UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Rwanda Maternal Health Care utilization in Reform

A horizontal inequity analysis of a community based health insurance implementation

Clara Larsson and Helena Nilsson

Graduate School
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Supervisor: Annika Lindskog

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1. INTRODUCTION

Individual health care utilization is to a large extent affected by its means of provision. This implies that the way individuals in a society use the provided health care, for instance, can depend on if it is privately or publically provided and how the individual is to pay for the services. Across countries of the developing world, the principal mean of payment for health care is still out-of-pocket payments in the form of user fees, and the costs of health care are hence in principal levied on the individual. This has been suggested to affect consumption of health care in these countries, leading to a decrease in usage among the poorest parts of their populations (Schneider & Hanson, 2006). In Rwanda, action has been taken against these adverse effects by implementation of a community based health insurance which serves as an alternative to user fees and this study aims at investigating the possible effects that this implementation might have had on the utilization of maternal health in the country.

The purpose of this study is hence to *examine if the inequity of delivery care utilization in Rwanda has changed over the past decade* and *what factors that might have affected possible changes in this inequity and if the implemented health insurance system might somehow be linked to these changes.* This is done by employing the concept of horizontal inequity using the method of concentration indices, where utilization of health care based on wealth is examined. To account for the inherent differences in need of health care among different income groups, the effect of varying need is removed by means of need standardization.

The focus of this thesis will be maternal care as this is one of the main objectives among the Millennium Development Goals and this issue is particularly urgent for Rwanda, which has had one of the highest rates of maternal mortality in the world over the past decade (Rwanda SPA Survey, 2007). The two means of health care utilization that will be in focus is use of *skilled assistance at delivery* and *place of delivery*. Our aim is to examine whether there has been a change in the case of not using any professional health care when giving birth and what might have affected this change. The data used for this analysis is Demographic Health Survey data from the years 2000, 2005 and 2008. Since there has been a major change in the structure of the health insurance system as well as a stabilization of the Rwandan society, we expect that there has been a change in the health care utilization pattern that could possibly arise due to these events.

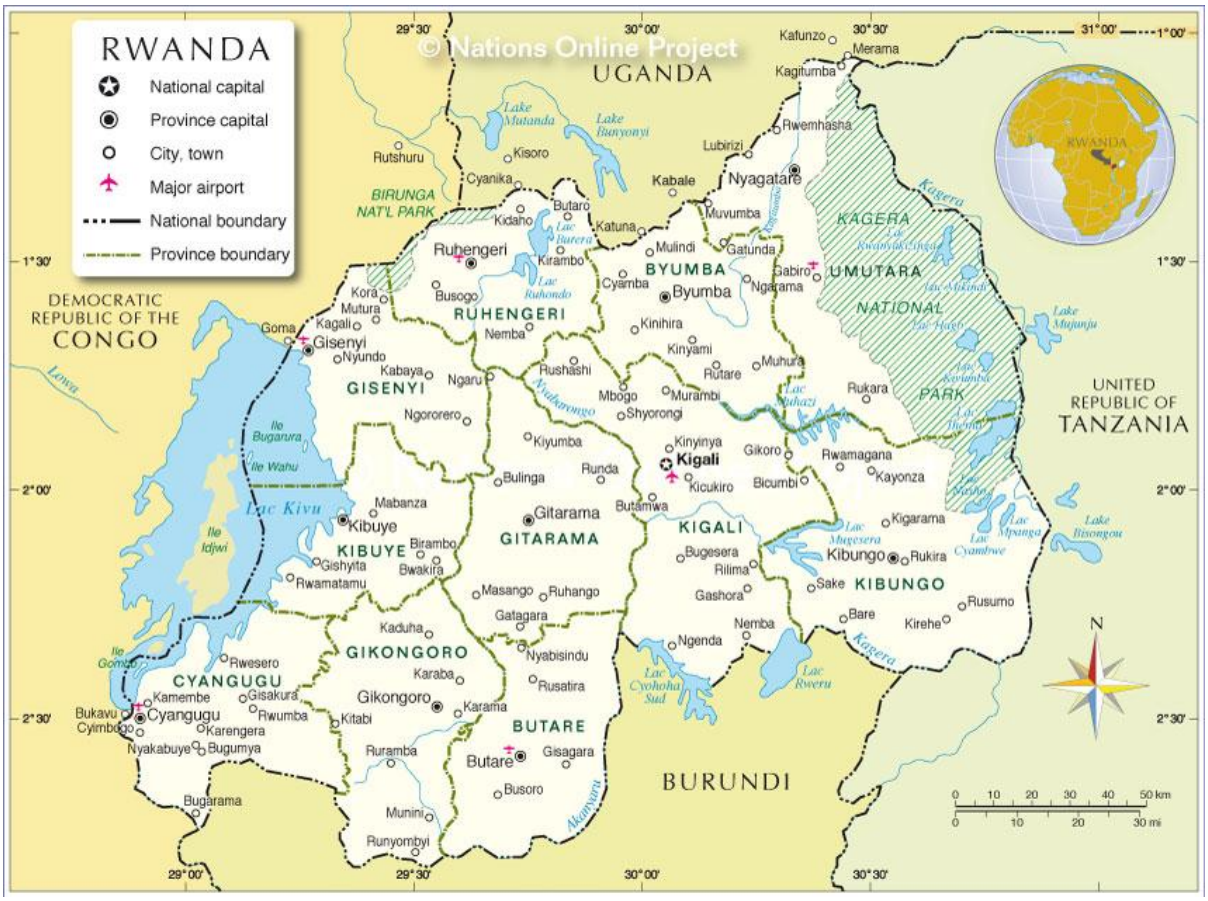
The study begins with a presentation of Rwanda and the implementation of the mutual health insurance in the country in section 2, which is followed by a literary review of the concept of

horizontal equity in section 3. The fourth section outlines theories that concerns market failures of health care, equity in health care as well as what is affecting an individual's health expenditures and it is followed by the fifth section, which outlines the methods used when conducting the quantitative analysis. The data is presented in section 6, which is followed by a presentation of the results in section 7, along with a discussion on policy implications, impacts of the reform and financial issues in section 8. Lastly, the main findings are concluded in section 9.

