdam
Printing: Ipskamp Drukkers, Enschede

# Evaluating Health Care Financing Reforms in Africa

**Het evalueren van hervormingen in de financiering van de gezondheidszorg in Afrika**

## Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus

Prof.dr. H.A.P. Pols

en volgens besluit van het College voor Promoties.
De openbare verdediging zal plaatsvinden op

donderdag 11 juni 2015 om 15.30 uur

door
Igna Elisabeth Johanna Bonfrer
geboren te Leiden

Erasmus University Rotterdam

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# Content

# Chapter 1

# Introduction

Africa is on a steady economic growth path. Over the last decade, most Sub-Saharan African (SSA) countries outperformed European and North-American countries' growth rates, as shown in Figure 1. A number of SSA countries are among the fastest growing economies in the world, coming from very low income levels, and moderate growth is predicted for most of these countries (International Monetary Fund, 2014; Rodrik, 2014). However, trends in the health status of the African population are lagging behind. Since 1990, most regions in the world have achieved a reduction in child mortality of at least 60 percent and Eastern Asia even reduced the number of children not reaching their fifth birthday by 74 percent. Over that same period, SSA achieved a reduction of only 45 percent (calculations based on Millennium Development Goals Report (2014)). Not only do trends in health status lag behind in SSA, the levels are also considerably lower. Almost half of all child deaths worldwide occur in SSA and disparities in child mortality between the poor and the better off are increasing. SSA has the highest maternal mortality ratio with 510 deaths per 100,000 live births, 70 percent of new HIV infections occur in this region (United Nations, 2014) and frequent outbreaks of other infectious diseases like Ebola create an important threat to population health. In addition to these infectious diseases, increased levels of non-communicable diseases associated with economic development create a "double burden of disease" (Maher et al., 2010). This combination of a high disease burden and steady economic growth creates both the need and the opportunity for health care financing reforms to improve equitable access to good quality health care, the topic of this thesis.


**Figure 1 |** Average annual growth in GDP per capita in percent over 2003-2013 (calculations based on World Development Indicators)

## Universal Health Coverage

The need for universal access to health care of good quality features high on policy agendas worldwide. This year will see the closing of the United Nations Millennium Development Goals which contain three directly health related goals (United Nations, 2014) and the start of the Sustainable Development Goals. The latter are expected to include the aim to achieve Universal Health Coverage (UHC) by 2030: providing good quality care to everyone who needs it, without causing financial hardship. In practice this means financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable medicines and vaccines for all (Open Working Group of the General Assembly, 2014). The World Health Organization has developed a simplified graphical representation of the different dimensions of the policy choices that need to be made on the path to UHC, as shown in Figure 2. The entire cube should be filled to achieve UHC but before getting at that stage policy makers have to decide on: i) breadth, reflecting who is covered, ii) depth, reflecting which type of services and of what quality are covered and iii) height, reflecting financial protection i.e. the proportion of costs covered.

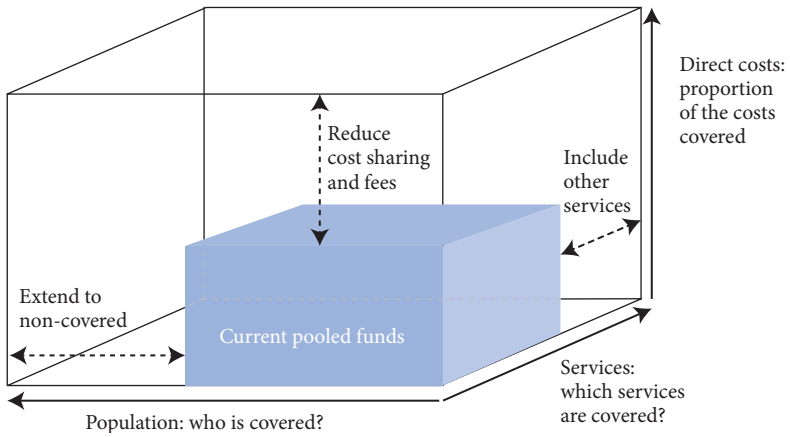


**Figure 2 |** Three dimensions to consider when moving towards universal health coverage (World Health Organization, 2010a)

## Evaluating health care financing reforms

Different health care financing strategies that have been implemented over the last decade in specific SSA countries, can prove to be important tools on the path towards UHC. The aim of this thesis is to provide evidence about the effectiveness of these health care financing reforms in improving equitable access to good quality health care. This evidence is necessary for policy makers taking decisions about the specific steps their country will take to achieve UHC by 2030.

### Improving access and financial protection

Health care financing strategies can focus on the demand side or the supply side of the health care sector. Demand side strategies, targeted at individuals or households, generally aim to improve financial protection and access to health care for those in need of preventive, acute or chronic care. An important constraint to healthcare access derives from the large out-of-pocket payments (OOP) incurred at the point of use. A popular demand side strategy across SSA is the implementation of health insurance schemes. In 2004 estimates already indicated the existence of approximately 900 schemes (of which many are operating only very locally) in Sub-Saharan Africa (De Allegri et al., 2009). Such schemes can serve as a means to protect households from the risk of medical expenses which can be large relative to modest incomes (van Doorslaer et al., 2007) and therefore cause households to fall into poverty (Wagstaff and van Doorslaer, 2003). The health insurance schemes that are introduced across SSA show a wide organizational variety, including obligatory (national) social health insurance (SHI) schemes, voluntary private health insurance (PHI) schemes and Community Based Health Insurance (CBHI) schemes operating at regional or local level.

In theory we would expect health insurance to contribute to UHC because risk pooling reduces the costs of using health care, in turn improving financial protection and access. However, whether in practice health insurance is a recommendable strategy for SSA is heavily debated. Drawing conclusions about this based on the available impact evaluations is difficult because of the heterogeneity across schemes in terms of risk pools, benefit packages, premiums and other organizational aspects. A number of studies have tried to provide evidence on the potential of health insurance for low and middle income countries (LMIC). King et al. (2009) found that Seguro Popular, a voluntary subsidized health insurance scheme in Mexico, reduced catastrophic expenditure but had no effect on health care utilization or health outcomes. Wagstaff et al. (2009) find increased health care utilization but also increased OOP spending after extension of insurance to the poor in China. The latter seemingly paradoxical finding is explained by the initiation of contact with health care providers. Based on impact evaluations in six East and Southeast Asian countries, van Doorslaer et al. (2014) conclude

that voluntary insurance is unlikely to bring coverage close to universally, even when heavily subsidised. Increased coverage generally raises the utilisation of health care but does not necessarily reduce the burden of OOP. The latter depends on the design of provider payments, as well as the benefit package. Giedion and Diaz (2010) conclude based on a literature review that health insurance improves access and use and seems to improve financial protection. However, Acharya et al. (2013) find uptake of voluntary insurance schemes to be less than expected. They find no strong evidence of effects on utilization and financial protection for members of the informal sector. This is problematic given that an estimated eighty percent of employment in SSA is in the informal sector (World Bank, 2013b). De Allegri et al. (2009) conclude based on a literature review that health insurance schemes suffer from low enrolment i.e. rates between one and ten percent, apart from a few isolated successes, most notably in Ghana and Rwanda.

### Improving quality of care

Supply side strategies, targeted at health care providers, generally aim to improve the number of services and the quality of care provided. A popular supply side strategy across SSA is the implementation of performance based financing (PBF). More than thirty African governments are currently piloting such payment methods and Burundi and Rwanda have already implemented it nationwide (World Bank Health Results Innovation Trust Fund, 2013). Through these PBF schemes, health care facilities are paid retrospectively based on the quantity and quality of services provided. This is different from traditional health care financing mechanisms where budget flows are linked to for example number of beds or estimated drug needs.

The current scientific knowledge base about the effects of PBF in SSA is quite limited (Ireland et al., 2011; Kalk et al., 2010; Eldridge and Palmer, 2009). A recent study by Miller and Babiarz (2013) confirmed that no formal evaluations are available for eighteen African countries where PBF has been piloted. A systematic review by Witter et al. (2012) on pay for performance in low and middle income countries, identified only one study (Peabody et al., 2011) – on the effects of bonuses for doctors in the Philippines – meeting high quality impact evaluation standards, with low risk of any bias. It found PBF to improve children's general self-assessed health and to reduce wasting but showed no effect on patient volumes. However, in this experiment similar effects were observed in another intervention group for which health insurance reimbursements to the hospitals were increased, suggesting that the effect mainly derived from increased resources. Rigorous evidence has also been generated on the effects of PBF in Rwanda. Basinga et al. (2011), Gertler and Vermeersch (2012) and de Walque et al. (2015) use a difference-in-differences analysis to show that PBF increased the use and quality of maternal and child services, child nutritional outcomes and HIV testing among married individuals.

## Research questions and outline

This introduction started out from the observation that the high disease burden coupled with the steady economic growth in Africa, created a need and opportunity for health care financing reforms in SSA. The relevance of such health care financing reforms is reflected in the political consensus to move towards universal health coverage. However, there is not one single path to UHC. Policy makers need to decide on the strategies most relevant to their local situation to reach UHC by 2030. Robust evaluations of earlier health care financing reforms provide important suggestions for future strategies towards UHC.

This thesis contains six research chapters and Figure 3 contains a geographical overview of the SSA countries included in this research. The initial two research chapters set the scene by first providing insight into the relative importance of health shocks compared to a range of other shocks that many poor households in the informal sector face. Thereafter inequities in health care utilization across different SSA countries are analysed. Given the importance of health shocks and the large inequities in health care utilization, the subsequent chapters evaluate specific demand and/or supply side interventions in Ghana, Burundi and Nigeria which could serve to provide protection against the financial consequences of health shocks and increase equitable access to quality care. Finally, from the lessons learned in these impact evaluations, conclusions and policy recommendations are distilled. The specific research questions underlying this thesis are discussed below.

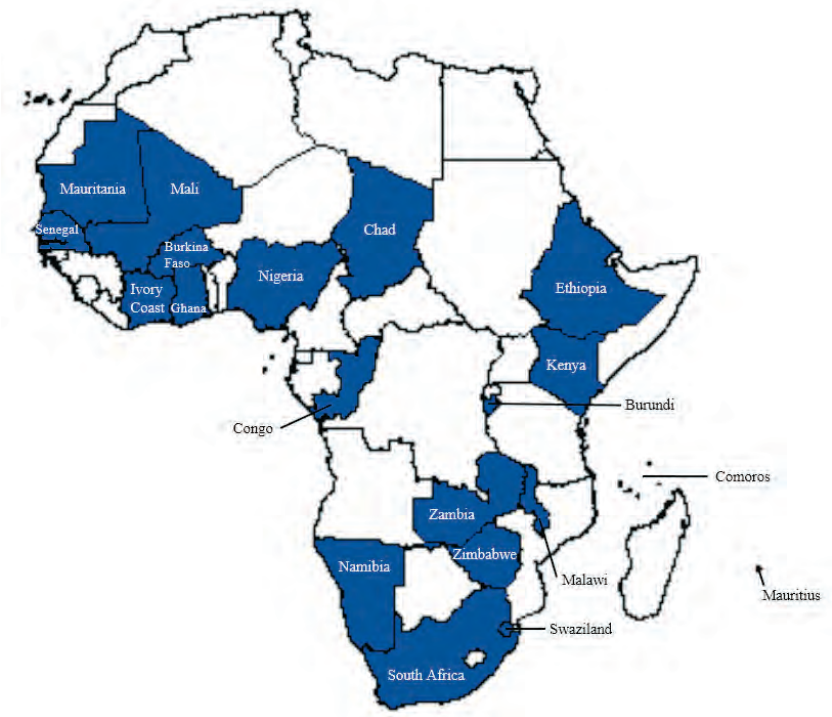


**Figure 3 |** Geographical overview of countries included in this research

*How much do health shocks affect households compared to other shocks?*

Risks are a central part of life for most households in SSA (Banerjee and Duflo, 2011) and health shocks in particular are associated with poverty (Leive and Xu, 2008). About 100 million people fall into poverty each year because of health care costs (World Bank, 2014). Formal mechanisms like health insurance schemes protecting households against the financial consequences of shocks are largely absent among poor rural households (European report on development, 2010). Chapter 2 identifies the relative importance of health shocks as compared to natural, economic and socio-political shocks, explores factors associated with coping behaviour and with foregone care. Data were collected among more than thousand randomly selected agricultural households in West Kenya and used to examine whether there is demand for formal protection against the financial consequences of health shocks among these agricultural households, given that they also face a wide range of other risks.

*Does the distribution of health care utilization match needs in Africa?*
Health care utilization differs widely across African countries as well as the extent to which health care is distributed according to people's needs instead of ability to pay. Although an equitable distribution of health care is an important policy goal, little is known about the extent to which this principle is violated across socio-economic groups in SSA. To set the scene before evaluating specific health care financing interventions in the subsequent studies, Chapter 3 contains an analysis of World Health Survey and Demographic and Health Survey data from eighteen African countries collected before these interventions were implemented. Socioeconomic inequalities in health care utilization are quantified and subsequently decomposed to understand the main underlying factors.

*What are the effects of the National Health Insurance Scheme in Ghana on maternal health-care use?*
One of the most ambitious health care financing reforms in SSA to improve financial protection, is the National Health Insurance Scheme (NHIS) implemented in Ghana in 2005 (Grepin and Dionne, 2013). Ghana has been the first country in SSA to establish a large scale health insurance scheme and other African countries are closely watching its progress (Escobar et al., 2010). Chapter 4 uses data from the Ghana Demographic and Health Survey 2008 to estimate the effects of the NHIS on maternal and child health care. Propensity score matching (PSM) is applied to limit the bias arising from the self-selection into the NHIS. First average effects are estimated and then heterogeneity of effects across socioeconomic groups is investigated.

*What are the effects of performance based financing in Burundi on the utilization and quality of maternal and child care?*
While many governments in SSA are piloting PBF, Burundi is one of only three African countries where PBF has been implemented nationwide. In Chapters 5 and 6 the effects of PBF on health care use and quality of care in Burundi are evaluated. The staggered rollout of PBF across provinces during the period 2006–2010 is used to identify its effects, based on two datasets. These datasets differ in several important aspects. The data used in Chapter 5 were collected by the party implementing the PBF scheme, in 9 out of the 17 provinces, among households and health care facilities. The latter provides insights into the quality of these facilities which could not be obtained from a household survey only. In Chapter 6 household level data from the nationally representative Burundi Demographic and Health Survey are used, collected by a party not involved in the implementation of the intervention.

*What are the effects of a combined demand and supply side intervention in Nigeria, consisting of a voluntary subsidized health insurance and health care facility upgrades?*
Most health care financing interventions focus either on the demand side or on the supply side. Such one-sided interventions run the risk of yielding limited results towards reaching UHC because they either provide the poor with access to low quality care or only the better off with access to good quality care. Interventions simultaneously improving financial protection and quality of care are scarce, although such interventions might provide an important avenue towards UHC. The intervention evaluated in Chapter 7 consists of both a voluntary subsidized health insurance and an upgrade of selected health care facilities to improve the quality of care in Nigeria, funded by the Dutch Health Insurance Fund. Household panel data were collected before and after the implementation of this combined intervention and PSM is used to estimate the effects of the intervention on both the insured and the uninsured.

Finally, Chapter 8 concludes and provides recommendations for policy makers. By answering the above questions, this thesis contributes to the evidence about the effectiveness of large and innovative health care financing interventions in African countries, for which so far scientific evidence has still been very limited. Hopefully these contributions to the body of scientific knowledge also prove to be beneficial to policy makers striving to provide good quality care to everyone who needs it, without causing financial hardship.

# Chapter 2

# How do health shocks affect agricultural households? Evidence from rural Kenya

Bonfrer, I., Gustafsson-Wright, E.

*Under review.*

## Abstract

Risks are a central part of life for households in low income countries and health shocks in particular have been shown to be associated with poverty. Formal mechanisms protecting households against the financial consequences of shocks are largely absent, especially among poor rural households. The majority of these households rely on agriculture, making them more susceptible to shocks. Our aim is to identify the relative importance of health shocks and to explore factors associated with coping behaviour and foregone care among agricultural households. We collected data through a cross-sectional survey among 1226 randomly selected agricultural households in Kenya. We determine the relative importance of health shocks and identify the distribution of shocks across socioeconomic groups. Probit regression models are estimated to study the factors associated with foregone care and coping strategies. In our sample, illness and injury shocks dominate all other shocks in prevalence. While the costs associated with these shocks are relatively low, the high prevalence makes their expected costs the highest among all shocks. Almost 2 percent of households incurred catastrophic health expenditure in the last year. The main coping strategies associated with facing a health shock are to i) use savings, ii) sell animals/farm land/assets and iii) ask for gifts/assistance/loans. The probability to use savings is significantly higher among the poor. One in five households forewent necessary care in the last twelve months and foregoing care is significantly associated with poor households and households with an uneducated head. Health shocks pose a significant risk to households. Implementing pre-payment or saving mechanisms might help protect households against the financial consequences of ill health. Such mechanisms however, should take into account the competing shocks that agricultural households face, making it almost impossible to reserve a share of their limited resources for the protection against *health* shocks.

## Introduction

Risks are a central part of life for most households in low income countries (LICs) (Banerjee and Duflo, 2011). Understanding these risks and the associated coping strategies is of critical importance to policy makers. The World Bank recently launched the World Development Report 2014 on "Risk and Opportunity" (World Bank, 2014) investigating how households can become more resilient to the wide range of risks they face. These risks can translate into a range of different "shocks", defined as adverse events that are costly to individuals and households in terms of lost income, reduced consumption or the sale of assets (Dercon et al., 2005).

Formal mechanisms to protect households against the financial consequences of shocks are largely absent in Sub-Saharan Africa (SSA), especially among poor rural households working in the informal sector (European report on development, 2010). The majority of these households rely on agriculture for their livelihoods i.e. 61 percent of total employment in Kenya is in the agricultural sector (World Bank, 2005). These agricultural households are often affected by limited access to resources, low agricultural productivity and repeated exposure to risks, making them more susceptible to shocks (Tirivayi et al., 2013). However, studies providing insights about shocks among agricultural households in SSA are limited and for Kenya specifically non-existent.

Illness is among the most important shocks associated with poverty in LICs (Leive and Xu, 2008). About 100 million people fall into poverty each year because of health care costs (World Bank, 2014). Health shocks can place a double financial burden on households, not only having to bear the costs of medical treatment but also the income loss from inability to work (Leive and Xu, 2008). Since the bulk of health care in LICs is financed through out-of-pocket (OOP) payments at the time of use, many households suffer financial catastrophe as a result of seeking care or forego necessary health care all together (Van Doorslaer et al., 2006; Xu et al., 2003). The combination of catastrophic health care expenditures and foregone earnings can cause households to slide below the poverty line or even deeper into poverty (Wagstaff, 2008), the so called "medical poverty trap" (Whitehead et al., 2001). Notwithstanding these considerable financial consequences, coverage by formal insurance against health shocks remains limited (Grimm, 2010; De Allegri et al., 2009), especially among agricultural households (Mathauer et al., 2008) which are also more susceptible (Tirivayi et al., 2013).

The aim of this paper is to identify the relative importance of health shocks compared to other shocks and to explore the factors associated with coping behaviour and foregoing necessary care among agricultural households facing illness in the absence of widespread

formal insurance schemes. We study households in the agricultural sector in Kenya where the need for increasing protection against health shocks is particularly high (International Labour Organization, 2013; Health Insurance Fund, 2011; PharmAccess Foundation, 2014). The recent World Development Report for example showed that Kenya's risk preparation (based on a composite index of human capital, physical and financial assets, social support and state support) is low compared to neighbouring countries Ethiopia and Tanzania (World Bank, 2014).

Protecting Kenyans against health shocks and their consequences is indeed high on the policy agenda. Several parties have recently rolled out health insurance schemes in Kenya, including the government and the Dutch Health Insurance Fund. The Kenyan government introduced the National Hospital Insurance Fund (Government of the Republic of Kenya, 2007) and the Dutch Health Insurance Fund cooperates with PharmAccess and the Africa Air Rescue Health Insurance Ltd. to offer low-cost health insurance to selected target groups in Kenya. The first group that became eligible for this insurance were the members of the Tanykina Dairy Plant Ltd. (Van der Gaag et al., 2011) and members of Lelbren Dairies Ltd. were expected to become eligible at a later stage. Both Tanykina and Lelbren are farmer cooperatives, collecting milk from individual farmers which is subsequently sold in bulk to factories. This is beneficiary to the members because the price per litre milk is higher for bulked milk than for smaller amounts provided by individual farmers (Lelbren Dairies Limited, 2011). The study presented here was conducted among the farmers of both cooperatives, before the health insurance was introduced.

Over the last decade, the literature on shocks in general and health shocks specifically has grown, though our understanding of the reasons behind the persisting vulnerability of agricultural households in SSA remains limited. A study by Wagstaff and Lindelow (2010) compared different shocks in Laos, showing that health shocks are more common than most other shocks and concentrated among the poor. Health shocks occur not only relatively frequent, evidence from rural Cambodia also shows that these shocks cause more serious economic damage to households than crop failure (2005). The importance of health shocks is confirmed by most studies in LICs on this topic (Asfaw and von Braun, 2004; Gertler and Gruber, 2002; Lindelow and Wagstaff, 2005) and in more detail by Heltberg and Lund (2009) who found that health shocks dominate in frequency, costliness and adversity in Pakistan. However, Pitt and Rosenzweig (1984) found only small effects of illness on farm profits in Indonesia. Households made up for reductions in labour within the family by hiring outside help, thereby maintaining previous consumption levels. A more recent paper also investigated economic risks of ill health in Indonesia, but differentiated findings across socioeconomic groups (Sparrow et al., 2014). They found that consumption smoothing following ill health

was indeed successful but only for the wealthiest half of the population. For the rural and poor households consumption smoothing was imperfect and non-food expenditure was affected. The main coping strategy for the poor was borrowing, inferring potential long-term effects through incurring debt. They also conclude that future income might be affected by depleting buffers such as assets and savings for consumption smoothing and financing health care.

When measuring financial protection against illness related expenditures, coping strategies provide important information on how households respond to health shocks (for a detailed description of coping strategies see for example Morduch (1995)). A literature review by McIntyre et al. (2006) showed that health shocks trigger one or several coping strategies, including reduction of (food) consumption, sale of assets or livestock, taking out formal and informal loans, diversification of labour activities and intra-household labour substitution. Leive and Xu (2008) show for fifteen African countries that in case of OOP health payments, 23 percent of households in Zambia and up to 68 percent in Burkina Faso borrow and sell assets. They also find that differences in coping strategies across socioeconomic groups are considerable: among Kenyan households in the lowest wealth quintile 45 percent of households affected by a health shocks sold assets or borrowed, while this percentage was 22 percent in the richest quintile.

Although coping strategies may help households to ensure coverage of their basic needs in the short run, the long-term consequences can be substantial (Flores et al., 2008). Assets or livestock often form an integral resource of a household's livelihood and selling may be the start of a vicious cycle of increased economic vulnerability. Children can be pulled out of school to enter the labour force and therefore fail to advance in school which can lead to long-term negative outcomes such as low educational attainment and lower future earnings (Duryea et al., 2007). Borrowing from family and friends can have severe effects because households often remain in debt for a considerable time after the health shock (Damme et al., 2004). Apart from lending, family and friends also assist affected households through donations, as is especially common in SSA countries where strong sharing obligations exist. Though these donations may prevent the affected household from having to revert to coping strategies with a long term economic impact, the effects on the donating family member(s) can be considerable. Grimm et al. (2011) applied a theoretical model on a sample of small entrepreneurs in Burkina Faso, showing that donations to the (extended) family, in particular for health related expenditures, can require foregoing profitable investments and hence inhibits long term growth of the enterprise of the donor.

In addition to these coping strategies to deal with the economic consequences of ill health, some households have to revert to forego necessary health care. The effects of foregoing

necessary care on health status and future health care costs can be considerable, but most studies ignore foregone treatment (Grimm, 2010). As far as we know, only one study has specifically quantified the extent of foregone care in LICs. This study by Abiola et al. (2011) in twenty SSA countries showed that 35 percent (Ghana) up to 82 percent (Zimbabwe) of the families went without medicine or medical treatment in the previous year.

While these studies provide important insights necessary to understand health shocks and the associated coping strategies, households in different contexts cope with health shocks differently (Leive and Xu, 2008; Townsend, 1995). The existing evidence from SSA is limited, especially for agricultural households, and no evidence is available for such households in Kenya specifically. This study tries to fill that gap using cross-sectional data on household characteristics, self-reported health shocks and associated coping mechanisms and on foregone care. Clearly these data allow us to identify correlations but do not allow us to estimate causal effects due to a lack of control for reverse causality between income and shock occurrence.

In the following sections of this paper we present the data collected and the methodology used. Subsequently we discuss the relative importance of health shocks, the average number of times households were affected by different shocks i.e. the shock prevalence, the socioeconomic inequality in shock occurrence and the self-reported impact of these shocks. Then we discuss coping strategies and indicate which factors drive the use of these different strategies by estimating a multivariate probit model. The relative importance of different aspects of out-of-pocket health expenditure is assessed and we calculate whether a household incurred catastrophic health expenditure. This is followed by the estimation of a probit model to identify the factors associated with foregoing necessary care. We conclude with policy implications informing decision-making on the protection of agricultural populations in SSA against the financial consequences of illness.

## Setting

Kenya is a low income country in East Africa, with a population of 40 million people. GNI per capita is 790$ and 46 percent of the population lives below the poverty line (World Bank, 2010a). While the health sector has predominantly been financed by households' OOP spending, the private sector share of total health care expenditure has decreased from 54 percent in 2002 to 37 percent in 2010. 77 percent of the children are fully immunized but under five mortality (U5M) remains high at 73 per 1000 live births. This is still far from Millennium Development Goal 4 aiming to reduce U5M to 33 per 1000 by 2015 in Kenya (United Nations, 2013).

Our study took place in West Kenya where an estimated 70 percent of the population is involved in dairy farming (Lelbren Dairies Limited, 2011), this is slightly higher than the overall average of 61 percent in Kenya (World Bank, 2005). This implies that the region is broadly representative for Kenya in terms of agricultural activity. A modal agricultural household has a total expenditure of 2600 US $/year and owns 4 cows and 10 chickens. Most farmers also own sheep, goats or donkeys and have a plot of land to grow crops. The remaining 30 percent of the population generates income through the cultivation of tea crops or as day labourer at dairy or tea farms (Lelbren Dairies Limited, 2011).

**Data**

We collected data from a random sample of 1226 agricultural households (7599 individuals) in 2011. Based on a list of all households in the study area supplying milk to the dairy farming cooperatives operating in this area - Tanykina Dairies Ltd. and Lelbren Dairies Ltd. -, 1315 households were selected through simple randomization for an interview and no weights were applied. The necessary sample size was calculated (StataCorp LP, 2013) for another study on health care visits in this population, which is slightly different from the health shocks studied here, though still related to the health status of the studied population. These calculations (power = 80 percent, $\alpha = 0.05$) showed that a minimum of 1200 households was required to pick up a 10 percent increase in the number of health care visits. To ensure that data from at least 1200 households would be available, a total of 1315 households were randomly selected. Of the selected households, 6.8 percent could not be interviewed because no consent was given, the household had moved recently out of the study area or the household could not be found, resulting in the study sample of 1226 households.

During a two-week training, 20 socioeconomic interviewers, 20 biomedical interviewers, 6 supervisors and 6 data entrants were trained to conduct and process the survey. The multidisciplinary team of trainers consisted of survey experts, researchers, data managers, a lab technician and a medical doctor from the Kenya Institute for Public Policy Research and Analysis, the School of Public Health at Moi University, the Amsterdam Institute for Global Health and Development and the Amsterdam Institute for International Development. Focus group discussions with farmers were organized to check that all questions were understandable and the survey was piloted among 162 households. The field work was subsequently conducted between 15 February and 26 March 2011 (van der Gaag et al., 2011). The interviewers worked in teams consisting of one socioeconomic and one biomedical interviewer. The questions used in this study were administered to the most knowledgeable person on behalf of all household members, which was in most cases the household head or spouse.

The survey contained questions on household characteristics including age, gender, education, employment, consumption, assets, livestock, shocks, coping strategies for those who incurred a health shock and foregone care. There is also information about current enrolment of households in a health insurance scheme. When this survey took place the only health insurance scheme readily available in the study area was the National Hospital Insurance Fund (NHIF), the primary provider of health insurance in Kenya (National Hospital Insurance Fund, 2014). Their coverage of the informal sector is limited and the benefit package contains only inpatient care in specific hospitals (Joint Learning Network for universal health coverage, 2014). In addition data was collected to develop a binary variable indicating whether the household diversified its income sources: only dairy farming (0) or also other income generating activities (1). Another binary variable indicates differentiation in the crops households are growing: more than one different types of crops (1) or not (0). The relevant sections of the survey are available upon request.

Ethical approval for this study was obtained from the Institutional Research and Ethics Committee from the Moi Teaching and Referral Hospital in Eldoret, Kenya under number 000603 on the 11th of February 2011. Written informed consent was obtained from respondents through signing a letter which explained the details of the study including the associated benefits and risks in both English and Swahili.

## Methodology

*Relative importance of health shocks*

We begin by identifying the relative importance of health shocks compared to other shocks. Households were asked how many times in the past twelve months they experienced health shocks (illness and injury in the household, death in the household), natural and biological shocks (natural disaster, storage, crop or livestock disease), economic shocks (job loss, drop in sale prices of agricultural products, increase in agricultural input prices) and socio-political shocks (political, religious, tribal conflict, theft). We calculate the percentage of households which were affected once, twice or more than twice for each type of shock, as well as the average number of times households were affected by these different shocks, we call the latter the "shock prevalence".

*Socioeconomic inequality in shocks*

We measure socioeconomic inequalities in the occurrence of the different shocks by means of a concentration index (cf. e.g. (Wagstaff and van Doorslaer, 2000)). Since the outcome measure is binary – shock occurred (1) or not (0), we use the corrected version of the concentration index as suggested by Erreygers (2009). The corrected concentration index (CCI) is calculated as follows:

$$CCI(y) = 8\ cov(y_i, R_i) \quad (1)$$

where $y_i$ indicates whether household *i* experienced the specific shock or not and $R_i$ represents the households' fractional rank in the socioeconomic distribution. Positive values of the CCI indicate a disproportionate concentration of *y* among the rich and vice versa.



To measure socioeconomic status, we use detailed information on household consumption from both purchased and self-produced goods. The yearly household consumption is based on a context specific list of 57 items of weekly food consumption, 33 items of non-food consumption such as housing, transport and personal care as well as 50 annual non-food items such as clothing, furniture, health and education. We assume that the weekly and monthly consumption is representative for the rest of the year and is therefore multiplied to obtain consumption information at yearly level.

*Self-reported impact and value lost*

For those households incurring a specific type of shock, the self-reported impact of this shock was collected on a five point Likert scale running from 1 *very small* to 5 *very large*. Respondents were subsequently asked to report the "value lost", the actual monetary impact of these shocks including not only expenditures but also income, asset and land losses associated with the specific shock. Because this was included in one single question, we cannot differentiate between the direct and indirect costs. Monetary values were reported in the local currency and converted to US dollars in 2011 (1 Kenyan shilling = 0.012 US $). We compare the value lost to the food consumption of the affected household and calculate the value lost as percentage of food expenditure. Both the value lost and the food expenditure are calculated per capita to correct for household size. Food expenditure is based on the 57 items of food consumption. We also calculate the average expected value lost, taking into account frequency and financial impact of these shocks for the population on average.

*Coping strategies*

Households were asked to indicate for each coping mechanism whether they used it (1) or not (0) in case of a health shock. Twelve coping strategies were included: do nothing, use savings, use insurance, sell animals/farm land/assets, work more hours, send children to relatives or friends, ask for gifts/assistance/loans from relatives and friends, borrow money from money lenders, borrow money from bank, seek religious/spiritual help, get help from a Non-Governmental Organization (NGO) and other. Up to three different coping strategies could be indicated per shock. We explore the coping strategies triggered by health shocks, and analyse the factors associated with the use of specific coping strategies for the shock where the probability of occurrence in the past 12 months was larger than 0.05.

Most households used more than one coping mechanism and we expect the choice for these mechanisms to be correlated. Given that the dependent variables in a set of otherwise independent equations are potentially interdependent, we apply a multivariate probit regression model (Cappellari and Jenkins, 2003) on the subsample of households reporting a health shock, as shown below.

$$y^*_{hc} = X_h + B_h + D_h + \varepsilon_{hc} \text{ with } c = 1, \ldots, C \quad (2)$$
$$y_{hc} = \begin{cases} 1, & y^*_{hc} > 0 \\ 0, & otherwise \end{cases}$$

with $y^*_{hc}$ a latent variable which is 1 if household $h$ adopted one of the $c$ coping strategies in case of a health shock. In this study the equation counter $c$ ranges from 1 to 4 representing the four coping strategies with a probability of occurrence larger than 0.05 (do nothing, use savings, sell animals/farm land/assets and ask for gifts/assistance/loans from relatives and friends). This threshold is used because the regression models for coping mechanisms with a lower probability of occurrence did not converge when applied to the subsample of households reporting a health shock. $X_h$ are household charateristics (proportion of children in household (hh), proportion of elderly in hh, poor household, middle income household, household has health insurance), $B_h$ are household head characteristics (age hh head, Christian hh head, primary educ. hh head, sec. or higher educ. hh head) and $D_h$ are variables indicating whether the household diversified its income sources and crops (hh has income from source other than dairy, hh has income from diverse crops). The error terms ($\varepsilon_{hc}$) are drawn from a multivariate normal distribution. We report coefficients of the multivariate probit model for all outcomes and explanatory variables. Standard errors are calculated for each equation using the STATA user-written command -mvprobit-. To calculate the average marginal effect, we use the simulation procedure proposed by Cappellari and Jenkins (2003) for a multivariate probit model and perform 50 random draws to increase accuracy (Jones et al., 2007).

*Out-of-pocket health expenditures and catastrophic expenditure*

We use total household health expenditure in the last twelve months for nine expenditure categories (drugs, outpatient care, laboratory tests, inpatient care, transport to and from medical facility, traditional medical services, therapeutic appliances, health insurance premium, other). Based on total household health expenditure and total non-food expenditure, we calculate whether a household incurred "catastrophic" expenditure (Xu et al., 2003).

When health care expenditures are large relative to the resources available to the household, the associated disruption to living standards is considered catastrophic. The catastrophic payment headcount is calculated as follows (O'Donnell et al., 2008):

$$H = \frac{1}{N}\sum_{h=1}^{H} E_h \quad (3)$$

where $N$ is the sample size and $E_h$ is 1 if the share of health care expenditure over total nonfood expenditure is larger than a threshold $z$ and 0 otherwise for household $h$. As proposed by Xu et al. (2003) we place the threshold $z$ at 40 percent of non-food expenditure.



*Foregone care*

Instead of spending on health shocks, households can also decide not to use necessary health care which limits costs, at the risk of experiencing a worse health status and higher health expenditures at a later stage. Every individual household member was asked whether he/she needed care in the last 12 months but could not get it, and subsequently had to indicate for which of the following reason(s): medical fees too expensive, no drugs available, could not afford medication, quality of care too low, could not take time off work, travel costs, no medical facility in the area, waiting times, unfriendly staff, other. The type of care foregone was also asked: care for acute illness, medication, care for chronic disease, therapeutic appliances, preventive care, maternity care, hospitalization and other. We identify the types of households more likely to forego care using a probit model similar to Equation (2) but with a single equation i.e. $c = 1$. We report coefficients of the single probit model for all explanatory variables. Standard errors are calculated using the STATA command -probit-. To calculate the average marginal effect we subsequently use the -margins- command. All analyses were performed in STATA 12.

## Results

### Relative importance of health shocks

Table 1 provides descriptive statistics. Kenyan households face a broad range of shocks, Figure 1 shows that the largest share of households (0.38) is faced with a drop in sale prices of agricultural products at least once. We also find that many households are affected at least once by storage, crop or livestock disease (0.37), natural disasters (0.34), increase in the agricultural input prices (0.33) and illness or injury in the household (0.32). Other shocks, related to theft, death and job loss occur only sporadically.

Figure 1 also shows that illness and injury affects households often more than once, while most other types of shocks hit only one time over the past twelve months. To take this frequency into account, we calculated the shock prevalence. This results in (first column Table 2) illness and injury being the most prevalent shock, with an average of 0.644 times per year. Followed by storage, crop or livestock disease (shock prevalence of 0.551 times per year), drop in sale prices of agricultural products (0.435), natural disaster (0.359) and increase in agricultural input prices (0.352).

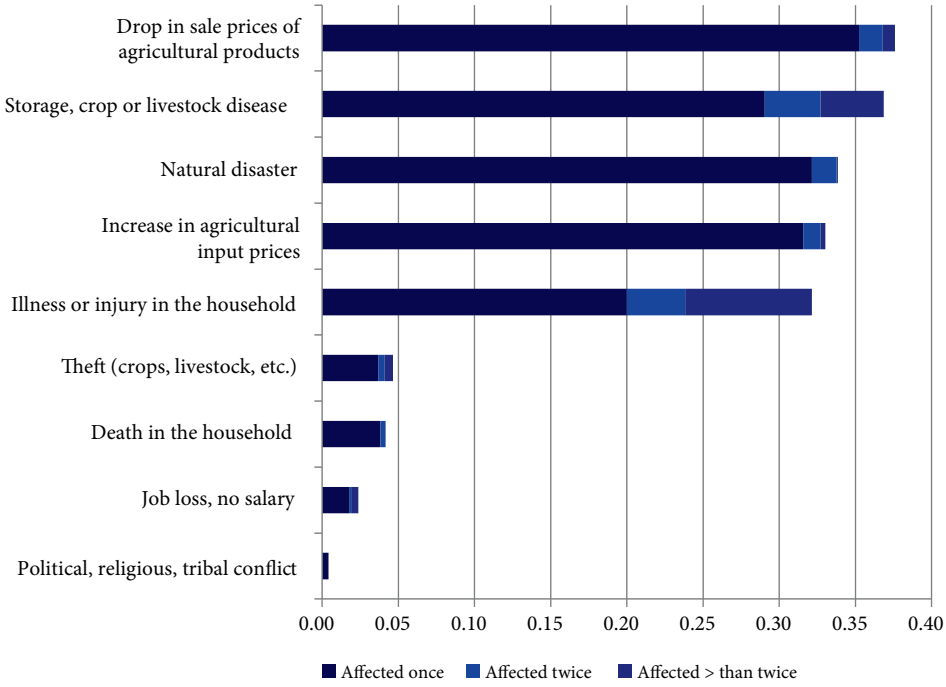


**Figure 1 |** Proportion of households facing shock

*Socioeconomic inequality in shocks*

All shocks, apart from the very sporadic political conflict, have a positive CCI (see Table 2), implying that these shocks are more prevalent among the better-off. Drop in sale prices of agricultural products is most disproportionally distributed towards the rich, followed by storage, crop or livestock disease. Health shocks are less unequally distributed across socioeconomic groups.

*Self-reported impact and value lost*

Table 3 shows the self-reported impact by type of shock (1 very small to 5 very large), showing that even though illness or injury is the most prevalent shock, the average impact is relatively low (3.2 out of 5.0) while death in the household has the largest reported impact on households (4.3 out of 5.0).



**Table 1** | Descriptive statistics

| | |
|---|---|
| Proportion of children in hh | 0.46 |
| Proportion of elderly in hh | 0.05 |
| Age hh head | 47.26 |
| Christian hh head | 0.90 |
| Primary educ. hh head | 0.42 |
| Sec. or higher educ. hh head | 0.46 |
| Poor household | 0.34 |
| Middle income household | 0.33 |
| Hh has income from source other than dairy | 0.52 |
| Hh has income from diverse crops | 0.74 |
| Hh has health insurance | 0.17 |

**Table 2** | Shock characteristics

| | Shock prevalence | CCI | Self-reported impact | Value lost $ | Value lost as % of food exp. | Exp. value lost as % of food exp. |
|---|---|---|---|---|---|---|
| Health shocks | | | | | | |
| Illness or injury in the household | 0.644 | 0.057 | 3.2 | 47 | 18 | 11 |
| Death in the household | 0.045 | 0.040 | 4.3 | 175 | 72 | 3 |
| Natural and biological shocks | | | | | | |
| Natural disaster | 0.359 | 0.059 | 3.5 | 70 | 28 | 10 |
| Storage, crop or livestock disease | 0.551 | 0.077 | 3.2 | 41 | 17 | 10 |
| Economic shocks | | | | | | |
| Job loss, no salary | 0.042 | 0.001 | 3.8 | 98 | 41 | 2 |
| Drop in sale prices of agricultural products | 0.435 | 0.123 | 3.4 | 58 | 22 | 10 |
| Increase in agricultural input prices | 0.352 | 0.044 | 3.2 | 28 | 10 | 4 |
| Socio-political shocks | | | | | | |
| Political, religious, tribal conflict | 0.004 | -0.001 | 3.4 | 34 | 15 | 0 |
| Theft (crops, livestock, etc.) | 0.068 | 0.052 | 3.0 | 31 | 11 | 1 |

*Note:* The last three columns contain per capita values

**Table 3** | Multivariate probit: factors associated with coping strategies in case of a health shock

| | Do nothing | | | Use savings | | | Sell animals/ farm land/ assets | | | Ask for gifts/ assistance/ loans | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect |
| Proportion of children in hh | -0.025 | 0.483 | -0.006 | 0.021 | 0.387 | 0.008 | 0.450 | 0.465 | 0.116 | -1.341*** | 0.472 | -0.242*** |
| Proportion of elderly in hh | -0.974 | 0.763 | -0.230 | -0.705 | 0.486 | -0.260 | 0.245 | 0.559 | 0.063 | -0.170 | 0.571 | -0.031 |
| Age hh head | 0.004 | 0.008 | 0.001 | -0.011 | 0.007 | -0.004 | 0.018** | 0.008 | 0.005** | 0.001 | 0.008 | 0.000 |
| Christian hh head | 0.112 | 0.280 | 0.025 | 0.010 | 0.225 | 0.004 | 0.062 | 0.267 | 0.016 | 0.325 | 0.318 | 0.051 |
| Primary educ. hh head | 0.289 | 0.297 | 0.070 | -0.295 | 0.233 | -0.109 | 0.452 | 0.292 | 0.118 | -0.338 | 0.257 | -0.061 |
| Sec. or higher educ. hh head | 0.247 | 0.316 | 0.059 | -0.285 | 0.248 | -0.103 | 0.600* | 0.311 | 0.157* | -0.632** | 0.292 | -0.109** |
| Poor household | 0.439* | 0.228 | 0.112* | -0.611*** | 0.185 | -0.231*** | 0.259 | 0.212 | 0.069 | 0.205 | 0.246 | 0.039 |
| Middle income household | 0.210 | 0.214 | 0.051 | -0.254 | 0.172 | -0.093 | 0.109 | 0.200 | 0.029 | 0.182 | 0.231 | 0.034 |
| Hh has income from s.o.t. dairy | -0.387** | -0.387 | -0.092** | 0.177 | 0.138 | 0.066 | 0.275* | 0.160 | 0.071* | -0.230 | 0.180 | -0.042 |
| Hh has income from div. crops | -0.053 | 0.171 | -0.013 | -0.001 | 0.146 | -0.000 | 0.330* | 0.174 | 0.081* | -0.048 | 0.190 | -0.009 |
| Hh has health insurance | 0.008 | 0.241 | 0.002 | -0.049 | 0.197 | -0.018 | -0.460* | 0.247 | -0.104* | -0.223 | 0.299 | -0.037 |
| *N* | *394* | | | *394* | | | *394* | | | *394* | | |

*Notes:* Data on shock level. Results are given for coping strategies with a probability larger than 0.05 in case of a health shock.

$\rho 21 = -0.730^{***}$, $\rho 31 = -0.102$, $\rho 41 = -0.100$, $\rho 32 = -0.415^{***}$, $\rho 42 = -0.324^{***}$ and $\rho 43 = 0.014$.

Log likelihood: -643.657 and Wald $\chi 2$ test: 77.58

* p<0.10; ** p<0.05; *** p<0.01

Health as well as other shocks can have considerable financial implications. Table 2 shows the average value lost for households which incurred a specific shock, both in US dollars and as percentage of household food expenditure per capita. These costs include not only direct expenditures but also the indirect costs of foregone earnings and sold assets and land. Death in the household (175$ per capita) is by far the most expensive shock, followed by job loss (98$ per capita) and natural disasters (70$ per capita). When we compare these costs to the yearly expenditure on food, we find that death in affected household takes up 72 percent of the total expenditure on food, which will probably have catastrophic effects. When we also take into account shock prevalence (Table 2 second column), the expected costs of illness or injury are high with 11 percent of yearly food expenditure and on par with sale price shocks and natural and biological shocks (all 10 percent of food expenditure).

*Coping strategies*

Figure 2 shows the dominant coping strategy associated with different types of shocks. Illness or injury costs are mostly covered by savings (56 percent), followed by selling livestock, land and assets (15 percent). There is also a considerable share of households indicating that they did nothing (16 percent) when illness or injury occurred. Death in the household leads to much larger reliance on relatives and friends for gifts, assistance and loans than any other shock. More formal arrangements, such as borrowing from a bank, are used only sporadically. Help from an NGO is not frequently sought in this population, nor is much spiritual or religious help for the financial consequences of shocks used.

Table 3 shows the association between a limited number of factors and the four most used coping strategies in case of a health shock. The multivariate probit results suggest interdependence across the equations (the estimated correlation coefficients $\rho 21$, $\rho 32$ and $\rho 42$ are significant), implying that the multivariate probit model is indeed the preferred model over individual probit models for each coping strategy separately. Of the coping strategies that were tested, the probability that a household does nothing in case of a health shock is significantly higher among the poor (11 percentage points (pp)) while this probability is significantly lower for households with income from a source other than dairy (9 pp). The probability to use savings is significantly lower among the poor (23 pp). The strategy to sell animals/farm land/assets is significantly more likely to be used in households where the head has a secondary or higher education (16 pp), by households who have income sources other than dairy (7 pp) and diversified their crops (8 pp), while the probability is lower among households who have a health insurance (10 pp). There is also a small but significant increase in the probability of using this coping strategy when the age of the household head is higher (0.01 pp). Finally, there is a negative association between asking for gifts/assistance/loans and the proportion of children in the household (24 pp) and also a negative association between

this coping strategy and the household head having a secondary or higher education (11 pp). To confirm robustness of these findings (see Tables A1-A3)[1]: i) an alternative model specification was tested which included additional interaction terms for the explanatory variables with a strong correlation (Cohen, 1988), ii) the original model was estimated on a sample excluding the top and bottom 10 percent of observations based on income and iii) the original model was estimated for a binary outcome variable reflecting whether any coping strategy was used or not. These robustness checks led to similar conclusions about the association between the factors tested and the coping strategies used in case of a health shock.

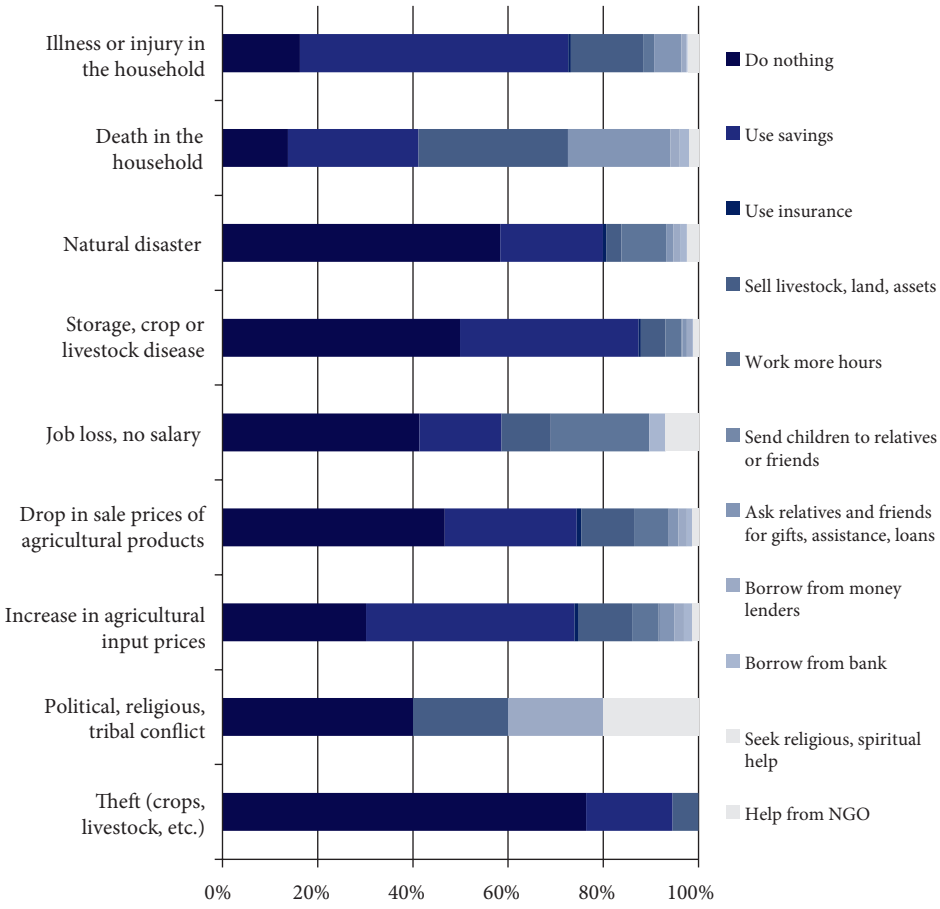


**Figure 2 |** Coping strategies used when faced with a shock

[1] Throughout this thesis numbers preceded by an "A" refer to information located in the Appendix of each chapter.