2. BACKGROUND

2.1 About Rwanda

Rwanda is a state located in the eastern parts of central Africa with a population of about 11 million inhabitants. The name of the capital is Kigali and prior to 2006 the country was divided into 12 provinces, namely Butare, Byumba, Cyangugu, Gikongoro, Gisenyi, Kibungo, Kibyue, Kigali-City, Kigali-Rural, Ruhengeri and Umutara which are now unitized into the larger Northern, Eastern, Southern, Western and Kigali provinces.



Source: One World Nations Online.

After the war in 1994, Rwanda has experienced both economic growth and social development and the nation has set goals that highly prioritizes economic growth and aims to rely less on foreign aid. However, a lot of public finance is still devoted to activities resulting from the war, such as prisons and orphan care. Living standards in the country have improved along with infrastructure, education and health care and poverty has been reduced **(**Logie, Rowson & Ndagije, 2008**).** However, the country remains very poor in certain areas, especially in the countryside, which houses about 60% of the population and the rising incomes are very unevenly distributed (Schneider & Hanson, 2006). The Gini-coefficient was estimated to 0.51 in 2008, a

slight rise from its' 2001 value of 0.47, only indicating a small improvement in distribution of income and there are still around 30% living in extreme poverty, which is particularly evident in the west and south provinces ((http://www.undp.org, 2007, Logie, Rowson & Ndagije, 2008**)**.

2.2 About the Rwandan Health Care System

Before colonization, the Rwandan health care system was to a great extent based on African traditional medicine where traditional healers were treating diseases by using, for example, plants and herbs. The use of modern medicine became more common as the Germans colonized the country and the transition into a modern health care system was also facilitated by the Catholic Church. This introduced health care system was centralized and the services were in essence free to the entire population (Rwanda SPA Survey, 2007). It was chiefly run by foreign missionary groups until the civil war in 1994 when the mass movement of refugees caused by the war lead to a breakdown of the health care system as well as to a shortage of human resources as most of the auxiliaries left the area **(**NE, 2012, WHO, 2012). After the war the government began to rebuild the system and to train health care staff. It has now adopted a primary health care approach that focuses on primary health care, decentralization, and community participation, development of human resources, strengthening of the health information system, all of which has an intersectoral approach to health. Human resources remains a challenge facing the government when trying to implement this program, as there still is a shortage of these types of resources in the health care sector. In 2008, a significant number of districts had as little as 2 doctors per 100,000 people while WHO recommends a minimum of 10. The lack of personnel has a large impact; the lack of midwives has for example caused maternal mortality to remain high. The government is pursuing investments in the health sector to solve these kinds of problems. The allocation of resources to the health care sector in total has also increased in recent years and is mainly decentralized into the country's districts **(**WHO, 2012). In 2002 the governmental spending on health care activities was estimated to 8.6% of its revenue, and this number increased to about 9.5% in 2007. The system is also supported by foreign aid to a large extent as more than half of the sector's funding come from donors and NGOs **(**Logie, Rowson & Ndagije, 2008**)**.

The primary health care approach also focuses on the prevalence of many diseases and there have been campaigns against, for example, HIV (WHO, 2012). Also in focus are malaria, diarrhea, malnutrition and potential threats of epidemics such as cholera and measles. The country is also committed to achieving the Millennium Development Goals (MDGs) by 2015, which also are focusing on improving the provision of basic health care services, especially to groups such as

women and children**.** The efforts made have yielded results in terms of recovery of the health care system but there are still many challenges remaining in order to obtain a functioning system and to reach the MDGs in 2015, maternal mortally ratio, for example, still remains one of the highest in the world (Rwanda SPA Survey, 2007).

2.3 Implementation of the mutual health insurance

Among the challenges is also that of improving access to health care services to the poor. Many households, especially after the government reintroduced direct payments in 1996, have a difficulty in affording appropriate health care and this leads to low utilization of the available services (Rwanda SPA survey 2007). The government of Rwanda has introduced a social insurance program in order to make health care services more available to the poor.

User fees had been present on and off from 1976 and onward and direct payments were reintroduced in 1996, as previously mentioned. In response, the population themselves organized to form their own "micro health insurances" to improve their finances and this developed into a government led project where micro health insurance was tested (Schneider, 2005). In 1999 micro health insurance schemes with voluntary membership were put into service in the three rural districts Gitarama, Byumba and Butare (Schneider & Hanson, 2006). The selection criteria were the regions' availability of a functioning district hospital as well as functioning health centers, the presence of political will to launch this type of prepayment for health services and lastly whether or not the region's population was interested in participating in a solidary fund for these prepayments. One also selected two regions for comparison, Kibungo and Bugesera (Schneider & Diop 2001[a]). The design and implementation of the system, as well as the management of it, was discussed and agreed upon at district level workshops, where community and health care representatives were participating, in combination with community gatherings with the local population. These discussions and agreements served as a base for decisions made at the central level, and the feedback loop between the central steering committee and the communities continue as the program is implemented. The process produced scheme-features, tools for legal, financial and contractual activities connected to the health insurance and training of staff to manage the schemes (Schneider & Diop, 2001[b]). During this process a total of 54 micro health insurance schemes were composed and at the end of 2000 the insurance covered about 9% of Gitarama's, Byumba's and Butare's total population, a number rising to around 19% in 2003 (Schneider, 2005). In 2003 the government expanded the project into a national system, which by 2005 covered all the regions in the country, and as much as 90% of the country's total population was

covered by the insurance in 2009 (healthmarketinnovations.org, 2011)

The enrollment in the insurance scheme is still voluntary and after enrollment, the individual must wait one month until he or she can utilize the insurance to receive care (healthmarketinnovations.org, 2011). However, once enrolled, the insurance program covers the drugs and services offered at the health centers as well as ambulance transport to one of the district hospitals (Schneider & Hanson, 2006). The services offered can for example consist of vaccinations, pre- and post-natal care as well as family planning and small surgical operations. One can also extend this minimum scheme to include services at the district hospitals, for example larger surgical operations and the cost of hospitalization (healthmarketinnovations.org, 2011). The districts have both hospitals and health centers and the insurance schemes are led by an executive bureau of volunteers elected by and among the members of the schemes. At a local level, federations have been formed that are partners with the hospital of the district and other authorities in the area. There are also prepayment bureaus contracted to the associated health center and there are supposed to be clear rules of the partnership between insurers and providers (Schneider & Diop, 2001[b]). There are however problems with for instance access; there are low occupancy rates in the hospitals and it might still be difficult for poor, rural inhabitants to get access to specialist care that is only available in the capital.