*Out-of-pocket health expenditures and catastrophic expenditure*

Table 4 shows that drugs contribute with 6 percent of food expenditure by far the most to OOP health expenditures, followed by inpatient and outpatient care expenditures. The burden of laboratory tests, transport, traditional medical services and the health insurance premium is considerably lower. Reported expenditures on therapeutic appliances are typically almost zero. On average 1.88 percent of households incurred catastrophic expenditure, this percentage is higher for those which reported at least one health shock (3.04) though those without a health shock also incurred catastrophic expenditure (1.32 percent). Catastrophic expenditures are slightly lower among the poorest tertile of households (1.69 percent) compared to the better off (1.97 percent).

**Table 4 |** Health care expenditure as percentage of food expenditure

| | |
|---|---|
| Drugs | 5.86 |
| Outpatient care | 1.24 |
| Laboratory tests | 0.41 |
| Inpatient care | 1.60 |
| Transport to and from medical facility | 0.51 |
| Traditional medical services | 0.10 |
| Therapeutic appliances | 0.01 |
| Health insurance premium | 0.19 |
| Other | 0.02 |

*Note:* percentages are based on per capita figures.

*Foregone care*

So far we studied ex-post coping strategies and health care expenditure, but households can also decide to forego necessary care. A considerable 21 percent of households report that at least one family member needed care in the past 12 months but could not get it. Often households which forego care, do this more than once. There is a clear socioeconomic gradient in foregoing care, the CCI is negative (-0.083) and the tertile of poorest households reporting an average of 0.49 foregone health care contacts compared to 0.34 among the richest households. This is an indication that foregoing necessary care relates to some extent to the available financial resources in a household. Table 5 shows individual level data for the type of foregone health care. 52 percent of all cases of self-reported foregone care related to care for an acute illness, another 28 percent was for medication and 12 percent reported foregoing care for a chronic disease. Preventive care, maternity care and hospitalization were less frequently reported to be foregone. Table 6 shows the reported factors associated with

foregoing necessary care. We find that 38 percent forewent care because the medical fees were too expensive and 20 percent because they could not afford the medication. Another considerable share (24 percent) of foregone care was associated with unavailability of drugs, while 6 percent forewent care because they perceived the quality of care to be too low. Only 2 percent forewent care because of travel costs or because of inability to take time off work, suggesting that direct costs of health care are more problematic than indirect costs.

**Table 5 |** Reported type of foregone medical care

| | Frequency | % of foregone care |
|---|---|---|
| Care for acute illness | 182 | 52 |
| Medication | 98 | 28 |
| Care for chronic disease | 43 | 12 |
| Other | 12 | 3 |
| Therapeutic appliances/equipment | 5 | 1 |
| Preventive care | 5 | 1 |
| Maternity care | 4 | 1 |
| Hospitalisation | 3 | 1 |

**Table 6 |** Reported reason for foregoing care

| | Frequency | % of reasons |
|---|---|---|
| Medical fees too expensive | 118 | 38 |
| No drugs available | 74 | 24 |
| Could not afford medication | 61 | 20 |
| Quality of health care too low | 19 | 6 |
| Other | 11 | 4 |
| Could not take time off work | 7 | 2 |
| Travel costs | 6 | 2 |
| No medical facility in the area | 5 | 2 |
| Long waiting times health facility | 4 | 1 |
| Unfriendly staff | 4 | 1 |

Table 7 shows the factors collected in this study that can be associated with foregoing care. These results confirm an association between poor households and foregoing care: the probability that a member from a poor household foregoes care is 7 percentage points higher. However, household where the head has at least primary education are less likely to forego

care. To confirm robustness of these findings (see Tables A4 and A5): i) an alternative model specification was tested which included additional interaction terms for the explanatory variables with a strong correlation (Cohen, 1988) and ii) the original model was estimated on a sample excluding the top and bottom 10 percent of observations based on income. These robustness checks led in most cases to similar conclusions about the association between the factors tested and foregone care.



**Table 7 |** Probit: factors associated with foregone care

| | Coefficient | s.e. | Av. marg. effect |
|---|---|---|---|
| Proportion of children in hh | 0.074 | 0.224 | 0.021 |
| Proportion of elderly in hh | -0.437 | 0.369 | -0.126 |
| Age hh head | -0.000 | 0.004 | -0.000 |
| Christian hh head | -0.045 | 0.138 | -0.013 |
| Primary educ. hh head | -0.235* | 0.140 | -0.068* |
| Sec. or higher educ. hh head | -0.240* | 0.144 | -0.069* |
| Poor household | 0.234* | 0.109 | 0.067* |
| Middle income household | 0.131 | 0.106 | 0.038 |
| Hh has income from source other than dairy | -0.053 | 0.084 | -0.015 |
| Hh has income from diverse crops | 0.008 | 0.094 | 0.002 |
| Hh has health insurance | -0.023 | 0.117 | -0.007 |
| *N* | *1226* | | |

*Notes:* Log likelihood: -629.458 and LR $\chi 2$ test: 13.24

* p<0.10; ** p<0.05; *** p<0.01

## Conclusions and policy implications

This study shows that agricultural households in Kenya, like in most other LICs, are confronted with a wide range of uninsured shocks. We find that, among agricultural households, the most prevalent shock is illness or injury but these households are also frequently confronted with shocks that are specifically relevant for households in agriculture i.e. storage, crop or livestock disease, drop in sale prices of agricultural products, natural disaster and increase in agricultural input prices.

The agriculture-related shocks are more prevalent among the better off. This pro-rich concentration might relate to the fact that only households which actually have agricultural products for sale, and not only for self-consumption, can be affected by these shocks. Health

shocks are less unequally distributed and although costs associated with illness or injury are relatively, total expected costs are the highest because of the frequency of these shocks. These costs are mainly driven by out-of-pocket expenditures on drugs, inpatient and outpatient care. Expenditures on therapeutic appliances are typically almost zero. This might be due to limited access and limited usefulness of appliances like crutches and wheelchairs in rural environments with little paving.

Direct and indirect health costs can place a considerable burden on households: almost 2 percent of households incurred catastrophic expenditure in the past 12 months which would translate to approximately 80,000 affected household members across Kenya. Several mechanisms were identified at the household level to cope with the costs associated with the health shock. The main coping strategies were to i) use savings, ii) sell animals/farm land/assets and iii) ask for gifts/assistance/loans. The probability that the first strategy is used is lower among the poor, while the second is more likely to be used by households with an educated head and diversified sources of income. Further, there is a negative association between having health insurance and selling animals/farm land/assets in case of a health shock. Households with a higher proportion of children and with an educated household head are less associated with gifts/assistance/loans. All three of these strategies can have long-term negative economic consequence for households, as they may limit the ability to generate future income. Formal arrangements, such as borrowing from a bank and other assistance mechanisms including help from NGOs or religious institutions are used only sporadically, this is probably due to low availability of these services. The estimated probability to use savings is significantly higher among the poor.

One in five households reported foregoing necessary care in the last twelve months and poor households were found to be more likely to forego care with an average of 0.49 foregone health care contacts in the past twelve months. In more than half of the cases, foregone care was indeed related to affordability of medical fees or medication. Households with an educated head were less associated with foregoing care. This fuels concerns about the ability of the Kenyan health care system to cater for the lowest socioeconomic groups. Another third of the cases of foregone care were reported to be associated with low quality of care and unavailability of drugs. This suggests that problems persist in the health care system, not only on the demand side (financial protection and access) but also on the supply side (availability and quality of care). Since only 2 percent of foregone care was associated with travel costs or inability to take time off work, it seems that the direct costs of health care are more problematic than indirect costs for agricultural households. Most cases of foregone care were for acute and chronic conditions, while only very few households reported to have foregone preventive or maternity care. Given the sharply rising prevalence of chronic diseases

in LMIC (de-Graft Aikins et al., 2010) the expenditures for these conditions will add to the current burden of costs associated with infectious diseases, creating further challenges for households to obtain necessary care.

Our study confirms findings of Leive and Xu (2008) that coping strategies with potential long term negative impact such as using savings and selling assets to finance health care are widely used in Kenya. More importantly, our study shows that in addition to these problematic coping strategies, many households still frequently have to forego necessary care, especially the poorer, lower educated households. Our analysis suggests that the direct costs of health care utilization mostly limit the access to care and that the indirect costs stemming from travel and taking time off work are considerably less problematic for agricultural households. Generally, in most African countries, the health financing system is too weak to protect households from health shocks (Leive and Xu, 2008). Having health insurance can facilitate medical treatment and recovery, while reducing out-of-pocket expenses, when a family member falls ill (World Bank, 2014). Health insurance has indeed emerged as a frequently used instrument in current health financing reforms in LICs aimed at achieving universal coverage (Chomi et al., 2014). Such pre-payment mechanisms could provide an important avenue for policy makers to complement efforts to reduce poverty with programs to limit vulnerability of agricultural households. The Government of Kenya is making plans to implement a social health insurance program by transforming the NHIF into a universal health coverage program (Kimani et al., 2014). In March 2014 the NHIF announced an extension of insurance cover to cater for Kenyans working in the informal sector (Meso, 2014). However, the effectiveness of health insurance mechanisms is heavily debated (Gustafsson-Wright et al., 2011), the enrolment rates for health insurance schemes differ widely across SSA (Garrett et al., 2009) and operational difficulties in the introduction of health insurance schemes in many LICs hamper their successful development (De Allegri et al., 2009). Even for the often heavily subsidized schemes, enrolment rates remain low (Banerjee and Duflo, 2011), for community based health insurance schemes the literature consequently reports rates between 1 and 10 percent (De Allegri et al., 2009). While 89 percent of the respondents in our study area who claim to know what health insurance is, confirm that health insurance would be useful for their family, the enrolment rate among dairy farmers in this area three years after introduction of the health insurance scheme from the Dutch Health Insurance Fund remains low with 11.5 percent (Langedijk-Wilms and den Teuling, 2014) (for more information on the scheme see (van der Gaag et al., 2011)).

One of the potential explanations for the limited health insurance enrolment lies in the multitude of shocks that these agricultural households face. Even though illness and injury proved to be on average the most prevalent shock, households were also frequently confronted

with a range of other shocks. For a household with limited resources it might therefore be impossible to reserve a share of their limited resources to the protection of health shocks through premium payments for a health insurance. When the health insurance premium is relatively high, paying these costs implies that these resources can no longer be used to protect consumption in case of occurrence of other shocks like crop diseases or increases in agricultural input prices. In other words households need more flexible risk management devices that need to work for several types of risk simultaneously.

Other explanations for the limited enrolment could lie in a miscalculation of the return from the health insurance or liquidity constraints when households are requested to pay an annual premium upfront. In addition to these demand side challenges, respondents also perceived supply side shortcomings in the Kenyan health care sector as apparent from the one third of foregone care cases attributed to low quality of care and unavailability of drugs. These shortcomings on the health care supply side could also make investment in a health insurance less attractive.

The question that remains now is whether there are policy options other than health insurance schemes to protect agricultural households against the financial consequences of ill health. Given the multitude of shocks that these agricultural households face, savings through formal or informal mechanisms not tied to specific shocks, might be an important avenue to protect consumption in case of competing adverse events. Gertler et al. (2009) showed for Indonesia that access to microfinance and lending programs helps households self-insure their consumption in case of unexpected illness. Indonesian families faced with a health shock that lived far from a financial institution suffered greater losses in consumption than families living nearer the institutions. Other more general financial safety net mechanisms preventing households from depleting important income generating assets can also play an important role in protecting households against the consequences of ill health. Policies could also aim to reduce the riskiness of the environment, for example through improving preventive care, regulating prices of agriculture products or introducing risk-reducing technologies in agriculture (e.g. vaccination of livestock and irrigation systems).

## Limitations and further research

In interpreting the results it is important to recognize the limitations of this study. First, the inability to estimate causal effects derives from the lack of control for reverse causality between income and occurrence of shocks. We try to overcome this problem by using consumption instead of assets ownership as a measure of income since selling assets is often

used as coping strategy. However, this is not likely to completely solve the problem because reducing consumption is also known to be an important coping mechanism. Second, there is a possible socioeconomic reporting bias in self-reported information about the frequency and impact of specific shocks. Such heterogeneity across socioeconomic groups has been documented in health status reporting: given the same objective health, respondents with different socioeconomic backgrounds tend to report differently on their health because they have less information, lower health expectations and possibly different frames of reference (Bago d'Uva et al., 2008; Lindeboom and van Doorslaer 2004; Salomon et al., 2003; Bonfrer et al., 2014b). Little is known about reporting bias related to specific shocks but it is possible that a similar underreporting by the poor is present in our study. This implies that we might underestimate the impact of shocks on poorer households.



Notwithstanding these limitations, our study suggests that health shocks are an important risk to households and that effective pre-payment mechanisms are needed to protect households against the financial consequences of ill health. However, such mechanisms have to take into account the competing risks that agricultural households face, which make it difficult to reserve a share of their limited resources to the protection of health shocks through premium payments for a health insurance.

The findings from this study also have relevance for other SSA countries with similarly limited formal insurance and considerable reliance on agriculture as income generating source. Further research is necessary to establish whether the most effective protection against the consequences of ill health can be provided through health insurance, saving mechanisms or more general financial safety net mechanisms, and how these can best be implemented.

# Appendix

**Table A1a** | Correlations across factors associated with coping strategies

| | Proportion of children in hh | Proportion of elderly in hh | Age hh head | Christian hh head | Primary educ. hh head | Sec. or higher educ. hh head | Poor household | Middle income household | Hh has income from source other than dairy | Hh has income from diverse crops | Hh has with health insurance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of children in hh | 1.000 | | | | | | | | | | |
| Proportion of elderly in hh | -0.441*** | 1.000 | | | | | | | | | |
| Age hh head | **-0.456***** | **0.580***** | 1.000 | | | | | | | | |
| Christian hh head | -0.006 | 0.014 | 0.013 | 1.000 | | | | | | | |
| Primary educ. hh head | 0.059 | 0.001 | -0.037 | 0.067 | 1.000 | | | | | | |
| Sec. or higher educ. hh head | 0.095* | -0.180*** | -0.212*** | 0.086* | -0.777*** | 1.000 | | | | | |
| Poor household | 0.232*** | -0.097* | 0.005 | -0.073 | 0.215*** | -0.207*** | 1.000 | | | | |
| Middle income household | 0.120** | -0.112** | -0.070 | 0.056 | 0.007 | 0.004 | -0.465*** | 1.000 | | | |
| Hh has income from source other than dairy | -0.111** | -0.121** | 0.036 | -0.036 | -0.111** | 0.171*** | -0.065 | 0.022 | 1.000 | | |
| Hh has income from diverse crops | 0.045 | -0.029 | -0.090* | -0.013 | -0.115** | 0.176*** | -0.161*** | 0.036 | 0.076 | 1.000 | |
| Hh has health insurance | 0.017 | -0.113** | -0.090* | 0.017 | -0.311*** | 0.362*** | -0.242*** | -0.012 | 0.110** | 0.046 | 1.000 |

*Notes:* Explanatory variables with a strong (>0.4) and significant correlation were included as interaction terms, these are indicated in bold. Variables that are by definition correlated (proportion of children in hh versus proportion of elderly in hh, education levels of the household head and household income) were not included.

* p<0.10; ** p<0.05; *** p<0.01

**Table A1b |** Multivariate probit with interaction terms: factors associated with coping strategies in case of a health shock

| | Do nothing | | | Use savings | | | Sell animals/ farm land/ assets | | | Ask for gifts/ assistance/ loans | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect | Coeff. | s.e. | Av. marg. effect |
| Proportion of children in hh | -0.829 | 1.696 | -0.196 | -0.227 | 1.463 | -0.084 | 1.796 | 1.833 | 0.463 | -2.938* | 1.560 | -0.526* |
| Proportion of elderly in hh | 1.401 | 3.079 | 0.331 | -2.135 | 2.176 | -0.787 | 0.909 | 2.554 | 0.234 | 2.938 | 2.230 | 0.526 |
| Age hh head | -0.002 | 0.018 | -0.000 | -0.014 | 0.015 | -0.005 | 0.031 | 0.019 | 0.008 | -0.008 | 0.016 | -0.001 |
| Christian hh head | 0.143 | 0.283 | 0.032 | 0.000 | 0.227 | 0.000 | 0.063 | 0.268 | 0.016 | 0.385 | 0.318 | 0.058 |
| Primary educ. hh head | 0.278 | 0.298 | 0.067 | -0.296 | 0.234 | -0.110 | 0.448 | 0.293 | 0.117 | -0.352 | 0.256 | -0.063 |
| Sec. or higher educ. hh head | 0.220 | 0.316 | 0.052 | -0.284 | 0.248 | -0.103 | 0.592* | 0.311 | 0.155* | -0.636** | 0.290 | -0.109** |
| Poor household | 0.418* | 0.230 | 0.106* | -0.610*** | 0.186 | -0.231*** | 0.257 | 0.213 | 0.069 | 0.204 | 0.249 | 0.038 |
| Middle income household | 0.203 | 0.214 | 0.049 | -0.253 | 0.173 | -0.093 | 0.106 | 0.200 | 0.028 | 0.180 | 0.234 | 0.033 |
| Hh has income from source other than dairy | -0.376 | 0.168 | -0.090 | 0.180 | 0.138 | 0.066 | 0.272* | 0.161 | 0.070* | -0.246 | 0.181 | -0.044 |
| Hh has income from diverse crops | -0.060 | 0.173 | -0.014 | -0.009 | 0.146 | -0.003 | 0.332* | 0.174 | 0.081* | -0.042 | 0.193 | -0.008 |
| Hh has health insurance | 0.019 | 0.240 | 0.005 | -0.055 | 0.198 | -0.020 | -0.444* | 0.248 | -0.100* | -0.204 | 0.298 | -0.034 |
| Age hh head * proportion of children in hh | 0.018 | 0.034 | 0.004 | 0.004 | 0.029 | 0.002 | -0.027 | 0.035 | -0.007 | 0.035 | 0.031 | 0.006 |
| Age hh head * proportion of elderly in hh | -0.035 | 0.048 | -0.008 | 0.020 | 0.031 | 0.007 | -0.013 | 0.036 | -0.003 | -0.039 | 0.032 | -0.007 |
| *N* | *394* | | | *394* | | | *394* | | | *394* | | |

*Notes:* ρ21 = -0.728***, ρ31 = -0.101 , ρ41 = -0.122 , ρ32 = -0.415***, ρ42 = -0.325*** and ρ43 = 0.027.

Log likelihood: -640.239 and Wald $\chi 2$ test: 81.03

Data on shock level. Results are given for coping strategies with a probability larger than 0.05 in case of a health shock.

* p<0.10; ** p<0.05; *** p<0.01

**Table A2** | Multivariate probit without top and bottom 10% based on income: factors associated with coping strategies in case of a health shock

| | Do nothing | | | Use savings | | | Sell animals/ farm land/ assets | | | Ask for gifts/ assistance/ loans | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | s.e. | Av. marg. effect | Coefficient | s.e. | Av. marg. effect | Coefficient | s.e. | Av. marg. effect | Coefficient | s.e. | Av. marg. effect |
| Proportion of children in hh | -0.162 | 0.569 | -0.038 | -0.197 | 0.449 | -0.072 | 0.953* | 0.550 | 0.245* | -1.285** | 0.555 | -0.233** |
| Proportion of elderly in hh | -0.761 | 0.954 | -0.179 | -1.542** | 0.676 | -0.562** | 0.743 | 0.711 | 0.191 | -0.012 | 0.744 | -0.002 |
| Age hh head | 0.004 | 0.009 | 0.001 | -0.011 | 0.007 | -0.004 | 0.019** | 0.009 | 0.005** | 0.004 | 0.009 | 0.001 |
| Christian hh head | 0.254 | 0.318 | 0.054 | 0.032 | 0.241 | 0.012 | -0.029 | 0.293 | -0.008 | -0.001 | 0.317 | -0.000 |
| Primary educ. hh head | 0.486 | 0.364 | 0.116 | -0.376 | 0.271 | -0.137 | 0.592* | 0.353 | 0.151* | -0.187 | 0.302 | -0.034 |
| Sec. or higher educ. hh head | 0.466 | 0.382 | 0.112 | -0.372 | 0.286 | -0.132 | 0.765** | 0.373 | 0.199** | -0.451 | 0.344 | -0.078 |
| Poor household | 0.498* | 0.272 | 0.127* | -0.543** | 0.216 | -0.203** | 0.224 | 0.247 | 0.059 | 0.094 | 0.291 | 0.017 |
| Middle income household | 0.356 | 0.249 | 0.087 | -0.261 | 0.195 | -0.095 | 0.068 | 0.223 | 0.017 | 0.022 | 0.271 | 0.004 |
| Hh has income from source other than dairy | -0.348* | 0.185 | -0.082* | 0.123 | 0.152 | 0.045 | 0.364** | 0.177 | 0.093** | -0.281 | 0.204 | -0.051 |
| Hh has income from diverse crops | -0.090 | 0.196 | -0.022 | -0.019 | 0.167 | -0.007 | 0.277 | 0.201 | 0.068 | -0.117 | 0.221 | -0.022 |
| Hh has health insurance | -0.108 | 0.284 | -0.024 | 0.048 | 0.225 | 0.018 | -0.544* | 0.286 | -0.119* | -0.390 | 0.382 | -0.060 |

*Notes:* $\rho 21 = -0.687^{***}$, $\rho 31 = -0.216^{*}$, $\rho 41 = -0.144$, $\rho 32 = -0.369^{***}$, $\rho 42 = -0.293^{*}$ and $\rho 43 = 0.005$.

Log likelihood: -517.813 and Wald $\chi 2$ test: 67.23

Data on shock level. Results are given for coping strategies with a probability larger than 0.05 in case of a health shock.

* p<0.10; ** p<0.05; *** p<0.01

**Table A3 |** Probit: factors associated with any coping (0/1) in case of a health shock

| | Coefficient | s.e. |
|---|---|---|
| Proportion of children in hh | 0.025 | 0.238 |
| Proportion of elderly in hh | 0.196 | 0.467 |
| Age hh head | 0.000 | 0.709 |
| Christian hh head | -0.012 | 0.008 |
| Primary educ. hh head | -0.080 | 0.275 |
| Sec. or higher educ. hh head | -0.059 | 0.298 |
| Poor household | -0.104** | 0.312 |
| Middle income household | -0.054 | 0.224 |
| Hh has income from source other than dairy | 0.103*** | 0.211 |
| Hh has income from diverse crops | 0.024 | 0.164 |
| Hh has health insurance | -0.016 | 0.168 |
| *N* | *394* | |

*Notes:* Log likelihood: -166.843 and LR χ2 test: 19.20

LR $\chi^2$ test: 19.20

Data on shock level. Results are given for coping (0/1) in relation to the strategies with a probability larger than 0.05 in case of a health shock.

* p<0.10; ** p<0.05; *** p<0.01

**Table A4** | Probit with interaction terms: factors associated with foregone care

| | Coefficient | s.e. | Av. marg. effect |
|---|---|---|---|
| Proportion of children in hh | -1.112 | 0.803 | -0.319 |
| Proportion of elderly in hh | 0.664 | 1.673 | 0.191 |
| Age hh head | -0.011 | 0.009 | -0.003 |
| Christian hh head | -0.040 | 0.138 | -0.011 |
| Primary educ. hh head | -0.230 | 0.140 | -0.066 |
| Sec. or higher educ. hh head | -0.231 | 0.145 | -0.066 |
| Poor household | 0.237** | 0.110 | 0.068** |
| Middle income household | 0.139 | 0.106 | 0.040 |
| Hh has income from source other than dairy | -0.052 | 0.084 | -0.015 |
| Hh has income from diverse crops | 0.006 | 0.094 | 0.002 |
| Hh has health insurance | -0.029 | 0.118 | -0.008 |
| Age hh head * proportion of children in hh | 0.025 | 0.016 | 0.007 |
| Age hh head * proportion of elderly in hh | -0.012 | 0.024 | -0.003 |
| *N* | *1226* | | |

*Notes:* Log likelihood: -627.71 and LR $\chi 2$ test: 16.74

* p<0.10; ** p<0.05; *** p<0.01

**Table A5 |** Probit without top and bottom 10% based on income: factors associated with foregone care

| | Coeff. | s.e. | Av. marg. effect |
|---|---|---|---|
| Proportion of children in hh | -0.094 | 0.255 | -0.027 |
| Proportion of elderly in hh | -0.117 | 0.446 | -0.034 |
| Age hh head | -0.002 | 0.004 | -0.001 |
| Christian hh head | -0.053 | 0.148 | -0.015 |
| Primary educ. hh head | -0.382** | 0.154 | -0.109** |
| Sec. or higher educ. hh head | -0.422*** | 0.158 | -0.121*** |
| Poor household | 0.333** | 0.132 | 0.095** |
| Middle income household | 0.210* | 0.122 | 0.060* |
| Hh has income from source other than dairy | -0.092 | 0.093 | -0.026 |
| Hh has income from diverse crops | 0.061 | 0.106 | 0.017 |
| Hh has health insurance | 0.076 | 0.131 | 0.022 |
| *N* | *994* | | |

*Notes:* Log likelihood: -506.49 and LR $\chi 2$ test: 17.34

* p<0.10; ** p<0.05; *** p<0.01

# Chapter 3

# Does the distribution of health care utilization match needs in Africa?

Bonfrer, I., Van de Poel, E., Grimm, M.
van Doorslaer, E. 2014.

*Health Policy & Planning, 29(7):921-937.*

## Abstract

An equitable distribution of health care use, distributed according to people's needs instead of ability to pay, is an important goal featuring on many health policy agendas worldwide. However, relatively little is known about the extent to which this principle is violated across socio-economic groups in Sub-Saharan Africa (SSA). We examine cross-country comparative micro-data from eighteen SSA countries and find that considerable inequalities in health care use exist and vary across countries. For almost all countries studied, health care utilization is considerably higher among the rich. When decomposing these inequalities we find that wealth is the single most important driver. In twelve of the eighteen countries wealth is responsible for more than half of total inequality in the use of care, and in eight countries wealth even explains more of the inequality than need, education, employment, marital status and urbanicity together. For the richer countries, notably Mauritius, Namibia, South Africa and Swaziland, the contribution of wealth is typically less important. Since the bulk of inequality is not related to need for care and poor people use less care because they do not have the ability to pay, health care utilization in these countries is to a large extent unfairly distributed. The weak average relationship between need for and use of health care and the potential reporting heterogeneity in self-reported health across socio-economic groups imply that our findings are likely to even underestimate actual inequities in health care. At a macro level, we find that a better match of needs and use is realized in those countries with better governance and more physicians. Given the absence of social health insurance in most of these countries, policies that aim to reduce inequities in access to and use of health care must include an enhanced capacity of the poor to generate income.

## Introduction

The extent to which health care use is distributed equitably, i.e. according to people's needs rather than ability to pay, is an important goal featuring on many health policy agendas worldwide. Income-related inequities in health care delivery have been documented for OECD countries and some high income Asian countries (Lu et al., 2007; van Doorslaer et al., 2000; van Doorslaer and Masseria, 2004; van Doorslaer et al., 2004) but comparative studies for lower income settings, in particular Sub-Saharan Africa (SSA) are scarce. The widely reported fact that health outcomes in Africa are poor in general, tends to obscure the existence of a steep socio-economic gradient in these outcomes. Gwatkin et al. (2007) find that socio-economic inequalities in under-five mortality, underweight and diarrhoea are considerable in SSA and to the disadvantage of the poor. The existence of these inequalities is not only a societal concern in itself, their persistence may also cement a possible health-poverty trap that can retard economic growth (Sala-i-Martin, 2005; Strauss and Thomas, 1998). A fair(er) distribution of health care delivery is therefore integral to success in reaching the targets of the MDGs related directly and indirectly to health (United Nations 2008).



The literature on socioeconomic inequalities in health care delivery in SSA is surprisingly thin. Earlier work has focused on access to maternal and child care (Cissé et al., 2007; De Brouwere and Van Lerberghe, 2001; Gwatkin et al., 2007; Magadi et al., 2003; Schellenberg et al., 2003; Zere and McIntyre, 2003; Zere et al., 2011) or on interventions for specific conditions such as HIV/AIDS (Loewenson, 2007; Scott et al., 2005). While maternal and child care are indeed crucial components of emerging health care systems, they only represent one segment of the system and consist of largely anticipated and relatively affordable services. Moreover, health inequities may widen in the near future when the sharply rising prevalence of chronic diseases (de-Graft et al., 2010) will add to the currently dominant burden of infectious diseases, creating further challenges for health care systems.

This paper aims to fill a gap in our current knowledge by measuring, comparing and decomposing inequalities in health care delivery beyond those observed in child and maternity care and drawing policy implications from this. We document and explain inequalities in health care delivery across SSA using rank-based measurement methods as outlined in O'Donnell et al. (2008). We use data from Demographic and Health Surveys (DHS) and World Health Surveys (WHS) from a set of eighteen countries in SSA.

The remainder starts with a description of our data and methods. This is followed by results on inequalities in health care utilization and the factors driving these. Thereafter we discuss limitations in the application of conventional tools to measure unfair inequalities in health

care delivery in SSA and the potential downward bias these have on the results presented. We end with a conclusion and three policy implications.

## Methods

### Data

We use nationally representative data from eighteen SSA countries for which a WHS and - in most cases – also a DHS was available. We use WHS data to study health care utilization among the general population and DHS data to investigate the utilization of maternity related care. Table 1 shows the countries included, the years in which the surveys took place and sample sizes for both WHS (adults and children) and DHS (children). The WHS sample sizes range from 1827 (Comoros) to 5524 (Malawi) respondents and for the DHS from 1989 (Comoros) to 14238 (Mali) respondents.

In addition to these micro level data, we use two sources of macro level data: the World Development Indicators (World Bank, 2010b) and the World Bank Governance Indicators (Kaufmann et al., 2010). These contain information on economic performance, population health and governance quality. Table 1 shows that all countries in our sample belong to the group of lower and middle-income countries, but vary widely in their GDP, population size, population health and education levels.

### World Health Surveys

The WHS were collected by the World Health Organization (WHO) in 2003 across a large set of countries and provide information on both household and individual level, with one adult per household randomly selected for an in-depth interview. The WHS contain detailed data on adults' health status, allowing for more extensive measurement of needs than most other commonly available data sets. However, the information on health care use is more limited. Respondents are asked about inpatient care use in the last five years and – *only* if the respondent has used no inpatient care – about his/her outpatient care use. This routing impedes separate analysis of outpatient care use. Therefore, we investigate inequities in the use of any care in the last year and inpatient care in the last five years.

Need for medical care is proxied by a rich set of 41 mostly self-reported health problems. Self-assessed health is measured on a five point scale from very good to very bad. For six chronic diseases – arthritis, angina, asthma, depression, psychosis and diabetes – respondents are asked about diagnosis and symptoms experienced in the last twelve months. We applied the algorithms derived by Moussavi et al. (2007) for the detection of conditions from these

questions to define indicators of these six chronic diseases. In our models these conditions are represented by separate indicators for each disease but for the sake of parsimony in summary Table A1 in the appendix, these are combined in *chronically ill* indicating whether a respondent has at least one of the chronic illnesses. Furthermore we indicate whether respondents report to suffer from any limitations in the eight WHO health domains: mobility, self-care, pain and discomfort, cognition, interpersonal, vision, sleeping and depression. As for the chronic diseases, these limitations are used in the models as separate indicators but reported as *limitation in any health domain* in Table A1 indicating whether a respondent has at least one moderate limitation. We also have indicators for an observed hearing problem, vision problem, use of cane or walker, walking difficulties, partial paralyses, continual cough, shortness of breath, mental problem, other health problem or limb amputation. Table A1 contains a single dummy variable *observed health problem* which is one if at least one problem was observed. Furthermore, we have indicator variables for reported symptoms of tuberculosis (TB) in the last year or the use of TB medication in the last two weeks; for reported oral problems or the use of medication for the mouth or teeth in the last year; for being involved in an accident in the last year and for women having given birth in the last year or the last five years. Demographics are captured by a set of age/gender indicators. The summary Table A1 only contains a variable for gender (1 = female) and a continuous variable for age.



The non-need related determinants of health care utilization consist of marital status, occupational status (no work as reference category) and highest educational achievement (no education as reference category). While these are used as separate indicators in the analysis, the summary Table A1 simply contains the dichotomous variable primary or higher education. To measure socio-economic status, we used wealth quintiles (wealth very low as reference category) derived from a wealth index that was constructed using principal component analysis on a set of variables related to household dwelling characteristics and asset ownership[2] (Filmer and Pritchett, 2001). Most of the DHS surveys are released with a wealth index, but for three DHS and for the WHS we had to construct a similar wealth index from the assets and housing characteristics included in the dataset. Rural-urban differences are captured by an indicator for urban versus rural areas.

[2] The WHS also contains expenditure data, but due to the rather concise set of survey questions these tend to be biased downward (Xu et al. 2009). For this reason, and for consistency with the DHS which has no expenditure or income data, we use the wealth index to proxy socio-economic status.

**Table 1** | Data and country characteristics

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample size | | | | | | | | | | | | | | | | | | |
| WHS | 4942 | 4767 | 1827 | 3048 | 3227 | 5085 | 4073 | 4627 | 5524 | 4616 | 3464 | 3966 | 4361 | 3223 | 2587 | 3058 | 4141 | 4228 |
| DHS, for child mortality calculations | 10645 | 5635 | 1989 | 4835 | 1992 | 9861 | 2992 | 6079 | 10915 | 14238 | n/a | n/a | 5168 | 10933 | n/a | 2812 | 6401 | 5247 |
| DHS, for other calculations | 8142 | 4414 | 921 | 3858 | 1477 | 3873 | 2385 | 5082 | 8045 | 10793 | n/a | n/a | 3685 | 2847 | n/a | 2034 | 5096 | 3915 |
| Data collection year | | | | | | | | | | | | | | | | | | |
| WHS | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 | 2003 |
| DHS | 2003 | 2004 | 1996 | 2005 | 1998 | 2005 | 2008 | 2008 | 2004 | 2006 | n/a | n/a | 2006 | 2005 | n/a | 2006 | 2007 | 2005 |
| Country characteristics | | | | | | | | | | | | | | | | | | |
| Population (x 100,000) | 129 | 94 | 6 | 33 | 185 | 709 | 210 | 340 | 129 | 113 | 28 | 12 | 19 | 107 | 461 | 11 | 112 | 125 |
| Gini index | 40 | 40 | 64 | 47 | 48 | 30 | n/a | 48 | 39 | 40 | n/a | n/a | n/a | 41 | n/a | 51 | 42 | n/a |
| GDP per capita, PPP (current int. $) | 941 | 862 | 1064 | 3090 | 1485 | 494 | 1050 | 1193 | 557 | 897 | 1496 | 9078 | 4575 | 1431 | 7522 | 3951 | 1001 | n/a |
| Primary education completed (%) | 28 | 33 | 63 | 55 | 45 | 35 | 68 | 88 | 59 | 39 | 44 | 98 | 93 | 45 | 95 | 58 | 61 | 83 |
| Life expectancy at birth, 2009 | 53 | 49 | 66 | 54 | 58 | 56 | 57 | 55 | 54 | 49 | 57 | 73 | 62 | 56 | 52 | 46 | 46 | 45 |
| Physicians (per 1000 people) | 0.05 | 0.04 | 0.15 | 0.20 | 0.12 | 0.03 | 0.15 | 0.14 | 0.02 | 0.08 | 0.11 | 1.06 | 0.30 | 0.06 | 0.77 | 0.16 | 0.12 | 0.16 |
| Expenditure | | | | | | | | | | | | | | | | | | |
| Total health expenditure (% of GDP) | 6 | 6 | 3 | 3 | 4 | 5 | 7 | 4 | 6 | 6 | 3 | 4 | 7 | 5 | 9 | 5 | 7 | n/a |
| OOP health expenditure (% of health expenditure) | 49 | 50 | 43 | 50 | 72 | 34 | 49 | 47 | 12 | 55 | 28 | 36 | 5 | 55 | 14 | 17 | 29 | n/a |

*Notes:* authors' calculations based on World Health Surveys (2003), Demographic & Health Surveys (1996 - 2008) and World Development Indicators (2007 - 2009)

Abbreviations of the countries represent: Burkina Faso, Chad, Comoros, Congo, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mali, Mauritania, Mauritius, Namibia, Senegal, South Africa, Swaziland, Zambia and Zimbabwe.

### Demographic and Health Surveys

The DHS data have the advantage of being updated regularly and being available for many countries, but they only contain information on health care use and health status of women at childbearing age and their children. Descriptive statistics of all variables are shown in Table A2 in the appendix.

To measure health care use, we construct an indicator of whether the child's mother has received sufficient antenatal care (defined as at least four antenatal care visits to a skilled health worker) and whether there was skilled birth attendance. Both outcome measures are used worldwide, including in the MDGs, to monitor progress in equitable access to mother and child care (United Nations, 2010a).



To investigate heterogeneity in self-reported health, we use information on children's health status, based on both reports from the mother and on objective anthropometric measurements (height and weight) performed by skilled interviewers. These include indicators for stunting and underweight, derived from continuous z-scores (World Health Organization, 2011). Stunting is a situation in which children fail to gain sufficient height given their age, a measure of long term malnutrition. Underweight describes a situation where a child weighs less than expected given his or her age and is a measure of both acute and chronic malnutrition (Wagstaff and Watanabe, 2000). The measures reported by the mother include indicators for episodes of diarrhoea, acute respiratory infection (ARI) and fever in the four weeks preceding the survey. These three self-reported measures are important proximate determinants of stunting and underweight (Caulfield et al., 2004; Rice et al., 2000; Sahib El-Radhi et al., 2008) and, eventually, also child mortality (Pelletier et al., 1993; Verwimp, 2012). Indicator variables for under-one (U1M) and under-five mortality (U5M) were constructed using information about children born between 1 and 10 years before the survey.[3] Self-reported mortality rates may also be affected by reporting bias. Gross under-reporting of deaths is common in certain SSA countries, but over-reporting of deaths may occur as well (Feeney, 2001; World Health Organization, 2006a). Inaccurate reporting can derive from simple failure of respondents to report known deaths within the stipulated reference period, taboo against talking about deaths and from confusion over household membership (Arudo et al., 2003; Curtis, 1995; Ndong et al., 1994; Stanton et al., 2001). We therefore consider mortality rates as another (quasi) self-reported health outcome instead of an objective measure.

[3] We also calculated under-five mortality rates for those children born between 15 and 5 years before the survey and confirmed results were very similar. Going back further in time has the advantage that there is full information on children's survival up to age 5, but the disadvantage that household living conditions at the time of survey are less likely to relate to those to children born 15 years ago. Restricting the sample to children born in 5-10 years before the survey did not give sufficient sample size for many of the countries under study.

## Measuring and decomposing inequality and inequity in health care delivery

We measure socio-economic inequalities in health care use, i.e. variation in health care use across socioeconomic status, by means of a corrected concentration index as suggested by Erreygers (2009) which is appropriate when the variable of interest is dichotomous.[4] The Erreygers-corrected concentration index is calculated as:

$$CCI(y)=8\ cov(y_i,R_i) \tag{1}$$

where $y_i$ refers to the health care use of individual $i$ and $R_i$ to his/her fractional rank in the socio-economic distribution. Positive values of CCI indicate a disproportionate concentration of $y$ among the rich and vice versa. Wagstaff et al. (2003) have suggested a decomposition technique to identify the underlying drivers of socio-economic inequality in health care utilization. If the health care variable of interest $y_i$ can be explained by a linear regression[5] on $K$ need related variables $x_k$ and $J$ non-need related variables $z_j$, i.e.:

$$y_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{ik} + \sum_{j=1}^{J} \beta_j z_{ij} + \varepsilon_i \tag{2}$$

then the CCI of $y$ can be written as (Erreygers, 2009; Wagstaff et al., 2003):

$$CCI(y) = 4\left[\sum_{k=1}^{K} \beta_k \bar{x}_k CI(x_k) + \sum_{j=1}^{J} \beta_j \bar{z}_j CI(z_j) + GC_\varepsilon\right] \tag{3}$$

with $\bar{x}_k$ and $\bar{z}_j$ representing the means of $x_k$ and $z_j$ respectively, and $CI(x_k)$ and $CI(z_j)$ their concentration indices, $GC_\varepsilon$ is a residual term. Equation (3) illustrates that socio-economic inequality in health care utilization is a weighted sum of the inequalities in its determinants, with the weights defined by the 'semi-elasticities' (regression coefficients evaluated at the means) and a residual term. The advantage of this decomposition is that it allows ascertaining to what extent the various factors 'contribute' to inequality in health care use. The higher this inequality (CI) or the semi-elasticity, the higher the contribution.

Socio-economic inequalities in health care utilization are only considered unfair, or inequitable, when these do not correspond to differences in need for health care across socioeconomic groups. The literature differentiates between "horizontal" and "vertical" equity. Horizontal equity means that individuals in equal need for care should receive equal amounts of care irrespective of other characteristics such as socioeconomic status or area

[4] Erreygers (2009) has shown that the CI, when applied to dichotomous variables, has considerable shortcomings, most importantly that it fails to satisfy the mirror condition (inequality in health does not "mirror" inequality in ill-health). This is especially important in cross country comparisons, as there tends to be great variation in the mean of outcomes between countries.

[5] The decomposition can also be used in the context of non-linear models, but at the expense of introducing approximation errors (van Doorslaer et al. 2004).

of residence. Vertical equity describes the extent to which persons with greater medical needs are treated more favourably (Wagstaff and van Doorslaer, 2000). In line with existing literature, this study focuses on horizontal inequity. An index of horizontal inequity $I$ can be obtained by subtracting the need contributions in (3) from the corrected concentration index:

$$I = CCI(y) - 4 \sum_{k=1}^{K} \beta_k \bar{x}_k CI(x_k) \quad (4)$$

which reflects any "unfair" differences in health care utilization.

We first estimate the CCI (Equation (1)) and I (Equation (4)) for each country for all health care use variables. We then estimate a linear probability model as specified in Equation (2) with need related variables $x_k$ and non-need related variables $z_j$ on the probability of any care use and inpatient care use.

We use the linear probability models to decompose the CCI (see Equation (3)) into five factors: need, wealth, education, other non-need and an error term. For any variable to contribute to inequality in health care use, two conditions have to hold: (i) it needs to be correlated with use and (ii) it needs to be unequally distributed across socio-economic status as measured by the CCI[6].

For the sake of parsimony in the linear probability models and the cross-country analysis, we aggregate all 41 need related variables into a single ill-health index using factor analysis. As a sensitivity check we also estimate the models with the full set of need related variables. The decomposition is initially based on the full set of need indicators but subsequently also grouped into one factor for ease of interpretation. As this paper is only concerned with measuring socioeconomic inequalities, we refer to socio-economic inequalities as "inequalities" in the remainder.

**Measuring cross-country differences in health care system responsiveness to needs**

We complement our micro level analyses with some macro level trends in the responsiveness of health care use to needs by performing an exploratory cross-country correlation analysis. We use the regression coefficient of the ill-health index from our linear probability model as a crude proxy for the responsiveness of a country's health care system to the needs of its population. We correlate this proxy with eight macro-level indicators of economic and social development: GDP per capita, primary completion rate, urban population (percent of total), physicians (per 1000 people) and four indicators for the quality of governance (voice &

[6] Estimated concentration indices of all covariates can be obtained upon request from the authors.

accountability, government effectiveness, rule of law and control of corruption) as obtained from the World Bank governance indicators (Kaufmann et al., 2010). Given the limited number of observations and the lack of panel data, we abstain from regression analysis.

## Results

### Descriptive statistics

Tables A1 and A2 show descriptive statistics of all covariates and dependent variables used from the WHS and DHS data respectively. Both utilization of any health care in the last year and inpatient care in the last 5 years are highest in Mauritius, 52 percent and 32 percent respectively, while Ethiopia and Swaziland have the lowest use of inpatient care, 4 percent and 6 percent respectively. Ethiopia also has the lowest use of antenatal care and skilled birth attendance (17 percent and 18 percent respectively), while this is among the highest in Swaziland (77 percent and 80 percent respectively).

### Inequality in maternity care use (DHS data)

Table 2 shows estimated corrected concentration indices for the use of sufficient antenatal care and skilled birth attendance. Since ideally (the mothers of) all children should receive these interventions, the need for these types of health care use is homogeneous across the sample, irrespective of income and education. This means that any measured inequality directly implies inequity. Both forms of maternal care are more concentrated among the better off in all countries, with estimated corrected concentration indices for antenatal care ranging from 0.07 in Zambia to 0.39 in Comoros, and those for skilled birth attendance from 0.17 in Ethiopia to 0.66 in Senegal. The rank correlation between inequality in the use of antenatal care and skilled birth attendance is insignificant (Spearman's rho = 0.356 and p = 0.192) but is large and significant when excluding outlier Zambia (Spearman's rho = 0.622 and p = 0.018).

### Inequality in general health care use (WHS data)

Table 2 also presents CCIs for any care and inpatient care and illustrates that again considerable inequalities in favour of the rich exist. Countries with lower inequality in the utilization of any care also have lower inequality in the use of inpatient care (Spearman's rho = 0.631 and p = 0.005). In only one country – Mauritius, by far the richest in our sample – health care use is more concentrated among the poor. The largest inequality is found in Côte d'Ivoire (0.16) while no significant inequalities were obtained for Zimbabwe. For inpatient care we find that inequalities are relatively large again in Côte d'Ivoire (0.08) and in South Africa (0.11). Inequality is virtually absent in Mali which is largely driven by the very low level of utilization (3 percent, Table A1). Comparing inequality in maternal care (DHS) with those

in general care (WHS) reveals that countries that do well on maternity care also do well on any care (Spearman's rho = 0.572, 0.580 with p = 0.032, 0.030 for sufficient antenatal care and skilled birth attendance respectively), while this is not the case for inpatient care.

Unlike for maternity care, cross-country comparisons of inequality in general health care use as measured by the CCI might partly reflect differences in the distribution of the need for care. In a later section we therefore decompose inequality in health care use and analyse to which extent the measured degree of inequality can be considered 'inequitable'.

## Explaining and decomposing inequalities in health care use

*Determinants of health care use*

Tables 3 and 4 show the estimated regression coefficients for need and non-need related factors on the probability of any care use and inpatient care use respectively. The results illustrate that in almost all countries, need – as measured by the ill-health index – is significant and positively associated with any health care use (15 out of 18 countries) and with inpatient care (12 out of 18 countries) but the effects are relatively weak. Regarding the non-need related variables, we find that being employed is in most countries positively correlated with any health care use but, surprisingly, not with inpatient care utilization. This might be explained by the fact that for employed people being hospitalized implies an indirect cost in terms of foregone earnings. Urbanicity is not significantly associated with any health care use, except for Zambia and Zimbabwe where any health care utilization is actually higher in rural areas. In Burkina Faso, Chad, Ethiopia and Mauritania people living in urban locations are more likely to use inpatient care. There is no strong correlation between primary education and the use of any care in most countries, while the relationship between having completed secondary or higher education and the use of any care is significant and negative in 12 out of 18 countries. Primary education is increasing the probability of using inpatient care in Chad, Kenya, Namibia and Zimbabwe, and only in the latter country this is also true for secondary and higher education. When the full set of need indicators is used instead of the index measure, the education-health care use relationship is positive in most countries, suggesting that the combined ill-health factor is not capturing as much of the need related variation as the full set of indicators and that this might bias the education-health care use relationship.[7] Higher wealth is associated with a higher probability of using care, but the coefficients are typically large and significant for the upper wealth quintile(s) only, indicating that in many of these countries large shares of the population are marginalized and only the (much) better off have better access to care.

[7] Results of the regression analysis using the full model can be obtained upon request from the authors.