At the time of implementation in the pilot regions, each household for a family of up to seven people, paid an annual fee of 2500 RWF (approximately 4 USD) to enroll in the program, to the prepayment bureau associated with the household's preferred health center. They also paid a co-payment of 100 RWF per episode of illness in the health center along with other fees that are excluded from the micro health insurance, such as certain drugs etc. (Schneider & Hanson, 2006). At present, the fees and co-payments instead vary from scheme to scheme (healthmarketinnovations.org, 2011). Treatment in hospital is only covered by the micro health insurance if it is referred by a health clinic, making the health clinic act as gate keepers to hospital care. This is a tool to discourage use of expensive hospital services in cases where they are not needed. If you are not enrolled, you pay a user fee instead, as was custom before the implementation (Schneider & Hanson, 2006). The rates previously outlined were set by taking into account user fees and an assumption of an increase in the utilizations rates. To avoid moral hazard and adverse selection due the availability of the insurance to groups with built up demand for health services, and hence increased costs of health care, caption provider payment was implemented. Caption provider payment implies that a fixed amount is paid to the health care

provider for each patient enrolled, not depending on whether that individual utilizes care or not (Zweifel, Breyer & Kifmann 2009). It acts as a measure to set the right incentives for the providers to control unnecessary use of the services as well as to improve their own productivity. The prepayment bureaus cover the administrative costs of the schemes by payment from their premiums funds as well as paying money to the related health center. They also pay the prepayment federation, which in turn reimburses the related hospital for the services it has provided to members of the scheme. Hence the members share the cost of the health care system (Schneider & Diop, 2001[b]). There is also an elected village committee that handle matters such as if a person is too poor to pay for their part of the scheme. If this is the case the cost is often subsidized by donors. People infected with HIV and that are in the PEPFAR program are usually also waived from payments. In 2004 about 10% of the population did not have to pay their fees **(**Logie, Rowson & Ndagije, 2008**)**.

3. LITERARY REVIEW ON HORIZONTAL EQUITY

Equity of health care utilization has been a well-researched topic for the past decades and the means employed in evaluating the equality of access involves a number of methods. It can be measured in two dimensions; horizontal and vertical. Vertical equity refers to that individuals with the greatest need are given the greatest access, while horizontal equity, means that those in equal need should be given equal access (Macinko & Starfield, 2002). Since this study concerns horizontal equity, a review of the literature concerning this concept is presented below.

3.1 Horizontal Equity in Developed Countries

In van Doorslaer et al's study on health care access in Australia (2008) health care utilization (measured in General Practitioner (GP) and specialist visits and hospital nights) was explained by income, need-variables and non-need variables. Income was measured as mean household weekly income, equivalent to the decile that the individual belong to. The need variables used were self-assessed health and chronic conditions, age and gender. As also pointed out by van Doorslaer and Masseria (2004) they argue that the more detailed the data is for the need-variables, the less pro-poor will the inequity appear to be. This is due to the fact that the worse off tend to suffer of worse health. Among the non-need variables education and activity status (employment) were included since these are characterized by affecting an individual's tendency to consume health care while they are themselves not easily influenced through policy. Additional variables were insurance type (public or private), a dummy variable for whether or not the respondent usually speaks English at home as an indicator of non-financial access to health care, and dummies for location in major city or inner region to capture differences in geographical access to health care services. Finally indirect standardization was used. The obtained results showed that GP and specialist visits were found to have HI indices of -0.05 and +0.06 respectively indicating inequity in utilization where the better off were more inclined to use specialist care. Admission to any hospital was found to have the value -0.032, which indicated pro-poor inequity (van Doorslaer et al., 2008).

In an OECD report on inequity in medical care utilization regarding number of doctor-, GP-, specialist (outpatient)-, inpatient- and dental care visits, in 21 European countries, income was calculated as disposable income per equivalent adult during the past year. Need and non-need variables were the same as in van Doorslaer et al's Australia study except for the addition of the need variable mobility and the non-need variables insurance coverage for medical care

expenditures and geographic region. The findings of this study indicated pro-rich inequity in doctor, specialist and dental visits and pro-poor inequity in GP visits.

Lua et al. (2007) study horizontal inequity in four high-income Asian countries followed the relatively recent introduction of ‘‘equal treatment for equal need’’ (ETEN) policy orientation. The categories of utilization studied were utilization of western doctors, licensed traditional medicine practitioners along with dental and emergency room visits and inpatient admissions. Need and non-need variables were similar to the Australia study; however, the following variables were also included: activity-limitation as a need variable, as well as insurance type, urban/rural residency and geographic region as non-need variables. In all three countries, all the types of utilization had rather low HI inequity values, except Hong Kong where Western doctor visits exhibited rather strong pro-rich inequity regarding GP care and pro-poor inequity regarding specialist care (Lua et al., 2007).

Lastly, van Doorslaer et al. conducted a study on horizontal inequity in utilization of GP visits and specialized care in 10 European countries. Apart from the variables used in the above-mentioned Australia study, this study also included marital status and employment (self-employed, unemployed etc.) and time dummies (to account for trends in utilization) among the non-need variables and excluded insurance. The need variables were the same as in the Australia study, namely age, gender and self-assessed health status. Further, indirect standardization method was employed and equivalence scales and deflation with CPI were used in the calculation of wealth indices. The resulting indices showed a pro-poor inequity with an average of approximately -0.02 in utilization of GP visits in the majority of the countries and a pro-rich in equity in the range between 0.026 and 0.199 of utilization of specialized care in all ten countries (van Doorslaer et al 2009).