**Table 2 |** Concentration indices (CI) for maternal and general health care and inequity indices (I) for general health care

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maternal care | | | | | | | | | | | | | | | | | | |
| Sufficient antenatal care (CI) | 0.15 | 0.27 | 0.39 | 0.23 | 0.37 | 0.21 | 0.25 | 0.25 | 0.15 | 0.30 | n/a | n/a | 0.11 | 0.28 | n/a | 0.10 | 0.07 | 0.13 |
| Skilled birth attendance (CI) | 0.35* | 0.33* | 0.47* | 0.26 | 0.49* | 0.17 | 0.44* | 0.46* | 0.29* | 0.36* | n/a | n/a | 0.34* | 0.66* | n/a | 0.34* | 0.54* | 0.30* |
| General health care | | | | | | | | | | | | | | | | | | |
| Any care (CI) | 0.11 | 0.09 | 0.11 | 0.08 | 0.16 | 0.05 | 0.11 | 0.07 | 0.07 | 0.05 | 0.12 | -0.06 | 0.03 | 0.10 | 0.08 | 0.07 | -0.04 | *-0.05* |
| Any care (I) | 0.12 | 0.10 | 0.10 | 0.06 | 0.15 | 0.07 | 0.13 | 0.12 | 0.09 | 0.05 | 0.13 | 0.00 | 0.05 | 0.08 | 0.06 | 0.03 | 0.01 | 0.01 |
| Inpatient care (CI) | 0.08** | 0.06** | 0.05** | 0.03** | 0.08** | 0.04 | 0.07** | 0.04 | 0.06 | *0.01*** | 0.09 | -0.10 | 0.06 | 0.04** | 0.11 | 0.07 | 0.03** | 0.05** |
| Inpatient care (I) | 0.08 | 0.06 | 0.04 | 0.02 | 0.08 | 0.04 | 0.08 | 0.06 | 0.06 | 0.00 | 0.10 | -0.04 | 0.06 | 0.03 | 0.10 | 0.04 | 0.06 | 0.05 |

*Notes:* country codes as indicated under Table 1

* CI skilled birth attendance differs significantly from CI sufficient antenatal care

** CI inpatient care differes significantly from CI any care

All CIs are significantly different from 0 at α=0,05 apart from those in italics

**Table 3** | Coefficients from linear regression on the use of any care in the last year

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ill-health index** | **0.05**** | **0.02**** | **0.04**** | **0.00** | **0.02*** | **0.04**** | **0.05**** | **0.09**** | **0.02*** | **-0.02**** | **0.03**** | **0.14**** | **0.07**** | **0.03**** | **0.05**** | **-0.01** | **0.02**** | **0.03**** |
| Demographics | | | | | | | | | | | | | | | | | | |
| Married | -0.04** | -0.01 | -0.02 | 0.03 | -0.06** | 0.00 | -0.03 | -0.02 | -0.02 | 0.03** | 0.05** | -0.04* | 0.00 | 0.05** | 0.02 | 0.01 | -0.04* | -0.01 |
| Manual work | 0.00 | 0.02** | 0.00 | 0.08** | -0.02 | 0.00 | 0.00 | 0.08** | 0.049** | 0.01 | -0.01 | 0.02 | 0.09** | 0.01 | 0.01 | 0.04* | 0.02 | -0.01 |
| Non manual work | 0.00 | 0.05** | 0.11* | 0.05* | 0.06* | 0.05 | 0.09** | 0.10** | 0.13** | 0.07* | 0.02 | 0.10** | 0.11** | 0.02 | 0.01 | 0.02 | 0.18** | 0.07* |
| Urban | 0.01 | 0.01 | -0.02 | 0.00 | -0.01 | 0.04 | 0.03 | 0.03 | -0.02 | -0.01 | -0.01 | 0.03* | 0.02 | -0.02 | 0.00 | -0.01 | -0.06** | -0.11** |
| Primary education | 0.09** | 0.01 | 0.01 | 0.00 | -0.02 | -0.01 | -0.02 | -0.01 | 0.03 | 0.01 | 0.05 | -0.01 | 0.02 | 0.01 | 0.00 | -0.01 | -0.09** | 0.00 |
| Secondary or higher | -0.02 | -0.02 | -0.01 | -0.07** | 0.01 | -0.02 | -0.17** | -0.06** | -0.20** | -0.05** | -0.03 | -0.11** | -0.07** | -0.06** | -0.04* | -0.04** | -0.23** | -0.04* |
| Wealth | | | | | | | | | | | | | | | | | | |
| Low | -0.01 | 0.06** | 0.03 | 0.04* | 0.04 | 0.01 | 0.04* | 0.02 | 0.03 | 0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.08** | 0.02 | -0.01 | -0.04 |
| Moderate | 0.02 | 0.05** | 0.03 | 0.09** | 0.04 | 0.02 | 0.03 | 0.02 | 0.06** | 0.03* | 0.03 | 0.00 | 0.00 | 0.02 | 0.06* | 0.07** | 0.05 | -0.01 |
| High | 0.03 | 0.08** | 0.11** | 0.08** | 0.11** | 0.05** | 0.09** | 0.11** | 0.07** | 0.03 | 0.13** | 0.04 | 0.03 | 0.14** | 0.07** | 0.07** | 0.02 | 0.05* |
| Very high | 0.13** | 0.13** | 0.13** | 0.11** | 0.18** | 0.06* | 0.15** | 0.13** | 0.14** | 0.08** | 0.16** | 0.01 | 0.07** | 0.12** | 0.17** | 0.08** | 0.10** | 0.10** |

*Notes:* country codes as indicated under Table 1

* significant at 5%; ** significant at 1%

**Table 4** | Coefficients from linear regression on the use of inpatient care in the last five years

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ill-health index** | **0.01** | **0.03**** | **0.04**** | **0.02**** | **0.04**** | **0.02**** | **0.04**** | **0.03**** | **0.01** | **0.00** | **0.05**** | **0.08**** | **0.04**** | **0.02*** | **0.04**** | **-0.01** | **0.00** | **0.02**** |
| Demographics | | | | | | | | | | | | | | | | | | |
| Married | 0.09** | 0.03* | 0.07** | 0.05** | 0.01 | 0.01 | 0.05** | 0.10** | 0.07** | 0.01* | 0.07** | 0.16** | 0.04** | 0.06** | 0.07** | 0.01 | 0.05** | 0.08** |
| Manual work | -0.03** | 0.02* | -0.02 | 0.07** | 0.00 | 0.00 | 0.00 | 0.00 | -0.05** | 0.00 | 0.00 | -0.14** | 0.00 | -0.03* | 0.00 | 0.03* | -0.02 | -0.06** |
| Non manual work | -0.09** | 0.00 | -0.01 | 0.06** | -0.01 | -0.01 | 0.02 | -0.05* | 0.02 | 0.00 | -0.02 | -0.10** | 0.01 | 0.00 | 0.05* | 0.00 | 0.09** | -0.03 |
| Urban | 0.08** | 0.04** | -0.02 | -0.03 | -0.02 | 0.04** | 0.02 | 0.02 | -0.01 | -0.01 | 0.10** | -0.01 | 0.02 | -0.01 | -0.06** | -0.01 | -0.01 | -0.04* |
| Primary education | 0.01 | 0.04* | 0.02 | 0.02 | -0.01 | 0.01 | 0.02 | 0.04* | 0.00 | 0.01 | 0.04 | 0.04 | 0.05** | -0.02 | 0.05 | 0.00 | 0.02 | 0.08** |
| Secondary or higher | 0.02 | -0.03 | -0.05 | -0.10** | 0.00 | -0.01 | -0.04* | 0.02 | -0.11** | -0.02** | -0.01 | -0.02 | -0.02 | -0.03 | 0.01 | -0.01 | -0.05** | 0.04** |
| Wealth | | | | | | | | | | | | | | | | | | |
| Low | 0.00 | 0.01 | 0.03 | 0.03 | 0.05** | 0.01 | -0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.03 | 0.07** | -0.01 | 0.01 | 0.02 | -0.03 | -0.01 |
| Moderate | 0.01 | 0.02 | 0.05 | 0.06** | 0.06** | 0.02** | 0.02 | -0.02 | 0.01 | 0.00 | 0.03 | -0.03 | 0.08** | 0.02 | 0.08** | 0.05** | -0.01 | 0.03 |
| High | 0.02 | 0.03* | 0.08* | 0.06** | 0.09** | 0.04** | 0.05** | 0.02 | 0.05** | 0.00 | 0.01 | -0.04 | 0.08** | 0.07** | 0.07* | 0.03* | 0.00 | 0.06** |
| Very high | 0.05* | 0.08** | 0.11** | 0.08** | 0.13** | 0.03** | 0.09** | 0.05* | 0.10** | 0.01 | 0.07** | -0.08** | 0.11** | 0.06** | 0.16** | 0.09** | 0.06* | 0.11** |

*Notes:* country codes as indicated under Table 1

* significant at 5%; ** significant at 1%

### Decomposition of inequalities in health care use

The decompositions of the CCI (Equation (3)) for the use of any care and inpatient care are shown in Figures 1 and 2 respectively, with the height of the bars representing the degree of inequality (CCIs in Table 2). For any variable to contribute to inequality in health care use, two conditions have to hold: (i) it needs to be correlated with use (Tables 3 and 4) and (ii) it needs to be unequally distributed across socio-economic status as measured by the concentration index[8]. For ease of interpretation, figures 1 and 2 show grouped contributions of need related variables, wealth, education and other non-need related variables (marital status, employment and urban/rural setting).



Figure 1 shows that inequality in the use of any care is largely driven by wealth itself; poor people use less care basically because they do not have the ability to pay. In twelve countries (Burkina Faso, Chad, Comoros, Congo, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mali, Mauritania and Senegal) the direct wealth contribution is responsible for considerably more than half of total inequality in the use of any care, and in eight countries (Burkina Faso, Chad, Comoros, Côte d'Ivoire, Malawi, Mali, Mauritania and Senegal) wealth explains more of the inequality in utilization than all other factors together. As shown in figures 1 and 2, the contributions for the "other non-need" category (other than wealth) which covers marital status, employment and urban/rural setting is rather small, highlighting the dominance of the wealth contributions. For some of the richer countries, notably Mauritius, Namibia, South Africa and Swaziland, the contribution of wealth is typically less important and smallest in Mauritius (9 percent). In Francophone countries (Burkina Faso, Chad, Comoros, Congo, Côte d'Ivoire, Mali, Mauritania and Senegal) the contribution of education is positive, while for most other, Anglophone countries, it tends to be negative. This seems to derive from the combined facts that higher education is typically more concentrated among the rich (positive CI) but also associated with a lower use of health care (negative coefficient) in quite some countries. The historical literature suggests that colonial policies explain a large part of the schooling differences observed between the former British and French colonies. In British more than in French colonies, efforts have been made to organize formal education to the local population. Today, the former British colonies still seem to hold an advantage. The two groups of colonies tend in fact to diverge in terms of total human capital, mainly on the secondary education side. Using matching techniques and controlling for initial ethnical and religious fragmentation, Cogneau (2003) shows that colonial power identity and the quality of the institutions they had set up left its mark on the way education developed in the post-colonial period. The generally lower level of education and greater disparity in conjunction with lower public health expenditure per capita in the Francophone countries in Western and Central Africa compared to the Anglophone countries in Southern Africa (Anyanwu

[8] Estimated concentration indices of all covariates can be obtained upon request from the authors.

and Erhijakpor, 2007; United Nations, 2010b) may explain why education tends to reinforce inequalities in health care utilization: the better educated appear to be capable of getting more out of a health care system than the less well educated if the system is of poor quality.

The distribution of need related variables contributes negatively to inequality in any health care utilization, implying that it makes use more concentrated among the poor, in two thirds of the countries, but only substantially (i.e. more than 75 percent) in Kenya, Mauritius and Zambia (see Figure 1). This stems from the combination of need being more concentrated among the poor (negative CI) and showing a clear positive relation with health care use (positive coefficient). In Comoros, Congo, Côte d'Ivoire, Senegal, South Africa and Swaziland need related variables contribute positively, which is mainly a result of the negative relationship (negative coefficient) between ill-health and health care use that exists for need variables in these countries. In sum, the decomposition results reveal that in most of these countries, need related variables only explain a rather small fraction of inequality in any health care use, indicating that the bulk of inequality is indeed driven by non-need variables and is therefore considered inequitable. This is also illustrated in the fourth row of Table 2, showing the inequity indices (I) for the use of any care (Equation (4)). Standardizing CIs for the distributions of need typically does not change the estimates very much. In six countries (Comoros, Congo, Côte d'Ivoire, Senegal, South Africa and Swaziland) it even *reduces* inequity. This is in sharp contrast to what is typically found in studies on OECD countries (Van Doorslaer and Masseria, 2004) and we return to the possible reasons for this finding in our later section on limitations.

Figure 2 shows that the decomposition results for inpatient care differ somewhat from those for any care, but the general pattern is similar. Inequality in the use of inpatient care is largely driven by non-need related factors, in particular wealth and to a much lesser extent by need. Only in Mauritius wealth contributes negatively to inequality in inpatient care, implying higher health care utilization among the lower income groups. In only five countries (Ghana, Kenya, Malawi, Mauritius and Zambia) the need variables jointly contribute negatively to inequality (see Figure 2). This implies that standardizing inequality in the use of inpatient care for differences in the distribution of need has little effect, even less so than for any care, as is shown by the inequity index *I* in row six of Table 2. Again, this will be further discussed in our section on limitations. The relatively large contributions of the other non-need related variables in Burkina Faso and Mauritania are mostly driven by urbanicity. As the use of inpatient care is much more dependent on the availability of hospitals, which are typically concentrated in urban areas, location is an important driver of inequalities in the provision of inpatient care in these countries. Education in most Francophone countries (apart from Congo) again shows a positive contribution to inequality, reinforcing the finding that education tends to raise socio-economic differences in health care utilization in these countries.

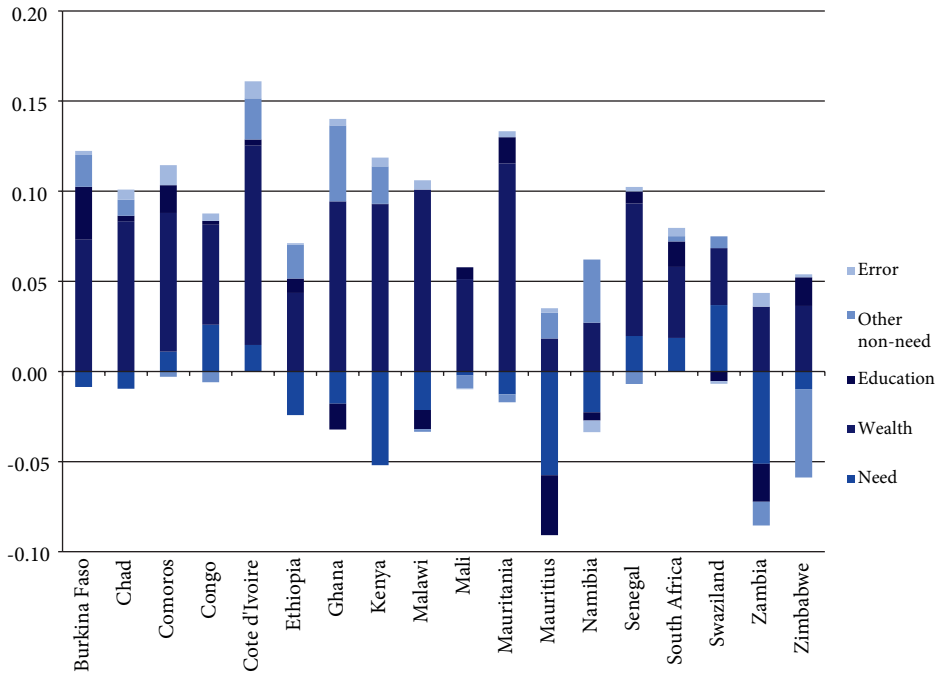


**Figure 1** | Decomposition concentration index of any care use

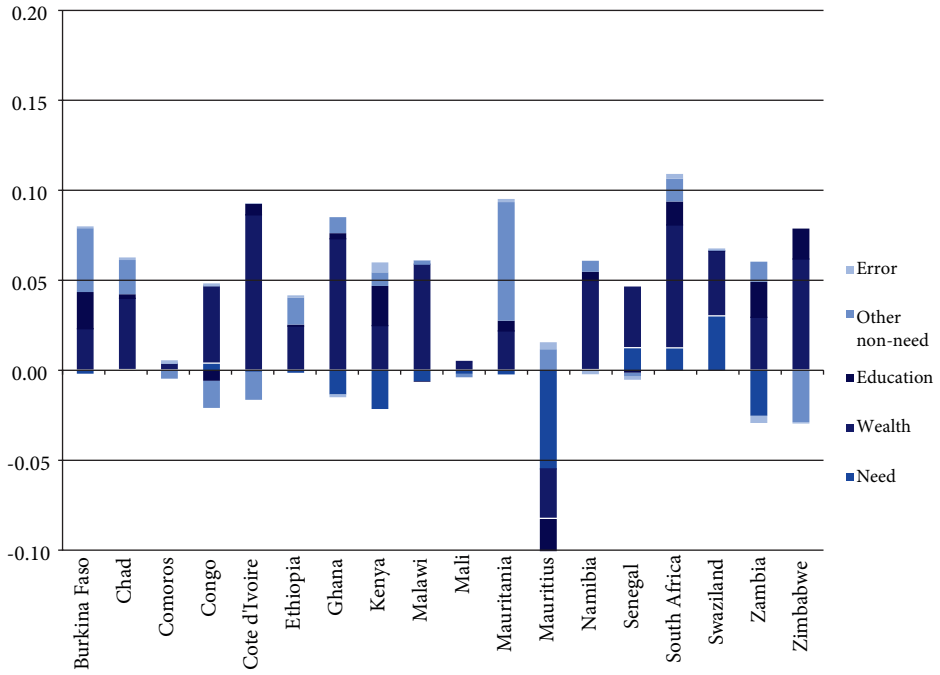


**Figure 2** | Decomposition concentration index of inpatient care use

### Cross-country differences in health care system responsiveness to needs

While there is considerable heterogeneity in the cross-country results, some clear trends in the responsiveness of health care use to need nonetheless do emerge from an exploratory correlation analysis at the macro level (see Table 5). We use the regression coefficient of the ill-health index in Tables 3 and 4 as a crude proxy for the responsiveness of a country's health care system to the needs of its population. In Table 5 we report correlations between this coefficient (as displayed in the first row in bold in Tables 3 and 4) and eight macro-level indicators of economic and social development. We find a large, positive and significant correlation between GDP per capita and the need responsiveness for any care in the last year as well as inpatient care in the last five years. The same holds for the primary education completion rate and the number of physicians per 1,000 inhabitants, with countries with more physicians displaying greater need responsiveness. However, and somewhat surprisingly, the percentage of the population living in urban areas does not correlate with need responsiveness for inpatient care where we would expect responsiveness to be better for those living closer to hospitals. In the literature good institutions are often considered as a precondition for adequate health care provision (see e.g. Deaton, 2006). We find that nmhjthree measures of good governance (voice & accountability, government effectiveness and the rule of law) are significantly and positively correlated with need responsiveness for any care. Government effectiveness also correlates positively with inpatient care responsiveness. While these correlations can obviously not be interpreted as causal evidence, they nonetheless suggest interesting research hypotheses that need testing in order to enhance our understanding of the causes of insufficient responsiveness to health care needs.

### Limitations in conventional equity measurement in low-income settings

While the decomposition results reveal interesting patterns, they also highlight the difficulty of trying to standardize the concentration index in general health care use for differences in the distribution of need. There are two important limitations in the conventional tools for measuring income-related inequity in health care use, as applied in this paper, especially in the context of low and middle income countries (LMICs). The first relates to the measurement of 'need for care' using indicators of self-reported health. These can suffer from reporting heterogeneity: given the same objective health, respondents with different socio-economic backgrounds tend to report differently on their health because they have less information, lower health expectations and possibly different frames of reference (Bago d'Uva et al., 2008; Lindeboom and van Doorslaer, 2004; Salomon et al., 2003). While this problem is not unique to LMIC, it is likely to be of greater importance in settings where awareness of health care needs is less widespread and more likely to be correlated with socio-economic status than in developed countries. Unfortunately, no objective health indicators are available in the WHS data that could be used to directly test this hypothesis. We therefore explore this issue

using DHS data by comparing inequalities in objective child health measures (stunting and underweight) with their self-reported proximate determinants (ARI, diarrhoea, fever). We would expect the CCIs to have the same sign and be of similar size for both measures. If this is not the case, we have an indication of reporting heterogeneity. Figure 3a-d shows plots of CCIs for underweight (x-axis) against CCIs for the self-reported measure (y-axis) respectively ARI, diarrhoea, fever and under-five mortality (U5M). All countries (except Swaziland) are above the diagonal, indicating that the self-reported measures of ill-health are less concentrated among the poor than the objective measures. For example, the inequality in underweight is greatest in Senegal (CCI -0.18), while the poor do not seem to report disproportionally more ARI and fever episodes than the rich (CCI resp. 0.07 and 0.01). Self-reported under-five mortality is also less disproportionately concentrated among the poor compared to the objective measure of underweight (Figure 3d).



**Table 5 |** Country-level correlations between need responsiveness and macro level indicators

| | Need-use correlate | |
|---|---|---|
| | **Any care** | **Inpatient care** |
| Need-use correlate | | |
| any care | 1.00 | – |
| inpatient care | 0.73* | 1.00 |
| Country characteristics | | |
| GDP per capita, PPP (int. $) | 0.54* | 0.55* |
| Primary completion rate | 0.63* | 0.51* |
| Urban population (% of total) | 0.02* | 0.44 |
| Physicians (per 1000 people) | 0.67* | 0.67* |
| Governance | | |
| Voice & accountability | 0.52* | 0.43 |
| Government effectiveness | 0.55* | 0.56* |
| Rule of law | 0.51* | 0.41 |
| Control of corruption | 0.46 | 0.41 |

*Notes:* Need responsiveness for any and inpatient care is measured by the coefficient of the ill-health index in Table 3 and Table 4 respectively. Macro-level indicators are taken from the World Development Indicators

* significant at 5%

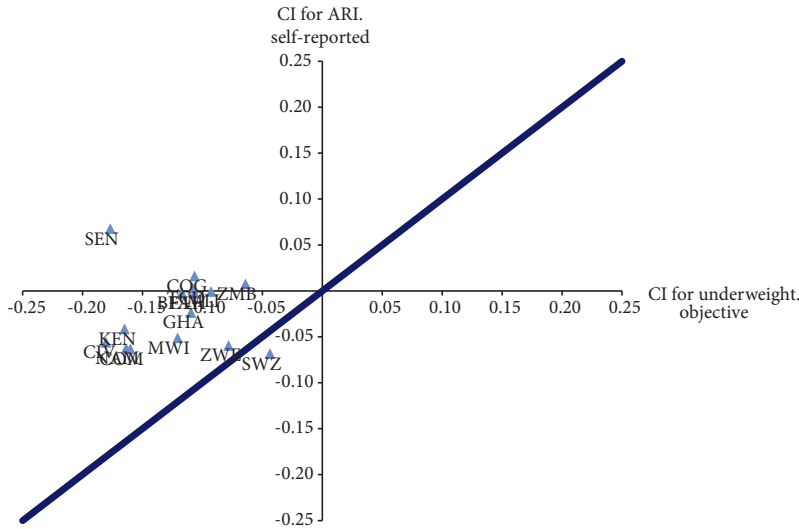


**Figure 3a |** Concentration indices (CI) for underweight and acute respiratory infection (ARI)

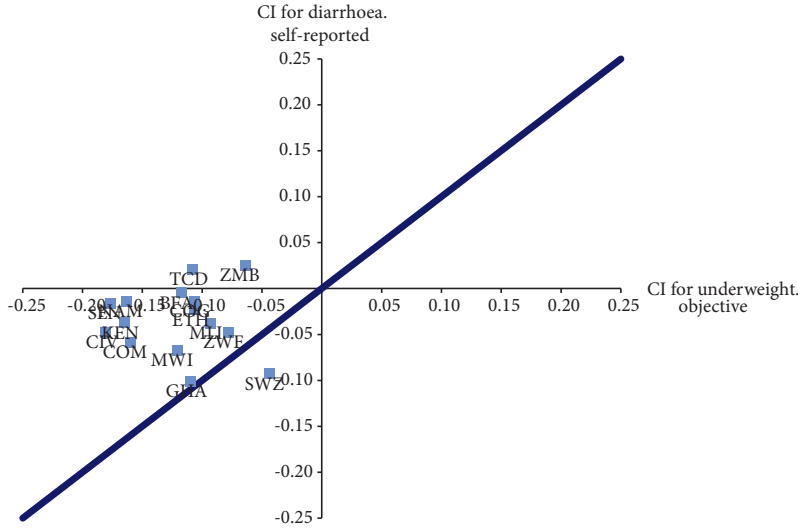


**Figure 3b |** Concentration indices (CI) for underweight and diarrhoea

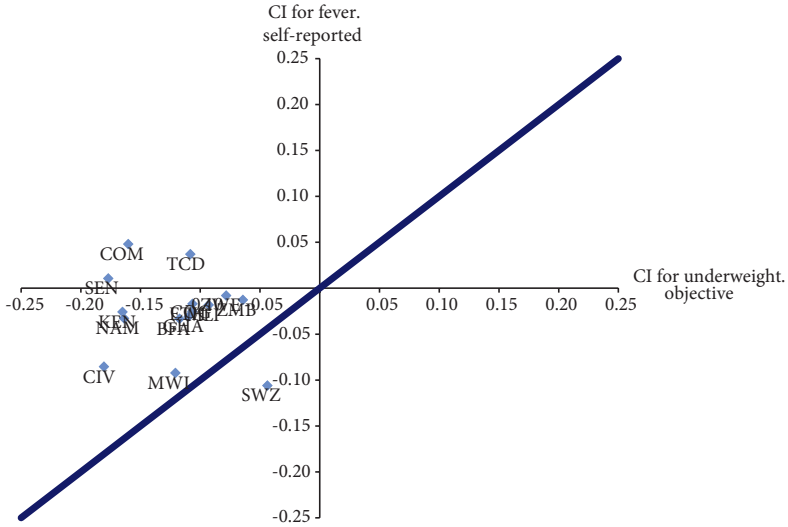


**Figure 3c |** Concentration indices (CI) for underweight and fever.

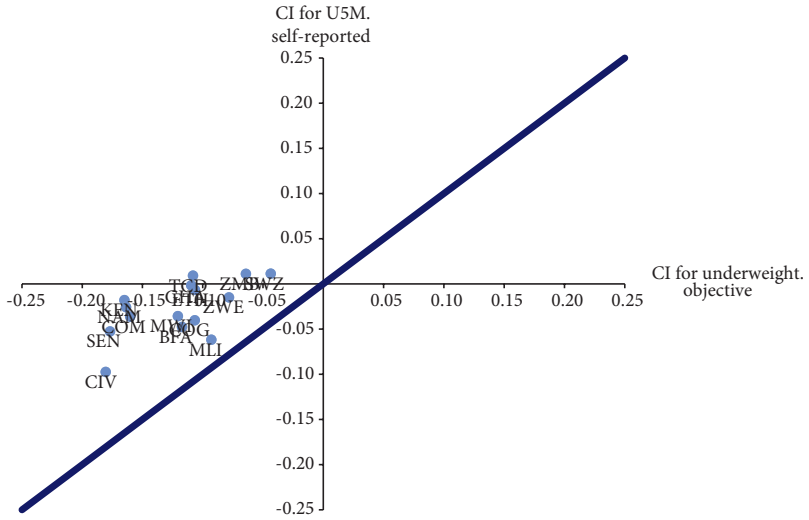


**Figure 3d |** Concentration indices (CI) for underweight and under-five mortality (U5M).

Figure 4 plots the same CCIs of the self-reported measures against the CCI of stunting – for parsimony all four figures are combined into one. It confirms the finding of a much weaker health-income gradient in the self-reported measures. While the latter are considered

proximate determinants of childhood malnutrition, they are no substitutes and hence one should be careful when interpreting these comparisons. The generally smaller inequality in self-reported measures does however suggest that poorer population groups may be underreporting their ill-health conditions compared to other, richer groups.

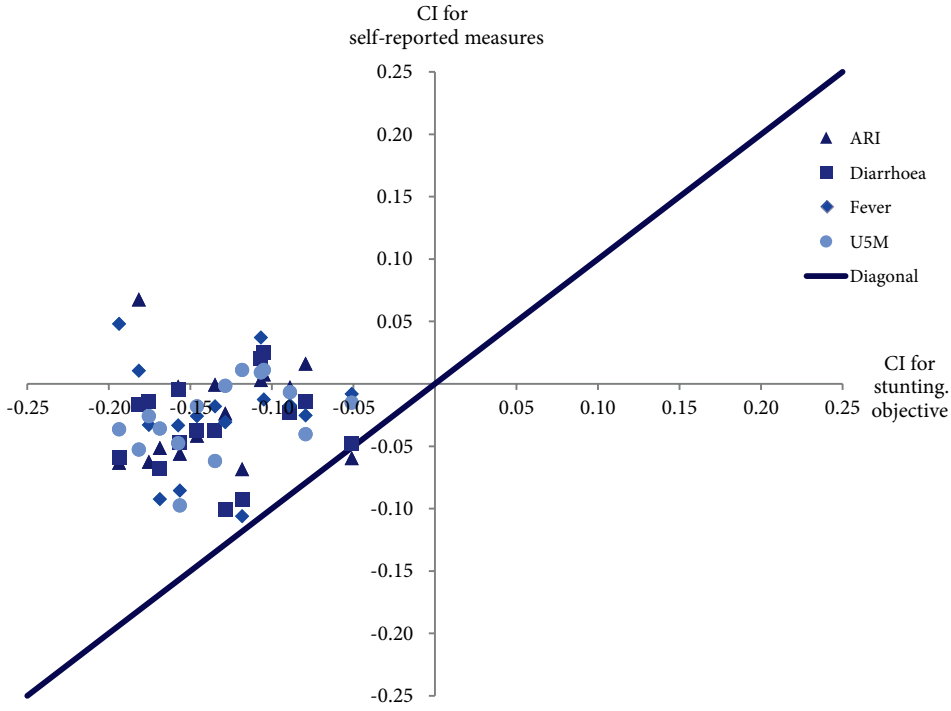


**Figure 4 |** Concentration indices (CI) for stunting and self-reported child health measures

The second limitation in the application of conventional methods for measuring equity in the delivery of health care in LMIC derives from the underlying assumption that, when measuring horizontal inequity in health care delivery, the average population relationship between the need for and the use of care (coefficients in Equation 3) is an appropriate vertical equity norm. This assumption has been referred to as 'on average, the system gets it right' (van Doorslaer and O'Donnell, 2010). While this seems a reasonable assumption in most OECD countries, it is very unlikely to hold, *on average*, in LMIC, where only a small proportion of the population can be expected to obtain access to appropriate health care when needed and a large part of the population foregoes care (Van de Poel et al. 2012). This is illustrated by the

rather small and often negative coefficients on the need indicators as shown in Tables 3 and 4. While important for deriving equity conclusions, a detailed study of vertical (in)equity is beyond the scope of this paper. We suffice here by stating that these limitations are likely to lead to an underestimation of actual inequities in health care.

## Conclusion

We examined the extent to which health care use in Africa is distributed according to people's needs rather than to their ability to pay. We did this separately for care delivered to mothers and children using DHS data and for more general adult use of out- and inpatient care using WHS data. The results for a set of 18 countries in Sub-Saharan Africa (SSA) confirm earlier findings (e.g. De Brouwere and Van Lerberghe, 2001; Gwatkin et al., 2007)) that the use of antenatal care and skilled birth attendance is disproportionately concentrated in women of higher socio-economic status. As the need for these services can be considered relatively homogenous across pregnant women, this is clearly an inequitable situation.



Adding to existing knowledge, we also find significant socio-economic inequalities in general use of health care services in all countries. The decomposition analysis demonstrates that the larger part of these inequalities is related to factors that are not indicators of need and can therefore be labelled as inequities. Our results suggest that socio-economic inequalities in both in- and outpatient care are mostly related to wealth itself, implying that the use of care is mostly determined by people's ability to pay for care, and, maybe surprisingly, not so much by their ill-health or need for care. The only exception to these findings is Mauritius, where inequities in both types of care are virtually absent, and wealth contributions are much smaller. Its distribution of medical care is much more related to variations in people's needs than to their socio-economic status. Clearly, given Mauritius' relatively high GDP, it is an outlier that more resembles the typical patterns observed in OECD countries and that outperforms all other SSA countries in terms of average health outcomes and supply of medical care. Exploratory cross-country comparisons suggest that countries which display a better need responsiveness are those with higher incomes, higher levels of education and with better governance and more effective institutions. Surprisingly we find that the need responsiveness of any care use is higher in countries with a higher urbanization rate but that this is not the case for inpatient care.

The results highlight three lessons for policy makers aiming to close the gap between needs and use of care. First, in the absence of health insurance coverage for the poor, any intervention that raises the income generating capacity of poor households is likely to have

considerable positive effects on health care use as well. Second, the unequal distribution of education also plays an important role in explaining health care inequity in Africa. This suggests that interventions that raise education levels among the worse off, thereby increasing the awareness of health needs and how to adequately respond to them, may prove to be a particularly effective route to reducing inequity. Third, an exploratory cross-country comparison demonstrates that indicators of good governance are positively associated with responsiveness to health needs. This suggests a potential role for good governance in improving health care equity.

Our analysis also draws attention to two important methodological problems encountered when measuring inequities in health care delivery in resource poor settings. The first one is the reporting bias in self-reported measures of ill-health which is specifically large among poorer respondents. To alleviate this problem future research should aim at obtaining better measures of need. The use of anchoring vignettes in the adjustment of reporting scales holds some promises in this respect (Bago d'Uva et al., 2011; Bago d'Uva et al., 2008), but their effectiveness in low income settings remains to be tested further.

The second shortcoming relates to the unlikely assumption of vertical equity being satisfied on average in each of these countries. The weak, and in some cases reversed, relationship between the need for and use of medical care does not appear to provide an estimate of adequate response to needs and is associated with an underestimation of inequities in health care delivery. If the average relationship between need and use is not an acceptable norm, then it deserves consideration to use others, like e.g. the average need-use relation in Mauritius for other SSA countries, or the average relationship holding for a group with better access, like the wealthier or those with higher education.

The answer to the question posed in the title of this paper is therefore negative: health care utilization does not match self-reported needs in SSA. Rather its distribution is much more determined by people's ability to pay and education. This generates further questions regarding wealth redistribution, risk sharing arrangements such as health insurance, the regulation of health systems in poor countries and the effectiveness of these options towards universal coverage. Conventional tools for measuring inequity in health care delivery underestimate inequities since the poor seem to under perceive and underreport their health needs and, on average, they themselves or the health care system also respond inadequately to these needs. Given the importance attached to equitable access by national and international health policy makers worldwide, it is vital to increase the income generating capacity of poor households and to develop more robust equity measures relevant to LMICs.

## Appendix

**Table A1** | Means of variables from WHS data (expressed as percentage unless indicated differently)

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Demographics | | | | | | | | | | | | | | | | | | |
| Gender (% female) | 53 | 53 | 55 | 53 | 43 | 52 | 55 | 58 | 58 | 42 | 61 | 52 | 59 | 48 | 52 | 54 | 55 | 64 |
| Age in years | 36 | 37 | 42 | 36 | 36 | 37 | 41 | 38 | 36 | 39 | 38 | 42 | 38 | 38 | 38 | 38 | 36 | 37 |
| Married | 75 | 69 | 51 | 25 | 38 | 66 | 56 | 60 | 65 | 57 | 62 | 67 | 30 | 60 | 34 | 47 | 55 | 59 |
| Manual work | 52 | 50 | 32 | 22 | 48 | 53 | 69 | 54 | 42 | 26 | 24 | 39 | 22 | 31 | 21 | 11 | 53 | 22 |
| Non manual work | 5 | 7 | 6 | 10 | 9 | 3 | 8 | 7 | 5 | 2 | 5 | 17 | 12 | 7 | 16 | 6 | 4 | 5 |
| Urban resident | 41 | 25 | 30 | 79 | 61 | 16 | 39 | 32 | 16 | 25 | 43 | 45 | 48 | 49 | 60 | 25 | 41 | 36 |
| Primary or higher education | 17 | 16 | 32 | 78 | 47 | 36 | 58 | 59 | 30 | 23 | 27 | 79 | 58 | 34 | 81 | 57 | 59 | 72 |
| Wealth | | | | | | | | | | | | | | | | | | |
| Low | 21 | 22 | 20 | 21 | 20 | 20 | 19 | 19 | 21 | 21 | 20 | 20 | 18 | 19 | 22 | 22 | 21 | 19 |
| Moderate | 20 | 20 | 19 | 19 | 19 | 19 | 20 | 19 | 20 | 19 | 21 | 19 | 20 | 21 | 20 | 18 | 19 | 19 |
| High | 20 | 19 | 19 | 18 | 19 | 19 | 21 | 21 | 19 | 18 | 20 | 18 | 21 | 21 | 18 | 20 | 19 | 22 |
| Very high | 20 | 16 | 18 | 18 | 17 | 20 | 19 | 22 | 16 | 18 | 18 | 19 | 21 | 19 | 21 | 22 | 17 | 22 |
| Self assessed health | | | | | | | | | | | | | | | | | | |
| Good | 43 | 37 | 34 | 18 | 37 | 30 | 35 | 39 | 24 | 30 | 43 | 42 | 29 | 31 | 33 | 15 | 31 | 29 |
| Moderate | 23 | 28 | 29 | 23 | 29 | 19 | 20 | 25 | 15 | 18 | 26 | 21 | 20 | 29 | 18 | 16 | 20 | 35 |
| Bad | 6 | 11 | 14 | 8 | 8 | 4 | 6 | 7 | 4 | 5 | 4 | 11 | 5 | 6 | 5 | 22 | 6 | 9 |
| Very bad | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 3 | 1 | 1 | 2 | 8 | 1 | 2 |

**Table A1 | *(Continued)***

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health status | | | | | | | | | | | | | | | | | | |
| Observed health problem | 14 | 38 | 12 | 10 | 15 | 16 | 11 | 20 | 6 | 6 | 12 | 20 | 11 | 13 | 16 | 8 | 12 | 15 |
| Limitations in health domain | 73 | 84 | 97 | 88 | 85 | 80 | 82 | 77 | 68 | 77 | 83 | 83 | 85 | 89 | 87 | 93 | 81 | 80 |
| Chronically ill | 39 | 52 | 36 | 29 | 34 | 45 | 30 | 36 | 46 | 25 | 41 | 33 | 31 | 36 | 35 | 32 | 23 | 28 |
| Tuberculosis | 2 | 3 | 3 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 3 | 1 | 3 | 1 | 2 | 2 | 2 | 3 |
| Has oral problem | 23 | 28 | 25 | 18 | 21 | 19 | 18 | 28 | 34 | 19 | 13 | 23 | 20 | 22 | 13 | 12 | 25 | 32 |
| Involved in accident | 6 | 5 | 5 | 4 | 10 | 2 | 8 | 12 | 9 | 3 | 3 | 7 | 5 | 3 | 6 | 3 | 6 | 4 |
| Delivery 1 year | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 2 |
| Delivery 5 years | 6 | 6 | 3 | 4 | 4 | 5 | 4 | 3 | 5 | 7 | 3 | 2 | 4 | 5 | 2 | 2 | 6 | 4 |
| Health care utilization | | | | | | | | | | | | | | | | | | |
| Any care | 22 | 10 | 27 | 14 | 28 | 18 | 29 | 34 | 35 | 11 | 22 | 52 | 23 | 23 | 19 | 8 | 35 | 34 |
| Inpatient care | 13 | 10 | 21 | 12 | 12 | 4 | 15 | 16 | 18 | 3 | 16 | 32 | 24 | 11 | 20 | 6 | 16 | 16 |

*Note:* country codes as indicated under Table 1

**Table A2** | Means of variables from DHS data (expressed as percentage unless indicated differently)

| | BFA | TCD | COM | COG | CIV | ETH | GHA | KEN | MWI | MLI | MRT | MUS | NAM | SEN | SAF | SWZ | ZMB | ZWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Child mortality | | | | | | | | | | | | | | | | | | |
| Under-one | 9 | 10 | 7 | 7 | 11 | 8 | 6 | 6 | 9 | 10 | n/a | n/a | 6 | 7 | n/a | 9 | 7 | 7 |
| Under-five | 14 | 14 | 9 | 9 | 15 | 10 | 7 | 7 | 11 | 14 | n/a | n/a | 7 | 9 | n/a | 10 | 9 | 8 |
| Health care utilization | | | | | | | | | | | | | | | | | | |
| Sufficient antenatal care | 19 | 25 | 50 | 76 | 41 | 17 | 78 | 47 | 56 | 35 | n/a | n/a | 77 | 38 | n/a | 81 | 59 | 70 |
| Skilled birth attendance | 59 | 32 | 52 | 88 | 62 | 18 | 71 | 45 | 56 | 48 | n/a | n/a | 80 | 49 | n/a | 74 | 48 | 79 |
| Self-reported health | | | | | | | | | | | | | | | | | | |
| Diarrhoea | 20 | 25 | 23 | 15 | 21 | 17 | 20 | 17 | 23 | 12 | n/a | n/a | 13 | 22 | n/a | 14 | 16 | 13 |
| Acute Respiratory Infection | 24 | 24 | 41 | 30 | 32 | 16 | 22 | 27 | 39 | 13 | n/a | n/a | 18 | 26 | n/a | 29 | 25 | 22 |
| Fever | 9 | 9 | 23 | 8 | 17 | 11 | 11 | 13 | 19 | 6 | n/a | n/a | 9 | 13 | n/a | 15 | 9 | 12 |
| Objective health | | | | | | | | | | | | | | | | | | |
| Stunting | 37 | 32 | 49 | 24 | 37 | 18 | 20 | 25 | 38 | 17 | n/a | n/a | 17 | 30 | n/a | 30 | 18 | 8 |
| Underweight | 38 | 39 | 34 | 23 | 23 | 43 | 23 | 29 | 48 | 34 | n/a | n/a | 24 | 17 | n/a | 22 | 38 | 28 |

*Note*: country codes as indicated under Table 1

# Chapter 4

# The effects of Ghana's National Health Insurance Scheme on maternal health care utilization

Bonfrer, I., Breebaart, L., Van de Poel, E.

*Under review.*

## Abstract

Increasing equitable access to health care is one of the main challenges African policy makers are facing today. In 2005 the Ghanaian government implemented the National Health Insurance Scheme (NHIS) and we evaluate the effects of NHIS enrolment on maternal healthcare use. We exploit child-level data from births between 2006 and 2008 in the Ghana Demographic and Health Survey. Propensity score matching is applied to limit the bias arising from self-selection into the NHIS. We estimate average effects and investigate heterogeneity of effects across socioeconomic groups. About forty percent of children have a mother who is enrolled in the NHIS. The mother's age, marital status, ethnicity, education, occupation, wealth and province of residence are the main predictors of the decision to enrol. NHIS enrolment significantly increases the percentage of pregnancies that were checked during antenatal care (ANC) visits with 7 percentage points (pp). NHIS membership has a significant effect on attended deliveries (10 pp). Caesarean sections increased with 5 pp and the number of children born from a pregnancy which was too soon or unwanted decreased with 7 pp. NHIS enrolment had almost no effect on child vaccinations. Among the poor, the effects on ANC and attended deliveries are similar. However, the effects on caesarean sections are about half the size (3 pp) and the reduction in unwanted pregnancies is larger (10 pp). We conclude that in the first years of operation, the NHIS has had a positive impact on the use of ANC and delivery care but not on child vaccinations and vitamin A supplements to children. Given the recent grim outlook for the sustainability of the NHIS, our positive findings might encourage policy makers to improve the financial structure of the NHIS such that it can serve as one of Ghana's means towards universal health coverage.

## Introduction

Increasing equitable access to health care is one of the main challenges African policy makers are facing today. An important constraint to healthcare access derives from the large out-of-pocket payments (OOP) incurred at the point of use. Health insurance can serve as a means to protect households from the risk of medical expenses which can be large relative to modest incomes (van Doorslaer et al., 2007) and therefore cause households to fall into poverty (Wagstaff and van Doorslaer, 2003). Whether health insurance is a recommendable strategy to improve access to health care in low- and middle income countries (LMIC) is hotly debated (Giedion and Diaz, 2010). A number of reviews have provided evidence on the potential of health insurance for LMIC. Spaan et al. (2012) report that there is strong evidence of improved health care utilization and financial protection through community based health insurance and social health insurance schemes. Giedion and Diaz (2010) report similar results: health insurance improves access and use and seems to improve financial protection. Although risk pooling can in theory reduce the costs of using health care, several operational difficulties hamper the actual implementation of health insurance schemes in Africa. Acharya et al. (2013) find the uptake of voluntary insurance schemes, in many cases, to be less than expected. They find no strong evidence of an impact on utilization and protection from financial risk for members of the informal sector. De Allegri et al. (2009) also report based on a literature review that health insurance schemes in African countries suffer from low enrolment, with rates between one and ten percent. While health insurance schemes across Africa differ widely in their benefit package, target population and other organizational features, De Allegri et al. (2009) identified common difficulties for these schemes. First, the lack of adequate legislative and regulatory frameworks implies that schemes have to register under unspecific laws. This is problematic because these laws were developed for associations or cooperatives, not allowing for specific arrangements relevant to health insurance schemes. Second, weak managerial capacity makes it difficult to determine actuarially fair premiums, conduct marketing campaigns and administer everyday book keeping. Finally, insufficient risk management limits the control over consumer fraud, adverse selection, overutilization and provider fraud. These difficulties can limit the success of health insurance schemes.

One of the most ambitious health care financing schemes in Sub-Saharan Africa (SSA), is the National Health Insurance Scheme (NHIS) implemented in Ghana in 2005 (Grepin and Dionne, 2013). Ghana has been the first country in SSA to establish a large scale financial protection scheme and other African countries are closely watching its progress (Escobar et al., 2010). The funding for the scheme is innovative and diverse. The NHIS is financed from four main sources: a value added tax on goods and services, an earmarked portion of social security taxes from formal sector workers, individual premiums and miscellaneous other

funds from investment returns, parliament and donors. The 2.5 percent tax on goods and services, the National Health Insurance Levy, is by far the largest source, comprising about 70 percent of revenues (Blanchet et al., 2012). The benefit package is broad, covering more than 95 percent of conditions that afflict Ghanaians. This package consists of i) coverage of all costs associated with outpatient and inpatient treatment, ii) full payment for medicine included in an approved list and iii) payments for referrals in an approved list (Gajate-Garrido and Owusua, 2013).

Most earlier research evaluated the effects of the NHIS on health care use in specific geographic areas, i.e. the Accra Metropolitan Area (Blanchet et al., 2012) and in two districts from both the Brong-Ahafo and the Upper East province (Mensah et al., 2010). Given that enrolment rates are highest in the latter two provinces (Ghana Statistical Service, 2009), probably relating to better supply of health care facilities, the findings from these two areas are not representative for the other parts of Ghana. One unpublished study (Gajate-Garrido and Ahiadeke, 2013) did estimate the effects of the NHIS at a national level. Our work adds to the limited knowledge about the nationwide effects of the NHIS on maternal health care utilization and specifically provides insights about the heterogeneity in effects across socioeconomic status. The latter is of particular importance, given Giedion and Diaz's (2010) conclusion from their systematic literature review on health insurance in LMICS, that knowledge about the distributional impact of these schemes is one of the biggest knowledge gaps in the field.

Earlier studies showed mixed effects of the NHIS on both health care use in general and maternal health care (MHC) specifically. Enrolment rates for the NHIS might compare favourably to the low rates reported for smaller scale initiatives across SSA (De Allegri et al., 2009), low uptake remains a key problem and enrolment is far from universal (Blanchet et al., 2012; Fenenga, 2015; Dixon et al., 2013). To estimate the effects of the NHIS, Blanchet et al. (2012) use propensity score matching (PSM) techniques. They find that women enrolled in the NHIS are more likely to obtain prescriptions, visit clinics and seek formal care when sick, but they do not study effects on maternal health care. Gajate-Garrido and Ahiadeke (2013) exploit variations in the insurance design to measure impact on maternal health care using an instrumental variable approach, and show that participation in the NHIS increases the probability of seeking curative and preventive health care. However, they study a smaller set of outcomes, for example not including an indicator whether a pregnancy was wanted or whether vitamin A supplements were provided, do not differentiate effects across the poor and the better off and use a different methodological approach. Mensah et al. (2010) use data for the Brong-Ahafo and the Upper East region, among those with the highest enrolment rates, and by applying PSM estimate that women enrolled in the NHIS are more likely to use

antenatal care, deliver in a healthcare facility and are less likely to have birth complications. In this paper we follow a similar approach as taken by Mensah et al. (2010), but we extend the analysis using nationally representative data and investigating heterogeneity of effects across socioeconomic groups.