3.2 Horizontal Equity in Developing Countries

Due to less organized labor markets and health facilities in developing countries, the variables of interest must be somewhat modified when analyzing these type of countries within the concept of horizontal equity. For instance; since income is irregular over time, other proxies need to be employed (Condradie et al, 2008). There are not many studies on horizontal equity performed in developing countries, compared to the number performed in more industrialized economies, however there are a few that have been conducted, which will be presented below.

Liu et al (2002) study changes of horizontal and vertical inequity in health care in China following the pilot insurance health reform in 1994. This study examined the changes in likelihood of visiting a health care facility (inpatient, outpatient and emergency) pre- and post-reform across groups of different socioeconomic statuses and health conditions. A difference in difference method was used to examine the changes in access for groups that differed in four aspects; health status (chronic diseases), income, education and job status. As individual characteristics this study included age, marital status, occupation, type of designated regular providers, and opinions about the health insurance reform. Findings were that regarding basic care, there had been an improvement in equity following the reform, with the new more inclusive insurance. However there was still inequity in access to the more expensive inpatient and specialist care (Liu et al 2002).

Terwait and Somkotra instead studied inequity in utilization of out- and inpatient care in Thailand following the implementation of Universal Coverage. Their measure of income was both in kind and in cash and indirect standardization of need was employed. The need variables used were age and gender and self-reported chronic conditions, as in the previously mentioned studies. However, in addition, these diseases were further subcategorized according to International Classification of Diseases. As non-need variables the same as in the other mentioned studies were used, including insurance type (public or private). Findings showed that after the Universal coverage program there was pro-poor inequity in in- and outpatient use with HI's of -0.067 and -0.061, respectively, and pro-rich respectively pro-poor inequity in private and public health care for both in- and outpatient care (Somkotra & Tewarit, 2011).

Further, Cissé et al's study on health access in four African cities used a consumption-based approximation of income rather than direct questions about income. This approximation was then weighted using equivalence scales. The health care utilization was measured by all expenditures associated to a visit to a health care facility, including transport etc., and consultation fees and medication, i.e. all money that were spent on health care. Need variables were self-assessed morbidity, as has been employed in most of the above described studies and the indirect standardization method was employed. The included non-need variables were education, occupation and lodging information. The resulting HI-indices indicated pro-rich inequity in three of the cities with indices ranging between +0.16 to +0.41 and in one of the cities an insignificant and rather weak pro-rich inequity with an index of +0.001 (Cissé, Luchini & Moatti, 2007).

In a study from 2010 by Hossain M., the horizontal inequity of health care utilization in Bangladesh was measured at four points in time between 1997 and 2007. The health care in focus was limited to maternal care and the utilization was defined as utilization of antenatal care, skilled attendance at birth and giving birth in a health facility. As need variables for the latter two utilization types the following were used: height-for-age of respondents and major complications at birth (prolonged labor, excessive bleeding etc.) and as non-need variables the following were used: education, religion and location. The changes of the inequity indices displayed a reduction for all three categories. HI for antenatal care went from +0.3 to +0.15 and HI's for skilled assistance and place of delivery went from around +0.6 to +0.4, and indicating that the initial pro-rich inequity had been reduced to some extent (Hossain, 2010).

The last study concerns horizontal equity in Rwanda in 2006. Data from the year 2000 on three rural districts was used in the evaluation. These are the same three regions that were pilots for the community based insurance, referred to as the pilot-regions in our study. Income was approximated by consumption over the past month; however, equivalence scales were not used. Health care utilization was measured using direct questions on recent health care utilization (visit to doctor, nurse etc.) plus health care expenditures including out of pocket payments on medication, insurance copayments, treatment costs etc. and indirect costs such as transportation. The need variables used were age, gender and self-assessment on the health status of the individual, the same as in previously described studies. In addition pregnancy and days in bed being sick were also included. The non-need variables were similar to those in previously mentioned studies and indirect standardization was used. However they did not account for the potential selection bias arising from the, at the time, low and voluntary enrolment into the MHI's. Their findings showed that health insurance had a positive effect on health care visits and further they found indications of a pro-rich inequity in utilization, with +0.3 for the uninsured and +0.15 for the insured, indicating that the introduced health insurance system has had a positive effect on inequity (Schneider & Hanson, 2006).

Concerning the method of need-standardization, the literature discussing whether direct or indirect method of standardization should be used is not in unison and while the majority is choosing indirect standardization (see van Dorslaer et al 2003, 2009, Somkotra &Tewarit 2009, Boubou et al. etc.) there are arguments that speak in favor of the direct method. In Gravelle (2003) it has been argued that the inclusion of non-need variables will remove some of the effect of income on health

and thus lead to a an inconsistent estimator of the concentration index and therefore direct method is more appropriate (Gravelle, 2003) Other papers in favor of direct standardization are van de Voorde and Schokkakert (2009).

To summarize, the types of care that are most frequently studied in both developing and developed countries are number of visits to GP's or specialists and use of public or private health care facilities. The findings of these studies are in general that there is a pro-rich inequity in specialized and private care while a pro-poor inequity is more common in use of GP's and public care. However, few studies focus on how the use of *no* health care is distributed. Especially in developing countries, the frequency of *none-use* is an issue and, especially regarding maternal care, a contributing factor to the high rates of maternal and child mortality. Often non-use of health care can imply no need i.e. that the individual is healthy, however, this study concerns maternal care at delivery, in the form of a health care facility and/or skilled assistance, which is something that is required for a safe delivery for all pregnancies. Therefore non-use is here not interpreted as no need. In effect, our sample is restricted to only include those with need which is an advantage compared to many other studies.

Few studies have been conducted on maternal care inequity in developing countries and in the one presented above the object of interest has been inequity in use of skilled assistance at delivery and use of health care facility at time of delivery. Since the one of the objects of the Millennium Development Goals is to increase the use of any health care and especially regarding maternity care, our study will examine the inequity in unskilled assistance and no health care facility at delivery.

4. THEORY

Health is a prerequisite for most activities and therefore health care is often perceived as a right. In combination with information asymmetries regarding health status and necessary treatment these characteristics makes the markets for health care and in effect also health insurance in need of intervention. Hence this is important to take into consideration when analyzing the implementation of the Rwandan mutual health insurance. In the following sections the market failures of health care and health insurance is explained, the notion of equality is discussed, the determinants of health care demand is outlined, and lastly the potentially underlying factors behind inequity is treated.

4.1 How and Why the Market for Health Care Goods and Health Insurance Fails

4.1.2 Market Failure of Health Care

According to First Welfare Theorem; health care as a good must *either* qualify as a public good, give rise to externalities *or* have agents that are not capable of rational decision-making, (which implies lack of consumer sovereignty) in order to justify government intervention. Health care possesses all of these characteristics. Externalities exists in both physical and physiological form, physical in terms of, for instance, limiting the spread of communicable diseases and psychological in terms of altruism as an individual might experience distress when another individual suffers due to insufficient access to health care (Zweifel, Breyer & Kifmann 2009). Health care can also in part be viewed as a public good since, for instance, a hospital bed can serve as an option good and thus yield utility that is both non-rivalry and non-excludable. Finally, due to the information asymmetry that arises in the physician-patient relationship, health care also exhibits the last of the characteristics, lack of consumer sovereignty. Due to the above characteristics, the market for health care as a good is likely to fail without a certain extent of government intervention.

As a consequence of the characteristics of health care as a good, health insurance also possesses some of the market failure characteristics. It contains externalities since an individual with no health insurance still is likely to receive care due to altruism implying a risk of free riding that will give rise to negative externalities. In addition, the consumer heterogeneity will result in risk selection meaning that individuals with a high risk of illness not will be granted insurance and hence end up as free riders. Information asymmetry is also a problem in the case of health insurance. Since health states are unObs.ervable, an average premium will lead to individuals with low risk of illness opting out, leaving only high risks (referred to in the literature as risk selection), which ultimately results in losses and in the long run, market failure. It is also the case that the

health states and prevention activities is information chiefly privy to the insured and since the cost is removed from the consumer to the insurance company there is thus an incentive to excessive consumption which is inefficient and which can lead to market failure in the long run.

In sum, due to the characteristics of health care there is risk of market failure both regarding health care as a good and regarding its financing structure, the health insurance. This results in a need for certain interventions, especially in the form of mandatory insurance and cost sharing (Zweifel, Breyer & Kifmann 2009). In the case of Rwanda the primary mode of intervention has been to introduce a voluntary but government health insurance in the form of community-based health insurance. Due to insurance being publically provided there would, hypothetically, be a reduction of problems arising from risk selection which in turn will reduce the problem of free-riding, since the government will first and foremost focus on enrolment of the entire population, thus this public system would prevent some of the underlying factors to market failure.

4.2 Equality in Health Care

Pareto efficiency is usually the rationale for most allocations of scarce resources. However this school of thought is not always in accordance with equality. The First Theorem of Optimality states that *"If a competitive equilibrium exists at all, and if all commodities relevant to cost or utilities are in fact priced in the market, then the equilibrium is necessarily optimal".* And an improvement in allocation can be made if *"...it is not possible to change the allocation of resources in such a way as to make some people better off without making others worse off"* (moneyterms.co.uk, 2012). Also, since it is sometimes impossible to make one person better off without making someone else worse off, there are versions of Pareto allocations where compensation is included, like for instance in the Kaldor-Hicks model[1]. However the problems with this school of thought is that it does not discriminate between the scenarios where two individuals are unequally well off, if individual *i* is extremely well off at the expense of *j*'s starvation or vice versa. Therefore even if health care market did fulfil the requirements for perfect competition the Pareto optimal allocations might not be desirable from an equality point of view (Reinhardt, 2001). Another parable for the conflict between equality and efficiency in the case of health care is for instance to refuse treatment of an uninsured patient, as this is a violation of the horizontal equity while at the same time it is efficient since it prevents wasteful consumption of a scarce resource and encourages careful use for those who are entitled to it (Matania & Yaniv, 2007).

[1] Kaldor-Hicks optimal outcome involves a less stringent version of the Pareto optimal outcome where the individual who is better off will compensate the one made worse off (Hicks, 1939).

4.2.1 How Does One Ensure Equality in Health Care Access?

In Le Grand, equal access is defined as a situation where individuals face the same prices. According to Culyer and Newhouse (2000) this definition is not adequate however since people with different ability to pay has different ability to obtain access. Therefore, Culyer and Newhouse conclude that equal access should be based on need rather than income and as a result, two concepts have crystallized: horizontal equity, equal access for those with equal need and vertical access, unequal access for those with unequal need. This means that if those in greatest need also have the highest benefit[2] of care, then allocation according to need results in efficiency. Thus, under the aspect of the efficiency objective of maximizing health gain, equity and efficiency is no longer in conflict**.**

In sum, to allocate according to Pareto optima is efficient but it does not take equality into account thus this rationale is insufficient to apply on health care. Efficiency and equality seems to offer only trade off solutions. However, once the concept of equality is modified from being based on access to need, according to the horizontal and vertical equity concepts, then there is no longer a tradeoff between equity and efficiency and optimal allocation of resources can be found by means of an efficiency objective of maximization (Culyer & Newhouse, 2000).

4.3 What Affects Individual Health Care Expenditure?

According to economic theory, as presented by Buchmeuller et al (2005) health care utilization ought to be positively affected by health insurance; the insurance lowers the price which according to economic theory will lead to a higher equilibrium quantity but what does theory say about what affects health care expenditures?