This paper is structured as follows: the next section provides information about Ghana and its NHIS. The data and outcome variables are described in the subsequent section followed by a description of the propensity score matching methods. We then provide the estimated effects of the NHIS on MHC, specifically antenatal care, delivery care, caesarean sections, too early or unwanted pregnancies, vitamin A supplements and child vaccinations. We end with a section containing concluding remarks, policy implications and the limitations of this study.

## The National Health Insurance Scheme in Ghana

Recent World Health Statistics (World Health Organization, 2014) suggest that Ghana performs better in terms of population health status compared to neighbouring Cote d'Ivoire, Togo, Burkina Faso and Nigeria. Ghana has a child mortality rate of 72 per 1000 live births while this rate ranges from 96 (Togo) to 124 (Nigeria) per 1000 live births in the region.



From 1957 the Ghanaian government provided health care services free of charge at the point of use in public health facilities. These services were financed by general taxes and external donor funding. By the early 1980s, emigration of health workers, shortages of essential medicines and deterioration of the health infrastructure disabled the government to further support a tax-based health care system. Subsequently the "cash-and-carry system" was introduced (Asenso-Okyere et al., 1998), aiming to recover some of the health care costs through user fees. Mensah et al. (2006) and Waddington and Enyimayew (1990) found that infrastructure and drug availability improved, while the degree of inequality in access increased. The largest declines in health care use were found among the poor, the women, the elderly and in rural areas. High treatment costs caused many households to postpone medical treatment and opt for self-treatment, spiritualists or unregulated traditional healers often with catastrophic results (Oppong, 2001).

Following an election promise by the New Patriotic Party in 2000, the National Health Insurance Scheme was established to improve financial protection and access, especially for the poorest and most vulnerable groups (Agyepong and Adjei, 2008; Gobah and Zhang, 2011). The National Health Insurance Act was passed into law in 2003, but the official implantation of the NHIS occurred in the autumn of 2005 (Witter and Garshong, 2009). NHIS membership covers a range of health care services in public facilities, including antenatal and delivery care for pregnant women. All children below 18 years old can obtain health care for free when

their parents or guardians are covered under the NHIS (National Health Insurance Authority, 2008; Ministry of Health Ghana, 2009; Gajate-Garrido and Ahiadeke, 2013). For more details on the NHIS, including the funding and the benefit package, we refer to Gobah and Zang (2011) and Witter and Garshong (2009).

Membership of the NHIS is legally mandatory, but in practice membership is optional (Witter and Garshong, 2009). There is no penalty for failing to enrol and individuals are not automatically part of the scheme. Ghanaians a required to go in-person to an NHIS office, complete the necessary registration documents and pay a registration fee to cover the photo identification card and administrative expenses (Blanchet et al., 2012).

According to the official NHIS guidelines, annual insurance premiums are determined based on an enrolee's income, ranging from 7.2 Ghanaian Cedi (GhC) (2.25 US $) for the very poor to 48 GhC (14.85 US $) for the very rich. However, given unavailability of income measures, a constant premium to all is charged in most cases of about 3 US dollars (Blanchet et al., 2012; Dalinjong and Laar, 2012). In addition a registration fee needs to be paid upon enrolment and with every annual re-enrolment costing about 1.25 US dollars (Gajate-Garrido and Owusua, 2013). While exemptions for premiums are in place for specific groups, this is not the case of registration fees.

Exemptions nullifying the premium exist for the indigent (National Health Insurance Scheme, 2014), for people over age 70 and for children under 18 whose parents both enrol. The indigent are those being unemployed with no visible source of income, no fixed residence and not living with someone employed and with a fixed residence (Blanchet et al., 2012). Sometimes additional unofficial requirements are added to be defined as indigent which most frequently include i) to be mentally or physically handicapped and ii) to be classified by community leaders or the social welfare department as indigent (Gajate-Garrido and Owusua, 2013).

Since mandatory enrolment is not enforced, NHIS coverage is not universal. Institutional data from the Ministry of Health (MoH) and NHIS show an increase in average enrolment rates from 18 percent in 2006 to 55 percent in 2008 (Saleh, 2012), although these figures are heavily debated (Arhin, 2013). Based on the GDHS, 39.8 percent of women had an NHIS membership in 2008 and other studies suggest that about one third of the population was covered by 2011 (Blanchet et al., 2012; Fenenga, 2015; Dixon et al., 2013). Considerable inequalities in enrolment rates across socio-economic groups exist (Arthur, 2012). Households in the richest quintile are significantly more likely to enrol compared to those in the poorest quintile, with respective enrolment rates of 41 and 27 percent (Jehu-Appiah et

al., 2011). Sarpong et al. (2010) found that in the Ashanti region 21 percent of the poor were enrolled compared to 60 percent of those in the highest income group. They argue that the low enrolment among the poor does not only relate to lower economic well-being but also to considerable travel time to health facilities. Other authors suggest that fees could be too high for the poor (Amporfu, 2013), awareness about insurance low, or the perceived value for money insufficient (Koch and Alaba, 2010; Dixon, 2011). Given the annual registration fee and the strict premium exemption rules, it could well be that enrolment in the NHIS remains too expensive for specific low income groups.

## Methods

### Data

We use the Ghana Demographic and Health Survey (GDHS) 2008, a nationally representative household survey with individual data collected for 4916 women aged 15-49 (Ghana Statistical Service, 2009).[9] These women were asked about all children born to them in the last five years (2003-2008) and more detailed information was obtained about the most recent birth. We analyse these data at child/pregnancy level for the period 2006-2008.



Information about the NHIS enrolment status is only available for the mother at the time of the interview, not at the time of pregnancy. This means we have to assume that enrolment status at time of interview is representative for the enrolment status during pregnancy. We limit our analysis to the most recent birth, up to two years preceding the interview, to increase credibility of this assumption[10]. This results in a sample of 2002 children, with a mean duration between birth and interview of 11 months.

We study eight main outcomes: at least 4 antenatal care (ANC) visits, at least 4 ANC visits with a skilled provider (doctor, nurse/midwife, auxiliary midwife or community nurse)[11], delivery assisted by a skilled provider, delivery assisted by a skilled provider in a public facility, caesarean section, pregnancy too soon or unwanted (occurred earlier than desired or when no or no more children were desired), child received vitamin A and child fully vaccinated (see Table 1). We differentiate between any assisted delivery and assisted delivery in a public

[9] More recent data is available from the Ghana Multiple Indicator Cluster Survey data from 2011, but these were collected after a reform that abolished insurance premia for pregnant women and under-fives and therefore does not allow for an identification of the effect of NHIS membership.

[10] Further reduction to a period of one year preceding the interview, results in a sample too small to perform our analyses. Mensah et al. (2010), make the same assumption but include births up to four years prior to the survey.

[11] The GDHS does not differentiate between ANC visits to public and private facilities.

facility to identify any switches from private to public facilities or from homebirth to a public facility. The pregnancy too soon or unwanted is introduced as a proxy for the use of family planning services. To provide additional insights into the details of the child vaccinations, we also present five additional outcomes: polio vaccination at birth, BCG vaccination, three additional polio vaccinations, three DTP vaccinations and measles vaccination. The latter four are calculated on the subsample of children who were born at least one year prior to the survey, reflecting that these vaccinations are obtained over the course of the first life year (for sample sizes see Table 1).

**Table 1 | Descriptives**

| | Number of children | | Unmatched means | | | Differences |
|---|---|---|---|---|---|---|
| | Uninsured | Insured | Overall | Uninsured | Insured | p-value |
| At least 4 ANC visits | 1206 | 796 | 0.84 | 0.80 | 0.91 | 0.000 |
| At least 4 ANC visits, skilled provider | 1206 | 796 | 0.44 | 0.37 | 0.55 | 0.000 |
| Attended delivery | 1206 | 796 | 0.52 | 0.40 | 0.71 | 0.000 |
| Attended delivery in public facility | 1206 | 796 | 0.43 | 0.31 | 0.62 | 0.000 |
| Caesarean section | 1206 | 796 | 0.06 | 0.03 | 0.10 | 0.000 |
| Pregnancy too soon or unwanted | 1206 | 796 | 0.37 | 0.40 | 0.31 | 0.000 |
| Child received vitamin A | 736 | 440 | 0.52 | 0.48 | 0.58 | 0.001 |
| Child fully vaccinated | 736 | 440 | 0.43 | 0.37 | 0.53 | 0.000 |
| Child received polio vaccination at birth | 1206 | 796 | 0.45 | 0.39 | 0.55 | 0.000 |
| Child received BCG vaccination | 736 | 440 | 0.72 | 0.68 | 0.78 | 0.001 |
| Child received all three polio vaccinations | 736 | 440 | 0.69 | 0.65 | 0.76 | 0.000 |
| Child received all three DTP vaccinations | 736 | 440 | 0.70 | 0.67 | 0.76 | 0.001 |
| Child received measles vaccination | 736 | 440 | 0.70 | 0.66 | 0.77 | 0.000 |

*Note:* p-values shown for individual t-tests comparing means for uninsured and insured.

Covariates used for the PSM are related to the mother's demographics, socio-economic status, education, occupation, religion, ethnicity, province of residence and time period. We proxy socioeconomic status with a wealth index estimated through principal component analysis on a large set of assets and dwelling characteristics available in the GDHS (Filmer and Pritchett, 2001). Table 2 provides an overview of the covariates.

**Table 2 |** Descriptive statistics and propensity score logit

| | Unmatched means | | Differences | Prop. score logit (n = 2002) | |
|---|---|---|---|---|---|
| | Uninsured (n = 1206) | Insured (n = 796) | p-value | Av. marg. effect | p-value |
| Urban household | 0.24 | 0.44 | 0.000 | -0.01 | 0.651 |
| Mother 20y - 35y | 0.76 | 0.79 | 0.088 | 0.11 | 0.034 |
| Mother above 35y | 0.18 | 0.18 | 0.797 | 0.18 | 0.003 |
| Mother married or living together | 0.91 | 0.94 | 0.010 | 0.07 | 0.082 |
| Mother's religion Christian | 0.42 | 0.50 | 0.001 | 0.03 | 0.261 |
| Mother's religion Muslim | 0.21 | 0.21 | 0.928 | 0.01 | 0.706 |
| Mother's ethnicity Akan | 0.36 | 0.38 | 0.257 | -0.11 | 0.002 |
| Mothers' ethnicity Ewe | 0.13 | 0.11 | 0.263 | -0.15 | 0.001 |
| Mother's ethnicity Mole-Dagbani | 0.26 | 0.26 | 0.865 | -0.07 | 0.035 |
| Mother is literate | 0.20 | 0.39 | 0.000 | -0.01 | 0.821 |
| Mother no or primary education | 0.73 | 0.48 | 0.000 | -0.18 | 0.000 |
| Mother's occupation none | 0.11 | 0.10 | 0.800 | -0.07 | 0.045 |
| Mother's occupation white-collar | 0.01 | 0.05 | 0.000 | 0.06 | 0.351 |
| Mother's occupation agriculture | 0.50 | 0.25 | 0.000 | -0.10 | 0.000 |
| Log household size | 1.72 | 1.65 | 0.001 | 0.00 | 0.904 |
| Household very poor | 0.43 | 0.20 | 0.000 | -0.40 | 0.000 |
| Household poor | 0.23 | 0.21 | 0.176 | -0.20 | 0.000 |
| Household moderate wealth | 0.16 | 0.17 | 0.641 | -0.17 | 0.000 |
| Household very rich | 0.06 | 0.18 | 0.000 | 0.08 | 0.056 |
| Ashanti | 0.14 | 0.15 | 0.526 | 0.19 | 0.000 |
| Brong-Ahafo | 0.06 | 0.10 | 0.003 | 0.40 | 0.000 |
| Eastern | 0.07 | 0.12 | 0.000 | 0.38 | 0.000 |
| Greater Accra | 0.09 | 0.08 | 0.291 | -0.05 | 0.404 |
| Northern | 0.21 | 0.11 | 0.000 | 0.27 | 0.000 |
| Upper East | 0.05 | 0.11 | 0.000 | 0.60 | 0.000 |
| Upper West | 0.10 | 0.12 | 0.107 | 0.44 | 0.000 |
| Volta | 0.09 | 0.08 | 0.845 | 0.29 | 0.000 |
| Western | 0.10 | 0.09 | 0.858 | 0.22 | 0.000 |

*Notes:* p-values shown for individual t-tests comparing means for uninsured and insured.

All models include time controls as well as the control variables listed above.

## Statistical analysis

Although NHIS membership is de jure compulsory, in practice enrolment is an individual's choice. Comparing health care use between enrolees and non-enrolees provides biased estimates of the effects of NHIS because it is likely that NHIS membership is driven by factors that also correlate with health and health care use. We therefore apply propensity score matching (PSM) to construct a sample of control observations (non NHIS members or uninsured) that are similar to the treated (NHIS members or insured) in terms of observable characteristics (Rosenbaum and Rubin, 1983).

To obtain propensity scores for each respondent, we estimate a logit model of the indicator of whether the child's mother is enrolled in the NHIS ($NHIS_i$) on all covariates shown in Table 2. We also include indicators for each birth quarter (three month period) within the time period in our data to pick up any time-varying characteristics. For ease of interpretation, we report average marginal effects as opposed to coefficients.

The average treatment effect on NHIS members can be written as (Khandker et al., 2010):

$$ATT_{PSM} = \frac{1}{N_T}\left[\sum_{t\in T}^{T} Y_t - \sum_{m\in M} w(t,m)Y_m\right] \quad (1)$$

where $N_T$ is the number of members $t$ and $w(t,m)$ is the weight used for control observation $m$ when comparing with treated observation $t$.

We apply four different methods[12] to match the treated to comparable controls on the basis of the propensity scores: nearest neighbour with replacement (NN w. rep.), nearest neighbour without replacement (NN w/o rep.), radius and kernel matching (Khandker et al., 2010). The first and second method matches each treated individual to the control observation with the closest propensity score, which means that the difference in propensity scores between the treated and the matched control can still be very large. To avoid this, radius matching applies a maximum propensity score distance (caliper), which we set at 0.02, in line with Mensah et al. (2010). Kernel matching uses a weighted average of all non-members to construct a hypothetical match for each member. The weights are determined by the distance to the propensity score of the member: closer non-members receive a larger weight. The precise nature of the weighting is determined by the form of the kernel and the bandwidth, which we set at 0.06 (Mensah et al., 2010).

[12] We use the routine "psmatch2" in STATA 13 by Leuven and Sianesi (2014).

We conduct a balancing test (results available upon request from authors) to check whether, within each quantile of the propensity score distribution, both the average propensity score and the mean of the explanatory variables are the same between the treated and control individuals. This ensures that the treated and the matched controls are balanced in that similar propensity scores are based on similar explanatory variables (Becker and Ichino, 2002). Figure 1 shows the propensity scores for both the treated and the untreated.

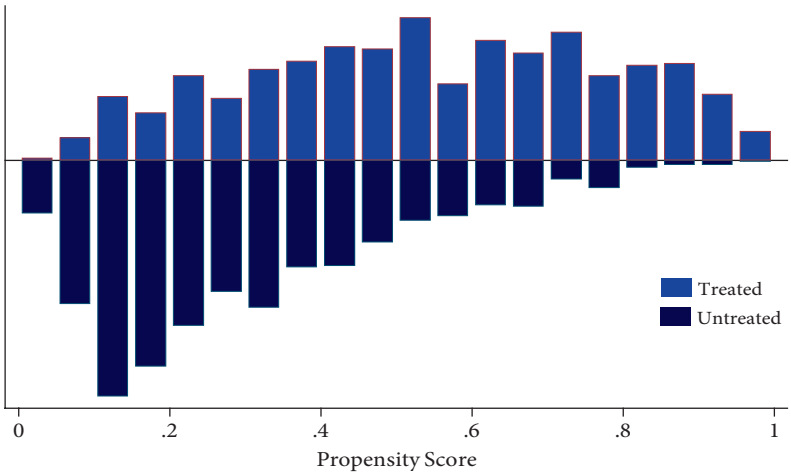


**Figure 1 |** Propensity scores across untreated (matched control observations) and treated

The validity of this PSM approach depends on two conditions: i) conditional independence and ii) sizeable common support or overlap in propensity scores across the treated and the matched control sample (Khandker et al., 2010). The first, requiring no unobserved characteristics to affect the decision to enrol cannot be tested, but matching on extensive information on maternal, household, child, regional and time characteristics, including socio-economic status, should eliminate most of the important drivers of selection bias, though some bias due to unobserved differences is likely to remain. We ensure validity of PSM in relation to the second condition by only considering observations on the common support of the propensity scores across the treated and the matched controls.[13]

[13] Excluding observations off the common support is possible given our relatively large number of observations. Less than one percent of our sample is off support. Following Leuven and Sianesi (2014), any observations with a propensity score higher than the maximum or lower than the minimum score of the controls are dropped.

### Heterogeneity of the effects

NHIS premiums might be high for the poorer segments of the population and costs associated with health care use not covered by the NHIS, such as travel costs, might prove to be a considerable financial burden to the less well-off. This potentially results in lower maternal care utilization among the poor. We therefore study the heterogeneity in the effects of the NHIS across socio-economic status. We re-estimate the propensity scores and apply the PSM only on the subsample of respondents in the bottom two wealth quintiles, which we refer to as the "poor". For consistency reasons we use the same decision-to-enrol model as applied for the full sample. Balance was achieved on all covariates apart from Mother's religion Muslim and Mother's ethnicity Mole-Dagbani (results available upon request from authors). The same four propensity score matching methods are applied to contrast the average outcomes between the poor members and the poor non-members. Figure 2 shows the propensity scores across the poor for both the treated (NHIS members) and the untreated (non NHIS members).

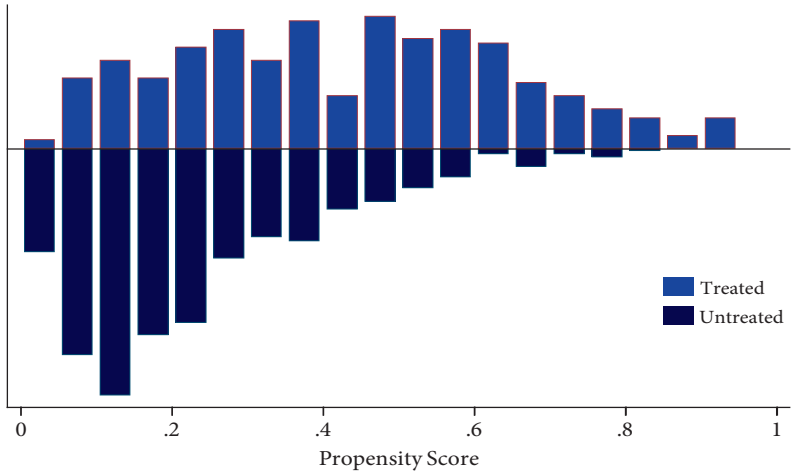


**Figure 2 |** Propensity scores across untreated (matched control observations) and treated among the poor

## Results

### Descriptive statistics

Table 1 shows the number of children in our sample across the insured and uninsured for all outcome measures. The unmatched means show that 84 percent of all children received

at least four ANC visits but only about half of these were by a skilled health care provider. About fifty percent of the births were attended by a skilled provider and the majority of these births took place in a public facility. 6 percent of the children was born with a caesarean section and for 37 percent of the live births the mother reported that the pregnancy was too soon or unwanted. 52 percent of the children received vitamin A and 43 percent was fully vaccinated. When comparing these means across the insured and uninsured, we find that for all types of health care utilization included in this study, the use is significantly higher among the insured ($p \leq 0.001$). For the one variable in our study that we would expect to be lower among those with an insurance, pregnancy too soon or unwanted, we indeed find that the mean is significantly lower among the insured (40 versus 31 percent, $p<0.000$), which might be related to increased use of family planning services.

39.8 percent of the children in our sample have a mother who is insured. Table 2 shows the unmatched means for the covariates across the insured and uninsured group. Urban residence, the mother being married, being Christian, being literate, being in white collar occupation and the household being in the upper wealth quintile are all more common among those with an insurance. Mothers with no or only primary education, working in agriculture, with larger households and from poor households are significantly less frequently among the insured. Further, living in the Brong-Ahafo and the Upper East province is more common among those with an insurance.



### Determinants of NHIS enrolment

The final two columns of Table 2 contain the results of a logit model of the decision to enrol in the NHIS. Average marginal effects for mother, household, child and regional characteristics are presented, time indicators are omitted for the sake of parsimony. The age of the child's mother, marital status, ethnicity, education, occupation, wealth and province of residence are important predictors of the decision to enrol in the NHIS. The probability that a 20 to 35 years old mother enrols in the NHIS is 11 percentage points (pp) higher ($p = 0.034$) compared to younger women and for mothers above 35 years old this probability is even 18 pp higher ($p = 0.003$). The probability that a mother who is married or living together is enrolled is 7 pp higher ($p = 0.082$), while mothers from the three largest ethnic groups in our sample: Akan, Ewe or Mole-Dagbani are significantly less likely to enrol compared to those from the minority ethnic groups (including Ga-Adang me, Guan, Grusi, Gruma and Mande). Mothers with no or only primary education have an 18 pp lower probability ($p<0.000$) to enrol and those without occupation (7 pp, $p = 0.045$) or working in agriculture (10 pp, $p<0.000$) are also less likely to enrol. The probability to enrol increases with household wealth. Compared to children whose mothers are residing in Central province, enrolment is significantly more likely in all other provinces but Great Accra. In the following step of our analysis, we use

this decision-to-enrol model as the principal mean to construct a balanced sample of NHIS members and comparable non NHIS members.

### Effects of NHIS enrolment

Having verified that the balancing property is satisfied, we present the ATT of being insured via the NHIS on MHC care use. The results are robust to different matching algorithms. Table 3 shows that NHIS enrolment increased the percentage of children who obtained at least four ANC visits by 7 percentage points (pp) ($p<0.01$) and when applying NN w/o rep. this is even 9 pp ($p = 0.008$). When looking specifically at the effects on four or more ANC visits provided by skilled providers, the effects are smaller though most matching methods still show a positive and significant effect. NHIS membership has a positive effect on attended delivery though the NN w. rep. method show no significant effect. When limiting this to only include the attended deliveries in public facilities, we again find significant positive effects of NHIS enrolment, at least 10 pp increase ($p = 0.018$). Caesarean sections increased with at least 5 pp ($p<0.01$) as an effect of being insured. Most methods show that the number of children born from a pregnancy which was too soon or unwanted is 7 pp lower ($p<0.05$) because of NHIS membership. Whether NHIS membership had an effect on children receiving Vitamin A supplements cannot be concluded from these results: two models suggest a statistically significant increase (10 to 12 pp) while the two remaining models show no significant effect. Finally, the NHIS had no significant effect on a child being fully vaccinated after his/her first birthday, which is confirmed by the absence of a consistent effect on the individual vaccinations underlying this outcome across the results of the four matching methods.

### Effects of NHIS enrolment among the poor

To study heterogeneity in the effects of NHIS enrolment across socio-economic groups, we estimated the effects among the children from poor households (for sample sizes see Table 4). A comparison of means before matching shows significantly higher utilization rates among the insured and a lower rate of children born from pregnancies which were too soon or unwanted.

Results from the PSM reveal that NHIS membership also had a positive effect on ANC visits, for the poor, though these effects are a bit smaller. We find significant effects on attended deliveries as a result of NHIS enrolment ranging from 10 to 14 pp ($p < 0.05$). Caesarean sections also increased significantly with 3 pp ($p < 0.05$), which is about half of the effect in the full sample. NHIS membership reduced unwanted pregnancies among the poor (10 pp, $p < 0.05$ with most matching methods), which is a larger reduction than in the full sample (7 pp). No effect was found on vitamin A supplements or on child vaccinations, which is in line with the findings from the full sample.

**Table 3** | Effects of insurance

| | NN w. rep.[a] | p-value | NN w/o rep.[a] | p-value | Radius[a] | p-value | Kernel[b] | p-value |
|---|---|---|---|---|---|---|---|---|
| At least 4 ANC visits | 0.09 | 0.008 | 0.07 | 0.001 | 0.07 | 0.006 | 0.07 | 0.009 |
| At least 4 ANC visits, skilled provider | 0.08 | 0.055 | 0.06 | 0.056 | 0.06 | 0.060 | 0.05 | 0.114 |
| Attended delivery | 0.07 | 0.114 | 0.11 | 0.000 | 0.10 | 0.003 | 0.10 | 0.002 |
| Attended delivery in public facility | 0.10 | 0.018 | 0.12 | 0.000 | 0.12 | 0.000 | 0.12 | 0.000 |
| Caesarean section | 0.05 | 0.003 | 0.05 | 0.000 | 0.05 | 0.000 | 0.06 | 0.000 |
| Pregnancy too soon or unwanted | -0.08 | 0.062 | -0.07 | 0.012 | -0.07 | 0.027 | -0.07 | 0.039 |
| Child received vitamin A | 0.12 | 0.026 | 0.10 | 0.014 | 0.07 | 0.101 | 0.08 | 0.106 |
| Child fully vaccinated | 0.08 | 0.108 | 0.07 | 0.103 | 0.06 | 0.142 | 0.06 | 0.212 |
| Child received polio vaccination at birth | 0.03 | 0.535 | 0.02 | 0.542 | 0.05 | 0.126 | 0.05 | 0.147 |
| Child received BCG vaccination | 0.06 | 0.194 | 0.05 | 0.174 | 0.05 | 0.230 | 0.03 | 0.478 |
| Child received all three polio vaccinations | 0.06 | 0.223 | 0.04 | 0.246 | 0.05 | 0.215 | 0.04 | 0.424 |
| Child received all three DTP vaccinations | 0.05 | 0.299 | 0.05 | 0.208 | 0.04 | 0.318 | 0.03 | 0.522 |
| Child received measles vaccination | 0.08 | 0.093 | 0.04 | 0.238 | 0.08 | 0.041 | 0.09 | 0.045 |

*Notes:* effects are shown for four different propensity score matching methods: nearest neighbor with replacement, neareast neighbor without replacement, radius and kernel. Values shown are the difference between the ATT for uninsured and insured.

All models include time controls as well as the control variables listed in Table 2.

[a] Imposed caliper width: 0.02

[b] Chosen bandwith: 0.06

## Discussion and policy implications

We compared maternal health care utilization between children from mothers with and without enrolment in the National Health Insurance Scheme (NHIS) in Ghana. We used propensity score matching (PSM) to limit the bias arising from the self-selection into the NHIS. About forty percent of the children have a mother who is enrolled in the NHIS and the mother's age, marital status, ethnicity, education, occupation, wealth and province of residence are the main predictors of the decision to enrol. We found that NHIS enrolment significantly increased the percentage of children whose mother obtained at least four antenatal care (ANC) visits, had a skilled health care worker present during birth and that were born with

a caesarean section. The effect on attended deliveries is larger when looking only at public facilities, suggesting that the increase in attended deliveries is not caused by a switch from private to public but by a reduction in homebirths. The average caesarean section rate for NHIS members, 10 percent, is just in the range advised by the World Health Organization of 10 to 15 percent (World Health Organization, 2010b), which does not suggest that the NHIS incentivizes providers to perform too many caesarean sections. NHIS had almost no effect on vitamin A supplements and child vaccinations. To study heterogeneity in the effects of NHIS across socio-economic groups, we also estimated the effects of NHIS on children from the 40 percent poorest households and found that for this group the effects on ANC utilization are a bit smaller, though still clearly present. We found a statistically significant and positive effect on attended delivery and caesarean sections. The reduction in unwanted pregnancies is particularly large among the poor. The GDHS did not allow to study the reasons behind the smaller effect sizes among the poor. Potential explanations include the time and monetary costs associated with repeated ANC visits which might be particularly problematic for the poor or limited awareness of the need for these types of care. However, further research is necessary to draw conclusions on this.

Our results are generally in line with, but smaller than, the study by Mensah et al. (2010) who found increases in ANC utilization of 20 to 23 pp, compared to the 7 to 9 pp that we found. The difference might be partly driven by the fact that we studied at least four ANC visits while Mensah et al. used at least three ANC visits, and to selectiveness of their sample. The effects on attended delivery in our study (7 to 11 pp increase) are similar to the 14 to 16 pp increase that Mensah et al. report. Both studies found no effect on polio vaccinations. However, Gajate-Garrido and Ahiadeke (2013) did find significant effects of NHIS enrolment on child vaccinations. This might be explained by the fact that they study vaccinations for children below five years old, while our study and Mensah et al. only include children below one year old. Administrative procedures to ensure free care for children from NHIS members might be time consuming, causing parents to delay the vaccinations until after the first birthday of their child. However, further research is necessary to better understand these contrasting findings.

Providing that our encouraging results hold up as the NHIS coverage is extended, increased enrolment in the NHIS leads to improvements in maternal health care (MHC) utilization. Following the period studied here, in late 2008, all pregnant women were offered free annual NHIS membership (National Health Insurance Authority, 2008; Ministry of Health Ghana, 2009). We do not have the necessary data to study the effects of this intervention, but given the socio-economic inequality in both enrolment and to some extent MHC utilization, alleviating the financial burden of premium payments might have been especially effective in increasing access for the poor segment of the population.

**Table 4** | Effects of insurance among the poor

| | Number of children | | Unmatched means | | | Differences | | | | Effects | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Uninsured | Insured | Uninsured | Insured | p-value | NN w. rep.[a] | p-value | NN w/o rep.[a] | p-value | Radius[a] | p-value | Kernel[b] | p-value |
| At least 4 ANC visits | 804 | 324 | 0.76 | 0.85 | 0.000 | 0.05 | 0.230 | 0.06 | 0.084 | 0.06 | 0.051 | 0.07 | 0.027 |
| At least 4 ANC visits, skilled provider | 804 | 324 | 0.30 | 0.44 | 0.000 | 0.09 | 0.075 | 0.11 | 0.013 | 0.05 | 0.187 | 0.05 | 0.171 |
| Attended delivery | 804 | 324 | 0.25 | 0.46 | 0.000 | 0.10 | 0.048 | 0.14 | 0.002 | 0.11 | 0.004 | 0.11 | 0.003 |
| Attended delivery in public facility | 804 | 324 | 0.20 | 0.42 | 0.000 | 0.10 | 0.049 | 0.14 | 0.001 | 0.12 | 0.001 | 0.12 | 0.001 |
| Caesarean section | 804 | 324 | 0.01 | 0.04 | 0.009 | 0.03 | 0.029 | 0.03 | 0.042 | 0.03 | 0.025 | 0.03 | 0.023 |
| Pregnancy too soon or unwanted | 804 | 324 | 0.38 | 0.31 | 0.027 | -0.08 | 0.129 | -0.10 | 0.013 | -0.10 | 0.013 | -0.10 | 0.009 |
| Child received vitamin A | 493 | 196 | 0.48 | 0.59 | 0.008 | 0.06 | 0.374 | 0.11 | 0.061 | 0.06 | 0.294 | 0.05 | 0.368 |
| Child fully vaccinated | 493 | 196 | 0.30 | 0.40 | 0.010 | -0.02 | 0.818 | 0.04 | 0.466 | 0.03 | 0.509 | 0.04 | 0.401 |
| Child received polio vaccination at birth | 804 | 324 | 0.32 | 0.43 | 0.001 | 0.08 | 0.134 | 0.06 | 0.168 | 0.05 | 0.234 | 0.04 | 0.303 |
| Child received BCG vaccination | 493 | 196 | 0.66 | 0.74 | 0.051 | -0.03 | 0.617 | 0.03 | 0.503 | 0.00 | 0.944 | -0.01 | 0.818 |
| Child received all three polio vaccinations | 493 | 196 | 0.64 | 0.71 | 0.072 | -0.04 | 0.576 | 0.05 | 0.308 | 0.01 | 0.881 | 0.00 | 0.936 |
| Child received all three DTP vaccinations | 493 | 196 | 0.66 | 0.72 | 0.105 | -0.05 | 0.466 | 0.05 | 0.363 | -0.01 | 0.818 | -0.02 | 0.726 |
| Child received measles vaccination | 493 | 196 | 0.65 | 0.73 | 0.035 | -0.03 | 0.624 | 0.05 | 0.294 | 0.01 | 0.849 | 0.00 | 0.984 |

*Notes:* p-values shown for individual t-tests comparing means for uninsured and insured and for effects on outcome measures.

Effects are shown for four different propensity score matching methods: nearest neighbor with replacement, neareast neighbor without replacement, radius and kernel. Values shown are the difference between the ATT for uninsured and insured.

All models include time controls as well as the control variables listed in Table 2.

[a] Imposed caliper width: 0.02

[b] Chosen bandwith: 0.06



Our analyses are subject to some limitations. First, our data and study design did not allow us to study effects of NHIS on maternal and child mortality. Using an estimate from the literature that institutional delivery lowers the risk of neonatal mortality by 29 percent in low and middle income countries (Tura et al., 2013), suggests that the introduction of NHIS in Ghana potentially reduced neonatal mortality by 3 percent. However, reductions in neonatal mortality also depend on the quality of care provided during these deliveries, for which we have no data, so this should only be seen as a tentative estimate. Demand side interventions, such as the NHIS, are likely to yield considerably more progress towards universal health coverage, when combined with supply side interventions aiming to improve the quality of care. An example of such a supply side intervention is performance based financing, for which implementation is currently under discussion in Ghana (World Bank, 2013a). A second limitation is related to the non-randomized rollout of NHIS and the lack of longitudinal data. We control for self-selection into the NHIS on observables but there might be remaining bias due to unobserved differences across the member and the matched non-member group that also correlate with health care use. Because we cannot observe whether any remaining relevant unobservables are positively or negatively correlated with enrolment and/or use, drawing a conclusion about some potential over- or underestimation of the impact of the NHIS is not possible. However, if such bias exist it is likely to be small. Following enrolment there is a waiting period for a maximum of six months (Oxfam, 2014), usually three months (Gajate-Garrido and Owusua, 2013), which is meant to limit adverse selection. Third, we assume that women's enrolment status at the date of the interview is representative for their status during their pregnancy in the last two years. Given that enrolment rates were increasing over time in this period (Saleh, 2012), we are likely to overestimate NHIS enrolment status at birth/pregnancy and therefore underestimate the effect of NHIS membership on MHC use.

Notwithstanding these limitations, our study shows encouraging results of the NHIS on antenatal and delivery care in the first years of its existence. However, the future of the NHIS is unsure. The World Bank reported in 2012 that the NHIS system has serious structural and operational inefficiencies and is on a trajectory to go bankrupt in 2013. For the NHIS to expand enrolment and become sustainable, more public resources are needed (Schieber et al., 2012) Recently the nationwide Christian Health Association of Ghana (CHAG) stopped providing services to NHIS members because of delays in payments from the Ministry of Health to the health care facilities for services provided to these members. Following a meeting in July 2014 between the CHAG, Minister for Health and the National Health Insurance Authority services for NHIS members were restored, after agreements had been reached about the outstanding payments to the health care facilities (Christian Health Association of Ghana, 2014; National Health Insurance Authority, 2014). However, questions remain about the sustainability of the NHIS, especially following members of parliament claiming in August

2014 that if the government does not take measures to resolve issues facing the NHIS, it will collapse (Sabi, 2014 and Addo-Tetteh, 2014).

Given the grim outlook for the sustainability of the NHIS, our positive findings might encourage policy makers to improve the financial structure of the NHIS such that it can serve as one of Ghana's means towards universal health coverage. However, the smaller effects among the poor also signal the necessity to continue efforts to improve targeting of the poor to ensure equitable access to health care in Ghana.

# Chapter 5

# Introduction of performance based financing in Burundi was associated with improvements in care and quality

Bonfrer, I., Soeters, R., Van de Poel, E., Basenga, O., Longin, G., van de Looij, F., van Doorslaer, E. 2014.

*Health Affairs, 33(12):2179-2188.*

## Abstract

Several governments in low- and middle-income countries have adopted performance based financing to increase health care use and improve the quality of health services. We evaluated the effects of performance based financing in the central African nation of Burundi from 2006–10. We found that performance based financing increased the share of women delivering their babies in an institution by 22 percentage points which reflects a relative increase of 36 percent and the share of women using modern family planning services by 5 percentage points, a relative change of 55 percent. The overall quality score for health care facilities increased by 45 percent during the study period, but performance based financing was found to have no effect on the quality of care as reported by patients. We did not find strong evidence of differential effects of performance based financing across socioeconomic groups. The performance based financing effects on the probability of using care when ill were found to be even smaller for the poor. Our findings suggest that a supply-side intervention such as performance based financing without accompanying access incentives for poor people is unlikely to improve equity. More research into the cost-effectiveness of performance based financing and how best to target vulnerable populations is warranted.

## Introduction

Several governments in low- and middle-income countries have adopted performance based financing in the health care sector, payment methods that reward performance. In Africa alone, more than thirty-five countries are in the process of introducing performance based financing (World Bank Health Results Innovation Trust Fund, 2013; Soeters et al., 2013). performance based financing is a strategy to improve the performance of health care providers through the use of explicit financial incentives for reaching targets on predefined performance measures related to the quantity and quality of health care services (Eijkenaar, 2013). Traditionally, in low-income countries, health system financing is based on prospective budget flows derived from for example bed counts, or estimates of needed pharmaceuticals. Under performance based financing, health care facilities are reimbursed retrospectively after verification of the quantity and quality of provided services.

While there is considerable enthusiasm among practitioners and implementers about the promise of performance based financing (Meessen et al., 2011; Meessen et al., 2006; Soeters and Vroeg, 2011), robust evidence on its effects in low- and middle-income countries is still limited (Ireland et al., 2011; Kalk et al., 2010; Eldridge and Palmer, 2009). A systematic review by Witter et al. (2012) identified one study (Peabody et al., 2011) on the effects of bonuses for doctors meeting higher-quality standards in the Philippines as the only study with low risk of bias. This study of the Philippines system found that performance based financing improved children's general health and reduced wasting, the process of muscle and fat tissue to "waste" away, but had no effect on patient volumes in the studied hospitals or quality scores for hospital care, as assessed through a quality measurement system developed for the study. Similar effects were found for another intervention group for which health insurance reimbursements to the hospitals were increased, suggesting that in the Philippines the effects were also driven by increased resources (Peabody et al., 2011).

For Rwanda, the first African country that introduced nationwide performance based financing, results from a difference-in-differences analysis (Witter et al., 2012; Basinga et al., 2011) indicated that performance based financing increased the quality and use of maternal and child health services and child nutritional outcomes. An experiment conducted in the Democratic Republic of Congo showed that performance based financing led to lower direct payments by patients to health facilities, comparable or better services and higher quality of care (Soeters et al., 2011).

Recently Yip et al. (2014) evaluated a capitation with pay-for-performance intervention in the Ningxia Province of China. This program focused on primary care providers' antibiotic

prescribing practices, health spending, outpatient visit volume, and patient satisfaction. The intervention led to a reduction of approximately 15 percent in antibiotic prescriptions and a small reduction in total spending per visit to primary health care providers. No effect on other outcomes was found.

This article adds to the limited scientific knowledge on the effects of performance based financing in low- and middle-income countries. We exploit the staggered rollout of performance based financing across provinces in the central African nation of Burundi between 2006 and 2010 and use a difference-in-differences approach to identify the effects of performance based financing on the use and quality of health care. Our results indicate that the introduction of performance based financing has led to some improvements in maternal care use and in quality scores of health care facilities.

## Performance based financing in Burundi

In December 2006 performance based financing was implemented in Burundi by the Ministry of Health, with help from nongovernmental organizations (NGOs), in three provinces: Bubanza, Cankuzo, and Gitega I. In October 2008 the financing system was implemented in six more provinces: Karuzi, Makamba, Bururi, Rutana, Ruyigi, and Ngozi. In April 2010 the financing system was implemented in the remaining provinces: Bujumbura-mairie, Bujumbura-rural, Cibitoke, Gitega II, Kayanza, Kirundo, Muramvya, Muyinga and Mwaro (Ministère de la santé publique Republique du Burundi, 2011).

In May 2006 seven months before the introduction of performance based financing in Burundi, user fees for deliveries, caesarean sections, and care for children under five years old were removed at public health care facilities throughout the country (Nimpagaritse and Bertone, 2011). To replace the lost income from eliminated user fees, facilities received payments from the government for the services provided for free. Ensuring timely payment to the facilities proved problematic (Nimpagaritse and Bertone, 2011; Kamana, 2012). In April 2010 the Ministry of Health incorporated payment for maternal and child health services into the performance based financing scheme.

As of 2014 performance based financing was implemented in almost 700 Burundi health care facilities (World Bank Health Results Innovation Trust Fund, 2013) and accounts for around 40 percent of the total average health facility budget. Fifty-two percent of the total funding for performance based financing is provided by the Burundese government, 28 percent by the World Bank, and the remaining 20 percent from various other donors (Kamana, 2012;

Musango et al., 2013). Facilities receive payments based on quantity and quality of health services (Bertone and Meessen, 2012). Quantity of health services provided is measured through twenty-three output indicators (Ministère de la santé publique Republique du Burundi, 2010), see Table A1. For this study, data were collected for six of these output indicators. Health care facilities report monthly to the Ministry of Health about quantities of health services delivered for each indicator. Reported quantities are verified and validated by a provincial committee through unannounced observation visits to facilities. In addition to the quantity-based payments, facilities can receive a quality bonus of up to 25 percent. Quality is assessed quarterly by local regulatory authorities on a randomly chosen day using a checklist (Kamana, 2012; The World Bank, 2010a) containing 220 items grouped into the following topics: general infrastructure and communication, business plan, income and costs, hygiene and sterilization, outpatient consultations, family planning, laboratory services, inpatient care, essential drug management, essential drug availability, maternal care, surgery, tuberculosis screening, vaccination, and antenatal care. The total payment to a facility is calculated as a weighted sum of the number of provided services in the previous three months times their unit payment multiplied by the quality bonus, which ranges between 1 and 1.25 depending on the score obtained from evaluation of facilities based on results of the checklist assessment.

## Methods

### Data

Repeated cross-sectional household surveys were conducted in 2006, 2008, and 2010 in selected provinces. In 2006 data were only collected in four provinces (two intervention and two control), and from 2008 onwards the survey was extended to eleven provinces to include all provinces where performance based financing was introduced at that time, see Table A2. Table 1 provides an overview of the timing of performance based financing introduction relative to the survey dates across provinces. Three phases can be distinguished: Phase 0 (baseline), Phase I (first stage of rollout), and Phase II (second stage of rollout). Note that the data collection in 2008 took place before the second stage of rollout, while the data collection in 2010 took place six months after rollout. Before the baseline, the Ministry of Health selected comparable control provinces in terms of income and presence of for-profit health care facilities. The facilities in the control provinces did not receive additional cash support.

### Sample and outcome measures

In each round of data collection, households were randomly selected through a clustered sample design (see Table 1 for sample sizes). From the household surveys, five different

samples were distinguished: households, women who delivered in preceding year, infants, women ages 15–49, and illness episodes, see Table A2. The respondents in the latter sample were household members that reported at least one illness episode in the past thirty days and were, therefore, also indicated as "patients." In addition, a random sample of seventy-five health care facilities across the study provinces was surveyed and revisited in subsequent waves, see Table A2.

**Table 1 |** PBF status at time of survey across provinces

| | Province | | 2006 | | 2008 | | 2010 | |
|---|---|---|---|---|---|---|---|---|
| | | | PBF | N | PBF | N | PBF | N |
| 01 | Bubanza | (I) | 0 | 125 | 1 | 125 | 1 | 125 |
| 02 | Cankuzo | (I) | 0 | 100 | 1 | 100 | 1 | 100 |
| 03 | Karuzi | (II) | 0 | 150 | 0 | 150 | 1 | 150 |
| 04 | Makamba | (II) | 0 | 125 | 0 | 125 | 1 | 125 |
| 05 | Gitega I | (I) | 0 | . | 1 | 75 | 1 | 100 |
| 06 | Bururi I | (II) | 0 | . | 0 | 100 | 1 | 100 |
| 07 | Bururi II | (II) | 0 | . | 0 | 50 | 1 | 50 |
| 08 | Gitega II | (II) | 0 | . | 0 | 225 | 1 | 200 |
| 09 | Muramvya | (II) | 0 | . | 0 | 150 | 1 | 150 |
| 10 | Rutana | (II) | 0 | . | 0 | 125 | 1 | 125 |
| 11 | Ruyigi | (II) | 0 | . | 0 | 125 | 1 | 125 |

*Notes:* I = phase I province
II = phase II province
. = no data collected

Sample sizes (N) shown are the number of households interviewed

Information based on Ministère de la santé publique Republique du Burundi (2011)

The household survey collected detailed information on health care use and self-reported satisfaction with health care. Eight main outcomes were identified directly relating to the services incentivized through performance based financing. The incentivized services that were studied using these main outcomes: antenatal care, pregnant woman fully immunized, institutional delivery by qualified staff, child younger than one year completely immunized, use of modern family planning, and use of at least one bed net as shown in Table A1. As a result of time and financial constraints, it was not possible to collect information related to the other incentivized services listed in Table A1. The eight incentivized outcome is quality of care at facilities. Quality scores were obtained through external audits by qualified health care workers who received specific training and were not residing in the province(s) of

study. A detailed checklist was used containing fifty-seven items grouped into the topics of infrastructure and communication, outpatient consultations, maternal care, family planning, vaccinations, laboratory services, drug availability, and medical consumables availability, as described in Table A3 and Soeters et al. (2011). Scores are summed to a total result that reflects overall process quality of services delivered in the facility. It should be emphasized that this score is collected by external health care workers and is not equal to the score calculated by the local regulatory office and used for performance based financing payments. The score collected by external health care workers is a condensed version of the one collected by the local regulatory office because of time and budget constraints. The items in the quality score for the study were defined before the program started and capture the essentials of the longer quality checklist used for the calculation of the bonus.

While we provide information on the eight subcategories of this quality score for additional insight, these are not part of our set of main outcomes. Additional outcomes were used that only indirectly relate to the general performance based financing aim of increasing accessibility and quality of care: health care use in case of illness, self-reported patient satisfaction, and child birth in the past twelve months. The child birth measure is expected to decrease via the effect of performance based financing on modern family planning. Health care use in case of illness is expected to increase because of the performance based financing incentives to raise outpatient and inpatient consultation rates. Reported patient satisfaction is also expected to increase in response to the performance based financing quality incentives. All relevant indirect outcomes that were collected are included in the study. Table A4 describes all main and additional outcome measures and their sample means by survey year for Phases I and II provinces.



### Analysis and explanatory variables

We identified the effects of performance based financing by comparing how changes in outcomes of interest (use and quality) correspond to the staggered rollout of performance based financing in Burundi. We identified the Phase I performance based financing effect by comparing the change in outcomes in the Phase I provinces between 2006 and 2008, before versus after the introduction of performance based financing, relative to the change in the control provinces (those that experienced performance based financing rollout in Phase II). Thereafter, the Phase II performance based financing effect was obtained by comparing the change in outcomes between 2008 and 2010 in Phase II provinces with that in the Phase I provinces over the same period. Detailed information on sample sizes for Phase I and Phase II is provided in Table A2.

We identified the effect of performance based financing in Phase I by restricting the sample to data from 2006 and 2008. The provinces Karuzi and Makamba acted as controls for Bubanza and Cankuzo. Thereafter, the effect of performance based financing in Phase II was identified by only using data from after 2006 and by using Bubanza, Cankuzo, and Gitega I as controls for the other provinces. Finally, we estimated the average effect of performance based financing on the pooled sample using both the Phase I and Phase II regions and the full period of data. This gave us the average performance based financing effect across all phases of implementation. We verified the robustness of the findings by estimating the effects for Phase I and Phase II using interaction effects on the full sample. We also allowed for a differential performance based financing effect on poor (bottom tertile) and non-poor households (top two tertiles) by including an interaction term between the performance based financing indicator and an indicator for the lower wealth tertile. Household wealth is proxied by total monthly household consumption expenditures, based on a list of eighteen items; weekly and yearly expenditure reports were converted to monthly values.

Because performance based financing introduction was not randomized, we controlled for other factors that may have influenced the use and quality of health care and may have correlated with the introduction of performance based financing. All models include year indicators to capture the time trend in outcomes common to treated and control provinces; a full set of province effects to capture time invariant differences; and a set of time-varying household-level characteristics: household size, income tertile of the household, age and sex of household members, number of illness episodes in the household in the past thirty days, indicators for all children in school, durable housing material, access to clean water, ownership of fertile land, health insurance, female income earner, married, polygamous, and farmer. Given the availability of panel data for facilities, we used facility fixed effects rather than province fixed effects to correct for differences across facilities.

The identifying assumption of such a difference-in-differences approach is that, conditional upon observable characteristics, in the absence of performance based financing there would have been no differential changes in the outcomes across these provinces (the parallel trend assumption). We discuss the plausibility of this assumption in the results section.

Least squares regression was used for all outcomes, and robustness of results was confirmed using fixed-effect logit models for all binary outcomes. Standard errors were adjusted for clustering at the province level to allow for the possibility of serially correlated province-level shocks (Bertrand et al., 2004; Angrist and Pischke, 2008).