In the Grossman model health is treated as both an investment good and as a consumption good, thus health is desired from two aspects: as an instrument to work and earn a living, the better health, the higher the return on work (to a point), and as a consumption good per se, as it feels good to be healthy. The health stock can be accumulated by investment in exercise and medicine. However, since these investments require sacrifice in terms of time and money, the health accumulation will come at the expense of other sources of utility. This ultimately results in a tradeoff between good health and a high consumption of other non-health related goods (Zweifel, Breyer & Kifmann 2009). According to the Grossman model, the individual will thus allocate his or her resources according to an inter-temporal utility maximization model where marginal utility

[2] Utility or benefit is most often measured in willingness to pay(w.t.p.), however in this study w.t.p. cannot be used since the results would imply that only the well-off would derive utility of health care.

from an investment in the health stock equals the marginal cost. From this model a demand for medical care can be derived, namely the structural demand for medical care which can be displayed as follows:

$$lnM = const. + lnH_1 - (1 - a_M)\, ln\, p + (1 - a_M)\, lnw_0 - a_E E$$

Where M is demand for medical care, H_1 is health stock or health status, a_M are the production elasticities of medical care and time spent doing health-improving activities, p is price of medical services, w_0 is wealth and a_E is the production elasticity of education. This expression indicates that a higher level of health stock will increase the demand for medical health care (Zweifel, Breyer & Kifmann 2009).

If one inserts the demand for health as an investment good, a model not included here, into the structural demand for medical care one obtains the reduced structural investment demand function, which can be displayed as follows:

$$\ln M = const. - (1 + a_M (e - 1)) * \ln p + (1 + a_M (e - 1)) - (1 - e) * a_E E$$

Where e is an elasticity that reflects the marginal efficiency of health capital H_1. The exogenous variables can be interpreted as having the following effects, where the variable's effect on the dependent variable is in brackets:

p (-): The higher the price of medical services, the lower is the demand on M. This results in more time being spent on health inducing activities, as this is a substitute for medical services.

w (+): The higher the initial wage rate, the higher is the demand for medical services since it is now more expensive in terms of opportunity cost to be ill.

E (-): A higher level of education has a negative effect on medical care demand since higher education results in a more efficient use of existing medical services.

Further, age has a positive impact since the depreciation rate of the health stock increases over time, therefore demand for medical services increases with age (Zweifel, Breyer & Kifmann 2009).

When instead inserting the health-consumption demand, a model not included here, into the medical care demand model one obtains_the reduced structural consumption demand function, which can be displayed as follows:

$$\ln M = const. - (1 + a_M (\kappa - 1)) * \ln p + (1 - \kappa)(1 - a_M) * \ln w - (1 - \kappa) a_E E - \kappa \ln \lambda$$

Where λ is strength of the wealth constraint, meaning that if this is high then wealth has a very strong effect on the demand for medical care, κ measures the elasticity of marginal utility of less sick time with respect to health stock. The effects of price and wages and education are the same as in the investment model (Zweifel, Breyer & Kifmann 2009).

In sum, according to the Grossman model, demand for medical services should increase with wages and current health stock and decrease with the price of medical expenditures and education (Zweifel, Breyer & Kifmann 2009).

4.4 Factors That Affect Inequity

As income is one of the explanatory factors behind the inequity in health care utilization, especially in low-income countries, an insurance that removes some of the cost's effect on the household budget should have an indirectly positive effect on inequity. What will then affect health insurance enrollment?

In low-income countries, where rural infrastructure often is neglected, the likelihood of purchasing health care insurance must be decreasing with *distance* to a health care facility. Since incomes are small it is unlikely that purchasing insurance will have a high priority in the time just before wages (or equivalent) are being paid. Thus the *time of payment collection* should be in synchronization with the income pattern. Lastly, *quality of care* should have a positive effect on likelihood of holding insurance (WHO, 2003).

In sum, long distance to a health facility, un-timely collection of insurance fees as well as low quality of the health care that is within reasonable distance are all factors that, via the likelihood of holding health insurance, should affect inequity to the negative. In this study we are primarily concerned with type of place of residence to proxy distance, whilst quality of care and time of payment collection are left out due to lack of data.

5. METHOD

5.1 Concentration Indices

In order to measure horizontal equity in use of health care using data from the demographic and health survey, DHS, one models it using a concentration curve from which one derives a concentration index. We hence use this method in order to examine if the utilization patterns of maternal care in Rwanda has changed over the past decade as it examines whether utilization has changed among different income groups.

The concentration curve plots the cumulative distribution of used health care services as a function of the cumulative distribution of the population, which is ranked by income (van Doorslaer et al., 2008). There is equality within the distribution of health care if the concentration curve coincides with the diagonal but if it lies above it this indicates that use of health care is more concentrated among the poor parts of the population. If the concentration curve instead is located below the diagonal, it indicates that the use is more concentrated among the rich parts of the population. The concentration index is then derived as twice the area between the concentration curve and the diagonal and it shows the degree of inequality in health care utilization. If this index is positive it denotes a pro-rich inequality while when it is negative it denotes a pro-poor inequality (van Doorslaer et al., 2008).

To obtain a concentration index that reflects inequality in an appropriate way one need-standardizes the use of health care. In order to do this one compares the Obs.erved distribution of health care usage with the distribution of need for health care (van Doorslaer et al., 2008). As a benchmark for this analysis, one uses the average relationship between health care use and need for the population as a whole as a standard for needed usage. Next, one analyses whether the data holds any systematic deviations from this standard measure by income level, here a probit model is used in order to complete this analysis. The results obtained from running this model is used in order to examine the effect certain variables have on utilization, and can hence be used to see what factors that might have affected possible changes in the utilization pattern of Rwandan health care.

5.2 Wealth Quintiles Using PCA

When turning to the measurement of inequity, one first needs to describe the distribution of actual and need-standardized health care utilization by wealth quintile. To construct wealth quintiles with DHS survey data one can for example use data on the method of principal component analysis, PCA. This is done when the data does not hold any information about income and one then wants

to generate wealth indices based on asset variables, such as, for example, if the respondent has a telephone or a television. PCA is a technique where one reduces the number of variables in the data collection into smaller dimensions by generating uncorrelated components from an original range of correlated variables. Each component is a linear, weighted combination of the original variables, and they can be created as from an original range of variables as follows:

$$PC_1 = a_{11}X_1 + a_{12}X_2 + \ldots + a_{1n}X_n$$
$$\ldots\ldots$$
$$PC_m = a_{m1}X_1 + a_{m2}X_2 + \ldots + a_{mn}X_n$$

Where a_{mn} is the weight of the m:th principal component and the n:th variable (Vyas & Kumaranayake, 2006). The components are perpendicular, meaning that they measure different dimensions in the data collection, a characteristic further confirming that they are uncorrelated. The weight for each component stems from the co-variance matrix of the data set. When ordering the components they are ordered so that the first component, PC_1, is explaining the largest possible amount of the variation in the original data collection, subject to a constraint of the sum of the squared weights, $a_{11}^2 + a_{12}^2 X_2 + \ldots + a_{1n}^2$ being equal to one (Vyas & Kumaranayake, 2006). Concerning the second component, PC_2, it is uncorrelated with the first component and explains further, but a smaller proportion of, the variation in the original data collection under the same constraint. The following components are also uncorrelated with its preceding components and therefore each component capture a further dimension in the original data collection but at smaller and smaller proportions (Vyas & Kumaranayake, 2006). It is also the case, that the higher the correlation is among the variables in the original data collection, the fewer principal components are needed in order to capture common information in the original collection (Vyas & Kumaranayake, 2006).

This method is appropriate when analysing data from DHS since this data does not contain any information regarding income and expenditures, but only information concerning household characteristics. In order to select the appropriate asset variables for employing the PCA one should focus on variables that proxy living standards. As indicated earlier, that could for example be variables such as if the respondent has a television or a telephone, but it could also be his or her household's source of drinking water or other variables indicating access to infrastructure and other utilities. As mentioned above, PCA is most efficient when the correlation among the variables in the original data set is high, but also when the distribution of the variables is varied across individuals or households since it accounts for the assets that are more unequally

distributed. This means that an asset that all individuals or households own, or that no individual or household own, would be given a zero weight and hence is of little use when trying to create wealth quintiles. Hence it is important to investigate the asset variables of the data set in order to know which variables to include in the PCA (Vyas & Kumaranayake, 2006). It is also important to ensure that the range of asset variables that is used is broad enough, in order to avoid truncation or clumping. The former is referring to problems with an even distribution of the variables indicating socioeconomic status spread over a narrow range which means that it is difficult to differentiate between poor and very poor, whereas the latter refer to problems with households being clumped into small numbers of separate clusters. If these problems are identified, one can add more variables to the analysis or create a combination of asset variables and variables showing access to infrastructure and utilities, but one must keep in mind that the key is to include variables that capture inequality among households or individuals (Vyas & Kumaranayake, 2006). The stability of the classification of individuals or household into different wealth quintiles is also related to the choice of variables included in the asset index (AI), meaning that variables describing household or individual ownership might derive a different PCA measure than variables describing access to infrastructure and utilities, this might not matter concerning the robustness of the results, but it might be important to keep in mind (Vyas & Kumaranayake, 2006).

Variables of categorical form are not useful when employing PCA, implying that they should be converted into binary variables if one wants to use them in the analysis. For example, a variable describing household floor material should be divided into different binary variables for each material used. One should further be aware of the problem of missing Obs.ervations. Excluding individuals or household with missing values will lower the sample size and might bias the result, which possibly will affect the statistical accuracy of the result, while replacing missing values with a mean value for that variable might reduce the variation among households or individuals and hence increase the possible problem of truncation and clumping previously described (Vyas & Kumaranayake, 2006).

When it comes to the issue of interpreting the results of the PCA, one should interpret a variable with a positive factor to be related with higher socioeconomic status, while a variable with a negative score is related with lower such status. However, ownership of some variables can be given a negative weight, implying that owning such an asset will rank you being poorer than if you wouldn't own it. Examples of such variables have for example been; owning a bicycle. This could be due to that such an asset variable is more strongly related to other variables that expected

to be related with low socioeconomic status. These types of results might occur if the indices have been created over both rural and urban regions, where the asset might represent wealth in one region but not in the other (Vyas & Kumaranayake, 2006).

Further, one can use the factor score from the first principal component in order to construct a socioeconomic score for each household or individual. This could then be included in a regression model. Since it is difficult to interpret its coefficient the factor score is usually used to divide the population of the sample into wealth quintiles. One uses cut-off points, either arbitrary or data driven, to order households or individuals into quintiles such as "poorest", "poorer", "middle", "richer" and "richest". An arbitrary approach is to classify households into these quintiles and then calculate the mean socioeconomic score for each quintile if the socioeconomic status is unevenly distributed, since in this case the difference in mean of the score should be even between contiguous quintiles. A data driven approach would instead be to classify households using a cluster analysis, which allows for assignment of cases to a fixed number of clusters according to a set of variables. One then derives the centre of the clusters, which difference in means should be as large as possible (Vyas & Kumaranayake, 2006).

5.3 Need-standardization of Health Care Utilization

When turning to the standardization of health care utilization, there are, as previously mentioned, two methods to choose from; direct standardization and indirect standardization. The measure obtained using direct standardization shows the distribution of health across groups of socioeconomic status that would be Obs.erved if all of these groups had, for example, the same age structure but group specific intercepts and age effects, while indirect standardization instead corrects the distribution by comparing it with the distribution that would be Obs.erved if all individuals had their own age but the same mean age-effect as the entire population. Both of these methods can be implemented by using regression analysis and the direct method immediately brings the standardized distribution of health across groups since there is no variation of the standardized values within the group. When using grouped data, both of the methods examine what the usage of health care would look like if there was no correlation among health variables and demographic variables but they control for this correlation in different ways. The direct method uses the demographic distribution of the whole population but the behaviour of the groups, while the indirect method uses group specific demographic distributions but the demographic effects of the whole population, as previously described (O'Donnell et al, 2008).

Here the method of indirect standardizations will be used, since, as mentioned in the literary review, it is the most frequently employed in the literature on horizontal inequity. The method of conducting this analysis is outlined below.