Let $\overline{Y}_{tp}$ represent the average value of the outcome of interest at time $t$ in province $p$. We can examine the change in $\overline{Y}$ in the phase I regions between 2006 and 2008 relative to the change in the control provinces (phase II):

$$(\overline{Y}_{2008,I} - \overline{Y}_{2006,I}) - (\overline{Y}_{2008,II} - \overline{Y}_{2006,II}) \quad (1)$$

Similarly, for the phase II regions, we can compare:

$$(\overline{Y}_{2010,II} - \overline{Y}_{2008,II}) - (\overline{Y}_{2010,I} - \overline{Y}_{2008,I}) \quad (2)$$

Note that in the second comparison, the phase I regions are being used as controls.
To control for other (observed) factors that influence the use and quality of health care, we estimate the health care use for individual $i$ at time $t$ in province $p$ as follows:

$$Y_{itp} = T_t + P_p + PBF_p + X_{itp} + \mathcal{E}_{itp} \quad (3)$$

The model includes year indicators ($T_t$) to capture the time trend in outcomes common to PBF and non-PBF provinces, and a full set of province effects ($P_p$) to capture time invariant differences. The interest lies in the effect of the PBF indicator ($PBF_{tp}$) which is switched on if the province $p$ has PBF at time $t$. Controlling for time varying individual variables ($X_{itp}$) accounts for the differences in observable characteristics between PBF and non-PBF provinces. We assume that the error term ($\varepsilon_{itp}$) is normally distributed such that (3) is a linear model. We have confirmed robustness of our results to using a logistic model for binary outcomes.

To account for the small number of clusters, we use the bootstrapping method proposed by Cameron et al. (2008) to obtain statistical inference. To further account for possible type I error because of multiple hypothesis testing, we apply a Bonferroni correction that also accounts for the inter-variable correlation between the outcome variables in each of the three families with multiple outcomes (Aker et al., 2012; Sankoh et al., 1997). These correlations are fairly low for the family "women who delivered in preceding year" and the family "illness episodes for which care was used" (respectively 0.03-0.20 and 0.04-0.35) suggesting that the method proposed by Aker et al. (2012) performs reasonably well (McKenzie, 2012). The correlation for the remaining family is obviously much higher (0.95-0.97) because BCG vaccination is part of the outcome of having at least one vaccination. We calculate the family-wise adjusted p-value for an alpha of 5 percent and report these in italics. Note that this correction only has a minor impact on the results. STATA 13 was used to perform all statistical analyses.

### Limitations

There are some limitations to our study. First, as performance based financing is rolled out at the provincial level in a nonrandomized way, it is possible for unobservable characteristics to violate the common trend assumption necessary to claim causality. Second, because performance based financing became a nationwide program in 2010, we have no "pure" control provinces left for the Phase II period. To the extent that performance based financing not only causes a shift in levels of health care use and quality but also causes an upward change in their trends, this could bias our results from the second implementation period downward. The inevitable assumption that Phase I districts represent a reliable control for Phase II districts is a limitation of the analysis. Third, we cannot distinguish between the *incentive* and *resource* effects of the performance based financing scheme as control provinces – unlike intervention provinces – were not given additional resources (Basinga et al., 2011). However, we do know that the average revenues for health facilities per person per year increased from $0.53 to $2.49 between 2006 and 2010 in Burundi, an almost fivefold increase. This increase is larger than was reported for Rwanda, where the revenue increase for health facilities was about threefold (Basinga et al., 2011). Fourth, our study could only examine a subset of six out of twenty-three performance based financing output indicators. Fifth, quality could only be measured by process indicators such as the availability of basic medical equipment, infrastructure, correct and up-to-date registries, prescription behaviour, and routine.

## Results

### Descriptive Statistics

For most outcomes, Phase I and Phase II provinces are similar at baseline (see Table A4). The one exception is that institutional deliveries were less common in the Phase I provinces (48 percent in Phase I provinces versus 73 percent in Phase II provinces). Further evidence supporting comparability of Phase I, Phase II, and provinces not surveyed is provided in Table A5, which does not reveal any systematic differences in terms of child mortality, poverty, education, and health care infrastructure (obtained from other data sources). Between 2006 and 2008, health care use and quality seem to have improved for Phase I provinces, while some deterioration was observed in the other provinces. This deterioration could be related to nationwide clashes between government forces and national liberation forces. The positive trend in the Phase I provinces might be an indication of the effect of performance based financing being stronger than the negative effect nationwide of political instability. In May 2008 the government and the liberation forces signed a ceasefire (BBC News, 2012). For information about the means for the control variables over time and across Phase I and Phase II provinces, refer to Table A6.

It is not possible to formally test the parallel trends assumption that in the absence of performance based financing there would have been no differential changes in the trends of the outcomes of these provinces. However, we further assess the credibility of the parallel trends assumption by comparing pre-intervention trends in maternal and child health care across Phase I and Phase II provinces using data from the Multiple Indicator Cluster Surveys (MICS) collected in Burundi in 2000 and 2005 that provide information on births from 1996 to 2004, the period *prior* to performance based financing introduction. Figure 1 confirms that pre-intervention trends in the relevant indicators available in the MICS (child's vaccination card, one BCG vaccination at or close to birth, three or more doses of polio vaccination, three doses of DTP vaccination, and at least one dose of measles vaccination) were very similar across the two groups of provinces.

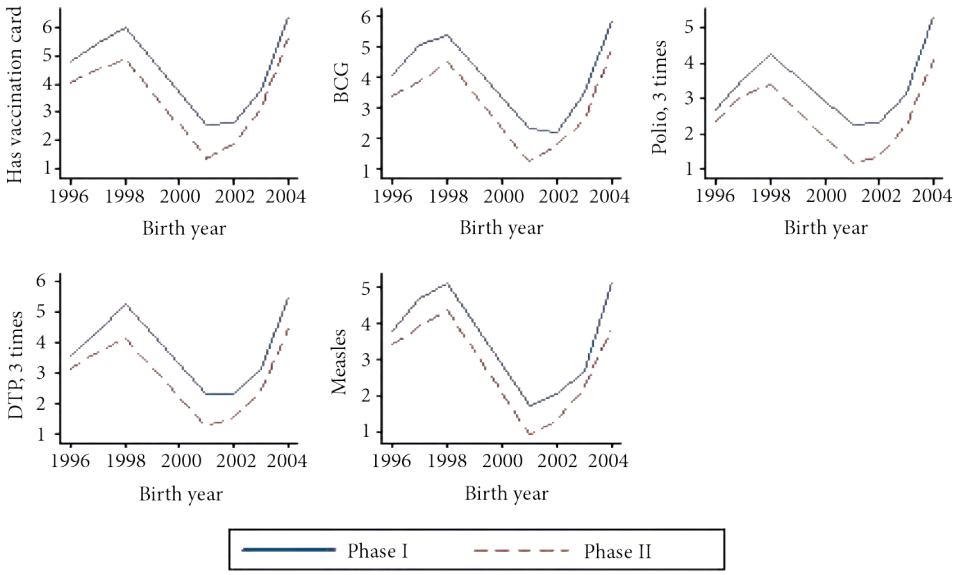


**Figure 1 |** Trends in child care in Burundi.

## Effects on use and quality of health care

Table 2 shows the estimated effects of performance based financing on both incentivized and indirect outcomes. Performance based financing in Phase I significantly increased the proportion of women delivering their babies in an institution by 38 percentage points, which reflects a relative increase of 79 percent, see Table A4 for baseline means. The share of pregnant women reporting more than one antenatal care visit increased significantly by 10

percentage points, a relative increase of 11 percent. The proportion of households reporting use of at least one bed net increased by 14 percentage points, a relative increase of 26 percent. The facility quality scores improved under performance based financing. The average quality score constructed from the external audits increased by 23 points, compared to the baseline average of 35 under performance based financing. Subcomponent quality scores are presented in Table A7. No effect was found of performance based financing in the Phase I provinces on vaccinations and use of modern family planning.

The lower half of Table 2 shows estimated effects of performance based financing on indirect outcomes. Though no significant effect was found on the use of family planning, performance based financing was found to significantly decrease the proportion of households in which a child was born in the past twelve months by 5 percentage points, a relative decrease of 19 percent. We found no evidence of a performance based financing effect on the number of times that health care was used in the case of an illness episode or on quality as reported by patients. The share of patients that reported the quality of care and the drug availability to be sufficient, the personnel to be respectful, or the waiting time to be reasonable, did not change significantly. There was also no change in the share of patients that felt cured.

Estimated performance based financing effects in Phase II are generally smaller compared to those in Phase I, as shown in Table 2. Performance based financing increased the share of institutional deliveries by 14 percentage points, a relative increase of 19 percent, which is less than half of the increase found in Phase I. No effect was found on the use of antenatal care in Phase II. However, the use of modern family planning did significantly increase by 6 percentage points, a relative increase of 67 percent. No performance based financing effect was found on bed-net use in Phase II, unlike the effect on bed-net use that was found in Phase I. The quality score increased by 16 points, or 38 percent, which is a considerably smaller effect than found in Phase I. Table A7 shows that the effect on the total quality score is mainly driven by improvements in infrastructure and communication, in addition to increased availability of family planning and drugs. We found no significant change in any of the five measures for patient satisfaction.

Pooling the data shows that the overall effect of performance based financing between 2006 and 2010 (Table 2) implies a significant improvement in about half of the studied incentivized services. Effects on indirect outcomes are generally smaller than on the directly incentivized ones. performance based financing increased the share of women delivering in an institution by 22 percentage points, a relative increase of 36 percent and the use of modern family planning services by 5 percentage points, which is a relative change of 55 percent. The overall facility quality score showed a relative increase of 45 percent (17 percentage points), and the share of patients reporting they felt cured increased by 9 percentage points (relative

change of 12 percent). No significant effect was found on the other aspects related to the quality of care as reported by patients. We found no effects of performance based financing on vaccination rates, the reported use of at least one bed net, nor on the use of care when ill. For most outcomes, there is no indication of heterogeneity of effects by poverty status (results available on request). Only for the use of health care when ill, we found the performance based financing effect to be smaller for the poor.

## Discussion

The experience in the first two phases of performance based financing implementation in Burundi led the Ministry of Health to gradually introduce further alterations to the performance based financing scheme, following the nationwide rollout. The main aims were to: improve the verification of reported results; foster a more equitable distribution of outcomes; and enhance the quality of care. Below, we discuss these three changes as well as funding and sustainability of the scheme.

### Alterations

In the initial phase of the performance based financing rollout, independent agencies (staffed by international NGOs) were responsible for the contracting of health facilities and the verification of reported results and payments. The payment function has now been taken over by the national government. So-called *Comités Provincial de Vérification et de Validation* (Provincial Verification and Validation Committees) were developed to perform the contracting and verification functions. These committees are public-private partnerships comprised of members from local government but also from civil society, provincial and district health management staff, international NGOs, and partners with technical expertise. A second change relates to enhancing equity in health care use via two routes. First, so-called isolation bonuses are paid to health care facilities in rural, remote areas or with a relatively large share of their target population living below the poverty line. The higher per capita budgets should reduce staff shortages by attracting health workers from urban areas. Second, additional funding is provided to health facility managers for the provision of care to the poorest part of their target population.

A third modification relates to the measurement of quality, which initially focused on structure and process quality. The Ministry of Health noted satisfactory improvements in these quality measures. The Ministry of Health's subsequent aim is to strengthen other aspects of quality of health care services. Beginning in 2014, the items on the quality checklist focus more on health outcomes and clinical aspects, aiming to move toward a full quality accreditation system which is currently not in place.

**Table 2 |** OLS estimation of effects PBF on incentivized and indirect outcomes

| | Phase I | p-value | N | Phase II | p-value | N | Pooled | p-value | N |
|---|---|---|---|---|---|---|---|---|---|
| **Incentivised outcomes** | | | | | | | | | |
| Women who delivered in preceding year | | *0.019* | | | *0.019* | | | *0.019* | |
| Institutional delivery | 0.38** | 0.000 | 274 | 0.14** | 0.034 | 715 | 0.22** | 0.000 | 845 |
| More than one antenatal care visit | 0.10** | 0.000 | 274 | 0.01 | 0.764 | 715 | 0.02 | 0.316 | 845 |
| More than one tetanus vaccination | 0.06 | 0.786 | 274 | 0.13 | 0.294 | 715 | 0.11 | 0.314 | 845 |
| Infants | | *0.049* | | | *0.049* | | | *0.048* | |
| At least one vaccination | 0.04 | 0.260 | 265 | 0.01 | 0.748 | 712 | 0.01 | 0.818 | 835 |
| BCG vaccination | 0.03 | 0.716 | 265 | 0.00 | 0.916 | 712 | -0.01 | 0.932 | 835 |
| Women 15y – 49y | | | | | | | | | |
| Modern family planning | 0.02 | 0.798 | 1329 | 0.06** | 0.046 | 3690 | 0.05* | 0.050 | 4341 |
| Households | | | | | | | | | |
| Use of at least one bed net | 0.14** | 0.000 | 1000 | -0.06 | 0.672 | 2700 | 0.00 | 0.950 | 3200 |
| Quality scores in health care facilities | | | | | | | | | |
| Total quality score | 22.92** | 0.000 | 49 | 15.88* | 0.062 | 130 | 17.24* | 0.062 | 159 |
| **Indirect outcomes** | | | | | | | | | |
| Households | | | | | | | | | |
| Child birth in past 12 months | -0.05** | 0.002 | 1000 | -0.01** | 0.018 | 2700 | -0.02** | 0.040 | 3200 |
| Illness episodes | | | | | | | | | |
| Health care used when ill | 0.06 | 0.396 | 1440 | -0.01 | 0.960 | 3770 | 0.02 | 0.750 | 4555 |
| Illness episodes for which care was used | | *0.014* | | | *0.014* | | | *0.014* | |
| Quality of care sufficient | -0.02 | 0.540 | 1291 | 0.03 | 0.406 | 3237 | 0.00 | 0.924 | 3928 |
| Drug availability sufficient | 0.02 | 0.850 | 1295 | 0.06 | 0.436 | 3250 | 0.04 | 0.492 | 3941 |
| Personnel respectful | 0.00 | 0.920 | 1300 | -0.03 | 0.534 | 3256 | -0.02 | 0.718 | 3947 |
| Waiting time reasonable | -0.03 | 0.666 | 1299 | -0.13 | 0.276 | 3259 | -0.12 | 0.318 | 3950 |
| Felt cured | 0.02 | 0.476 | 1294 | 0.11 | 0.048 | 3241 | 0.09** | 0.012 | 3932 |

*Notes*: All models include province and time controls and the control variables as listed in Table A8.

The phase II and pooled models for quality scores in health care facilities contain facility fixed effects.

p-values calculated using bootstrapping method proposed by Cameron et al. (2008)

*Italics: family-wise adjusted p-value for an alpha of 5 percent based on Bonferroni correction with inter-variable correlation adjustment.*

* and ** reflect statistical significance at the 10 and 5 percent level, based on p-values adjusted for multiple outcomes testing.

* family-wise p<0.10; ** family-wise p<0.05

### Funding and sustainability

The initial implementation of performance based financing in Phase I, inspired by earlier programs in Cambodia and Rwanda (Soeters and Griffiths, 2003; Soeters et al., 2006), was funded by aid agencies and international NGOs (including the Dutch NGO Cordaid). The Ministry of Health of Burundi is now providing the majority of funding for the national performance based financing program, though the reliance on funding from outside the country remains considerable. Performance based financing sustainability seems secured because it is now recognized as a national strategy. The national government committed to annually allocate 1.4 percent of its budget to performance based financing and related health financing strategies.

### Further observations

The introduction of performance based financing in Burundi improved use of maternal care services and quality of health care services in the period 2006–10. Examining the effect of performance based financing on six of the twenty-three incentivized services, we found a positive effect on four of the six services in at least one of the implementation phases, as well as on the total quality score for health services. We found significant increases in institutional deliveries, antenatal care use (in Phase I), modern family planning, and bed-net use (in Phase I). The improvement in the total quality score in health care facilities based on external audits was large and significant but not confirmed by patient reports. The share of patients that felt cured after using health care greatly increased, though this outcome may be prone to reporting bias. No significant effects were found on the quantity of general health care used or on vaccinations in infants and pregnant women. We could not test for a performance based financing effect on the seventeen other incentivized services that mostly relate to care for HIV, tuberculosis, and sexual transmittable diseases.



While some positive performance based financing effects were obtained across the *entire* study period, effects were considerably larger in the early-adopting than the later-adopting provinces. The reasons for the lower effectiveness in the later period are unclear. Since institutional deliveries were lower at baseline for the early-adopting provinces, there may have been more room for improvement, but this does not explain the larger effects on other outcome measures. It could also be related to performance based financing causing a steeper upward trend in Phase I outcomes, creating a downward bias in our Phase II estimates.

We did not find strong evidence of differential effects of performance based financing across socioeconomic groups, and the performance based financing effects on the probability of using care when ill were even smaller for the poor. This suggests that a supply-side intervention such as performance based financing without accompanying access incentives aimed at the poor is unlikely to improve equity. Outcomes that were not directly incentivized by performance based financing payments showed less improvement compared to those directly incentivized.

### Rwanda's experience

Our study findings can be compared to those of Basinga et al. (2011), who exploited the staggered rollout of performance based financing in Rwanda to estimate its impact using difference-in-differences analysis. Rwanda is one of the few African countries with nationwide performance based financing, and its neighbouring location to Burundi makes it a suitable comparator. The Rwanda performance based financing setup was similar, though subsidies to health care providers were slightly lower. The main design difference was that the control provinces received additional funding in Rwanda. The supply-side financing system also differed: Rwanda introduced performance based financing within a system of community-based health insurance, while in Burundi user fees for deliveries and care for children younger than five years of age were removed. Basinga et al. (2011) found a 23 percentage point increase in the number of institutional deliveries in Rwanda; close to the 22 percentage point increase we found in Burundi. They reported no significant impact of performance based financing on tetanus vaccination or child immunization, in line with our findings. Neither study found a consistent effect on antenatal care use. The quality score in the Rwandese study is not directly comparable to ours as it only relates to antenatal care, while the Burundi study evaluates a broad range of quality in health service delivery, but both studies found the quality score to be the outcome measure showing the largest improvement.

The observed improvements in some of the incentivized services are likely to contribute to achieving the targets set by Millennium Development Goals 5 and 4 of reducing maternal and child mortality (Lozano et al., 2013). World Bank Group President Jim Yong Kim recently announced that an additional $700 million will be devoted to enhancing women and children's health through results-based financing, to help reach these Millennium Development Goal targets by 2015 (Kim, 2013).

### Remaining questions

While our findings are encouraging, they also leave some remaining questions. The observed differences in effects between implementation waves call for further exploration of the relative contributions of the subcomponents of performance based financing programs, such as the targeting of the vulnerable and the engagement of the community. We also cannot offer a conclusion on the effect of performance based financing on the non-incentivized services as that could not be studied with our data. Future research should also aim to identify effects of performance based financing on health outcome measures such as maternal and child mortality. Further clarification is required on the issue of whether performance based financing mainly affects health care use and quality through expanded facility resources or through a change in provider incentives. This would be essential to answer the questions of whether performance based financing is a cost-effective intervention and whether its effects outweigh its additional administrative burden.

# Appendices

**Table A1 |** PBF payments for output indicators

| Output indicator *j* | Payment in US dollar |
|---|---|
| Children 6 – 59 months receiving Vit A | 0.05 |
| Outpatient consultancy – new case | 0.25 |
| **Antenatal care: new and standard visits** | 0.40 |
| Diagnosis and treatment of STD | 0.50 |
| In patient bed day | 0.50 |
| **Pregnant woman fully immunized** | 0.50 |
| Small surgery intervention | 0.50 |
| Latrine newly constructed | 0.70 |
| Child treated after birth HIV mother | 1.00 |
| Family planning: referral of tubal ligation and vasectomy | 1.00 |
| HIV mother treated | 1.00 |
| Patient referred to hospital and feedback obtained | 1.00 |
| Pregnant woman counseled and tested for HIV | 1.00 |
| Person voluntary counseled and tested for HIV | 1.00 |
| **Bed net distributed** | 1.50 |
| **Child under 1 completely immunized** | 1.50 |
| HIV case diagnosed and referred | 1.50 |
| **Family planning: new and re-attendants, oral & injectable** | 2.00 |
| HIV mother referred to hospital | 2.00 |
| **Institutional delivery by qualified staff** | 2.00 |
| Family planning: implant or IUD | 5.00 |
| Patient diagnosed with TB (3 sputum checks) | 10.00 |
| TB patient correctly treated during 6 months | 20.00 |

*Notes:* Information based on Ministère de la santé publique Republique du Burundi (2011)

In bold the six output indicators which are evaluated in this study.

**Table A2** | Sample sizes

| | | No PBF | PBF | Total |
|---|---|---|---|---|
| Households | Phase I | 775 | 225 | 1000 |
| | Phase II | 1050 | 1650 | 2700 |
| | Pooled | 1550 | 1650 | 3200 |
| Women who delivered in preceding year | Phase I | 202 | 72 | 274 |
| | Phase II | 286 | 429 | 715 |
| | Pooled | 416 | 429 | 845 |
| Infants | Phase I | 192 | 73 | 265 |
| | Phase II | 282 | 430 | 712 |
| | Pooled | 405 | 430 | 835 |
| Women 15y – 49y | Phase I | 1026 | 303 | 1329 |
| | Phase II | 1443 | 2249 | 3692 |
| | Pooled | 2092 | 2249 | 4341 |
| Illness episodes | Phase I | 1115 | 325 | 1440 |
| | Phase II | 1411 | 2359 | 3770 |
| | Pooled | 2196 | 2359 | 4555 |
| Health care facilities | Phase I | 38 | 11 | 49 |
| | Phase II | 49 | 81 | 130 |
| | Pooled | 78 | 81 | 159 |

**Table A3 |** Quality scores for health care facilities

| | max. score |
|---|---|
| **General** | |
| Availability of catchment area health map and displayed at the wall | 1 |
| Quarterly business plan (or action plan) of health facility available and used | 1 |
| Monthly technical meetings by health facility staff conducted of which a report produced and available | 1 |
| Referral documents are available | 1 |
| Radio or mobile phone system is available and functional for communication health staff and next referral level | 1 |
| Cost recovery tariffs are known and displayed for patients | 2 |
| Personnel sterilises the instruments according to the standards, autoclave available and utilized every day | 1 |
| Waste is collected and put in appropriate containers, availability of bins and safety box for needles | 1 |
| Incineration done correctly – waste pit available | 1 |
| Presence of latrines in sufficient quantity and in good working condition | 1 |
| Cleanliness of the court, no waste or hazardous materials to be found in the yard | 1 |
| **Outpatient** | |
| Correct numbers in the register | 1 |
| Services available 24/24 hours, 7/7 days, check the register: last Sunday | 1 |
| Protocol displayed for the management of malaria | 1 |
| Satisfactory management of uncomplicated malaria, check the records of the last 5 cases | 2 |
| Satisfactory management of severe malaria, check the records of last 2 cases of quinine injection | 1 |
| Availability stethoscope/functional sphygmomanometer | 2 |
| Availability of functional thermometer | 1 |
| Availability of functional otoscope | 1 |
| Availability of functional weighing scale | 1 |
| **Maternity** | |
| Availability of partogram | 1 |
| Taking blood pressure during childbirth, filled in the partogram or the admission sheet | 1 |
| Systematic measurement of the APGAR after childbirth, filled in the maternity register | 1 |
| Availability of a measuring tape (to measure height) | 1 |
| Availability of obstetric stethoscope | 1 |
| Delivery table in good condition (functional feet rest) | 2 |
| Availability of two obstetric sterilized boxes, containing at least one scissor, two clamps and one needle holder | 1 |
| Availability of functional baby weighing scale | 1 |
| Availability of a suction set (manual or vacuum) | 1 |
| Availability bed nets in in-patient room | 2 |

**Table A3** | *Continued*

| | max. score |
|---|---|
| **Family planning** | |
| Register available and well used | 2 |
| Oral and injectable contraceptive methods available in sufficient quantity, at least 20 oral strips and 10 ampoules | 2 |
| IUDs available, at least 5 | 1 |
| Register well utilized, 5 records, check sphygmomanometer, hepatomegaly, varicose veins and weight | 2 |
| Nurse calculates the expected number of women for family planning in catchment area | 1 |
| **Vaccination and antenatal care** | |
| Availability DTC + Hib + Hep, BCG, measles, polio, and tetanus | 1 |
| Regular monitoring of the cold chain, availability of books or sheet temperature, 2 x day | 1 |
| Standards of vaccine storage, available vaccines: VAR & VAP in freezer, other vaccines in the refrigerator | 1 |
| Stock notebooks EPI customers – at least 10 | 1 |
| ANC Register available and well utilized – at least 10 | 2 |
| Stock records ANC – at least 25 | 1 |
| **Laboratory** | |
| Availability of functional centrifuge | 1 |
| Availability of a functional microscope, immersion oil, mirror or electricity, blades | 3 |
| Availability GIEMSA | 1 |
| **Availability of tracer drugs, safety stock = average monthly consumption (AMC)/2** | |
| Amoxicillin caps 250 mg | 1 |
| Artesinat tabs 50 mg – amodiaquine 200 mg | 1 |
| Cotrimoxazol tabs 480 mg | 1 |
| Diazepam 10 mg/2ml – injectable | 1 |
| Mebendazol tabs 100 mg | 1 |
| Methergin amp 10 units | 1 |
| Metronidazole tabs 250 mg | 1 |
| Paracetamol tabs 500 mg | 1 |
| Quinine tabs 500 mg | 1 |
| ORS sachets | 1 |
| **Availability consumables, safety stock = average monthly consumption (AMC)/2** | |
| Sterile gloves | 1 |
| Bandages | 1 |
| Glucose 500cc 5% | 1 |
| *Score total* | *68* |

**Table A4 |** Means for incentivized and indirect outcomes in PBF phase I and phase II provinces

| | Main or additional outcome | Sample | Phase I provinces | | | Phase II provinces | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2006 | 2008 | 2010 | 2006 | 2008 | 2010 |
| **Incentivized outcomes** | | | | | | | | |
| Maternal care | | Women who delivered preceding year | | | | | | |
| Institutional delivery (1/0) | Main | | 0.48 | 0.87 | 0.88 | 0.73 | 0.67 | 0.81 |
| More than one antenatal care visit (1/0) | Main | | 0.93 | 0.99 | 0.96 | 0.94 | 0.93 | 0.94 |
| More than one tetanus vaccination (1/0) | Main | | 0.83 | 0.90 | 0.62 | 0.83 | 0.85 | 0.72 |
| Child care | | Infants | | | | | | |
| At least one vaccination (1/0) | Main | | 0.95 | 0.98 | 0.95 | 0.93 | 0.93 | 0.93 |
| BCG vaccination (1/0) | Main | | 0.95 | 0.98 | 0.95 | 0.91 | 0.92 | 0.91 |
| Family planning services | | Women 15y – 49y | | | | | | |
| Modern family planning (1/0) | Main | | 0.09 | 0.08 | 0.12 | 0.09 | 0.06 | 0.15 |
| Musquito bed nets | | Households | | | | | | |
| Use of at least one bed net | Main | | 0.53 | 0.65 | 0.85 | 0.42 | 0.51 | 0.64 |
| Quality scores in health care facilities | | Health care facilities | | | | | | |
| Total quality score | Main | | 35.44 | 49.35 | 51.76 | 41.92 | 31.20 | 50.02 |
| *max. 68 points* | | | (6.49) | (11.73) | (7.58) | (8.93) | (7.39) | (6.50) |
| Infrastructure and communication score | Additional | | 4.06 | 8.76 | 9.18 | 5.77 | 2.84 | 8.34 |
| *max. 12 points* | | | (1.91) | (2.82) | (2.21) | (2.42) | (2.07) | (1.89) |
| Outpatient consultations score | Additional | | 6.13 | 8.82 | 8.94 | 8.08 | 6.04 | 8.91 |
| *max. 11 points* | | | (2.42) | (2.10) | (1.25) | (1.93) | (2.10) | (1.60) |
| Maternal care score | Additional | | 6.75 | 9.12 | 9.18 | 8.85 | 5.96 | 8.53 |
| *max. 12 points* | | | (1.91) | (2.26) | (1.98) | (2.12) | (2.30) | (3.10) |
| Family planning score | Additional | | 2.81 | 4.24 | 4.41 | 2.85 | 2.00 | 4.51 |
| *max. 8 points* | | | (2.32) | (2.61) | (3.06) | (2.58) | (2.40) | (2.50) |
| Vaccinations score | Additional | | 3.13 | 4.47 | 5.94 | 5.62 | 2.80 | 4.79 |
| *max. 7 points* | | | (1.63) | (2.37) | (1.09) | (1.45) | (1.57) | (1.55) |
| Laboratory services score | Additional | | 3.63 | 3.82 | 4.59 | 3.00 | 3.43 | 4.60 |
| *max. 5 points* | | | (1.59) | (1.74) | (1.00) | (1.96) | (1.78) | (0.95) |
| Drug availability score | Additional | | 6.75 | 8.12 | 7.41 | 5.85 | 6.12 | 7.91 |
| *max. 10 points* | | | (1.88) | (1.83) | (3.34) | (2.48) | (2.49) | (1.97) |

**Table A4 | *Continued***

| | Main or additional outcome | Sample | Phase I provinces | | | Phase II provinces | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2006 | 2008 | 2010 | 2006 | 2008 | 2010 |
| Med consumable availability score | Additional | | 2.19 | 2.00 | 2.12 | 1.92 | 2.02 | 2.43 |
| *max. 3 points* | | | (0.91) | (1.32) | (1.22) | (1.04) | (0.97) | (0.71) |
| **Indirect outcomes** | | | | | | | | |
| Child birth in past 12 months (1/0) | Main | Households | 0.27 | 0.30 | 0.26 | 0.25 | 0.27 | 0.25 |
| Health care used when ill (1/0) | Main | Illness episodes | 0.86 | 0.91 | 0.88 | 0.89 | 0.87 | 0.85 |
| Satisfaction with care used | | Illness episodes for which care was used | | | | | | |
| Quality of care sufficient (1/0) | Main | | 0.94 | 0.88 | 0.95 | 0.87 | 0.84 | 0.93 |
| Drug availability sufficient (1/0) | Main | | 0.90 | 0.83 | 0.92 | 0.88 | 0.79 | 0.92 |
| Personnel respectful (1/0) | Main | | 0.86 | 0.83 | 0.95 | 0.91 | 0.85 | 0.93 |
| Waiting time reasonable (1/0) | Main | | 0.46 | 0.55 | 0.85 | 0.40 | 0.60 | 0.77 |
| Felt cured (1/0) | Main | | 0.76 | 0.65 | 0.67 | 0.75 | 0.60 | 0.74 |

Notes: Between brackets standard deviation for non-binary outcomes.

The number of observations in the specific samples (N) are shown in Table A2.

**Table A5 |** Characteristics by province at baseline

| Province | Child mortality per 1000 live births | Poverty incidence (%) | Adults finished primary education (%) | Health care centres per 100.000 inhabitants | Doctors per 100.000 inhabitants |
|---|---|---|---|---|---|
| Bubanza | 214 | 57.0 | 56.8 | 5.1 | 0.6 |
| Cankuzo | 147 | 67.7 | 41.3 | 8.0 | 1.5 |
| Karuzi | 154 | 68.9 | 65.8 | 3.6 | 1.7 |
| Makamba | 143 | 57.3 | 43.4 | 6.4 | 0.8 |
| Gitega | 137 | 68.2 | 53.8 | 5.5 | 0.7 |
| Bururi | 81 | 56.7 | 44.8 | 12.7 | 1.0 |
| Muramvya | 144 | 70.0 | 55.3 | 6.6 | 3.3 |
| Rutana | 190 | 72.9 | 52.4 | 11.3 | 0.7 |
| Ruyigi | 163 | 76.0 | 37.3 | 6.0 | 1.1 |
| Bujumbura-mairie | 102 | 28.7 | 57.7 | n/a | n/a |
| Bujumbura-rural | 134 | 64.3 | 56.8 | n/a | n/a |
| Cibitoke | 167 | 59.5 | 38.8 | 8.4 | 0.4 |
| Kayanza | 107 | 75.5 | 64.7 | 6.6 | 1.8 |
| Kirundo | 224 | 82.3 | 54.2 | 6.2 | 1.2 |
| Muyinga | 216 | 70.5 | 50.8 | 4.9 | 0.7 |
| Mwaro | 94 | 61.5 | 47.7 | 8.5 | 1.2 |
| Ngozi | 179 | 75.4 | 54.8 | 6.7 | 1.4 |
| *National* | *151* | *66.9* | *52.9* | *n/a* | *n/a* |
| Sources: | Author's calculations based on MICS 2005 (N = 5819 children) | UNDP, 2010 | Author's calculations based on MICS 2005 (N = 13864 adults) | Ministère de la Planification Centrale 2007 | Ministère de la Planification Centrale 2007 |

**Table A6 |** Household level means for controls in PBF phase I and phase II provinces

| | Phase I provinces | | | Phase II provinces | | |
|---|---|---|---|---|---|---|
| | **2006** | **2008** | **2010** | **2006** | **2008** | **2010** |
| Household size | 5.64 | 5.79 | 5.58 | 6.05 | 6.02 | 5.92 |
| Low income | 0.38 | 0.34 | 0.29 | 0.37 | 0.35 | 0.31 |
| High income | 0.38 | 0.29 | 0.40 | 0.29 | 0.26 | 0.40 |
| Nr of girls below 1y | 0.10 | 0.17 | 0.12 | 0.11 | 0.15 | 0.11 |
| Nr of boys below 1y | 0.14 | 0.14 | 0.13 | 0.16 | 0.12 | 0.13 |
| Nr of girls 1y to 5y | 0.49 | 0.46 | 0.52 | 0.47 | 0.52 | 0.50 |
| Nr of boys 1y to 5y | 0.51 | 0.58 | 0.59 | 0.59 | 0.52 | 0.53 |
| Nr of girls 6y to 14y | 0.86 | 0.70 | 0.70 | 0.94 | 0.87 | 0.83 |
| Nr of boys 6y to 14y | 0.78 | 0.81 | 0.60 | 0.94 | 0.85 | 0.76 |
| Nr of women 15y to 49y | 1.24 | 1.36 | 1.39 | 1.36 | 1.37 | 1.36 |
| Nr of men 15y to 49y | 1.13 | 1.26 | 1.10 | 1.11 | 1.25 | 1.23 |
| Nr of women >49y | 0.19 | 0.15 | 0.20 | 0.18 | 0.16 | 0.24 |
| Nr of men >49y | 0.20 | 0.17 | 0.23 | 0.21 | 0.20 | 0.22 |
| All girls (6y-14y) in school | 0.77 | 0.88 | 0.93 | 0.78 | 0.83 | 0.91 |
| All boys (6y-14y) in school | 0.81 | 0.83 | 0.95 | 0.81 | 0.83 | 0.90 |
| Durable housing material | 0.36 | 0.51 | 0.70 | 0.67 | 0.69 | 0.78 |
| Access to clean water | 0.48 | 0.81 | 0.90 | 0.90 | 0.88 | 0.83 |
| Owns fertile land | 0.67 | 0.57 | 0.37 | 0.67 | 0.57 | 0.35 |
| Nr of illness episodes | 1.78 | 1.54 | 1.54 | 1.70 | 1.48 | 1.61 |
| Has health insurance | 0.04 | 0.05 | 0.08 | 0.09 | 0.08 | 0.11 |
| Female income earner | 0.20 | 0.21 | 0.34 | 0.18 | 0.25 | 0.35 |
| Married | 0.84 | 0.79 | 0.72 | 0.85 | 0.79 | 0.73 |
| Polygamy | 0.08 | 0.06 | 0.07 | 0.03 | 0.04 | 0.04 |
| Farmer | 0.88 | 0.92 | 0.88 | 0.89 | 0.86 | 0.90 |

**Table A7** | OLS estimation of effects PBF on subitems of total quality score

| | Phase I | p-value | N | Phase II | p-value | N | Pooled | p-value | N |
|---|---|---|---|---|---|---|---|---|---|
| Infrastructure and communication score | 6.91** | 0.000 | 49 | 4.86** | 0.040 | 130 | 5.37** | 0.008 | 159 |
| Outpatient consultations score | 2.77 | 0.354 | 49 | 2.64* | 0.094 | 130 | 2.88** | 0.004 | 159 |
| Maternal care score | 3.78 | 0.534 | 49 | 2.49 | 0.212 | 130 | 3.16* | 0.070 | 159 |
| Family planning score | 2.35 | 0.522 | 49 | 2.25** | 0.034 | 130 | 2.17* | 0.056 | 159 |
| Vaccinations score | 2.92 | 0.144 | 49 | 0.59 | 0.628 | 130 | 1.63 | 0.292 | 159 |
| Laboratory services score | 0.92 | 0.584 | 49 | 0.33 | 0.326 | 130 | 0.32 | 0.452 | 159 |
| Drug availability score | 2.61 | 0.108 | 49 | 2.67** | 0.014 | 130 | 1.88* | 0.054 | 159 |
| Med consumable availability score | 0.67 | 0.268 | 49 | 0.06 | 0.854 | 130 | -0.17 | 0.792 | 159 |

*Notes:* All models include time controls and the control variables as listed in Table A6.

The phase II and pooled models also contain facility fixed effects.

p-values calculated using bootstrapping method proposed by Cameron et al. (2008)

* p<0.10; ** p<0.05

# Chapter 6

# The effects of performance incentives on utilization and quality of maternal and child care in Burundi

Bonfrer, I., Van de Poel, E., van Doorslaer, E. 2014.

*Social Science & Medicine, 123:96-104.*

## Abstract

Africa's progress towards the health related Millennium Development Goals remains limited. This can be partly explained by inadequate performance of health care providers. It is therefore critical to incentivize this performance. Payment methods that reward performance related to quantity and quality, called performance based financing (PBF), have recently been introduced in over 30 African countries. While PBF meets considerable enthusiasm from governments and donors, the evidence on its effects is still limited. In this study we aim to estimate the effects of PBF on the utilization and quality of maternal and child care in Burundi. We use the 2010 Burundi Demographic and Health Survey (August 2010 – January 2011, n = 4916 women) and exploit the staggered rollout of PBF between 2006 and 2010, to implement a difference-in-differences approach. The quality of care provided during antenatal care (ANC) visits improved significantly, especially among the better off, although timeliness and number of ANC visits did not change. The probability of an institutional delivery increased significantly with 4 percentage points among the better off but no effects were found among the poor. PBF does significantly increase this probability (with 5 percentage points) for women where PBF was in place from the start of their pregnancy, suggesting that women are encouraged during ANC visits to deliver in the facility. PBF also led to a significant increase of 4 percentage points in the probability of a child being fully vaccinated, with effects more pronounced among the poor. PBF improved the utilization and quality of most maternal and child care, mainly among the better off, but did not improve targeting of unmet needs for ANC. Especially types of care which require a behavioural change of health care workers when the patient is already in the clinic show improvements. Improvements are smaller for services which require effort from the provider to change patients' utilization choices.

## Introduction

Africa's progress towards the health related Millennium Development Goals (MDGs) remains limited. The goal of reducing child mortality from 178 to 59 deaths per 1000 live births by 2015 is unlikely to be met given the current rate of 109 deaths per 1000 live births (United Nations, 2013). One of the reasons for this stagnation in health improvements is the inadequate performance of health care providers in low income countries (LICs) (Rowe et al., 2005, Miller and Babiarz, 2013). A study across a set of LICs found, through unannounced visits, a staggering 35 percent of absenteeism among health care providers. Since many of the providers actually present in the facility were not working, this percentage may still paint a too favourable picture (Chaudhury et al., 2006). Even if providers are delivering health care services, these are often of insufficient quality - referred to as the know-do gap (Leonard and Masatu, 2010; Peabody et al., 2006). Das and Gertler (2007), for example, compared doctor knowledge in Tanzania through a clinical vignettes study to their performance in actual daily practice. Results showed that doctors completed only 24 percent of the elements they knew how to do (as apparent from a vignettes study) when presented with a patient with malaria and 38 percent for a child with diarrhoea (Das and Gertler, 2007). A similar result was found for Rwanda where providers knew on average 63 percent of appropriate procedures but delivered only 45 percent (Gertler and Vermeersch, 2012).

Given these examples of inadequate performance, it is critical to incentivize health care providers to behave in line with the best interest of their patients. A large number of African governments is currently piloting payment methods that reward performance in the health care sector; Burundi and Rwanda have been the first countries to implement these methods nationwide (World Bank Health Results Innovation Trust Fund, 2013). Through these performance based financing (PBF) schemes, health care facilities are paid retrospectively based on the quantity and quality of services provided. This is different from traditional health care financing mechanisms where budget flows are linked to for example number of beds or estimated drug needs. The PBF schemes typically affect health care provision in two ways: first, through incentives for providers to expend more effort in specific activities and second, through an increase in the amount of financial resources (Gertler and Vermeersch, 2012).

Over the last decade PBF has gained popularity among practitioners and governments (Meessen et al., 2011; Meessen et al., 2006; Soeters and Vroeg, 2011; Magrath and Nichter, 2012). More than 30 Sub-Saharan African (SSA) countries are now in the process of introducing payment methods that reward performance or have already done so (Meessen, 2013; Fritsche et al., 2014). This enthusiasm is likely to be sparked further by the World

Bank's recent pledge of 700 million US dollar to be spent on women and children's health through performance based financing by 2015 (Kim, 2013). While the World Bank has initiated several PBF pilots across Africa with associated impact evaluations, the current knowledge base about the effects of PBF in LMIC is still quite limited (Ireland et al., 2011; Kalk et al., 2010; Eldridge and Palmer, 2009). A recent study by Miller and Babiarz (2013) confirmed that no formal evaluations are available for eighteen African countries where PBF has been piloted, including Burundi. A systematic review by Witter et al. (2012) on pay for performance in low and middle income countries, identified only one study (Peabody et al., 2011) – on the effects of bonuses for doctors in the Philippines – meeting high quality impact evaluation standards, with low risk of any bias. It found PBF to improve children's general self-assessed health and to reduce wasting but showed no effect on patient volumes. However, in this experiment similar effects were observed in another intervention group for which health insurance reimbursements to the hospitals were increased, suggesting that the effect mainly derived from increased resources. Though not considered low risk of bias by Witter et al., rigorous evidence has also been generated on the effects of PBF in Rwanda. Basinga et al. (2011) and Gertler and Vermeersch (2012) use a difference-in-differences analysis to show that PBF increased the use and quality of maternal and child services, and child nutritional outcomes. Sherry et al. (2013) use the same experimental design, but a different dataset and find a significant increase in the proportion of women delivering in facilities but no impact of PBF on antenatal care utilization, child vaccinations and contraceptive use.

More recently Bonfrer et al. (2014a) have examined the effects of a pilot PBF program in Burundi with implementation support from the Dutch Non-Governmental Organization (NGO) Cordaid in 9 out of 17 provinces (Bubanza, Bururi, Cankuzo, Gitega, Karuzi, Makamba, Muramvya, Rutana and Ruyigi). Using three waves of data, they study the effects of PBF on antenatal care, institutional deliveries, vaccinations, modern family planning, reported patient satisfaction and a quality score based on a checklist for health care facilities. They find positive effects of PBF on institutional deliveries, antenatal care utilization, modern family planning and the quality score, though this latter finding is not reflected in an increased reported patient satisfaction. The present study builds on this earlier work and extends the analysis in several respects. First, and perhaps most importantly, we evaluate the *nationwide* effects of PBF, i.e. including provinces where NGOs other than Cordaid provided technical support to the Ministry of Health (MoH) for implementation. Furthermore, the use of the Burundi Demographic and Health Survey (BDHS) offers important advantages over the data collected by Cordaid. Not only is the sample size about 9 times larger (7742 births), the BDHS also provides a broader range of outcome measures related to (the timing of) vaccinations and the content of ANC provided. In addition to the number of ANC visits, it registers whether the mother's blood pressure was taken, whether she received an anti-tetanus vaccination and

whether the first visit was in the first trimester of pregnancy. Finally, it is important to note that the BDHS data were collected independently from the PBF program, while the earlier study used data collected by the implementing agency Cordaid, which might potentially have affected reporting and induced bias. Independent data collection is especially important in a context of PBF, where random visits and interviews are conducted to verify quantity and quality of care which are used as parameters to determine payments to facilities.

Given the limited evidence on the effectiveness of PBF in SSA and the considerable expansion of this financing mechanism across the continent, there is an urgent need for evidence on impact. This study contributes evidence on the effects of PBF in Burundi, a country where PBF has gradually become a nationwide policy in the period from 2006 to 2010. Burundi is a post-conflict country, among the lowest income countries in the world with a GDP of barely 251 current US$ per capita (World Bank, 2012) and located in central Africa. The case of Burundi is especially interesting as health systems in post-conflict states are often forced to innovate which can generate useful lessons for other settings (Witter, 2012). The health status of the population is poor as reflected in an infant mortality rate of 67 per 1000 live births compared to 35 per 1000 worldwide (World Bank, 2012).

The primary aim of the PBF scheme in Burundi was to improve maternal and child health (Busogoro and Beith, 2010). We therefore study its effects on the quantity of child and maternal care use and its quality based on the reported services provided during antenatal care (ANC) visits. We use the BDHS and exploit the staggered rollout of PBF across provinces between 2006 and 2010, to implement a difference-in-differences approach.

In the following sections we first discuss the details of the PBF scheme introduced in Burundi, followed by a description of the data and the statistical analyses. Then we discuss the common tend assumption, followed by the estimated effects. These effects are discussed and we end with some concluding remarks.



## Performance based financing in Burundi

Starting from the end of 2006, PBF was implemented in almost 700 health care facilities in Burundi (World Bank Health Results Innovation Trust Fund, 2013). Based on quantity and quality of services provided, facilities receive performance related funding (Bertone and Meessen, 2012) which on average makes up 40 percent of the total facility budget (World Bank Health Results Innovation Trust Fund, 2013). Quantity is measured using various output indicators including ANC, vaccinations, family planning, and HIV care (Ministère

de la santé publique Republique du Burundi, 2010). Different levels of PBF payments are associated with these output indicators as shown in Table 1.

**Table 1 |** Average payments for output indicators

| Health care service *j* | Average payment $P_j$ in US dollar |
|---|---|
| Children 6 – 59 months receiving Vit A | 0.05 |
| Outpatient consultancy – new case | 0.25 |
| Antenatal care: new and standard visits | 0.40 |
| Diagnosis and treatment of STD | 0.50 |
| In patient bed day | 0.50 |
| Pregnant woman fully immunized | 0.50 |
| Small surgery intervention | 0.50 |
| Latrine newly constructed | 0.70 |
| Child treated after birth HIV mother | 1.00 |
| Family planning: referral of tubal ligation and vasectomy | 1.00 |
| HIV mother treated | 1.00 |
| Patient referred to hospital and feedback obtained | 1.00 |
| Pregnant woman counseled and tested for HIV | 1.00 |
| Person voluntary counseled and tested for HIV | 1.00 |
| Bed net distributed | 1.50 |
| Child under 1 completely immunized | 1.50 |
| HIV case diagnosed and referred | 1.50 |
| Family planning: new and re-attendants, oral & injectable | 2.00 |
| HIV mother referred to hospital | 2.00 |
| Institutional delivery by qualified staff | 2.00 |
| Family planning: implant or IUD | 5.00 |
| Patient diagnosed with TB (3 sputum checks) | 10.00 |
| TB patient correctly treated during 6 months | 20.00 |

*Notes:* Based on Ministère de la santé publique (2011)

Health care facilities report monthly to the MoH about the quantity of incentivized services delivered. A provincial committee verifies and validates the reported quantities through unannounced visits to facilities. On top of the quantity based payments, facilities receive a quality bonus ranging from 0 to 25 percent. Local regulatory authorities assess the quality every three months on a randomly chosen day using a standardized checklist procedure for availability of medical supplies, equipment, administrative procedures, prescription

behaviour, lab services and hygiene (World Bank, 2010c; Kamana, 2012; Busogoro and Beith, 2010; Soeters, 2013). Based on information about quantity and quality, the formula used to calculate the total subsidy to facility *i* in period *t* is

$$PBFsubsidy_{it} = \left( \sum_{j=1}^{J} P_j N_{ijt} \right) \cdot Q_{it} \ with \ \ 1 \leq Q_t \leq 1.25 \qquad (1)$$

where $P_j$ is the subsidy received by the health care facility per health care service *j*. $N_{ijt}$ is the number of services *j* delivered in facility *i* over period *t*. $Q_{it}$ is the quality bonus which health care facility *i* receives in period *t*, ranging from 0 to 25 percent, depending on the score obtained from the checklist (Bonfrer et al., 2014a). Health care facilities have some autonomy to decide on the allocation of PBF revenues across two broad categories: up to 50 percent of payments can be used for staff remuneration and the remaining share must be invested in service quality improvements (Busogoro and Beith, 2010).

Table 2 details the rollout dates of the program: PBF was first implemented by the MoH with help from non-governmental organizations (NGOs) in three provinces in December 2006 and over time all other provinces were added (Ministère de la santé publique Republique du Burundi, 2011; Busogoro and Beith, 2010; Bonfrer et al., 2014a). The selection of provinces in the early (pilot) phase of the PBF roll-out was done by the MoH, with the aim to ensure comparability across intervention and control provinces. When presenting descriptive statistics, we group the provinces into early adopters starting December 2006 (Bubanza, Cankuzo and Gitega), middle adopters starting October 2008 (Bururi, Karuzi, Makamba, Rutana, Ruyigi) and later adopters starting mostly April 2010 (Ngozi, Bujumbura-rural, Cibitoke, Kayanza, Kirundo, Muramvya, Muyinga, Mwaro and Bujumbura-mairie).

Before the introduction of PBF, in May 2006, user fees for deliveries and care for under-fives were removed throughout Burundi in governmental, non-faith based, facilities (Nimpagaritse and Bertone, 2011). These facilities received payments from the government for the services provided for free. Following the problematic implementation of this policy (Nimpagaritse and Bertone, 2011; Kamana, 2012), the MoH decided to make the reimbursement for these maternal and child care services also performance based by incorporating it into the PBF scheme in April 2010. Given that this was a nationwide program implemented before the start of PBF, it does not affect our estimates which are based on differences in the changes in outcomes over time, isolating the part of change attributable to PBF.

## Methods

### Data

We use the Burundi Demographic and Health Survey (BDHS) data collected in 2010 (August 2010 – January 2011, after nationwide rollout of PBF as shown in Table 2), in which a nationally representative sample of 4916 women was asked about maternal and child care use for all of their pregnancies in the past five years. It thus provides information on births occurring in the period 2005-2010, during which PBF was rolled out in Burundi, and for every reported birth we identify whether PBF was being implemented in the mother's province of residence in the month that the delivery took place. In the case of antenatal care we identify whether PBF was in place nine months earlier, at the start of the pregnancy.

**Table 2 |** Timing of PBF introduction

| | |
|---|---|
| Bubanza | 01-12-2006 |
| Bujumbura-mairie | 01-04-2010 |
| Bujumbura-rural | 01-04-2010 |
| Bururi | 01-10-2008 |
| Cankuzo | 01-12-2006 |
| Cibitoke | 01-04-2010 |
| Gitega | 01-12-2006 |
| Karuzi | 01-10-2008 |
| Kayanza | 01-04-2010 |
| Kirundo | 01-04-2010 |
| Makamba | 01-10-2008 |
| Muramvya | 01-04-2010 |
| Muyinga | 01-04-2010 |
| Mwaro | 01-04-2010 |
| Ngozi | 01-12-2009 |
| Rutana | 01-10-2008 |
| Ruyigi | 01-10-2008 |

*Notes:* Based on Bonfrer et al., 2014a and Busogoro & Beith, 2010

As outcome measures we use all (11) pregnancy and birth related health care services registered in the BDHS that are incentivized in the PBF scheme. The first four outcomes relate to ANC and were collected for the most recent birth among women who gave birth in the last five years. Since virtually all women in the sample used ANC at least once (99 percent), we create a

variable indicating whether the mother used ANC from a doctor, nurse or midwife more than once before she gave birth (*>1 ANC)*. *First trimester ANC visit* indicates whether the mother used ANC from a doctor, nurse or midwife at least once before the end of the first trimester of the pregnancy. Although timeliness of the first visit was not directly incentivized through PBF, it is an important measure to monitor quality. *Blood pressure (BP) measurement* and ≥ *1 anti-tetanus vaccination* indicate whether the mother had her BP measured and whether she received at least one anti-tetanus vaccination in the prenatal period. Both indicators are internationally recognized as essential elements of good quality ANC (Lincetto et al., 2007; World Health Organization, 2006b). Anti-tetanus vaccinations in pregnant women were incentivized through the PBF subsidy 'pregnant woman fully immunized' while there was no specific subsidy for the BP measurement of pregnant women. *Institutional delivery* indicates whether the mother gave birth in a public health care facility while a doctor, nurse or midwife was present.

Regarding child outcomes, which are collected for all children born in the last five years, we include indicators of whether children were fully vaccinated -as shown on their vaccination cards- by the age of one year (excluding those younger than one at the time of survey) (*child fully vaccinated at 1 year*) and more specific indicators for each of the vaccinations received (*BCG vaccination at 1 year, polio vaccination at birth, three additional polio vaccinations at 1 year, three DTP vaccinations at 1 year* and *measles vaccination at 1 year)*. Although information about child mortality is also available in the BDHS, we have insufficient power to detect a plausible effect (for $\alpha = 0.05$ and power = 0.80 a sample size of at least 32,358 births would be necessary to detect a neonatal mortality reduction of 12 percent as we currently observe across births without and with PBF). Table 3 shows sample sizes for all outcome measures for children with and without PBF at birth or from the start of the pregnancy. All models control for household characteristics (size, socioeconomic status, age and sex of the household head and access to water and electricity) and for mother's demographics (age at birth, education, first pregnancy) as shown in Table 4. Socioeconomic status is measured by a wealth index, included in the BDHS, and estimated from principal component analysis on a large set of assets and dwelling characteristics (Filmer and Pritchett, 2001).

No ethical approval was sought because no primary data collection took place for this study.

### Statistical analysis

We identify the effects of PBF by comparing changes in the outcome measures in provinces with PBF (treated) to changes in provinces without PBF (controls). Subject to the common trend assumption – which requires that the trend among the controls is a valid counterfactual of what would have happened to the treated in the absence of PBF – this difference-in-

differences strategy isolates the part of the change that is causally attributable to the impact of PBF (Imbens and Wooldridge, 2009). We assess the plausibility of this assumption in the Results section.

We implement the difference-in-differences approach by estimating the following probit model for each of the $k$ dichotomous outcome measures $y_{itp}^{k}$ (*>1 ANC, first trimester ANC visit*, *BP measurement, anti-tetanus vaccination*, *child vaccinations* and *institutional delivery*) for pregnancy/child $i$ at time $t$ in province $p$ as follows:

$$y_{itp}^{k*} = \alpha_k + \beta_k PBF_{tp} + X_{itp}\Psi + \delta_t + \phi_p + \varepsilon_{itp} \quad (2)$$

where $y_{itp}^{k*}$ is a latent index and the error term ($\varepsilon_{itp}$) is drawn from a normal distribution. Our main interest lies in the effect ($\beta_k$) of the PBF indicator ($PBF_{tp}$) which is switched on if province $p$ had PBF at time $t$ when the child is born (or when the mother was pregnant). The model includes 63 birth period indicators ($\delta_t$) for the month and year in which the child was born to capture the time trend in outcomes common to the intervention and control areas, and a full set of province effects ($\emptyset_p$) to capture time invariant differences between provinces. We use 9 birth half year indicators instead of the 63 month-year indicators for *>1 ANC* because this model had problems converging with the large number of fixed effects and the relatively small sample size. Controlling for time varying individual variables ($X_{itp}$) accounts for the differences in observable characteristics between treated and controls, and adds precision. Standard errors are adjusted for clustering at the province level (Bertrand et al., 2004; Angrist and Pischke, 2008). We have confirmed robustness of our results to using ordinary least squares regression models (significance is lost for the effect on two of the specific vaccination variables, see Table A1).

For each outcome measure, the result is presented as the average partial effect of the PBF indicator among the births (or pregnancies) which had taken place at a time and in a province where PBF was implemented, i.e. the average treatment effect on the treated (ATET). In extended probit models, the effect is allowed to differ by poverty status by interacting the PBF indicator with a variable indicating whether the household is in the bottom two wealth quintiles (poor). All statistical analyses were done in Stata 12.

**Table 3 |** Sample sizes and baseline means of outcome measures

| | Sample sizes | | | Baseline means | | | | |
|---|---|---|---|---|---|---|---|---|
| | No PBF | PBF | Total | Early adopters | Middle adopters | Later adopters | Joint test of significance, p-value | Total |
| >1 antenatal care | 3603 | 1299* | 3603 | 0.98 | 0.94 | 0.96 | 0.26 | 0.96 |
| First trimester antenatal care | 3576 | 1289* | 3576 | 0.18 | 0.14 | 0.28 | 0.00 | 0.23 |
| Blood pressure measurement | 3576 | 1289* | 3576 | 0.36 | 0.50 | 0.59 | 0.00 | 0.53 |
| ≥ 1 Anti-tetanus vaccination | 3614 | 1302* | 3614 | 0.59 | 0.60 | 0.68 | 0.08 | 0.64 |
| Institutional delivery | 5253 | 2489 | 7742 | 0.50 | 0.46 | 0.45 | 0.26 | 0.46 |
| Child fully vaccinated at 1 year | 4595 | 1177 | 5772 | 0.31 | 0.27 | 0.29 | 0.48 | 0.29 |
| BCG vaccination at 1 year | 4595 | 1177 | 5772 | 0.34 | 0.32 | 0.33 | 0.79 | 0.33 |
| Polio vaccination at birth | 5253 | 2489 | 7742 | 0.31 | 0.29 | 0.30 | 0.83 | 0.30 |
| Three additional polio vaccinations at 1 year | 4595 | 1177 | 5772 | 0.34 | 0.30 | 0.32 | 0.58 | 0.32 |
| Three DTP vaccinations at 1 year | 4595 | 1177 | 5772 | 0.34 | 0.31 | 0.33 | 0.64 | 0.32 |
| Measles vaccination at 1 year | 4595 | 1177 | 5772 | 0.33 | 0.29 | 0.32 | 0.61 | 0.31 |

*Note:* * PBF in place when the mother was pregnant

## Results

### Summary statistics and the common trend assumption

Table 4 compares subgroup means for all control variables. While there are some significant differences, this is not necessarily a problem for the difference-in-differences analysis. The more important assumption – that the trends in outcomes for treatment and control groups are parallel in the absence of treatment – cannot formally be tested. However, to assess its credibility we compare pre-intervention trends in maternal and child health care across the three groups of provinces using data from the Multiple Indicator Cluster Surveys (MICS) collected in Burundi in 2000 and 2005 that provide information on births in 1996 – 2004, i.e. prior to the introduction of PBF. The MICS does not collect exactly the same outcome variables as the BDHS, but it has information on ownership of a child's vaccination card, one BCG vaccination at birth or closely after that, three or more doses of polio vaccination, three doses of DTP vaccination and at least one dose of measles vaccination. Figure 1 displays the trends in these five indicators for mother and child care and confirms that trends were very similar across the three groups of provinces in the period prior to the start of the PBF program. Estimating a probit model with indicators for birth years, indicators for early, middle and later adopters and the interactions between these two shows for all outcome variables that interactions are not jointly significant (p-values range from 0.321 for Measles

to 0.698 for DTP), implying that the trends were parallel before the intervention. We do see that the improvement in vaccination coverage rates occurred somewhat later for the early adopters (2002) compared to middle and late adopters (2001). Overall fluctuations in coverage rates are likely to be driven by socio-political instability arising from the ethnic conflict between Hutus and Tutsis from 1993 till 2005. Similar fluctuations were not only reflected in vaccination rates but they are apparent in the Burundi economic indicators in general, as reflected in for example trade levels (see Figure A1).

**Table 4** | Sample means for all control variables

| | Early adopters | Middle adopters | Later adopters | Total |
|---|---|---|---|---|
| Household size | 5.85 | 6.02 | 5.90 | 5.92 |
| Lowest wealth quintile | 0.25 | 0.17 | 0.19 | 0.19 |
| Lower wealth quintile | 0.23 | 0.23 | 0.17 | 0.20 |
| Higher wealth quintile | 0.18 | 0.20 | 0.17 | 0.19 |
| Highest wealth quintile | 0.13 | 0.17 | 0.31 | 0.24 |
| Child is mother's firstborn | 0.21 | 0.20 | 0.21 | 0.21 |
| Mothers' age at birth < 21 years | 0.54 | 0.56 | 0.52 | 0.54 |
| Mothers' age at birth > 35 years | 0.46 | 0.44 | 0.48 | 0.46 |
| Mother no primary education | 0.52 | 0.54 | 0.46 | 0.49 |
| Age of household head in years | 36.39 | 36.35 | 36.81 | 36.61 |
| Male household head | 0.87 | 0.85 | 0.83 | 0.84 |
| Safe drinking water | 0.62 | 0.69 | 0.65 | 0.65 |
| Household has electricity | 0.06 | 0.04 | 0.12 | 0.09 |

Furthermore, in the remaining columns in Table 3 we present baseline (2005-2006) means for selected outcome variables from the BDHS for the early, middle and later adopters. For each outcome, we test for area differences by estimating a simple model with only three covariates: indicators for the early, middle and later adopters. The p-values from the joint test of significance (in 7$^{th}$ column of Table 2) show that there are no significant between-area differences in terms of baseline levels for antenatal care, anti-tetanus vaccinations, institutional delivery and child vaccinations. This suggests that no structural differences were present across the groups of provinces nominated for the different stages of roll-out.

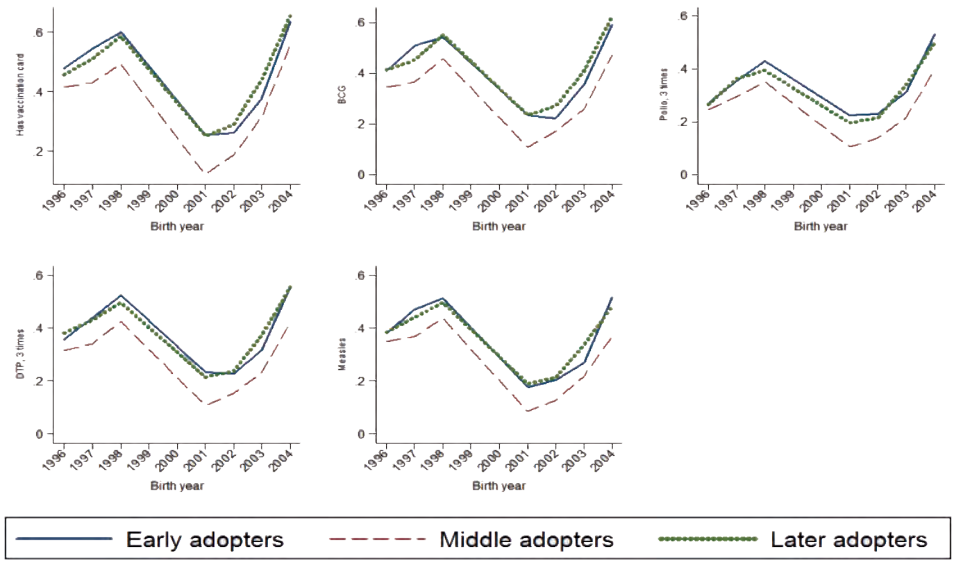


**Figure 1** | Pre-intervention trends in mother and child care

## Estimated effects

Table 5 presents estimated average marginal effects of PBF for all outcome measures. The estimates suggest that PBF in Burundi did *not* affect the probability of a child's mother receiving more than one ANC visit during pregnancy or that the ANC visit took place within the first trimester. However, we do find a marginally significant (p = 0.065) increase of 6 percentage points (pp) in the probability that a mother reported to have had her BP measured at least once during her pregnancy. The likelihood of receiving one or more anti-tetanus vaccinations (as part of the ANC) also increased significantly (p<0.000) and substantially (10 pp). This suggests that while PBF did not lead to a further increase in the quantity or timeliness of ANC provided – most likely because the utilization rate for >1 antenatal care was already so high at baseline (96 percent) – it did improve the quality of ANC provided as measured by whether certain important components were delivered. The positive coefficient of PBF is not significantly different from zero for the probability of delivering in an institution. We further examined this finding in a number of ways. The finding was not different between urban or rural residence of the mother. We also did not find any effect on deliveries when the outcome measure was relaxed to no longer require the presence of a doctor, nurse or midwife. Neither did we find any effect when the outcome measure was expanded to not only include governmental but also private facilities (detailed results available upon request). We did, however, find that PBF significantly raises the probability of a child being fully vaccinated

**Table 5 |** Probit model showing average marginal effects of PBF on treated, using interaction effects

| | Sample size full model | Full model | Full model | Full model | | Sample size subset model | Subset model |
|---|---|---|---|---|---|---|---|
| | | | Alternative treatment definition | poor | non-poor | | |
| > 1 antenatal care visit | 4.902 | -0.004 | n/a | -0.001 | -0.007 | 2471 | -0.006 |
| First trimester antenatal care | 4.865 | 0.014 | n/a | 0.025 | 0.006 | 2448 | 0.029 |
| BP measured during pregnancy | 4.865 | 0.061* | n/a | 0.055 | 0.064** | 2448 | 0.063* |
| ≥ 1 anti-tetanus vaccination | 4.916 | 0.100*** | n/a | 0.106*** | 0.107*** | 2477 | 0.114** |
| Institutional delivery | 7.742 | 0.027 | 0.051* | 0.003 | 0.043** | 3961 | 0.051*** |
| Child fully vaccinated at 1 year | 5.772 | 0.044* | -0.008 | 0.066** | 0.027 | 2974 | 0.064** |
| BCG vaccination at 1 year | 5.772 | 0.037*** | 0.003 | 0.049* | 0.027* | 2974 | 0.060*** |
| Polio vaccination at birth | 7.742 | 0.069*** | 0.011 | 0.063*** | 0.076*** | 3961 | 0.071*** |
| Three additional polio vaccinations at 1 year | 5.772 | 0.032** | -0.029 | 0.048* | 0.019 | 2974 | 0.048*** |
| Three DTP vaccinations at 1 year | 5.772 | 0.031** | -0.024 | 0.047* | 0.019 | 2974 | 0.050*** |
| Measles vaccination at 1 year | 5.772 | 0.042** | -0.002 | 0.058* | 0.030 | 2974 | 0.061** |

*Notes:* All models contain control variables as shown in Table 4 and region and time controls

The full model with alternative treatment definition estimates the effects of PBF when in place from the start of pregnancy (as opposed to being in place at birth) for the outcomes related to delivery and vaccinations. For the other outcome variables, relating to antenatal care, the treatment was already defined in this manner, so no alternative treatement definition is defined (indicated as n/a).

The subset model is based on data from the subset of provinces used in the earlier study by Bonfrer et al. 2014 with data from the NGO Cordaid: Bubanza, Bururi, Cankuzo, Gitega, Karuzi, Makamba, Muramvya, Rutana and Ruyigi.

* p<0.10; ** p<0.05; *** p<0.01

(4pp; p = 0.060), an effect that was driven by an increase in all components of the vaccination package (BCG, polio, DTP and measles). We found no significant effect of PBF on neonatal mortality, likely caused by the lack of power necessary to pick up an effect of credible size, as mentioned in the Data section.

Columns 5 and 6 in Table 5 allow for heterogeneity of the effects across poor and non-poor respondents. The effects of vaccinations are generally stronger for children in poor households, except for the polio vaccine, which is the only vaccination provided immediately at birth. For antenatal care, we find little poor versus non-poor differences in the probability of having a tetanus vaccination, but an increased probability of BP measurement during pregnancy only occurs among the non-poor. Institutional deliveries increased significantly (by 4pp; p = 0.028) among the non-poor, while there is no effect among the poor.

## Discussion

In this study we use the nationwide rollout of PBF in Burundi to estimate its effects on the utilization and quality of maternal and child care services. We do not find any evidence that PBF affects the likelihood of the mother receiving more than one ANC visit during pregnancy, or of an ANC visit to occur in the critical first trimester. However, we do find a significant rise in the likelihood of BP measurement and anti-tetanus vaccination as part of the ANC. We also found the increase in BP measurement during pregnancy to be fully driven by the (larger) effect among the non-poor. This implies that PBF improved the quality of care during ANC visits, especially among the non-poor, but not the targeting of unmet ANC needs. The fact that institutional deliveries were found to increase significantly among the non-poor, but not among the poor, fuels concerns about lower effectiveness of PBF where it is needed most. Greater effects on institutional deliveries among the better off could indicate that PBF might not improve equity in outcomes as it does not overcome demand side barriers. While in principle fees for delivery care are waived, it is likely that other costs, like transportation, might constrain poor women more to deliver in a facility. This argument seems to hold less for vaccinations, for which demand side constraints may be less binding as its administration is less urgent, costly and time consuming. PBF was also found to significantly increase the administration of a full vaccination package, including all of its components (BCG, polio, DTP and measles). The vaccinations effects are stronger for children in poor households, except for the polio vaccine provided at birth. The latter may relate to the higher rates of institutional deliveries within the non-poor group, which gives them better access to this service.

Are these large or small effects and how do they compare to earlier work on PBF in Burundi? Our findings show a smaller impact of PBF overall compared to the PBF pilot program which was evaluated in a subset of 9 out of 17 provinces (Bonfrer et al., 2014a). The main differences in findings are the absence of an effect on institutional deliveries and on having more than one ANC visit during pregnancy. In part, this is due to the selection of provinces for the PBF pilot evaluation: we also find a significant 5pp increase in the probability of delivering in an institution if we restrict our analyses to the 9 provinces included in the pilot evaluation, but even then the effect is considerably smaller than the reported pilot effect (22pp). Another source of differences in the effect on institutional deliveries is the timing of the data collection. Our evaluation includes births which took place directly after the introduction of PBF while the evaluation of the pilot was based on information from births which in almost all cases occurred at least 9 months after the introduction of PBF. To test whether and to which extent this difference in timing of data collection drives results, we changed the definition of the PBF indicator to reflect PBF presence at the start of the pregnancy as opposed to only just before the delivery (see column 3 in Table 5). We then do find a significant effect of PBF on institutional deliveries of 5 pp ($p = 0.058$), which suggests that PBF needs to be in place at the start of a pregnancy to have an effect on institutional deliveries. To test whether ANC utilization is the pathway explaining this finding, we include *>1 ANC* as an explanatory variable in the probit model and find that the effect of PBF on institutional deliveries ($p = 0.182$) indeed vanishes and that ANC as explanatory variable is positive and significant (17pp; $p = 0.000$). This strongly suggests that health care providers encourage women during subsequent ANC visits to deliver in the facility, as also suggested by Gertler and Vermeersch (2012) for Rwanda. Overall, however, our estimated effect of PBF on institutional delivery in the nationwide program remains smaller than in the earlier pilot evaluation.

The effect on the probability of more than one ANC visit during pregnancy found in the pilot study (10pp) is not reproduced with the BDHS when restricting the analysis to the subset of provinces, though Bonfrer et al. (2014a) also did not find this in all cases. The estimated size of the effect on anti-tetanus vaccination for pregnant women is the same in both studies (11pp) but was not significant in the pilot study, possibly due to its smaller sample size. Estimated effects on child vaccinations are difficult to compare, since the pilot study only collected information on whether the child received at least one vaccination for each of the diseases (and no information on its timing). Moreover, the pilot study was based on mothers' reports of their child's vaccination while the BDHS data are derived from the child's vaccination card. The reported baseline vaccination rates in the pilot study were therefore much higher than those reported in the BDHS (95 percent versus 46 percent for BCG vaccination), and this probably explains why the pilot evaluation did not find an effect while this study did (3.7pp increase, $p = 0.000$). The more detailed BDHS information also reveals substantial effects

of PBF on the probability of children receiving the full course of vaccination. Finally, our findings on blood pressure measurement and anti-tetanus vaccination suggest that quality of care has improved because of PBF. Bonfrer et al. (2014a) also reported that pilot provinces included in the first phase of roll-out started off at a lower baseline and had therefore more room for improvement. They found effects indeed to be smaller (institutional delivery) or no longer significant (antenatal care) for births in provinces where PBF was rolled out in the second phase. This may also partly explain the differences between the effects of the pilot program and our results based on all provinces, where a larger share of the sample did not obtain PBF in the first phase.

Our results can also be compared to the estimates effects of PBF in neighbouring Rwanda, the only other country with nationwide PBF, even though we need to be cautious in comparing PBF program effects across countries given the heterogeneity in organizational, social, and institutional environments (Miller and Babiarz, 2013). First we therefore highlight the main differences in health care financing, content of the PBF scheme itself, and set-up of the impact studies in both countries.

Sherry et al. (2013) use a similar approach as ours with the Rwanda Demographic and Health Surveys of 2005 and 2007/08. They find a significant increase in the proportion of women delivering in facilities (9.8pp) but no impact of PBF on antenatal care utilization, child vaccinations and contraceptive use. They do find an impact on non-rewarded services related to antenatal care specifically urinalysis (5.1 pp) and iron supplementation (9.3 pp). No significant effect is found on other aspects of antenatal care like vitamin A supplementation. They also do not find any effect on health outcomes. Basinga et al. (2011a) confirm considerable effects on institutional deliveries (23pp) and the absence of significant impacts of PBF in Rwanda o vaccinations and antenatal care.



The set-up of PBF was very similar in Burundi and Rwanda, but subsidies were slightly lower in Rwanda. One clear difference lies in the fact that in Rwanda the control provinces received additional funding, enabling differentiation between the incentive and resource effect, while this was not the case in Burundi (Basinga et al., 2011). The financing system for the demand side also differed between the two countries: Rwanda introduced PBF within a system of community based health insurance while in Burundi user fees for deliveries and care for under-fives were removed. The differential relative importance given to certain services is apparent from the subsidy levels and shows a greater focus on HIV/AIDS care and institutional deliveries in Rwanda and a focus on family planning and TB care in Burundi. Generally, subsidies for vaccinations were higher in Burundi while those for institutional delivery were higher in Rwanda. We indeed see effects of PBF on vaccinations in Burundi

(4pp increase; p = 0.060), while this is not the case for Rwanda (Basinga et al., 2011; Gertler and Vermeersch, 2012; Sherry et al., 2013) and no or smaller effects on institutional delivery in Burundi compared to Rwanda (9.8 pp increase) (Sherry et al., 2013). The latter difference might also be explained by the relatively low subsidy for institutional deliveries in Burundi where it is not among the highest subsidized services, as it is in Rwanda. Further research is necessary to provide insights into the effectiveness of PBF in the context of demand side interventions like community based health insurance (Robyn et al., 2014) or user fee removal. All in all, it seems that the differences in the relative importance given to specific aspects of the PBF design also produced differences in incentivized outcomes.

## Conclusion

It seems clear that PBF has had some positive impacts in Burundi. Especially for types of care which require a behavioural change of health care workers when the patient is already in the clinic we see improvements. While the likelihood of measuring a pregnant woman's BP and giving an anti-tetanus injection during an ANC visit increased, mothers did not respond by going for more than one ANC visit or to initiate these visits during the critical first trimester. This is consistent with the argument of Gertler and Vermeersch (2012) that it is more difficult for PBF to increase utilization of services that depend on patient choices than services that are under the provider's control. They also argue that initiation of care takes more effort than its continuation, suggesting that policy makers might want to increase the PBF unit payments for first time antenatal care use. Like Gertler and Vermeersch, we believe that conditional cash transfers to poor women for the timely utilization of ANC may be more effective in influencing decisions of care utilization over which patients have direct control. Provider incentives like PBF seem more appropriate to incentivize the quality or content of ANC visits which is more controlled by health care providers. Cost-effectiveness comparisons could shed light on the relative efficiency of both health care financing options.

Some qualifications are in order. While many of the outcomes used are accepted measures of clinical performance (e.g. prenatal care use in first trimester of pregnancy), they are still indicators of processes, not outcomes. The assumption is that these result in improved patient or population health outcomes, but this may not always hold. It would obviously be preferable if performance incentives rewarded health improvement directly rather than the use of health services or other health inputs.

There are some limitations to the analyses presented in this paper. First, because of the non-random rollout of PBF, it is possible that unobservables affect both the placement of the PBF

and our outcomes of interest which creates bias on our impact estimates. While it is not possible to test for this problem, the common trends in health care use in the period prior to PBF does give credence to the parallel trends assumption. Given that this intervention was implemented at the province level (n = 17), a randomized set-up is unlikely to guarantee comparability across intervention and control provinces. Generally, randomization at a lower level is preferable from a design point of view, but in practice often difficult to achieve. Second, the implementation of PBF in Burundi, as in many other contexts, involved a change in provider incentives coupled with a substantial increase in their budget. It was in this study not possible to separate these effects, while this would obviously be very valuable information for policy makers.

Notwithstanding these limitations, our study is among the first to show evidence of PBF in an African country affecting the utilization and quality of maternal and child care. It is also the first to compare results from a PBF pilot to those of a nationwide program. This is timely given the many PBF pilots set up across SSA and likely to transit to nationwide programs in the near future. Although the World Bank has invested considerably in evaluating PBF, not many of these impact evaluations have yet been finalized. The rapid growth in the use of performance pay (Miller and Babiarz, 2013) will provide ample scope for evaluation and evidence generation on the question whether and how PBF can live up to the expectation of improving access to good quality care in SSA.

**Table A1 |** OLS model showing effects of PBF, using interaction effects

| | Sample size full model | Full model | Full model | | Sample size subset model | Subset model |
|---|---|---|---|---|---|---|
| | | | poor | non-poor | | |
| > 1 antenatal care visit | 4902 | -0.004 | -0.001 | -0.007 | 2471 | -0.005 |
| First trimester antenatal care | 4865 | 0.013 | 0.022 | 0.005 | 2448 | 0.024 |
| BP measured during pregnancy | 4865 | 0.060** | 0.056* | 0.063** | 2448 | 0.062 |
| ≥ 1 anti-tetanus vaccination | 4916 | 0.106*** | 0.105*** | 0.107*** | 2477 | 0.118*** |
| Institutional delivery | 7742 | 0.028 | 0.011 | 0.041* | 3961 | 0.058** |
| Child fully vaccinated at 1 year | 5772 | 0.048* | 0.068** | 0.032 | 2974 | 0.061* |
| BCG vaccination at 1 year | 5772 | 0.042* | 0.055* | 0.032 | 2974 | 0.058* |
| Polio vaccination at birth | 7742 | 0.074*** | 0.065*** | 0.081*** | 3961 | 0.074** |
| Three additional polio vaccinations at 1 year | 5772 | 0.036 | 0.052* | 0.024 | 2974 | 0.046 |
| Three DTP vaccinations at 1 year | 5772 | 0.036 | 0.051 | 0.025 | 2974 | 0.048 |
| Measles vaccination at 1 year | 5772 | 0.048* | 0.063** | 0.035 | 2974 | 0.059* |

*Notes:* All models contain control variables as shown in Table 4 and region and time controls. The subset model is based on data from the subset of provinces used in the earlier study by Bonfrer et al. 2014a with data from the NGO Cordaid: Bubanza, Bururi, Cankuzo, Gitega, Karuzi, Makamba, Muramvya, Rutana and Ruyigi

* p<0.10; ** p<0.05; *** p<0.01

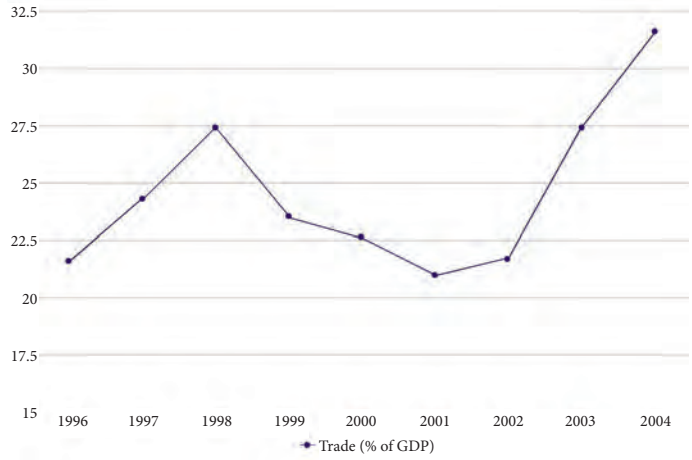


**Figure A1 |** Trend in trade levels Burundi

# Chapter 7

# Effects of a subsidized voluntary health insurance on insured and uninsured in Nigeria

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*BMG Working Paper 2015.01*

## Abstract

Interventions aiming to simultaneously improve financial protection and quality of care might provide an important avenue towards universal health coverage (UHC). In this study we exploit panel data collected in 2009 and 2011 among 3509 randomly selected respondents in Kwara, Nigeria to estimate the effects of the Kwara State Health Insurance program on both the insured and uninsured. Within this program a subsidized voluntary low cost health insurance was offered by a private insurer and activities were undertaken to upgrade quality in selected health care facilities. Using propensity score matching we find that for the insured the program increased health care utilization and reduced out of pocket (OOP) expenditure. These improvements seem largely driven by the insurance. However, among the uninsured in the area with upgraded facilities, formal health care utilization decreased, informal health care utilization increased and OOP expenditures went up. These results suggest crowding-out of the uninsured from formal care facilities, which is problematic given that 67 percent of our sample did not take up the insurance in the initial two years of implementation. We conclude that implementing voluntary health insurance as a means towards UHC, warrants careful design of simultaneous supply side interventions to limit potential negative effects on those who do not enrol in the insurance. Further research is necessary to identify the processes driving the crowding-out of the uninsured.

## Introduction

Interventions aiming to simultaneously improve financial protection and quality of care are scarce in low and middle income countries (LMIC). However, such combined interventions might provide an important avenue towards the achievement of Universal Health Coverage (UHC): provision of good quality care to everyone who needs it, without causing financial hardship (Open Working Group of the General Assembly, 2014). Many health care financing interventions in Sub-Saharan Africa (SSA) focus solely on the demand side, i.e. individuals or households, by providing insurance coverage (Giedion and Diaz, 2010) or on the supply side, i.e. health care providers, by trying to improve the quality of care through for example performance based financing (Witter et al., 2012). Such one-sided interventions run the risk of yielding limited results towards reaching UHC because they either provide the poor with access to low quality care or only the better off with access to good quality care.

The aim of this study is to estimate for both the insured and the uninsured the effects on health care utilization and expenditure from a combined demand and supply side program in Kwara State, Nigeria. The Kwara State Health Insurance (KSHI) program provides access to a heavily subsidized voluntary health insurance scheme offered by a private insurer and initiates quality upgrades in health care facilities. We first estimate the effects of the combined intervention on the insured (*total effect*). Subsequently we attempt to estimate the effect of the insurance independent of the quality upgrade on the insured (*insurance effect*) and we estimate the effect of the quality improvements on the *un*insured (*quality effect*). The latter two estimates provide insights into i) the relative impact of offering insurance compared to upgrading facilities and ii) the effects of the intervention on the uninsured. This is particularly relevant for recent discussions (see for example Van Doorslaer et al. (2014)) about how the poor can be reached most successfully through demand and/or supply side interventions.

This study adds to the existing body of knowledge from LMIC about the effect of programs combining demand and supply side interventions in the health care sector and more specifically about the effect of voluntary health insurance schemes on utilization and financial protection among both insured and uninsured. Without suggesting that we provide a complete overview, below we present a selection of relevant existing work.



Powell-Jackson et al. (2014) study in Ningxia province, China, the effects of a redesign of the rural insurance benefit package combined with the introduction of performance based financing among primary care providers. They find that the insurance intervention, in isolation, led to a 47 percent increase in the use of outpatient care and greater intensity of treatment. However, the two interventions in combination showed no effect on health

care use above that generated by the redesign of the insurance benefit package. A second relevant study was performed in Thailand which implemented a major reform extending health insurance coverage and changing the organization and payment of public health care providers with the intention of raising cost-effectiveness. Limwattananon et al. (2015) show that this reform reduced out of pocket (OOP) expenditure by 28 percent and raised utilization of both inpatient and ambulatory care. King et al. (2009) found that Seguro Popular, a voluntary subsidized health insurance scheme in Mexico, reduced catastrophic expenditure but had no effect on health care utilization or health outcomes. Wagstaff et al. (2009) find increased health care utilization but also increased OOP spending after extension of insurance to the poor in China. The latter seemingly paradoxical finding can according to the authors be explained by the initiation of health care utilization because of the insurance, resulting in additional expenditures which are not covered by the insurance. Giedion and Diaz (2010) conclude based on a literature review that health insurance improves access and utilization and seems to improve financial protection. However, De Allegri et al. (2009) conclude, also based on a literature review, that health insurance schemes suffer from low enrolment i.e. rates between one and ten percent, apart from a few isolated successes.

### The intervention in Kwara state, Nigeria

In 2006, the Dutch Health Insurance Fund (HIF) received a 100 million euro grant from the Dutch Ministry of Foreign affairs to develop, implement and evaluate, together with its implementing partner PharmAccess Foundation (PAF), health insurance programs in four African countries, including Nigeria (Health Insurance Fund, 2007). In 2009 the HIF and PAF introduced the KSHI program (formerly known as Hygeia Community Health Care) in the research area in Kwara state, together with the private partner Hygeia Nigeria Limited. Nigeria is a lower middle income country with a population of 179 million inhabitants, of which 46 percent live below the poverty line. Life expectancy lies at 52 years and the gross national income per capita is 2710 US dollars (World Bank, 2015).

Kwara state is located in the North Central geopolitical zone of Nigeria, bordering Benin and has a population of 2.5 million (Kwara State, 2014a). Similar to the rest of the country, Kwara State has a weak health system with inadequate government funding for health, weak governance and legislation, inadequate health infrastructure and poor service quality (Hendriks et al., 2014). The KSHI program has received international recognition through among others the OECD Health Innovation prize, commendation from the United Nations Secretary General and the Bill & Melinda Gates Foundation for its creative approach to pro-poor health care delivery (Kwara State, 2014b). The voluntary subsidised health insurance is provided through a the private insurer Hygeia and a range of activities are undertaken to upgrade the quality in the two largest health care facilities in the research area, located in the Afon and Aboto Oja districts in Central Kwara (Hendriks et al., 2014).

## Voluntary subsidised health insurance

The voluntary subsidised health insurance offered to individuals, covers a range of health care services, as shown in Table 1 (Gustafsson-Wright et al., 2013). The insurance generally covers preventive care as well as in- and outpatient care, in the intervention facilities. If necessary, referral to two tertiary care facilities in the state capital Ilorin is possible. The insurance does not cover high technology investigations (for example magnetic resonance imaging), major surgeries and complex eye surgeries, family planning commodities, treatment for substance abuse/addiction, cancer care requiring chemotherapy and radiation therapy, provision of spectacles, contact lenses and hearing aids, dental care, management of acute cardiovascular events other than admission to a hospital intensive care treatment and dialyses (Hendriks et al., 2014).

**Table 1** | Services covered by KSHI

| |
|---|
| Annual check-ups |
| Antenatal care and delivery |
| Eye examination and care |
| Health education |
| Hospital care and admissions (unlimited) |
| Inpatient care |
| Laboratory investigations and diagnostic tests |
| Minor and intermediate surgeries |
| Neonatal care |
| Outpatient care |
| Preventive care including immunization |
| Provision of prescribed drugs and pharmaceutical care |
| Radiological investigations |
| Screening for diseases including malaria and tuberculosis |
| Screening for sexually transmitted diseases |
| Specialist consultation |
| Testing and counseling for HIV |



The insurance is offered to the population by trained agents and community leaders such as Emirs and village heads are involved in the rollout. The agents go door-to-door to explain the insurance scheme and offer those interested the opportunity to enrol. In addition large-scale communication activities are implemented in the target communities. This includes marketing for the program via billboards, comics, brochures, flyers and elaborate

announcements and information sharing on the radio. Enrolment is possible with the agents and at dedicated kiosks in several urban centres and during several events organised for the community. After signing up there is a waiting time of minimal six days and maximal 36 days. It is not possible to sign up and immediately obtain coverage for any type of health care utilization. All households living in the intervention area are eligible for enrolment, without any pre-enrolment screening for chronic diseases (Hendriks et al., 2014). Table 2 displays information about the duration between enrolment in the health insurance and the first use of a health care service covered by the insurance. Hygeia & PharmAccess program data showed that the average duration between enrolment and first contact with a health care provider is at least half a year and 10 to 16 percent of the enrolees have their first visit within a month after enrolment, suggesting that most enrolees typically sign up several months before they actually use health care. The latter is to some extent re-assuring because the effect estimates in this study would be biased if enrolment in the insurance at the point of use would occur frequently.

The insurance policy covers a period of one year, after which enrolees need to re-enrol. Because the program is heavily subsidized by the Kwara State government (about 60 percent of the total subsidy) and the HIF, enrolees pay seven percent of the total premium which results in an annual self-paid premium of 300 Naira or approximately 2 US dollars per person per year (Gustafsson-Wright et al., 2013). This translates to 0.96 to 0.16 percent of the average annual per capita consumption for respectively the poorest and richest twenty percent of the target population at baseline (Hendriks et al., 2014). Enrolees do not incur OOP payments when using covered health care services at the upgraded health care facilities because these facilities receive direct payments from Hygeia (Gustafsson-Wright and Schellekens, 2013).

**Table 2 |** Duration between enrolment and first use of health care services

| Enrollment year | Average # days between enrolment and first use of covered health care | Percentage of enrollees with first use after enrolment within one month |
|---|---|---|
| 2009 | 191 | 16 |
| 2010 | 230 | 10 |
| 2011 | 159 | 13 |

Calculations based on Hygeia – PharmAccess program data

## Payment and quality upgrade of health care facilities

In addition to providing the health insurance, the two largest health care facilities in the intervention area are upgraded and a new payment mechanism is implemented. For the

insured using primary care, payment from the insurer to the health care provider is based on a capitation fee per enrolee. Payment for other types of care is based on fee-for-service. The insurer has no say about the facilities' prices for the services used by the uninsured.

The quality improvement program consists of three components. First, grants are provided to upgrade the equipment in an intervention facility. Second, a baseline assessment in the facility is conducted and a quality improvement plan is formulated and follow-up visits are planned. Examples of quality improvement interventions include implementation of treatment guidelines, upgrading of laboratory equipment, assurance of continuous essential drug supplies, adequate medical file keeping, waste management protocols and hospital infection control protocols. Third, health care staff at the intervention facility receive relevant training.

## Methods

### Data

Data were collected among a randomly selected sample of households in the intervention area (Afon and Aboto Oja districts, Kwara state) and in the control area (Ajasse Ipo district, Kwara state) (Hendriks et al., 2014). The control district was selected on the basis of its similarity with the intervention area characteristics in terms of language, main economic activities, income levels, urban/rural composition and population size. At baseline, limited availability and quality of health care services was found in all districts. In both the intervention and control area, there were few functional health care facilities before the implementation of the combined program. An assessment was performed across all facilities in both areas showing that most were poorly maintained, essential equipment was lacking and patient numbers were low. The intervention area included three public and three private facilities from which the private Ilera Layo clinic in Aboto Oja and the public General Hospital Afon in Afon were selected to participate in the program. The control area included three public and two private facilities (Hendriks et al., 2014).

A stratified two-stage random sample was drawn in 2009 in the intervention and control areas. All households located in the study areas were eligible for inclusion. The first stage consisted of a random selection of 100 out of 300 enumeration areas (EAs) from the 2005 National Population Census. These 300 EAs were located within 15 kilometres distance from the towns Afon, Aboto Oja and Ajasse Ipo, the capitals of the intervention and control districts. Subsequently a local census was performed to list all households in these 100 EAs. In the second stage, households were randomly sampled from this list to take part in the

survey. A number of replacement households were sampled within each EA, in anticipation of household migration in the period between the local census and the baseline survey. The baseline data were collected in May and June 2009 and the second wave was collected in the same months in 2011, limiting a potential seasonal bias. The survey was extensively piloted and local staff was recruited and trained to administer the survey[1] (Hendriks et al., 2014). The KSHI program was launched shortly after the baseline survey was finished.

The resulting balanced panel, for which observations from both 2009 and 2011 were available, contains 2191 observations from the intervention and 1318 from the control area. Due to migration, refusal, death and other reasons the number of observations decreased between the baseline and the second wave, resulting in an attrition rate of 4.9 percent in the intervention group and 3.0 percent in the control group.

### Statistical analysis

Using these panel data and the differences in exposure between intervention and control groups, we estimate three effects: i) the *total effect* of the combined intervention on the population in the intervention area, ii) the *insurance effect* on the population in the intervention area and iii) the *quality effect* on the uninsured in the intervention area. Because enrolment in the health insurance is voluntary, a simple comparison in outcomes between enrolees and non-enrolees provides biased estimates because the decision to enrol is likely to be driven by factors that also correlate with health and health care use. We therefore apply propensity score matching (PSM) to construct the relevant samples of control observations that are similar to the treated in terms of observable characteristics (Rosenbaum and Rubin, 1983).

Table 3 identifies the treatment and control group for the estimation of the three different effects. Those living in the control area, where no insurance or facility upgrade was offered, serve as a potential match for selected observations from the intervention area. Being "insured" is defined as an individual (or the most knowledgeable household member on his/her behalf) reporting to have a health insurance at the moment of the second wave of the survey (May-June 2011). The data does not allow us to determine when an insured individual took up this insurance with the KSHI program.

First, the total effect is estimated by comparing the insured in the intervention area to the matched controls with a high probability of taking up the insurance had it been offered in the control area. Second, the insurance effect is based on a comparison between the insured

[1] Ethical clearance was obtained from the Ethical Review Committee of the University of Ilorin Teaching Hospital. Informed consent was obtained from all participants by signature or by fingerprint.

and the uninsured in the intervention area, which both profit from the facility upgrades but differ in their enrolment status. This allows us to estimate the insurance effect for those who also experienced the facility upgrades and givens an idea of the relative importance of the insurance effect in the total effect. Finally, the quality effect is estimated by comparing the uninsured in the intervention area, who profit from the facility upgrades but not from the insurance, to the matched controls with a low probability of taking up the insurance had it been offered. This allows us to estimate the effects of the program on those who did not take up the insurance. While these three estimates are highly policy relevant, we cannot disentangle the total effect into a pure insurance uptake or facility upgrade effect as would have been the case when both parts of the intervention had been implemented in different areas.

**Table 3 |** Identification of treatment and control groups

| | Intervention area | | Control area | |
|---|---|---|---|---|
| | Insured | Uninsured | Matched to insured | Matched to uninsured |
| Total effect | T | | C | |
| Insurance effect | T | C | | |
| Quality effect | | T | | C |

*Note:* T = treatment group, C = control group

The outcome measures used in this study are shown in Table 4. We first estimate the total, insurance and quality effect on the use of *any* health care in the past year and subsequently differentiate between the use of any formal and informal health care. Formal care refers to care provided in a hospital, clinic, (primary) health centre or by a private doctor, nurse, midwife or paramedic. Informal care includes care provided by a traditional healer, pharmacist, patent medicine vendor, alternative medicine provider or religious person. We then use a different part of the questionnaire where for every respondent with self-reported need, the use of health care is differentiated between chronic, acute, hospital and other health care. Finally we study the effects on per capita health expenditure in the past year in Naira divided by one thousand (1000 Naira is about 5.30 US $).

To obtain propensity scores for each respondent, we estimate a probit model for the decision to enrol in the insurance on all baseline covariates shown in Table 5. The covariates in this model include the standard age & gender, education, marital status, urbanicity, wealth, employment and some (self-assessed) health variables. We also include covariates reflecting the distance between the household and the nearest upgraded facility. In the control area this is the "to be upgraded facility" which is a comparable facility which would be upgraded

if the program would be rolled out to the control area in the future. A variable reflecting whether a respondent reported an acute illness or injury between the two waves was included to control for some of the potential bias arising from respondents who took up the insurance because of health problems arising after the baseline survey. We also include variables reflecting determinants of the willingness to enrol in a health insurance which often remain unobserved: whether someone states to be interested in a health insurance and the four personality dimensions i) extraversion, ii) conscientiousness, iii) emotionally stability and iv) openness to experience, ranging from zero to fifty (Norman, 1963). Finally we include variables reflecting the outcome measures at baseline to control for different starting levels of health care utilization and health care expenditure.

This probit model is estimated on the observations in the intervention area, reflecting the fact that they can make an actual decision to enrol, as opposed to the control area where the insurance is not offered. The parameters are subsequently extrapolated to those from the control area to estimate propensity scores for all respondents. The probit model underlying the estimation of the quality effect has to reflect the decision to *not* enrol because this effect is estimated on the *un*insured. This is the same probit model but with all coefficient signs reversed. For ease of interpretation, we report average marginal effects as opposed to coefficients.

The average treatment effect on the treated can be written as (Khandker et al., 2010):

$$ATT_{PSM} = \frac{1}{N_T}\left[\sum_{t\in T} Y_t - \sum_{m\in M} w(t,m)\, Y_m\right] \quad (1)$$

where $N_T$ is the number of treated $t$ and $w(t,m)$ is the weight used for control observation $m$ when comparing with treated observation $t$. Effects are estimated based on the observed values for the outcome measures from the second wave while baseline values of these outcomes are included in the decision to enrol probit model[2].

[2] As a sensitivity check we also estimated the three different effects using a difference in differences approach. We excluded all baseline values of the outcome variables from the decision to enrol probit model and studied changes in outcomes between 2009 and 2011 as opposed to outcome levels in 2011. This led to qualitatively the same conclusions.

**Table 4** | Means for outcome measures

| | Insured 2009 | Uninsured 2009 | Unmatched controls 2009 | Insured 2011 | Uninsured 2011 | Unmatched controls 2011 |
|---|---|---|---|---|---|---|
| Any care in past year | 0.257 | 0.233 | 0.362 | 0.465 | 0.307 | 0.322 |
| Any formal care in past year | 0.214 | 0.164 | 0.300 | 0.422 | 0.201 | 0.212 |
| Any informal care in past year | 0.042 | 0.070 | 0.061 | 0.044 | 0.105 | 0.110 |
| Any chronic care in past year | 0.068 | 0.056 | 0.069 | 0.155 | 0.080 | 0.070 |
| Any acute care in past year | 0.154 | 0.157 | 0.236 | 0.317 | 0.235 | 0.247 |
| Any hospital care in past year | 0.018 | 0.020 | 0.025 | 0.056 | 0.032 | 0.033 |
| Any other care in past year | 0.102 | 0.087 | 0.178 | 0.073 | 0.022 | 0.049 |
| Per capita health expenditure in past year (naira/1000) | 2.088 | 1.780 | 1.820 | 1.165 | 1.181 | 2.323 |

**Table 5 |** Means for covariates and estimates decision-to-enroll probit model

| | Insured 2009 | Uninsured 2009 | Unmatched controls 2009 | Av. marg. effect | Coeff. | p-value |
|---|---|---|---|---|---|---|
| Male 0-18 years | 0.205 | 0.215 | 0.248 | 0.016 | 0.047 | 0.624 |
| Male >18 years | 0.274 | 0.309 | 0.241 | -0.022 | -0.064 | 0.693 |
| Female >18 years | 0.362 | 0.298 | 0.295 | 0.061 | 0.174 | 0.267 |
| Primary education | 0.109 | 0.119 | 0.112 | -0.070** | -0.198 | 0.040 |
| Married | 0.544 | 0.491 | 0.440 | 0.078** | 0.222 | 0.027 |
| Urban | 0.636 | 0.429 | 0.524 | -0.123*** | -0.348 | 0.009 |
| 0 to 1 km to (to be) upgraded facility | 0.302 | 0.142 | 0.131 | 0.0146*** | 0.414 | 0.000 |
| 2 to 3 km to (to be) upgraded facility | 0.007 | 0.003 | 0.001 | 0.165 | 0.470 | 0.293 |
| 3 to 4 km to (to be) upgraded facility | 0.062 | 0.091 | 0.068 | -0.213*** | -0.603 | 0.000 |
| 4 or more km to (to be) upgraded facility | 0.224 | 0.433 | 0.417 | -0.245*** | -0.694 | 0.000 |
| Lowest wealth tertile | 0.255 | 0.422 | 0.212 | -0.176*** | -0.499 | 0.000 |
| Middle wealth tertile | 0.389 | 0.363 | 0.382 | -0.096*** | -0.273 | 0.000 |
| Household has savings | 0.186 | 0.159 | 0.150 | -0.028 | -0.078 | 0.375 |
| Job in services | 0.134 | 0.122 | 0.158 | -0.046 | -0.129 | 0.342 |
| Job in trade | 0.219 | 0.171 | 0.149 | -0.018 | -0.050 | 0.711 |
| Job in agriculture | 0.190 | 0.229 | 0.149 | 0.014 | 0.040 | 0.756 |
| Not working | 0.293 | 0.321 | 0.386 | -0.028 | -0.080 | 0.384 |
| Good self-assessed health | 0.937 | 0.936 | 0.925 | 0.036 | 0.102 | 0.419 |
| Normal BMI (20-25) | 0.285 | 0.283 | 0.266 | -0.004 | -0.011 | 0.876 |
| Got acute illness or injury between waves | 0.398 | 0.316 | 0.331 | 0.081*** | 0.231 | 0.000 |
| Interested in health insurance | 0.553 | 0.525 | 0.467 | -0.034 | -0.097 | 0.352 |
| Extravert personality | 25.530 | 25.499 | 24.951 | -0.010*** | -0.030 | 0.001 |
| Conscientious personality | 37.553 | 37.088 | 36.807 | 0.001 | 0.003 | 0.693 |
| Emotionally stable personality | 29.188 | 28.675 | 28.533 | 0.006** | 0.017 | 0.040 |
| Personality open to experience | 33.805 | 33.622 | 33.597 | -0.006* | -0.016 | 0.078 |
| Any care in past year (baseline) | 0.257 | 0.233 | 0.362 | -0.036 | -0.103 | 0.597 |
| Any formal care in past year (baseline) | 0.214 | 0.164 | 0.300 | 0.189*** | 0.537 | 0.001 |
| Any chronic care in past year (baseline) | 0.068 | 0.056 | 0.069 | -0.007 | -0.021 | 0.900 |
| Any acute care in past year (baseline) | 0.154 | 0.157 | 0.236 | -0.074 | -0.209 | 0.165 |
| Any hospital care in past year (baseline) | 0.018 | 0.020 | 0.025 | -0.076 | -0.217 | 0.331 |
| Any other care in past year (baseline) | 0.102 | 0.087 | 0.178 | -0.096* | -0.274 | 0.061 |
| Per capita health exp (baseline) | 2.088 | 1.780 | 1.820 | 0.004 | 0.010 | 0.191 |
| *N* | | | | *2191* | | |

*Notes:* The probit model uses the listed covariates as collected in 2009, so means for 2011 are not reported. Some covariates were not collected in 2011.

* p<0.1; ** p<0.05; *** p<0.01

Having obtained the propensity score for all treatment and control observations, we define the three relevant samples to estimate the total, insurance and quality effect as shown in Table 3. For each of the three samples we apply Kernel matching[3] to match the treated to comparable controls on the basis of the propensity scores. Kernel matching uses a weighted average of all controls to construct a hypothetical match for each enrolee. The weights are determined by the distance to the propensity score of the enrolee: closer controls obtain a larger weight (Khandker et al., 2010). The precise nature of the weighting is determined by the form of the kernel and the bandwidth, which we set at 0.06 (Mensah et al., 2010). To check sensitivity of the results we also apply the three other often used matching methods: nearest neighbour with replacement (NN w. rep.), nearest neighbour without replacement (NN w/o rep.) and radius matching (Khandker et al., 2010). The first and second method match each treated individual to the control observation with the closest propensity score, which means that the difference in propensity scores between the treated and the matched control can still be very large. To avoid this, radius matching applies a maximum propensity score distance (caliper), which we set at 0.02, in line with Mensah et al. (2010). For the sake of parsimony we present results from Kernel matching only when the other matching methods lead to qualitatively the same conclusions. The results from the other matching methods are available upon request from the authors.

We conduct a balancing test to check whether after matching, the mean for each explanatory variable across treatment and control group, does not significantly differ. This ensures that the treated and the matched controls are balanced in that similar propensity scores are based on similar explanatory variables (Becker and Ichino, 2002). Using the STATA user-written command –pscore- we find that the balancing property is satisfied when studying the insurance effect (see Table 3) on the treated and controls in the intervention area. While for the estimation of the total effect balance is achieved on the majority of the explanatory variables, this is not the case for "3 to 4 km to (to be) upgraded facility", "Married" and "Emotionally stable personality". For the quality effect balance is also achieved for most explanatory variables, apart from "Good self-assessed health", "Household has savings", "Not working" and "Lowest wealth tertile". This partial imbalance relates to the fact that the probit model reflecting the decision to enrol can only be estimated on the sample where the decision was actually made by respondents (the intervention area i.e. the sample used to estimate the insurance effect) and not on a sample including respondents that could not choose for an insurance (control area, used to estimate the total and quality effect).



[3] We use the routine "psmatch2" in STATA 13 by Leuven and Sianesi (2014).

The validity of this PSM approach depends on two conditions: i) conditional independence and ii) sizeable common support or overlap in propensity scores across the treated and the matched control sample (Khandker et al., 2010). The first, requiring no unobserved characteristics to affect the decision to enrol cannot be tested, but matching on demographics, (changes in) health status, distance to health care facilities and personality traits should eliminate most of the important drivers of selection bias, though some bias due to unobserved differences is likely to remain. However, given that we match at baseline outcomes, this bias should only result from time varying unobservables. We ensure validity of PSM in relation to the second condition by only considering observations on the common support of the propensity scores across the treated and the matched controls.[4] Figures 1-3 show the density graph for the samples underlying the estimates of the total, insurance and quality effect.

## Results

In our sample, 33 percent of the respondents was enrolled in the KSHI program. The probability to enrol in the insurance scheme in our sample is smaller for those with primary education, reporting to live in an urban area, living further away from a (to be) upgraded facility (>3 km), in a lower wealth tertile, with an extravert personality and who used other care, for example preventive care, in the past year at baseline (Table 5). The probability to enrol correlates positively with being married, a reported acute illness or injury between the two waves of data collection (2009-2011), having an emotionally stable personality and the use of any formal care in the past year at baseline. This suggests some over representation of less healthy individuals in the program.

Table 4 shows the averages for the outcome measures in 2009 and 2011, before matching. For ease of interpretation this information has also been represented graphically in Figures 4-6. Table 5 shows means for the covariates at baseline before matching. Table 6 shows the effect estimates after using Kernel matching[5]. Note that the estimate of the insurance and the quality effect does not sum to the total effect because the first is calculated among the insured within the intervention area while the latter is calculated using the sample of uninsured and matched controls. Those who took up the insurance *and* benefited from the facility upgrades because they lived in the intervention area show a significant increase in the use of any care of 9 percentage points (pp) on average (Total effect, column 2), when compared to matched controls from the area where facilities were not upgraded. This increase was driven by an

[4] Excluding observations off the common support is possible given our relatively large number of observations. Less than 0.5 percent of our samples is off support. Following Leuven and Sianesi (2014), any observations with a propensity score higher than the maximum or lower than the minimum score of the controls are dropped.
[5] Results NN w. rep., NN w/o rep. and radius available upon request from the authors.

increase in formal health care use and a simultaneous smaller decrease in informal health care use. The use of any chronic care also significantly increased, with 8 pp. A small increase in hospital care use (2 pp) was also observed for the insured in the intervention area. Health care expenditure reduced significantly with on average 1315 Naira per capita (6.95 US $) at an annual basis, which is a relatively large (i.e. a 63 percent) reduction compared to 2088 Naira per capita at baseline.

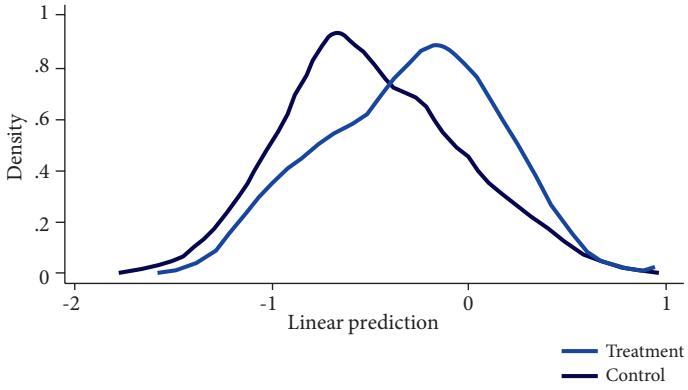


**Figure 1.** Total effect, kernel density estimate for treatment and control observations

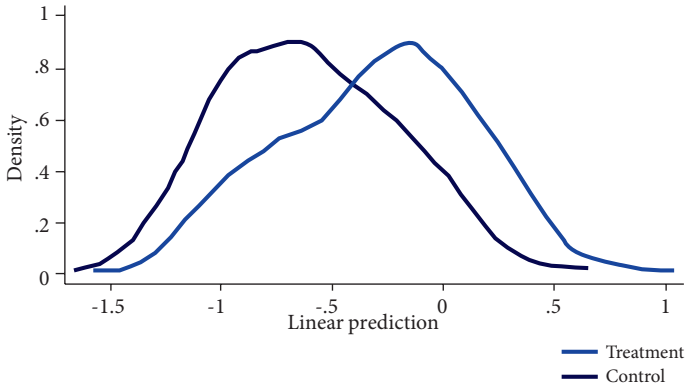


**Figure 2.** Insurance effect, kernel density estimate for treatment and control observations

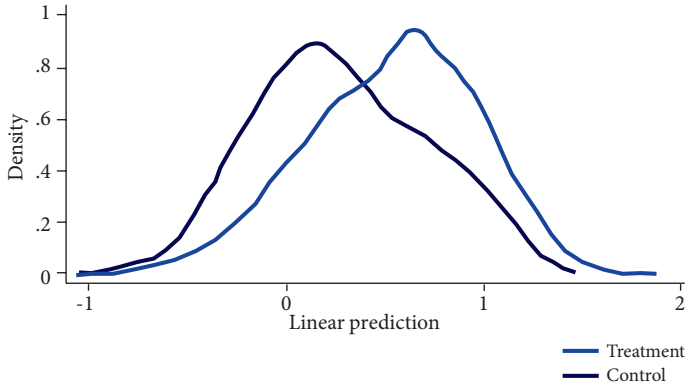


**Figure 3.** Quality effect, kernel density estimate for treatment and control observations

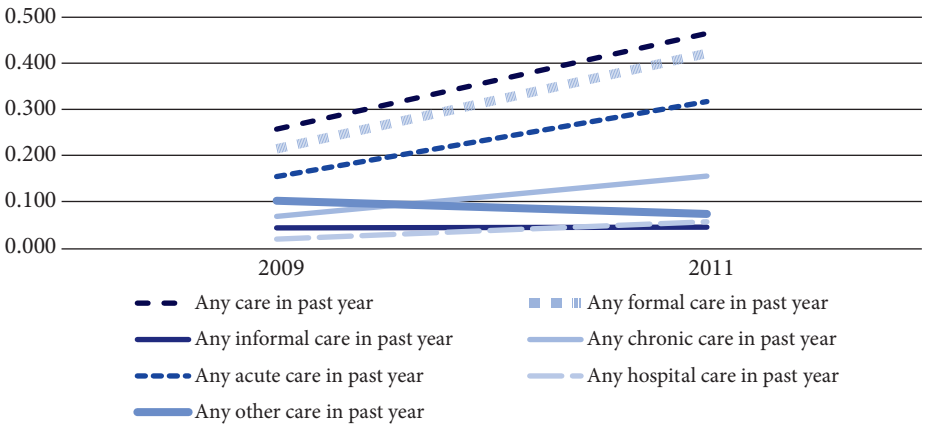


Figure 4. Changes in outcomes between baseline and second wave among insured

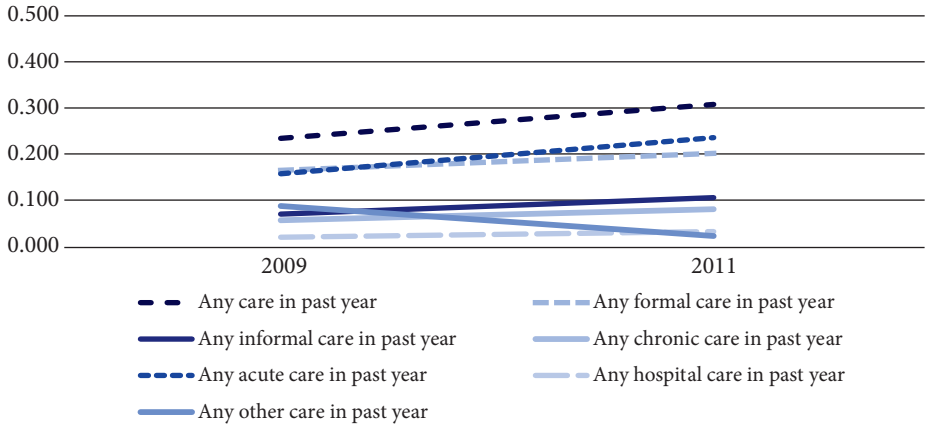


**Figure 5.** Changes in outcomes between baseline and second wave among uninsured

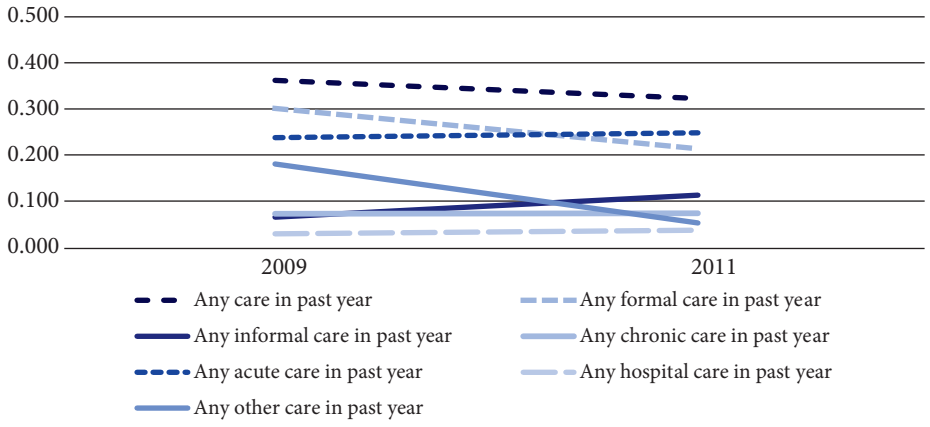


**Figure 6.** Changes in outcomes between baseline and second wave among unmatched controls



When comparing those with insurance to those without, but all living in the area where facilities were upgraded, we estimate insurance effects similar to the total effect, though in most cases slightly smaller. However, contrary to the total effect, the insurance effect suggests a significant increase in the use of any other care (5 pp) but no significant reduction in health care expenditure. The latter is due to a decrease in expenditure in the treatment area for both insured and uninsured, though smaller for the latter (see Table 4).

The quality effect, assessed as the difference between the uninsured in the intervention area and the matched controls, shows a relatively large and significant average fall in almost all types of health care utilization[6]. Only the use of informal care increases significantly with 7 pp, suggesting that the uninsured in the intervention area moved away from formal care. Although we cannot directly compare the size of the effects, the reductions in formal health care utilization among the uninsured in the intervention area seem particularly large when compared to the increases resulting from the total and insurance effect. These negative effects on the uninsured are not in line with our initial expectations and suggest that the supply side intervention to improve the quality of facilities, without simultaneous take up of health insurance, has not raised but lowered formal health care utilization among the uninsured. We also observe a significant increase in health care expenditure in this group, which seems to be driven by an increase in expenditure among the matched controls (see Table 4). The latter suggests that the reduction in health care use among the uninsured is not so much driven by a possible price increase but by a crowding out effect of the uninsured. This negative effect is of importance given that 67 percent of our sample did not take up the insurance.

**Table 6 |** Effect estimates using Kernel matching

| | Total effect | | Insurance effect | | Quality effect | |
|---|---|---|---|---|---|---|
| | Kernel | p-value | Kernel | p-value | Kernel | p-value |
| Any care in past year | 0.094*** | 0.000 | 0.089*** | 0.000 | -0.113*** | 0.000 |
| Any formal care in past year | 0.170*** | 0.000 | 0.164*** | 0.000 | -0.182*** | 0.000 |
| Any informal care in past year | -0.076*** | 0.000 | -0.075*** | 0.000 | 0.069*** | 0.000 |
| Any chronic care in past year | 0.078*** | 0.000 | 0.059*** | 0.000 | -0.068*** | 0.000 |
| Any acute care in past year | 0.021 | 0.340 | 0.021 | 0.354 | -0.034 | 0.135 |
| Any hospital care in past year | 0.018* | 0.087 | 0.022** | 0.035 | -0.033*** | 0.003 |
| Any other care in past year | 0.015 | 0.209 | 0.048*** | 0.000 | -0.042*** | 0.000 |
| Per capita health expenditure in past year (naira/1000) | -1.315*** | 0.000 | -0.133 | 0.418 | 0.660*** | 0.000 |

*Note:* * p<0.1; ** p<0.05; *** p<0.01

To check whether the above results were indeed driven by the studied intervention, we estimate the effects for health care utilization in the upgraded facilities only. These effects can be estimated for the outcome measures where specific information is available about

[6] We have performed several sensitivity checks and found in all cases negative effects on health care utilization when comparing uninsured to matched controls. We first checked the quality effect when limiting the sample to those living close to a health care facility (<3 km), we then trimmed the sample to only exclude the 10 percent observations with the least common support and we finally estimated the effect only on (would be) upgraded health care facilities as opposed to all health care facilities. All estimations provided qualitatively the same conclusion: the facility upgrades reduced health care utilization among the uninsured.

the facility where the respondent used care (any chronic, acute, hospital or other care in the past year). Table 7 suggests that the earlier findings are indeed driven by the KSHI program because the earlier significant increases in health care utilization, when estimating the total and the insurance effect, as well as the significant decrease in utilization resulting from the quality effect are confirmed based on observations from the upgraded facilities only.

**Table 7 |** Effect estimates for health care utilization in upgraded facilities using Kernel matching

| | Total effect | | Insurance effect | | Quality effect | |
|---|---|---|---|---|---|---|
| | Kernel | p-value | Kernel | p-value | Kernel | p-value |
| Any chronic care in past year | 0.125*** | 0.000 | 0.093*** | 0.000 | -0.107*** | 0.000 |
| Any acute care in past year | 0.205*** | 0.000 | 0.150*** | 0.000 | -0.155*** | 0.000 |
| Any hospital care in past year | 0.030*** | 0.000 | 0.024*** | 0.000 | -0.032*** | 0.000 |
| Any other care in past year | 0.051*** | 0.000 | 0.050*** | 0.000 | -0.050*** | 0.000 |

*Note:* * p<0.10; ** p<0.05; *** p<0.01

## Discussion and limitations

The aim of this study is to estimate the effects of the Kwara State Health Insurance (KSHI) program on both the insured and the uninsured in Kwara State, Nigeria. Through this program the Health Insurance Fund and the private insurer Hygeia provide access to a subsidized voluntary health insurance scheme and the PharmAccess Foundation (PAF) initiates quality upgrades in selected health care facilities. These facilities receive a combination of fee-for-service and capitation based payments and a quality improvement program consisting of three components. First, grants are provided to upgrade the equipment in intervention facilities. Second, a baseline quality assessment in the facility is conducted, an improvement plan is formulated and follow-up visits are planned. Third, health care staff receive relevant training.

Using panel data collected in 2009 and 2011 among 3509 randomly selected respondents from the intervention area and a comparable control area, we estimate three different effects of this combined demand and supply side program. We use the differences in exposure between the intervention and control groups, with individuals in the first group exposed to facility upgrades and the offer to enrol in a subsidized voluntary health insurance and individuals in the control area for which both were not available. We estimate i) the *total effect* of the combined intervention on the population in the intervention area, ii) the *insurance effect* on the population in the intervention area and iii) the *quality effect* on the uninsured in the intervention area. To limit the bias arising from heterogeneity across those who do and do not decide to enrol in the insurance, we apply propensity score matching to construct

three samples of control observations that are similar to the treated in terms of observable characteristics. The total effect is estimated by comparing the insured in the intervention area to the matched controls with a high probability of taking up the insurance had it been offered in the control area. The insurance effect is based on a comparison between the insured and the uninsured in the intervention area, which both profit from the facility upgrades but differ in their enrolment status. This allows us to estimate the insurance effect for those who also experienced the facility upgrades and givens an idea of the relative importance of the insurance effect in the total effect. Finally, the quality effect is estimated by comparing the uninsured in the intervention area, who profit from the facility upgrades but not from the insurance, to the matched individuals in the control group with a low probability of taking up the insurance had it been offered. This allows us to estimate the effects of the program on those who did not take up the insurance. Given the setup of this study we cannot disentangle the total effect into pure insurance and facility upgrade effects as would have been the case if both parts of the intervention had been implemented in different areas. Another limitation derives from the fact that we only know the reported enrolment status at the moment of the survey (May-June 2011). Enrolment into the KSHI program is for a period of twelve months and can be initiated throughout the year. This can lead to an over- or underestimation of our treatment effects depending on whether the enrolment at the time of survey over- or underestimates the enrolment in the period twelve months before the survey.

We found that the total intervention improved health care utilization and decreased out of pocket (OOP) expenditure among the insured. These improvements seem mainly driven by the health insurance, because the size and direction of the insurance effects are similar to the total effects. However, we can only estimate the insurance effect among those who also experienced the facility upgrades. This implies that we do not know what the effect of the insurance would have been without the facility upgrades. It is possible that the effect of the insurance alone would have been smaller had no facility upgrades been implemented. We subsequently estimated the effect of the quality improvements on the uninsured, which make up 67 percent of the study sample. We found that among the uninsured living in the intervention area, formal health care utilization decreased, informal care utilization increased and OOP expenditures went up. These effects were relatively large and not necessarily in line with initial expectations of such a program aiming to improve access to formal care and financial protection. Our findings suggest crowding-out of the uninsured from formal care facilities. Our data did not allow identification of the practical routes of crowding-out but we can provide some preliminary suggestions. First, given that the providers received fee-for-service payments for a range of services, providers might have had less financial incentives to care for to the uninsured. However, we do not know how the OOP payments received from uninsured compare to the fee for service payments received for the insured when providing these services, this requires further investigation. Also, further research in which a differentiation

is made between the effects on primary care (payment through a capitation fee per enrolee) and on the other types of care (fee-for-service) would allow to draw additional conclusions about the effect of the payment method on the behaviour of health care providers and the associated potential crowding-out of uninsured. Second, the upgrade of the facilities together with the provision of health insurance may have created (longer) queues which were particularly discouraging to the uninsured. In fact, the increase in patients coming to the facilities was described as "enormous", although it was unclear whether only the insured or also the uninsured were in these queues (Hendriks, 2014). Third, the perception towards the upgraded facilities may have changed, reducing the use of these facilities by the uninsured. Prices may have increased for those paying out of pocket because health care facilities were free to set their prices. However, we do not have the necessary information about prices for health care services to test this latter hypothesis. A more methodological explanation for the negative estimates for the quality effect relates to fact that we could only study the effects of the facility upgrade among the uninsured. To the extent that our matching exercise does not rule out differences in unobservables that correlate with not taking up insurance and decreases in health care use over time, our estimated quality effects could be biased downward. However, the negative quality effects were particularly large compared to the total and insurance effect, suggestion that even with some downward bias due to unobservables our conclusion remain qualitatively the same. Further research - for example through interviews with potential health care users, especially those who did not take up the insurance - is necessary to fully understand the processes driving the crowding-out of the uninsured.

Hygeia – PharmAccess program data showed that in March 2015 the total number of current enrolees was 16,220 though the exact target population is not defined. The program evaluated in this study is currently being developed into a state-wide scheme, aiming to expand the program to cover 600,000 people within the next five years. The program would then reach 60 percent of the rural population in Kwara State. Currently the program has been expanded to 26 health care providers (April 2015) and the State's government has agreed to increasingly contribute to the payment of the premium subsidy for low-income individuals and to invest in health care infrastructure. Further research is necessary to determine whether the geographical expansion of the program, combined with the aim to further increase the enrolment rate, reduces the negative effects of the program on the uninsured.



This study showed that when implementing or potentially expanding voluntary health insurance as a means towards UHC, careful design of supply side interventions is warranted to limit potential negative effects on those who did not enrol in the insurance. Given that we found that the uninsured are those with on average lower levels of income, imperfectly designed interventions may increase utilization and financial protection among the insured but in turn widen overall socioeconomic inequalities.

# Chapter 8

# Conclusion and policy recommendations

The main aim of the research presented in this thesis is to provide evidence about the effectiveness of health care financing strategies implemented over the last decade in Sub-Saharan African (SSA) countries. This evidence provides policy makers with information to take well informed decisions about the steps their country could take towards achieving Universal Health Coverage (UHC) by 2030: providing good quality care to everyone who needs it, without causing financial hardship. This research is timely given Africa's steady economic growth combined with a double burden of disease i.e. high rates of both infectious and non-communicable diseases. This creates the need and opportunity for health care financing reforms aiming to improve equitable access to good quality care.

The thesis started by providing insight into the relative importance of health shocks compared to a range of other shocks that African households in the informal sector face. Subsequently inequities in health care utilization across eighteen SSA countries were determined and decomposed to identify the underlying determinants. The remainder of the thesis focused on the effects of a health insurance scheme, a performance based financing scheme and an intervention combining a voluntary insurance with quality improvements in clinics, implemented in respectively Ghana, Burundi and Nigeria. In this chapter general conclusions and policy recommendations are distilled from these studies.

## Health shocks threaten households but insurance uptake remains low

Formal mechanisms protecting households against the financial consequences of shocks are largely absent in SSA, especially among households with employment in the informal sector (European report on development, 2010). This is a sizeable problem given that approximately eighty percent of employment in SSA is informal (World Bank, 2013). One of the potential routes towards better financial protection for these households is the introduction of pre-payment mechanisms limiting the financial consequences of health shocks. However, these households face a multitude of shocks, so it is important to first determine the relative importance of health shocks compared to other shocks. This helps to identify the most important risk(s) in these households' portfolios, requiring attention from policy makers. For Chapter 2 data were collected among 1226 randomly selected agricultural households in West Kenya who would later be offered a voluntary health insurance and for whom selected clinics in the area would be upgraded.

Among the households in this sample, the average shock prevalence (number of times a shock occurred over the last year) was highest for health shocks (0.64), followed by storage, crop or livestock disease, a drop in sale prices of agricultural products, a natural disaster

and an increase in agricultural input prices (ranging from 0.55 to 0.35). These shocks were concentrated among the better-off. The costs associated with health shocks can be considerable and almost two percent of households incurred catastrophic health expenditure in the last year. To cope with health shocks households most often turned to dissaving, selling animals/farmland/assets and asking for gifts/assistance/loans. These are all strategies likely to have long term negative economic consequences. On top of that, one in five households reported to have foregone necessary care in the past year, especially those with low levels of education and income.

Our results show that health shocks pose a significant risk to households. Implementing pre-payment or saving mechanisms is therefore necessary to protect households against the financial consequences of ill health. Shortly after the data for this study were collected the Tanykina Community Healthcare Plan (TCHP) was implemented. This plan consisted of a voluntary health insurance and the upgrade of selected clinics through a collaboration of the Health Insurance Fund, PharmAccess and the African Air Rescue with Tanykina Dairy Ltd. The latter is a cooperative for dairy farmers aiming to increase the revenues of its members through bulking milk and providing training and advice. More information on the intervention can be found in van der Gaag et al. (2011). However, three years after the implementation of the TCHP, the enrolment rate among dairy farmers in this area was only 11.5 percent (Langedijk-Wilms and den Teuling, 2014). This was lower than expected and at that stage did not allow for the planned full-fledged impact evaluation of the program.

An internal evaluation confirmed three main issues: low enrolment, the revenues from the insurance premium were not sufficient to cover actual costs for health care used by the enrolees and administration and marketing costs were high (den Teuling and Ogink, 2014). This evaluation identified "price too high" as one of the main causes for low enrolment, implying that premiums took up an unacceptable large share of household income. A related explanation for the limited enrolment, based on our study, lies in the multitude of shocks that these households face. Even though illness and injury prove to be on average the most prevalent shock, households are also frequently confronted with a range of other shocks. For those households it might be impossible to reserve a share of their limited resources for the protection of health shocks through health insurance premium payments. Especially when the premium is high compared to household income, these resources can no longer be used to protect consumption in case of occurrence of other shocks. In other words, these households might benefit from more flexible risk management devices that can work for several types of risk simultaneously. Additionally, our analysis showed that respondents perceived supply side shortcomings: one third of foregone care cases were attributed to low quality of care and unavailability of drugs. These perceived shortcomings on the health care supply side can make investment in health insurance less attractive.

## Health care in Africa is not distributed according to need

The previous study focused on one country only and therefore did not provide insights into the need for health care across different SSA countries. Little comparative evidence about health care utilization and inequities among these countries has been published so far. This is surprising given that an equitable distribution of health care use, distributed according to people's needs instead of ability to pay, is an important goal featuring on the health policy agendas of most SSA countries. To shed light on this question, data for eighteen countries from the World Health Surveys (WHS) and the Demographic and Health Survey (DHS) were analysed in Chapter 3. Considerable inequalities in health care use were observed: for almost all countries, health care utilization was considerably higher among the better off, while there is no indication that they had greater care needs. In fact, ability to pay proved to be the most important predictor of health care use. This study showed for a wide range of SSA countries -with very different characteristics – the need for health care financing reforms, promoting forms of pre-payment for health care or user fee removal, reducing the reliance on out-of-pocket (OOP) payments at the point of use. Further research is necessary to determine how to best increase financial protection, for example through voluntary or mandatory health insurance schemes. While this study focused on the (lack of) financial protection, the study in the next chapter was about actual (inequalities in) health care access.

## Ghana's NHIS had positive effects on maternal care use

To establish whether health insurance can indeed be an effective mechanism to increase equitable access, we evaluated in Chapter 4 the effects of the National Health Insurance Scheme (NHIS) in Ghana. The NHIS is one of the first health insurance schemes in SSA with wider coverage and is sometimes seen as an example for other SSA countries. The results from this study cannot be directly extrapolated to other health insurance schemes in SSA, because of the considerable diversity across schemes, but it does provide important insights into the effectiveness of this ambitious health care financing reform.

Our study is among the first to estimate the nationwide effect of the NHIS on mother and child care. Child level data from the Demographic and Health Survey in Ghana over the period 2006-2008 showed that about forty percent of the children's mothers were enrolled in the NHIS. Women that were more likely to enrol were those which were married, above twenty years old and with higher education and income levels. We found that enrolment in the NHIS raised the use of antenatal care (ANC) among pregnant women and the rate of deliveries attended by a skilled health care provider. It also increased the rate of caesarean sections to an

average nationwide level in line with guidelines from the World Health Organization (2010). Enrolled mothers were also less likely to report that their most recent pregnancy was too soon or unwanted. However, NHIS enrolment had almost no effect on child vaccinations and vitamin A supplements. Among the poor, the effects on ANC and attended deliveries were similar to those in the full sample. The effects on caesarean sections were about half the size and the reduction in unwanted pregnancies was larger. From this we concluded that in its first years of operation, the NHIS had a positive impact on the use of ANC and delivery care but not so much on care for the child after birth.

Although these findings are encouraging, at least in terms of maternal care utilization, a large share of the Ghanaian population remains without NHIS coverage. Enrolment rates differed widely by province, literacy level, occupation and income level. Ghana is making some progress towards UHC but is still far from reaching this goal. Furthermore, the World Bank reported in 2012 that the NHIS has serious structural and operational inefficiencies and is on a trajectory to go bankrupt in 2013. This has not yet occurred, but the situation still seems fragile. For the NHIS to expand enrolment and become sustainable, more public resources are needed (Schieber et al., 2012). Given the grim future outlook for the NHIS, our encouraging findings can stimulate policy interest into finding sustainable sources of funding for the NHIS such that it can serve as a means to help Ghana achieve UHC.

Not only equal access but also the way providers are paid is critical to achieve UHC. Over the period studied, health care providers were paid on a fee for service basis. They billed the NHIS without a standardized fee schedule for services and medicines and could negotiate rates at the district level. Soon after this, concerns over inefficiency and price differences across providers led to a change in the provider payment policy. Ghana Diagnostic Related Groupings were introduced as well as standardized medicine fees based on an itemized list (Agyepong et al., 2014). Although this system ensured standardization in fees across districts, from a theoretical perspective it does not necessarily increase efficiency. Paying health care providers based on the number of services is likely to incentivize them to provide more services, which are not necessarily needed. However, this concern for overutilization through supplier induced demand seems more relevant for countries where utilization rates are already high, as is the case in many developed countries. Given that a large proportion of African populations still forego necessary care, there does not seem to be a direct need to move from a fee for service to a capitation based system, although considerable improvements can be made to existing provider payment mechanisms to stimulate quality of care.

## PBF can help to improve quality but does not change utilization

Through reforms in financing of the supply side, health care providers can be incentivised to improve their performance. A strategy that has gained interest over the last decade is the introduction of performance based financing (PBF). PBF schemes are designed to pay health care facilities retrospectively based on the quantity and quality of services provided. This is a radical departure from more input-based traditional health care financing mechanisms where budget flows were linked to for example number of beds or estimated drug needs.

While PBF meets considerable enthusiasm from governments and donors, the evidence on its effects is still limited. We investigated the effects of PBF in Burundi, one of the three countries (the others are Rwanda and Sierra Leone), where PBF has been implemented nationwide. Burundi serves as an example for policy makers in many other SSA countries currently experimenting with PBF pilots. In Chapters 5 and 6 two studies were performed based on two different data sets, both providing information over the period 2006-2010. The first dataset covered about half the country and was collected by Cordaid, the party involved in implementing PBF. The findings based on these data are promising but the subsequent nationwide study using the Burundi Demographic and Health Survey (BDHS) data showed considerably smaller effects. While in 2006, before PBF was implemented, just over half of all live births took place in a health care facility, the Cordaid data analysis showed that institutional deliveries increased with one third as a result of the introduction of PBF. Paying providers based on performance as implemented in Burundi also doubled the proportion of women reporting to use a modern family planning method but no sustained effects on antenatal care use, vaccinations and the use of bed nets were found. An overall quality score based on external audits of the structure and process quality of facilities almost doubled as a result of PBF. In the nationwide study with BDHS data we investigated quality of care using mothers' reports of what happened during antenatal care visits and found that the behaviour of health care providers changed to become more in line with international antenatal care guidelines (blood pressure measurement and anti-tetanus vaccinations). Moving back to the Cordaid data, the large improvement in the overall quality score, was not (yet) confirmed by self-reported patient satisfaction. The nationwide study confirmed some of the above findings, though effects were smaller in size. It is especially striking that the large effects on births taking place in a health care facility found with the Cordaid data were not replicated when making a nationwide comparison, using the BDHS data. We checked whether this was related to the selection of provinces in the Cordaid dataset but reducing the BDHS dataset to the provinces included in the first dataset did not strongly reduce the differences in effect sizes. This seems to suggest that the quality of one of the data sources was lower, though we have no evidence to determine which dataset best reflected reality.

Overall our findings suggested that PBF has had some positive impacts when using the data from the subset of provinces but not so much when making a nationwide comparison, over the initial 2.5 years of implementation. Especially for types of care which require a behavioural change of health care workers when the patient is already in the facility we see improvements. In our studies this is for example reflected in relatively high effects on blood pressure measurement and anti-tetanus vaccinations during ANC visits. Improvements are smaller for services which require effort from the provider to change patients' utilization choices, examples of such services from our study include the timely initiation of ANC by women in the first trimester of their pregnancy and institutional deliveries. We found that among women who received ANC, institutional deliveries did significantly increase as a result of PBF, this could suggest that health care providers took the opportunity during ANC visits to encourage these women to deliver in a facility. In line with our findings, Gertler and Vermeersch (2012) found that the Rwandan PBF programme was more successful in increasing utilization of services that are under the provider's control, rather than those that depend on patients' choices.

With a supply side intervention like PBF, one of the main worries is that the poor do not benefit sufficiently. Indeed, when studying only the poorest forty percent of the population, we found in most cases that effects are similar or smaller compared to those in the general population. So far the PBF policy in Burundi did not include elements to target the poor, investments in specific strategies for this group are therefore likely to be helpful to improve equity and make important steps towards UHC.

## Reaching UHC requires careful design of both demand and supply side interventions

Following the evaluations of PBF in Burundi we suggested that an intervention on the demand side would help to increase access for the poor. After evaluating the NHIS in Ghana, the importance of good provider payment mechanisms was pointed out. This suggests that interventions aiming to simultaneously improve financial protection and quality of care might provide an important avenue towards UHC. However, the design details of such combined interventions are likely to be essential to ensure that the incentives in the system lead to the desired outcomes. An example of such a simultaneous reform on both demand and supply side, is the Kwara State Health Insurance (KSHI) program, implemented by the Health Insurance Fund (HIF) in Kwara state, Nigeria. While there is considerable international interest, especially among non-governmental organizations, in the effectiveness of the different schemes implemented by the HIF, the published evidence on its impact is still

limited (Hendriks et al., 2014; Gustafsson-Wright and Schellekens 2013; Health Insurance Fund, 2015). The study in Chapter 7 evaluating the KSHI scheme aimed to fill part of that gap by estimating the effects of the program on health care utilization and OOP expenditure. To get a good understanding of the intended and potentially unintended effects of specific elements of this program, we estimated the effects among both the insured (33 percent of the sample) and the uninsured.

Within the KSHI program a voluntary low cost health insurance was offered by a private insurer, the quality of selected health care facilities was upgraded and a capitation fee coupled with a fee for service was implemented for payments from the insurer to the provider. For the uninsured OOP payments remained in place. Using propensity score matching we found that for the insured the program increased health care utilization and reduced OOP expenditure. We then showed that these improvements were largely driven by the insurance as opposed to the quality upgrade. However, among the uninsured living in the area with upgraded facilities, formal health care utilization decreased, informal care utilization increased and OOP expenditures went up. These results suggest crowding-out of the uninsured from formal care facilities, which is problematic given that 67 percent of the respondents did not take up the insurance in the initial two years of implementation. While the reasons for the crowding-out phenomenon are far from clear, this study suggests that a supply side intervention alone, without take up of a health insurance may be insufficient and even hamper progress towards UHC.

## Policy recommendations

Decisions about optimal health care financing interventions are context specific. Examples from one country cannot simply be copied to other countries. However, some tentative recommendations for policy makers can be obtained from the studies in the thesis. The NHIS scheme in Ghana, the PBF scheme in Burundi and the KSHI program in Nigeria are all examples of cutting edge programs watched closely by policy makers and donors. *First,* the study in Chapter 3 showed that the unequal distribution of education played an important role in explaining health care inequity in SSA. This suggests that interventions that raise education levels among the poor, thereby increasing the awareness of health needs and how to adequately respond to them, may prove to be a particularly effective route to reducing inequity in health care use. *Second,* Chapters 2 and 4 combined with earlier evidence (for example De Allegri et al. 2009) showed that enrolment in voluntary health insurance schemes across SSA remains far from universal. When considering the implementation of a voluntary health insurance it is therefore important to first estimate the expected costs of collecting premiums,

providing insurance cards and other relevant expenses to determine whether these outweigh the benefits for a potentially small group of enrolees. *Third,* Chapters 5 and 6 show that the initiation of care, for example timely antenatal care, may require more effort from providers than continuation of care. Initial visits should therefore be rewarded higher in performance based schemes, allowing the organisation of outreach activities stimulating mothers and other patients to come to the clinic on time. *Fourth,* many interventions including those studied in the thesis focus on maternal care and care for infectious diseases. Given the changing burden of disease, it is necessary to increase the provision of services for non-communicable diseases across SSA. To achieve this extension of services, it seems more appropriate to address the functioning of health care systems as a whole as opposed to the disease specific interventions as advocated by among others the Bill & Melinda Gates Foundation. However, further research is necessary to identify the most efficient way to strengthen health care systems dealing with this double burden of disease, while simultaneously allowing for the continued development of disease specific vaccines and drugs. *Fifth,* the emerging debate about whether and how to combine interventions on the demand and the supply side to achieve UHC in low and middle income countries is often presented as a new discussion. However, robust evidence generated in high income countries where such reforms have already taken place should be used more frequently. The famous RAND Health Insurance Experiment for example, which started in 1971 in the United States, already showed the importance of both demand and supply side incentives (Brook et al., 1983). Of course existing information from high income settings should be supplemented with findings from well-designed impact evaluations across SSA. *Sixth,* in the debates about UHC a relatively large share of attention is directed to increasing insurance coverage. Also, many parties implementing health insurance schemes in SSA have given limited attention to getting provider incentives right. This seems a missed opportunity because without simultaneously addressing quality of care, the expansion of financial protection will have limited impact on population health. African governments as well as international organizations with sufficient leverage, like the World Bank, should therefore move away from one sided interventions and take the lead in proposing combined schemes. Such combined interventions can be challenging to initiate because it requires the involvement of more stakeholders and new bridges need to be build. *Seventh,* to improve quality of care it is crucial to agree on a definition of quality and to monitor this quality. So far reliable metrics to monitor quality progress across countries around the world are largely absent. Discussions about the Sustainable Development Goals, which will follow on the Millennium Development Goals, should therefore include the agreement on a feasible set of worldwide quality measures, which can also be collected in low resource settings. Progress on these quality measures can then be monitored across countries, through inclusion in ongoing surveys like the Demographic and Health Surveys and in clinic level surveys. *Finally,* the choice for specific health care financing interventions seems to be driven more by "fashion

trends" than by reliable evidence on its effectiveness. The fact that more than 900 health insurance schemes (De Allegri et al., 2009) were implemented a few years ago across SSA, while the evidence on its effectiveness remains limited as well as the enrolment rates, is an example of such trend sensitive choices, often made by aid organizations. Choices should be driven more by incremental evidence on "what works" generated through robust impact evaluations as for example advocated by Banerjee and Duflo (2011), otherwise this trend sensitivity is likely to limit the effectiveness of development aid.

While policy makers in SSA have a wealth of in-depth knowledge about the practical implications of different health care financing strategies, the robust scientific evidence on its effectiveness is limited and can be difficult to interpret. Hopefully this thesis helps to fill part of that gap and leads towards increased evidence based decision making on the path towards affordable good quality care for all. Informed policy makers can then ensure that Bill Gates wins his big bet made at the start of 2015 that "The lives of people in poor countries will improve faster in the next 15 years than at any other time in history."

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# Summary

Africa is experiencing steady economic growth, but trends in the health status of the population are lagging behind. The high disease burden from communicable and non-communicable diseases combined with the economic growth creates both the need and the opportunity for health care financing reforms to improve equitable access to good quality health care. The aim of the research presented in this thesis is to provide evidence about the effectiveness of health care financing reforms implemented over the last decade in Sub-Saharan African (SSA) countries. This evidence provides policy makers with information necessary to take well informed decisions about the steps their country could take towards achieving Universal Health Coverage (UHC) by 2030: providing good quality care to everyone who needs it, without causing financial hardship.

## Health care financing strategies

Health care financing strategies can focus on the demand or the supply side of the health care sector. Demand side strategies, targeted at individuals or households, generally aim to improve financial protection and access to health care for those in need of care. Supply side strategies, targeted at health care providers, generally aim to improve the number of services and the quality of care provided.

## Improving access and financial protection

A popular demand side strategy across SSA is the implementation of health insurance schemes. Such schemes can serve as a means to protect households from the risk of medical expenses which can be large relative to modest incomes and therefore cause households to fall into poverty. The health insurance schemes that are introduced across SSA show a wide organizational variety, including obligatory (national) social health insurance schemes, voluntary private health insurance schemes and community based health insurance schemes operating at local level. Whether health insurance is a recommendable strategy for SSA and which type of insurance would be most beneficial is heavily debated.

## Improving quality of care

A popular supply side strategy across SSA is the implementation of performance based financing (PBF). Through these PBF schemes, health care facilities are paid retrospectively based on the quantity and quality of services provided. This is different from traditional health care financing mechanisms where budget flows are linked to for example number of beds or estimated drug needs. The current scientific knowledge base about the effects of PBF in SSA is still quite limited.

## Structure of this thesis

To provide evidence about the need for demand and supply side health care financing strategies in SSA, this thesis first provides insights into the relative importance of health shocks compared to a range of other shocks that African households face. Then inequities in health care utilization across eighteen SSA countries are determined and underlying determinants are identified. The subsequent chapters contain impact evaluations of a health insurance scheme, a performance based financing scheme and an intervention combining a voluntary insurance with quality improvements in health care facilities, implemented in respectively Ghana, Burundi and Nigeria. In the final chapter conclusions and policy recommendations are distilled from the six studies in this thesis.

## Health shocks threaten households but insurance uptake remains low

Formal mechanisms protecting households against the financial consequences of shocks are largely absent in SSA, especially among households with employment in the informal sector. One of the potential routes towards better financial protection for these households is the introduction of pre-payment mechanisms limiting the financial consequences of health shocks. However, these households face a multitude of shocks, so it is important to first determine the relative importance of health shocks compared to other shocks. **Chapter 2** shows that among a random sample of agricultural households in West Kenya, health shocks are most prevalent, followed by storage, crop or livestock disease and a drop in sale prices of agricultural products. To cope with the considerable costs of health shocks households most frequently turn to dissaving, selling assets and asking for loans. These are all strategies likely to have long term negative economic consequences.

Given the significant risk that health shocks pose to households, pre-payment or saving mechanisms are necessary to protect households against the financial consequences of illness. Soon after the data for this study in West-Kenia were collected, the Tanykina Community Healthcare Plan (TCHP) was implemented. This plan consisted of a voluntary health insurance and the upgrade of selected clinics. However, three years after the implementation of the TCHP, the enrolment rate among the farmers in this area was only 11.5 percent. This was lower than expected and at that stage did not allow for the planned full-fledged impact evaluation of the program.

Based on our study, a potential explanation for the limited enrolment lies in the multitude of shocks that these households face. Even though health shocks prove to be on average the most prevalent, households are also frequently confronted with a range of other shocks. For those households it might be impossible to reserve a share of their limited resources for the protection of health shocks through health insurance premium payments. In other words, these households might benefit from more flexible risk management devices that can work for several types of risk simultaneously. Additionally, our analysis showed that respondents perceived supply side shortcomings including low quality of care and unavailability of drugs. These perceived shortcomings on the health care supply side can make investment in health insurance less attractive.

## Health care is not distributed according to need but to ability to pay

**Chapter 3** provides insights into the need for and use of health care across different SSA countries. An equitable distribution of health care use, distributed according to people's needs instead of ability to pay, is an important goal featuring on the health policy agendas of most SSA countries. Data from eighteen countries from the World Health Surveys and the Demographic and Health Survey were analysed. Considerable inequalities in health care use were observed: for almost all countries, health care utilization was considerably higher among the better off, while there is no indication that they had greater care needs. In fact, ability to pay proved to be the most important predictor of health care use. This study showed for a wide range of SSA countries -with very different characteristics – the need for health care financing reforms, promoting forms of pre-payment for health care or user fee removal, reducing the reliance on OOP payments at the point of use. Further research is necessary to determine how to best increase financial protection, for example through voluntary or mandatory health insurance schemes.

## Ghana's NHIS had positive effects on maternal care use

To establish whether health insurance can indeed be an effective mechanism to increase equitable access, we evaluated in **Chapter 4** the effects of the National Health Insurance Scheme (NHIS) in Ghana. The NHIS is one of the first health insurance schemes in SSA with wider coverage and is sometimes seen as an example for other SSA countries. This study estimates the nationwide effect of the NHIS on mother and child care. Child level data from the Demographic and Health Survey in Ghana over the period 2006-2008 showed that about forty percent of the children's mothers were enrolled in the NHIS. We found that enrolment in the NHIS raised the use of antenatal care (ANC) among pregnant women and the rate of deliveries attended by a skilled health care provider. It also increased the rate of caesarean sections to an average level in line with guidelines from the World Health Organization. Enrolled mothers were also less likely to report that their most recent pregnancy was too soon or unwanted. However, NHIS enrolment had almost no effect on child vaccinations and vitamin A supplements. Among the poor, the effects on ANC and attended deliveries were similar to those in the full sample. The effects on caesarean sections were about half the size and the reduction in unwanted pregnancies was larger. From this we conclude that in its first years of operation, the NHIS had a positive impact on the use of ANC and delivery care but not so much on care for the child after birth.

## PBF can help to improve quality but does not change utilization

Through reforms in financing of the supply side, health care providers can be incentivised to improve their performance. PBF schemes are designed to pay health care facilities retrospectively based on the quantity and quality of services provided. We investigated the effects of PBF in Burundi, where PBF has been implemented nationwide. Burundi serves as an example for policy makers in many other SSA countries currently experimenting with PBF pilots. In **Chapters 5 and 6** two studies were performed based on two different data sets, both providing information over the period 2006-2010. The first dataset covered about half the country and was collected by Cordaid, the party involved in implementing PBF. The findings based on these data are promising: the proportion of births in an institution increased by one third, the share of women using modern family planning services doubled and the quality score of health care facilities increased considerably. However, the subsequent nationwide study using the Burundi Demographic and Health Survey data showed smaller effects. The large effects on the proportion of births in a health care facility found with the Cordaid data were not replicated when making a nationwide comparison, using the Demographic and Health Survey data. It is not entirely clear what explains these differences in results.

Especially for types of care which require a behavioural change of health care workers when the patient is already in the facility we see improvements. In our studies this is for example reflected in relatively high effects on blood pressure measurement and anti-tetanus vaccinations during ANC visits. Improvements are smaller for services which require effort from the provider to change patients' utilization choices, examples of such services from our study include the timely initiation of ANC by women in the first trimester of their pregnancy and institutional deliveries. We found that among women who received ANC, institutional deliveries did significantly increase as a result of PBF, this could suggest that health care providers took the opportunity during ANC visits to encourage these women to deliver in a facility. With a supply side intervention like PBF, one of the main worries is that the poor do not benefit sufficiently. Indeed, when studying only the poorest forty percent of the population, we found in most cases that effects are similar or smaller compared to those in the general population. So far the PBF policy in Burundi did not include elements to target the poor, investments in specific strategies for this group are therefore likely to be helpful to improve equity and make important steps towards UHC.

## Careful design of both demand and supply side interventions

Interventions aiming to simultaneously improve financial protection and quality of care might provide an important avenue towards UHC. However, the design details of such combined interventions are essential to ensure that the incentives in the system lead to the desired outcomes. An example of such a simultaneous reform on both demand and supply side, is the Kwara State Health Insurance (KSHI) program, implemented by the Health Insurance Fund (HIF) in Kwara state, Nigeria. While there is considerable international interest in the effectiveness of the different schemes implemented by the HIF, the published evidence on its impact is still limited. The study in **Chapter 7** estimates the effects of the KSHI scheme on health care utilization and OOP expenditure. We estimated the effects among both the insured (33 percent of the sample) and the uninsured.

Within the KSHI program a voluntary low cost health insurance was offered by a private insurer and the quality of selected facilities was upgraded. For the uninsured OOP payments remained in place. For the insured the program increased health care utilization and reduced OOP expenditure. We showed that these improvements were largely driven by the insurance as opposed to the quality upgrade. However, among the uninsured living in the area with upgraded facilities, formal health care utilization decreased, informal care utilization increased and OOP expenditures went up. These results suggest crowding-out of the uninsured from formal care facilities, which is problematic given that 67 percent of the

respondents did not take up the insurance in the initial two years of implementation. While the reasons for the crowding-out phenomenon are far from clear, this study suggests that a supply side intervention alone, without take up of a health insurance may be insufficient and even hamper progress towards UHC.

## Towards Universal Health Coverage

In the debates about UHC a relatively large share of attention is directed to increasing insurance coverage. Many parties implementing health insurance schemes in SSA have given limited attention to getting provider incentives right. This seems a missed opportunity because without simultaneously addressing quality of care, the expansion of financial protection will probably have limited impact on population health. African governments as well as international organizations should therefore move away from one sided interventions and take the lead in proposing combined schemes, as recommended in **Chapter 8**. Such combined interventions can be challenging to initiate because it requires the involvement of more stakeholders.

Unfortunately the choice for specific health care financing interventions so far seems to have been driven more by "fashion trends" than by reliable evidence on its effectiveness. The fact that more than 900 health insurance schemes were implemented a few years ago across SSA, while the evidence on its effectiveness remains limited as well as the enrolment rates, is an example of such trend sensitive choices, often made by aid organizations. Choices should be driven more by incremental evidence on "what works" generated through robust impact evaluations, otherwise this trend sensitivity is likely to limit the effectiveness of development aid.


WEDNESDAY
THURSDAY
FRIDAY
SATURDAY

# Samenvatting

Afrikaanse landen hebben de afgelopen jaren een gestage economische groei laten zien. Echter is deze niet gepaard gegaan met een soortgelijke stijging in de gezondheidstoestand van de bevolking. De grote ziektelast door infectieziekten en toenemende welvaartsziekten, in combinatie met de economisch groei, maakt hervormingen in de financiering van de gezondheidszorg mogelijk en noodzakelijk. Door hervormingen kan gelijkere toegang tot gezondheidszorg en een betere kwaliteit van deze zorg worden gerealiseerd. Het onderzoek in dit proefschrift heeft tot doel om de effectiviteit te bepalen van hervormingen in de financiering van de gezondheidszorg die in de afgelopen tien jaar in Sub Saharisch Afrikaanse (SSA) landen zijn doorgevoerd. Dergelijke informatie is noodzakelijk voor beleidsmakers om goed onderbouwde beslissingen te nemen over de stappen die hun land kan zetten richting zogenaamde "Universal Health Coverage" (UHC) in 2030: het voorzien in zorg van goede kwaliteit voor iedereen die het nodig heeft, zonder financiële drempels.

## Financieringsstrategieën voor de gezondheidszorg

Financieringsstrategieën voor de gezondheidszorg kunnen gericht zijn op de vraagkant of de aanbodkant van de gezondheidszorgsector. Vraagkantstrategieën, gericht op individuen of huishoudens, hebben tot doel financiële bescherming te geven en toegang tot noodzakelijke zorg te verbeteren. Aanbodkantstrategieën, gericht op zorgaanbieders, hebben tot doel de hoeveelheid en de kwaliteit van de geleverde zorg te verhogen.

## Verbeteren van toegang en financiële bescherming

Een populaire vraagkantstrategie in SSA is de implementatie van zorgverzekeringen. Zulke verzekeringen beogen huishoudens te beschermen tegen het risico van hoge eigen betalingen in geval van ziekte. Deze kosten kunnen erg hoog zijn in verhouding tot vaak beperkte inkomens. Bij ziekte kunnen huishoudens daardoor in armoede terecht komen. De zorgverzekeringen die in SSA zijn geïntroduceerd verschillen sterk, zo zijn er verplichte (nationale) sociale zorgverzekeringen, vrijwillige private zorgverzekeringen en zorgverzekeringen georganiseerd vanuit lokale gemeenschappen. Of zorgverzekeringen aanbevolen moeten worden voor SSA en welke vormen van zorgverzekeringen dan het meest aantrekkelijk zouden zijn, is op het moment onderwerp van hevige discussie.

## Verbeteren van kwaliteit van zorg

Een populaire aanbodkantstrategie in SSA is de implementatie van prestatiebekostiging. Met deze prestatiebekostigingsprogramma's worden zorginstellingen achteraf betaald op basis van de kwantiteit en kwaliteit van door hen geleverde zorg. Dit is anders dan de traditionele financiering van de gezondheidszorg waar budgetten zijn gekoppeld aan bijvoorbeeld het aantal bedden of een schatting van de benodigde medicatie. De huidige wetenschappelijke kennis over de effecten ven prestatiebekostiging in SSA is vrij beperkt.

## Opbouw van dit proefschrift

Om meer achtergrondinformatie over de relevantie van vraag- en aanbodkantstrategieën voor de financiering van de gezondheidszorg in SSA te verschaffen, geeft dit proefschrift eerst inzicht in het belang van onverwachte ziekte ten opzichte van allerlei andere onverwachte tegenslagen waarmee Afrikaanse huishoudens kunnen worden geconfronteerd. Vervolgens worden ongelijkheden in gezondheidszorggebruik in achttien SSA landen bepaald en de onderliggende determinanten geïdentificeerd. De daarop volgende hoofdstukken bevatten effectstudies van een zorgverzekering, een prestatiebekostigingsprogramma en een gecombineerde interventie van een vrijwillige zorgverzekering met kwaliteitsverbeteringen in zorginstellingen. Deze programma's zijn geïmplementeerd in respectievelijk Ghana, Burundi en Nigeria. In het laatste hoofdstuk worden conclusies en beleidsaanbevelingen gedestilleerd uit de zes studies in dit proefschrift.

## Onverwachte ziekte bedreigt huishoudens maar inschrijving voor zorgverzekeringen blijft beperkt

Formele mechanismen om huishoudens te beschermen tegen de financiële gevolgen van onverwachte tegenslagen bestaan nauwelijks in SSA, vooral niet voor huishoudens waarvan de leden werkzaam zijn in de informele sector. Een van de mogelijke routes om deze huishoudens betere financiële bescherming te bieden is de introductie van zorgverzekeringen die de financiële gevolgen van onverwachte ziekten beperken. Echter, huishoudens kunnen worden geconfronteerd met meerdere onverwachte tegenslagen. Het is van belang te weten hoe de gevolgen van onverwachte ziekte zich verhouden tot de gevolgen van andere mogelijke onverwachte tegenslagen. **Hoofdstuk 2** laat zien dat in een groep van willekeurig geselecteerde agriculturele huishoudens in West-Kenia, onverwachte ziekte de meest voorkomende tegenslag is, gevolgd door ziektes in opgeslagen goederen, gewassen & vee en een plotselinge

afname van de verkoopprijzen van agriculturele producten. Om de aanzienlijke kosten van deze tegenslagen op te vangen moeten huishoudens hun spaargeld inzetten, bezittingen verkopen of leningen aangaan. Dit zijn allen oplossingen die naar verwachting op de lange termijn negatieve economische gevolgen zullen hebben voor deze huishoudens.

Gegeven het aanzienlijke financiële risico door onverwachte ziekte, is het aanbieden van een verzekering of spaarsysteem noodzakelijk om gezinnen te beschermen tegen hoge zorguitgaven. Kort nadat de gegevens voor deze studie in West-Kenia waren verzameld is het "Tanykina Community Healthcare Plan" (TCHP) geïmplementeerd. Dit programma bestaat uit een vrijwillige zorgverzekering en het verbeteren van de kwaliteit in enkele klinieken. Echter, drie jaar na de implementatie van het TCHP, had slechts 11.5 procent van de boeren in dit gebied zich verzekerd. Dit percentage was lager dan verwacht en het was dan ook niet mogelijk de geplande effectstudie om het programma te evalueren uit te voeren.

Op basis van de resultaten uit onze studie kan deze beperkte inschrijving mogelijk verklaard worden door de veelvoud aan onverwachte tegenslagen waar deze huishoudens mee geconfronteerd worden. Hoewel ziekte de meest voorkomende tegenslag is, worden huishoudens ook vaak geconfronteerd met een reeks van andere tegenslagen. Voor deze huishoudens kan het daarom onmogelijk zijn om een gedeelte van hun beperkte middelen in te zetten om de premie voor de zorgverzekering te betalen. Met andere woorden, deze huishoudens zouden profijt kunnen hebben van meer flexibele hulpmiddelen die gelijktijdig financiële bescherming bieden tegen verschillende onverwachte tegenslagen. Daarnaast liet onze analyse zien dat respondenten tekortkomingen ervaren in het zorgaanbod zoals lage kwaliteit van zorg en het niet beschikbaar zijn van medicijnen. Deze tekortkomingen in zorgaanbod kunnen het eveneens minder aantrekkelijk maken om in een zorgverzekering te investeren.

## Gebruik gezondheidszorg is niet gebaseerd op behoefte maar op inkomen

**Hoofdstuk 3** geeft inzicht in de behoefte aan zorg en het gebruik van zorg in verschillende SSA landen. Dit is van belang omdat een eerlijke verdeling van gezondheidszorggebruik, op basis van een ieders behoefte in plaats van inkomen, een prioriteit is op de meeste politieke agenda's in SSA landen. Gegevens van achttien landen waar de "World Health Surveys" en de "Demographic and Health Surveys" zijn uitgevoerd werden geanalyseerd. Hieruit bleken aanzienlijke ongelijkheden in gezondheidszorggebruik: in bijna alle landen was het zorggebruik aanzienlijk hoger onder de rijkeren, terwijl er geen aanwijzing is dat zij ook een grotere behoefte aan zorg hadden. Het blijkt zelfs dat inkomen de

belangrijkste voorspeller is van gezondheidszorggebruik. Deze studie laat voor een reeks van landen –met heel verschillende karakteristieken- de noodzaak tot hervormingen in de gezondheidszorgfinanciering zien. Het is van belang zorguitgaven uit eigen zak te beperken door het promoten van zorgverzekeringen of door (een deel van) de eigen betalingen voor gezondheidszorg af te schaffen. Verder onderzoek is nodig om te bepalen wat de beste manier is om individuen financiële bescherming tegen zorguitgaven te bieden, bijvoorbeeld door vrijwillige of verplichte zorgverzekeringen.

## Ghanese NHIS heeft positieve effecten op gebruik van moeder- en kind zorg

Om te bepalen of zorgverzekeringen inderdaad een effectief mechanisme kunnen zijn om meer gelijke toegang tot zorg te bewerkstelligen, evalueren we in **Hoofdstuk 4** de effecten van de "National Health Insurance Scheme" (NHIS) in Ghana. De NHIS is een van de eerste zorgverzekeringsprogramma's in SSA met een aanzienlijk dekkinsgebied en wordt door sommigen dan ook gezien als een voorbeeld voor andere SSA landen. Deze studie schat het landelijke effect van de NHIS op moeder- en kind zorg gebruik. Gegevens van Ghanese kinderen uit de "Demographic and Health Survery" over de periode 2006-2008 laten zien dat veertig procent van de moeders van deze kinderen verzekerd waren via de NHIS. We vonden dat het hebben van een NHIS verzekering het gebruik van prenatale zorg en het percentage bevallingen in het bijzijn van een gekwalificeerde zorgverlener deed toenemen. Het zorgde ook voor een toename van het percentage keizersneden tot een gemiddeld niveau overeenkomstig de richtlijnen van de Wereldgezondheidsorganisatie. Verzekerde moeders hadden daarnaast een kleinere kans op een ongewenste zwangerschap. Echter, het hebben van een NHIS verzekering had bijna geen effect op vaccinaties en het gebruik van vitamine A supplementen bij deze kinderen. De effecten op prenatale zorg en bevallingen met een gekwalificeerde zorgverlener waren onder de armen grotendeels gelijk aan die in de gehele bevolking. De effecten op keizersneden waren ongeveer half zo groot en de afname in ongewenste zwangerschappen was groter onder de armen. Hieruit concluderen we dat gedurende de eerste jaren dat de NHIS beschikbaar was, deze een positieve invloed had op het gebruik van prenatale- en bevallingszorg maar niet zozeer op de zorg aan het kind na de geboorte.

Prestatiebekostiging kan helpen om kwaliteit te verbeteren maar verandert zorggebruik niet
Door hervormingen in de financiering van de aanbodskant van de gezondheidszorg, kunnen zorgverleners gestimuleerd worden om hun prestaties te verbeteren. Prestatiebekostiging is het achteraf betalen van zorgverleners op basis van de kwantiteit en kwaliteit van door

hen geleverde zorg. We onderzochten de effecten van prestatiebekostiging in Burundi, waar prestatiebekostiging landelijk is ingevoerd. Burundi is een voorbeeld voor beleidsmakers in allerlei andere SSA landen waar men momenteel experimenteert met prestatiebekostiging. In Hoofdstukken 5 en 6 zijn twee studies uitgevoerd op basis van twee verschillende gegevensbestanden, die beide informatie bevatten over de periode 2006-2010. Het eerste bestand bevatte gegevens die representatief zijn voor de helft van het land, verzameld door de implementerende partij Cordaid. De bevindingen op basis van deze gegevens zijn veelbelovend: het percentage geboortes dat in een zorginstelling plaatsvond nam met een derde toe, het deel van de vrouwen dat gebruik maakt van moderne anticonceptie methoden verdubbelde en de kwaliteitsscore van de zorginstellingen nam aanzienlijk toe. Echter, de vervolgstudie met nationale gegevens uit de Burundese "Demographic and Health Survey" liet kleinere effecten zien. De grote positieve effecten op geboortes die in een zorginstelling plaatsvonden welke eerder gevonden werden met de Cordaid data, konden niet worden gerepliceerd met de landelijke gegevens. Het is niet geheel duidelijk wat deze verschillen in resultaten verklaart.

Met name voor vormen van zorg waarvoor een gedragsverandering van de zorgverleners nodig is wanneer de patiënten al in de kliniek zijn, zien we verbeteringen. In onze studies is dit bijvoorbeeld zichtbaar in de relatief grote effecten op bloeddrukmetingen en anti-tetanus vaccinaties tijdens de prenatale zorg. De verbeteringen zijn kleiner voor vormen van zorg waarbij de patiënt eerst nog moet worden overtuigd om naar de kliniek te komen. Voorbeelden uit onze studie van dergelijke vormen van zorg zijn het tijdig starten van prenatale zorg en het kiezen voor een bevalling in een zorginstelling. We vonden dat onder vrouwen die al naar de kliniek kwamen voor prenatale zorg, bevallingen in een zorginstelling significant toenamen als gevolg van prestatiebekostiging. Dit suggereert dat zorgverleners van de gelegenheid gebruik maakten tijdens de prenatale zorg om vrouwen aan te moedingen in de zorginstelling te bevallen. Bij een aanbodskantinterventie zoals prestatiebekostiging is één van de belangrijkste zorgen dat de armen er niet voldoende van profiteren. Inderdaad, wanneer we alleen keken naar de veertig procent armsten blijkt dat in de meeste gevallen de effecten gelijksoortig of kleiner zijn dan in de volledige onderzoekspopulatie. Tot nu toe omvatte het prestatiebekostigingsbeleid in Burundi nog geen maatregelen om specifiek de armen te bereiken. Investeringen in dergelijke elementen helpen waarschijnlijk om gelijkere toegang tot zorg te bewerkstelligen en daarmee een belangrijke stap richting UHC te zetten.

## Doordacht ontwerp van zowel vraag- als aanbodkant interventies

Interventies die ten doel hebben om gelijktijdig financiële bescherming en kwaliteit van zorg te verbeteren kunnen een belangrijke route naar UHC zijn. Echter, de details van het ontwerp van dergelijke gecombineerde interventies zijn van groot belang om er zeker van te zijn dat de prikkels in het systeem leiden tot de gewenste uitkomsten. Een voorbeeld van een gelijktijdige hervorming van zowel de vraag- als aanbodkant is het "Kwara State Health Insurance" (KSHI) programma, geïmplementeerd door het Health Insurance Fund (HIF) in de staat Kwara in Nigeria. Terwijl er internationaal aanzienlijk enthousiasme is over de effecten van de verschillende programma's die door het HIF zijn geïmplementeerd, is het bewijs hiervan in wetenschappelijke tijdschriften nog beperkt. De studie in **Hoofdstuk 7** schat de effecten van het KSHI programma op zorggebruik en op eigen betalingen. Effecten zijn geschat onder de verzekerden (33 procent van de studiepopulatie) en onder de onverzekerden.

Vanuit het KSHI programma wordt een vrijwillige goedkope zorgverzekering aangeboden door een private verzekeraar en wordt de kwaliteit van bepaalde zorginstellingen verbeterd. Voor de onverzekerden blijven de eigen betalingen bestaan. Voor de verzekerden nam het zorggebruik toe en zorguitgaven af. Deze verbeteringen werden grotendeels veroorzaakt door de verzekering en niet zozeer door de kwaliteitsverbeteringen. Echter, onder de onverzekerden woonachtig in het gebied waar de instellingen zijn verbeterd, nam het gebruik van formele gezondheidszorg af en het gebruik van informele zorg en de zorguitgaven toe. Deze resultaten suggereren dat de onverzekerden als het ware worden "weggeduwd" door de verzekerden uit zorginstellingen waar formele zorg wordt verleend. Dit is een aanzienlijk probleem omdat 67 procent van de respondenten zich niet verzekerd had tijdens de eerste twee jaar dat het programma beschikbaar was. Hoewel de oorzaken van dit "wegduw" fenomeen verre van duidelijk zijn, suggereert deze studie in ieder geval dat een aanbodskant interventie zonder dat men zich gelijktijdig voor een zorgverzekering inschrijft, onvoldoende is en voortgang richting UHC zelfs kan hinderen.

## Richting Universal Health Coverage

In de debatten over UHC wordt vrij veel aandacht besteed aan het vergroten van zorgverzekeringsdekking. Veel partijen die deze verzekeringen implementeren in SSA hebben maar beperkt aandacht voor het optimaliseren van de financiële prikkels voor de zorgverleners. Dit lijkt een gemiste kans omdat zonder het gelijktijdig verbeteren van de kwaliteit van zorg, de uitbreiding van financiële bescherming maar beperkte invloed zal hebben op de gezondheid van de bevolking. Afrikaanse overheden en internationale

organisaties zouden daarom weg moeten bewegen van éénzijdige interventies en zich meer moeten richten op gecombineerde interventies, zoals besproken in **Hoofdstuk 8**. Dergelijke gecombineerde interventies zijn lastig te initiëren omdat het betrokkenheid van meerdere partijen vereist.

Helaas lijkt de keuze voor bepaalde gezondheidszorg financieringsmechanismen tot nu toe voornamelijk gedreven te zijn door datgene wat "in de mode is" in plaats van door betrouwbaar bewijs over de effectiviteit van deze mechanismen. Het feit dat enkele jaren geleden meer dan 900 zorgverzekeringsprogramma's in SSA zijn ingevoerd, terwijl het bewijs van de effectiviteit evenals het aantal inschrijvingen beperkt blijft, is een voorbeeld van dergelijke trendgevoelige keuzes, vaak gemaakt door ontwikkelingshulp organisaties. Deze keuzes zouden meer gedreven moeten worden door bewijs over "wat werkt" dat gegenereerd kan worden door robuuste effectstudies, anders bestaat de kans dat deze modegevoeligheid de effectiviteit van ontwikkelingshulp beperkt.

# List of publications and submissions

**Chapter 2**

Bonfrer, I., Gustafsson-Wright, E. How do health shocks affect agricultural households? Evidence from rural Kenya. Under review.

**Chapter 3**

Bonfrer, I., Van de Poel, E., Grimm, M., van Doorslaer, E. 2014. Does the distribution of health care utilization match needs in Africa? Health Policy & Planning, 29(7):921-937.

**Chapter 4**

Bonfrer, I., Breebaart, L., Van de Poel, E. The effects of Ghana's National Health Insurance Scheme on maternal health care utilization. Under review.

**Chapter 5**

Bonfrer, I., Soeters, R., Van de Poel, E., Basenga, O., Longin, G., van de Looij, F., van Doorslaer, E. 2014. Introduction of performance based financing in Burundi was associated with improvements in care and quality. Health Affairs, 33(12):2179-2188.

Bonfrer, I., Soeters, R., Van de Poel, E., Basenga, O., Longin, G., van de Looij, F., van Doorslaer, E. 2013. The effects of performance based financing on the use and quality of health care in Burundi: an impact evaluation. The Lancet, Vol. 318, S19 (Abstract).

**Chapter 6**

Bonfrer, I., Van de Poel, E., van Doorslaer, E. 2014. The effects of performance incentives on the utilization and quality of maternal and child care in Burundi. Social Science & Medicine, 123:96-104.

**Chapter 7**

Bonfrer, I. Van de Poel, E. Gustafsson-Wright, E., van Doorslaer, E. 2015. Effects of a subsidized voluntary health insurance on insured and uninsured in Nigeria. BMG Working Paper 2015.01.

## Other publications

Hendriks, M., Wit, F., Roos, M., Brewster, L., Akande, T., De Beer, I., Mfinanga, S., Gatongi, P., van Rooy, G., Kramer, B., Janssens, W., Lammers, J., Bonfrer, I., Angula, T., van der Gaag, J., Rinke de Wit, T., Lange, J., Schultz, C. 2012. Hypertension and cardiovascular risk factors in rural and urban populations in sub-Saharan Africa. PLoS One, 7(3):1-10.

Van der Gaag, J., Lange, J., Schultsz, C., Heidenrijk, M., Gustafsson-Wright, E., Hendriks, M., Bonfrer, I., van der List, M., Páp, D., Brouwer, I., te Pas, M., Rooijakkers, J., Boers, A., Duynhouwer, A. 2011. Impact Evaluation of HIF-supported Health Insurance Projects in Kenya: Dairy Farmers, Baseline Report.

Bonfrer, I., Van der Poel, E. 2015. Performance Based Financing: main lessons from two recent scientific studies. Invited blog post for www.healthfinancingafrica.org

Van Oostrum, J., Bonfrer, I., Wagelmans, A., Kazemier, G. 2009. Requirements for a full service level agreement at an operating room department – a case study, in: Van Oostrum, Applying mathematical models to surgical patient planning. ISBN 978-90-5892-217-5.

# PhD portfolio Igna Bonfrer

## Training

2013 Masterclass Development Economics by Prof. A. Deaton (Princeton), AMC, Amsterdam
2013 Course design, EUR, Rotterdam
2012 Individual presentation training, Speechless, The Hague
2010 Econometric Analysis of Healthcare Demand, Swiss School of Public Health, Geneva
2010 Klaar in vier jaar, Hertz trainingen, Rotterdam
2010 Poster workshop, NVAS, Leiden
2010 International Health and Policy Evaluation, ISS, The Hague
2010 Impact evaluation by Prof. P. Gertler (University of California), AIID, Amsterdam
2010 The Challenge of World Poverty by Prof. E. Duflo (MIT), open online course
2010 Introduction to Swahili, Lowani language centre, Leiden

## Field work

2012 Feasibility study health insurance for small entrepreneurs in Burkina Faso
Jointly initiated a pilot household survey, performed baseline quality assessment of eight health care facilities, assisted in field supervision and discussed the project in French with local partners.

2010 Coordinator impact evaluation of a health insurance project in Kenya
Obtained ethical approval, organised focus group discussions, developed the household survey with local partners, organised training for forty local interviewers, supervised survey pilots in the field, informed local leaders and ensured efficient communication between all international partners. Data was collected among 1200 households.

## Conferences and other meetings

### Presentations at conferences

2015 International Health Economics Association conference, Milan
2015 Strategies towards Universal Health Coverage: African experiences, EUR, Rotterdam
2014 Engaging communities in sickness and health, NVTG, Amsterdam
2014 Low Lands Health Economists' Study Group, paper discussed by G. Frederix, Voorne
2013 PBF of health care provision, Chr. Michelsen Institute, Bergen
2013 Programme de Développement des Services de Santé, Cordaid, The Hague
2013 Nederlandse Vereniging voor Afrika Studies conference, Leiden
2013 International Health Economics Association conference, Sydney
2012 Health Insurance for the Poor platform conference, Rotterdam
2012 Research Conference on Microinsurance, University of Twente, Enschede
2012 Health. Development. Inequality., TU Darmstadt, Darmstadt
2012 Economic development international conference, Bordeaux University, Bordeaux
2012 Low Lands Health Economists' Study Group, paper discussed by R. Baltussen, Almen
2012 Development Economics Conference German Economic Assocation, ZEF, Bonn
2012 European Conference Health Economics Association, Zurich
2011 Low Lands Health Economists' Study Group, paper discussed by J. Polder, Soesterberg
2010 Human Welfare Conference, University of Oxford, Oxford

### Presentations at other meetings

2014 Guest lecture at the Chair of Development Economics, University of Passau, Passau
2013 Health Economics internal seminar, EUR, Rotterdam
2013 Lunch seminar, Crawford school of Public Policy, Canberra
2012 Workshop Performance Based Financing, EUR, Rotterdam
2012 BMG seminar, EUR, Rotterdam
2012 Guest lecture at the Institute of Housing and Sustainability, EUR, Rotterdam
2011 Health Economics internal seminar, EUR, Rotterdam
2011 BMG Innovation fund progress presentation, EUR, Rotterdam
2010 Rotterdam Global Health Initiative meeting, EUR, Rotterdam

### Poster presentations at conferences

2013 Global Health Metrics and Evaluation Conference, IHME, Seattle
2011 International Health Economics Association conference, Toronto
2011 Universal Health Coverage Symposium, Monash University, Kuala Lumpur
2011 Nederlandse Vereniging Afrika Studies conference, Berg en Dal

### Discussant at conferences

2012 Health. Development. Inequality., TU Darmstadt, Darmstadt
2012 Economic development international conference, Bordeaux University, Bordeaux

### Participant at conferences

2013 Access to health insurance conference, EUR, Rotterdam
2013 Towards sustainable global health architecture, RGHI, Rotterdam
2013 De Anatomische Les, AMC, Amsterdam
2013 Africa: Regional Economic Outlook, ASC,Leiden
2012 Africa's future and the World Bank's support to it, ASC, The Hague
2012 Themadag PBF in de Zorg, NVAO, Utrecht
2011 An Ideal Match?! NGOs and Academia in Research for Global Health, Amsterdam
2011 When Markets Fail, AIGHD, Amsterdam
2011 Statistics & Economics conference, EUR, Rotterdam
2011 Imagining Global Health Anew, RGHI, Rotterdam
2010 Presentation WRR report Development Aid, The Hague
2010 Low Lands Health Economists' Study Group, Egmond aan Zee
2010 Impact Evaluation Conference, AIID, Amsterdam

### Participant at other relevant meetings

2012 Prins Claus Chair Lecture and Introduction to HRH Queen Máxima, The Hague
2011 Lecture Poor Economics by Prof. E. Duflo (MIT), Amsterdam
2010 Observer at expert meeting on Universal Health Coverage, WHO, Rotterdam

## Teaching

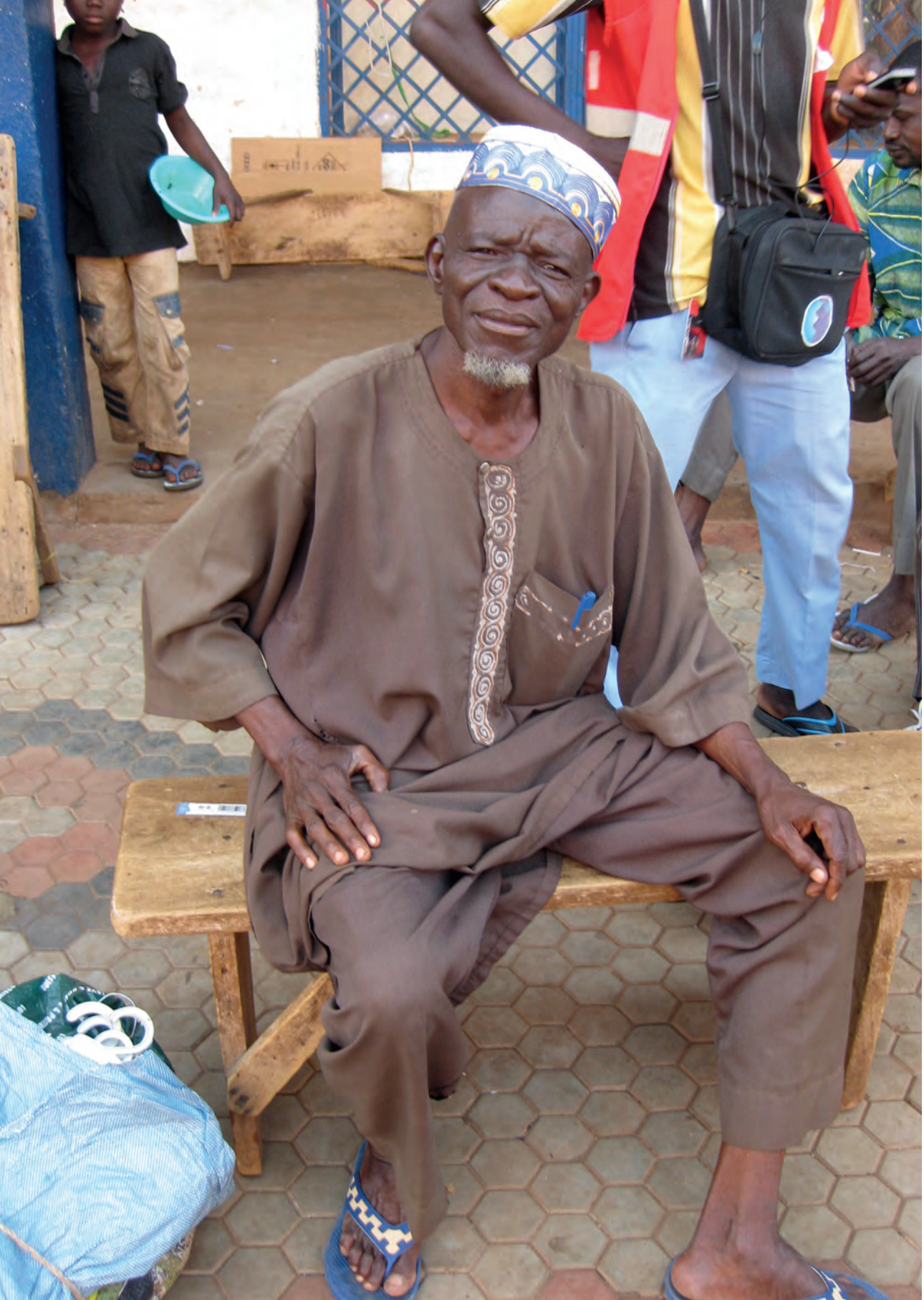
| | |
|---|---|
| 2011-2015 | Coordinator Economics of Health & Health care, MSc level, with Prof. E. van Doorslaer |
| 2010-2015 | Supervisor for 11 thesis students, BSc and MSc level |
| 2010-2015 | Co-reader for 18 thesis students, BSc and MSc level |
| 2015 | Coordinator teaching activities Health Economics section at iBMG |
| 2010-2013 | Introduction to Health Economics, kick-off lecture |
| 2010-2014 | Lectures on Relative Efficiency Measurement (Student evaluation 4.0 out of 5) |
| 2010-2011 | Computer working groups, Economics of Health & Health Care |
| 2012 | Proefcollege Gezondheidswetenschappen |
| 2010 | Working groups, Sociaal Medische Wetenschappen |

## Reviewing

| | |
|---|---|
| 2015 | World Bank Economic Review |
| 2015 | International Journal of Public Health |
| 2014 | Social Science & Medicine |
| 2014 | International Journal for Equity in health |
| 2014 | Health Policy and Planning |
| 2014 | Research Grant, South African Medical Research Council |

## Awards and funding

| | |
|---|---|
| 2015 | NWO Rubicon Fellowship for post-doctoral research at Harvard University |
| 2014 | Reserve candidate Niels Stensen Fellowship |
| 2013 | Travel grant for international conference, Erasmus Trustfonds |
| 2012 | Seed money for innovative research proposals, RGHI, Insurance in Burkina Faso |
| 2012 | Seed money for innovative research proposals, RGHI, PBF in Burundi |
| 2011 | First prize for innovators in Global Health, group contest, NVTG |
| 2011 | Honorable mention of poster titled “Health Insurance Across Africa”, NVAS |
| 2010 | Prof. H.W. Lambers Prize, Erasmus Trustfonds |
| 2009 | BMG Innovationfund for PhD research with Prof. E. van Doorslaer, EUR |



# About the author

Igna Bonfrer (1986) is a researcher at the institute of Health Policy and Management (iBMG), Erasmus University Rotterdam. Her research focuses on impact evaluations of health care financing reforms such as the introduction of health insurance schemes and performance based financing programs, so far mainly in African countries.

At the Erasmus University, Igna obtained in one year both her MSc in Health Economics, Policy & Law (*cum laude*) and her MSc in Econometrics & Management Science. She later received the Prof. H.W. Lambers Prize for the successful completion of her MSc degrees in combination with societal relevant activities. She subsequently went to the University of Oxford where she did the MSc in History of Science, Medicine and Technology. During that year she also worked as research assistant in the field of Health Economics for Prof. Winnie Yip. In 2010 she returned to the Erasmus University where she started her PhD research, funded by the BMG Innovation Fund, with Prof. Eddy van Doorslaer, Prof. Michael Grimm and Dr. Ellen Van de Poel.

During her PhD Igna did field work in both Kenya and Burkina Faso, where she coordinated data collection through large household surveys. She has further been involved in policy experiments in Ghana, Burundi and Nigeria. Igna has presented her work at several international conferences and has published in among others Health Affairs, Health Policy and Planning, Social Science & Medicine and PLoS One. At the Erasmus University she jointly coordinates the MSc course in Economics of Health and Health Care, supervises several BSc and MSc students writing their thesis in the field of Global Health and teaches working groups and lectures in the MSc in Health Economics, Policy & Law.

In September 2015 Igna will start her post-doctoral research at Harvard University, funded through a NWO Rubicon Fellowship. In this research she plans to evaluate the effects of Obama Care, specifically aspects related to performance based financing.


Champ

# Dankwoord

Met veel plezier kijk ik terug op de afgelopen vijf jaar waarin ik bij het instituut voor Beleid & Management van de Gezondheidszorg (iBMG) mijn promotie onderzoek heb kunnen uitvoeren. Ik heb de ruimte gekregen om me te ontwikkelen tot onderzoeker en docent. Dank aan iedereen die hier een grote of kleine rol in heeft gespeeld.

In de eerste plaats wil ik mijn promotoren Eddy van Doorslaer en Michael Grimm evenals mijn copromotor Ellen Van de Poel heel hartelijk bedanken. Eddy, toen ik tijdens mijn Master in Oxford werd gepeild voor een promotietraject daar, was mijn reactie dat ik liever bij jou aan de Erasmus Universiteit wilde promoveren. Daar ben ik nog steeds blij om. Je hebt me geleerd alleen claims te maken over de effecten van een interventie wanneer dat daadwerkelijk mogelijk is. De vriendelijkheid en gedegenheid waarmee je me begeleid hebt, zijn essentieel geweest voor dit proefschrift. Ondanks je drukke agenda slaag je er altijd in aanwezig te zijn en feedback te geven wanneer dat nodig is.

Michael, after you moved to the University of Passau you remained available to provide the final comments on my different studies. I learnt most from you during our field work in Burkina Faso. You showed me how respectful communication with local partners can be combined with reaching your goals. Some say that German professors place a lot of emphasize on hierarchy. Not you, as became clear to me in Ouagadougou. The taxi we hired could only fit four of us so you directed your juniors to take a seat and folded yourself into the trunk of the stationcar. Though the bumpy road probably wasn't memorable for you, it did make quite an impression on me.

Ellen, na mij heb jij de meeste tijd in dit proefschrift gestoken. Iedere keer wanneer ik bij je binnenliep met een vaag geformuleerde detailvraag, wist jij precies wat ik bedoelde en zorgde je ervoor dat ik met een helder antwoord je kamer uitliep. Ik heb enorm kunnen profiteren van je doelgerichte en eerlijke aanpak. Je bent een voorbeeld voor me en ik kijk ernaar uit onze samenwerking voort te zetten.

Further I would like to thank the members of my PhD committee as well as my co-authors for their time and effort. I am thankful for the funding received from the BMG Innovation fund and the Rotterdam Global Health Initiative. I am indebted to the Amsterdam Institute for International Development, specifically Jacques van der Gaag, the Amsterdam Institute for Global Health and Development, the Health Insurance Fund and PharmAccess, specifically Annegien Langedijk-Wilms, for allowing me to join their ongoing research about health

insurance schemes in Kenya and Nigeria. David, Inge, Marijke, Tineke and of course Marijn, the most intense part of my PhD was during our 18-hour work days in Kenya. Thank you for your huge efforts and great company. Renate, I enjoyed the field work we did in Burkina Faso and learnt a lot from you. For both field work projects I would like to thank all local partners, interviewers and respondents for their time and effort, without you the research would not have been possible.

Er zijn vele anderen die tijd in mij hebben geïnvesteerd voorafgaand aan dit promotietraject, dank aan de docenten op mijn basisschool de Beekbrug, het Fioretti College, de Erasmus Universiteit en de University of Oxford en andere betrokkenen.

Mijn vriendinnen en vrienden wil ik bedanken voor hun vertrouwde gezelligheid. Leonie, dank voor het plezier en de goede gesprekken tijdens onze thee afspraken waarbij we rond middernacht nog steeds niet uitgepraat zijn. Anne, Nienke, Yorick en jullie partners, met niemand is Munchkin spelen leuker dan met jullie. Janneke, Mariëtte, Renske, Lisette en Lisette, het is mooi hoe we nog steeds met een glimlach de anekdotes uit onze middelbare school periode ophalen. Marjon, toen we net op kamers woonden in het grote Rotterdam spraken we wekelijks af en kookten we een eenvoudige maaltijd. Inmiddels spreken we niet meer zo frequent af maar eten we wel in de betere restaurants van Rotterdam. Gelukkig hebben we er nog vele te ontdekken. Leontine, jij bent mij in veel dingen een stapje voor en ik kijk met veel plezier met je mee. Melanie, na de middelbare school zijn we de studiebanken blijven delen tijdens onze studie Econometrie. Leuk om te zien dat je het inmiddels al zo ver geschopt hebt. Liset en Jacoline, na ons bestuursjaar bij de FBMG hebben we contact gehouden, jullie zijn inmiddels vertrokken uit Rotterdam maar dat maakt het niet minder gezellig om af te spreken.

Bij veel van mijn (oud) collega's had ik de neiging ze op te nemen in bovenstaande "vrienden" sectie, wat veelzeggend is voor de aangename sfeer bij het iBMG. Dank aan mijn collega's bij het iBMG en de Erasmus School of Economics voor jullie oprechte interesse. Specifiek dank aan Apo, Matthijs, Pieter, Renske en Tim voor de leuke afwisseling die jullie in mijn werkdagen hebben gebracht. Steef, dank voor het enthousiasme waarmee jij me in mijn eerste jaar hielp met mijn programmeervragen over STATA. Imke, dank voor je vriendelijke en accurate ondersteuning bij de organisatie van onderwijs gerelateerde zaken. Laura, ik kan me geen beter begin van de werkdag voorstellen dan met jouw enthousiaste "Heeee Ig, goedemorgen!". Ik heb bewondering voor de manier waarop je je onderzoek combineert met je dressuur rijden en het liefdevol verzorgen van je paarden en veulen. Mocht je besluiten geen carrière te maken in de wetenschap, weet dan dat je in mijn ogen met je dressuur al

een prof bent! Saskia, jij bent een van de meest zachtaardige mensen die ik ken en hebt tegelijkertijd het doorzettingsvermogen van een marathonloper. Je biedt altijd een luisterend oor en ik ben dankzij jouw leuke verhalen over je afgelopen weekend, altijd op de hoogte van de beste hotspots in onze stad. Dank voor je oprechtheid en lieve interesse in mij. Hedwig, of we nu om drie uur 's nachts op het Franse platteland deelnemen aan de Roparun of op een doordeweekse dag achter onze computer zitten, jouw aanwezigheid is altijd een genot. Wat fijn dat we al onze successen en onzekerheden hebben kunnen delen. Na iedere verhuizing bleven we kamergenootjes, maar helaas zal dat na mijn verhuizing naar de VS niet langer kunnen. Ik zal je oprechte interesse en goede suggesties voor allerhande grote en kleine zaken missen.

Zo rond de start van mijn promotie werd mijn directe omgeving ook uitgebreid met mijn (toekomstige) schoonfamilie. Connie, Henri, Stefan, Mariska en Lusy, dank voor jullie interesse en bereidheid om je te verdiepen in zoiets ongrijpbaars als mijn "promoveren".

Mijn lieve broer Martien, ik bewonder je enthousiasme en grote kennis over Apples, BlackBerries, Rasperry Pi's en bugs, voor mij blijven dit toch vooral dingen die je op de fruitschaal vindt. Dank voor je hulp bij het ontwerpen van mijn proefschrift en voor je interesse in de reizen die ik de afgelopen jaren gemaakt heb. Ik kijk nog steeds met veel plezier terug op onze safari in Kenia. Ooit dachten we dat jouw afstuderen en mijn promoveren wel eens zouden kunnen samenvallen, maar je hebt me mooi ingehaald!

Lieve pap en mam, dank voor de liefdevolle en stabiele basis die jullie me altijd geven. Mam, jouw doorzettingsvermogen is niet te evenaren, maar het beetje dat ik ervan heb meegekregen was al ruim genoeg voor dit promotietraject. Op de basisschool nam je reeds de tijd om mijn schrijfsels van suggesties te voorzien, op de middelbare school zat je tot middernacht mijn verslagen te lezen en recent heb je zelfs de Nederlandse samenvatting van mijn proefschrift van doortastend commentaar voorzien. Zonder jouw aanmoedigingen zou ik niet zo ver zijn gekomen. Pap, jouw kennis, interesse in mijn bezigheden en positief kritische insteek hebben me klaargestoomd voor de academische wereld. Je knipt al jaren relevante stukken voor me uit de krant, zo ook: "NRC Handelsblad, 28 juni 2006, *Nederland biedt Afrika zorgpolis, 100 miljoen beschikbaar*". In dit nieuwsbericht werden projecten van PharmAccess en het Health Insurance Fund geïntroduceerd. Nu, bijna tien jaar later, maakt de evaluatie van één van deze projecten onderdeel uit van mijn proefschrift. Mijn interesse was dus al vroeg gewekt en je hebt daarmee misschien wel een nog grotere invloed op mijn proefschrift gehad dan je dacht.

Lieve Rogier, we hebben elkaar leren kennen rond de start van mijn promotietraject en dankzij jou ben ik niet verworden tot een stoffige wetenschapper. Ik heb veel van je geleerd, onder andere over waterpolo, muziek, series en films. Door jouw zorgvuldige selectie van wat we samen op de bank kijken, kan ik op verjaardagen enthousiast meepraten over de nieuwste series. Je geeft me de ruimte om de wereld over te reizen en geborgenheid om naar terug te keren. Bedankt voor je lieve woorden, humor en zelfgebakken brood. Ik kijk uit naar ons avontuur in Boston!

Africa is experiencing steady economic growth but trends in the health status of the population are lagging behind. This provides an opportunity for health care financing reforms to improve equitable access to good quality health care. The aim of this thesis is to provide evidence about the effectiveness of health care financing reforms, such as health insurance and performance based financing, implemented in different African countries over the last decade. This evidence can help policy makers to take well informed decisions about reforms necessary to achieve Universal Health Coverage by 2030.

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