When using the indirect standardization method the need-adjusted health care usage is obtained by regressing care utilization, y_i, on a set of explanatory variables which includes individual household income, need variables, $x_{k,i}$, such as health status and age and non-need variables, $z_{p,i}$, such as socioeconomic status and an error term as follows:

$$y_i = \alpha + \beta_i + \eta \sum_k \gamma_k x_{k,i} + \sum_p \delta_p z_{p,i} + \varepsilon_i$$

Where γ_k and δ_p are estimation parameters and ε_i is an error term. One uses this equation to create need-predicted values of health care utilization, $\hat{y}_i^X$, which displays the amount of care the individual would receive if he or she on average would have been treated as other individuals with the same characteristics of need. To do this, the coefficient estimates that are obtained when estimating this equation is then combined with the actual values of the need-variables ($x_{k,i}$) and the sample mean values of the income variable and the non-need variables ($z_{p,i}$) as follows:

$$\hat{y}_i^X = \hat{\alpha} + \hat{\beta} inc^m + \sum_k \hat{\gamma}_k x_{k,i} + \sum_p \hat{\delta}_p z_{p,i}^m + \varepsilon_i$$

When carrying through this combination, one obtains the need-predicted values of health care utilization $\hat{y}_i^X$. Then the estimate of need-standardised health care usage, $\hat{y}_i^{IS}$, is computed by taking the difference between the actual utilization and the predicted utilization and adding the sample mean of health care utilization, y^m, as follows:

$$\hat{y}_i^{IS} = y_i - \hat{y}_i^X + y^m$$

The need-standardized distributions of medical care are then given by the wealth quintile means of these indirectly standardized measurements and one interprets them as the expected distributions of health care utilization if need for use were equally distributed across the wealth quintiles. Since it is problematic to compare the distributions' of the wealth quintiles across care, one summarizes the degree of inequality using the concentration index which for weighted data is calculated using the following covariance formula:

$$C = \frac{2}{y^m} \sum_{i=1}^{n} w_i (y_i - y^m)(R_i - R^m) = \frac{2}{\mu} \mathrm{cov}_w (y_i, R_i)$$

Where w_i is the sample weight for individual *i*. This index then measures the degree of inequality of need-standardized use. If the concentration curve for need-standardized utilization coincides with the concentration curve for actual usage, it is a sufficient, but not a necessary condition for health care usage to be equal horizontally. It is possible to have zero inequality horizontally even with crossing curves if, for instance, if inequality favouring rich in on part of the distribution is equally offset by an inequality favouring poor in another part of the distribution. (van Doorslaer et al., 2008).

5.4. The Rwandan Model

The two dependent variables we employ in our model, no utilization of a health care facility at delivery and no use of skilled assistance at delivery, are binary and thus a probit model will be employed to model the utilization of the two types of health care. This model can be displayed as follows:

$$p(y=1) = \phi(\alpha + \beta wealth.quintile + \gamma_1 age + \gamma_2 age^2 + \gamma_3 daylightvision.problem + \gamma_4 nightblindness + \gamma_5 interval.under18m + \delta_1 eligible.womenin.h.h. + \delta_2 highest.level.of.education + \delta_3 type.of.place.of.residence + \delta_4 relation.to.h.h.head + \delta_5 sex.h.h.head + \delta_6 pregnancy.wanted + \delta_7 marital.status + \delta_8 husband.in.h.h.)$$

Since one is interested in the marginal effects of the variables the one models the probit as follows:

$$\frac{dp(y=1)}{dx_1} = \kappa * \phi(\alpha + \beta wealth.quintile + \gamma_1 age + \gamma_2 age^2 + \gamma_3 daylightvision.problem + \gamma_4 nightblindness + \gamma_5 interval.under18m + \delta_1 eligible.womenin.h.h. + \delta_2 highest.level.of.education + \delta_3 type.of.place.of.residence + \delta_4 relation.to.h.h.head + \delta_5 sex.h.h.head + \delta_6 pregnancy.wanted + \delta_7 marital.status + \delta_8 husband.in.h.h.)$$

Where x_i =*wealth.quintile, age, age*^{2}...etc. and $\kappa = \beta$, γ_i and δ_i, and i =1, 2, 3…Here *y* is the type of health care: *no skilled assistance at delivery* and *no facility at delivery* and the regressors with γ and δ coefficients are need and non-need variables, respectively. The reference dummies are poorest (for *wealth. index*), no education (for *highest.level.of.education*), head (for *relationship. to h.h.head*, male (for *sex.of.h.h.head*), pregnancy not wanted at the time (for *pregnancy.wanted*) and not married (for *marital.status*).

As described above, this regression is repeated for all regions, pilot regions and the other regions for each of the three datasets.

6. DATA AND VARIABLES

6.1 Data and Variables

The data used in this study is Demographic Health Survey data from Rwanda and composes three data sets from 2000, 2005 and 2007/2008, which consist of 10421, 11321 and 7313 individuals respectively on utilization. The number of Obs.ervations for each variable, such as skilled assistance and place of delivery, can be found in section 11.3 in the Appendix. The data has been collected through interviews and concerns type of utilization when giving birth, complications before and during birth and control variables such as education and type of place of residence. All variables found in this analysis are described in section 11.3 in the Appendix.

When examining the data set one Obs.erves that the number of interviewed individuals is evenly distributed across the regions, with approximately 8% to 9% of the respondents in each region, but with a slight overrepresentation from the capital region, Kigali. The same can be Obs.erved for the wealth quintiles, where approximately 20% end up in each quintile. However when only examining the data from the pilot regions, which is described in section 11.5 in the Appendix, it can be Obs.erved that these have a lower share of the population belonging to the richest quintile. Regarding the type of place of residence, the majority of the population lives in rural areas except for the richest part, which is overrepresented in the urban areas. When turning to education level and type of place of residence, the pilot regions do not deviate much from the other regions: primary education is the most common attainted level of education and rural living is the most frequently Obs.erved area of residence.

To be able to utilize the methods outlined in section 5 for our examination of Rwandan health care we have created a model fitting the data available on Rwandan health care utilization. As outlined above, the variables that are used in the analysis can be divided into four categories, namely health care utilization, income, need-variables and non-need variables.

Due to the low rate of wage labor in Rwanda, which causes most payment transfers to be in-kind, Obs.ervations on neither income nor health care expenditures can be Obs.erved in terms of RWF per year. Consumption could be used as a proxy for income; however such data is not available in the DHS dataset[3]. For these reasons alternative measures for income and health care must be

[3] Data on consumption is required to be very detailed so unless an income proxy in the form of consumption is a specific purpose, these types of data are typically not collected.

employed. Regarding a measure of income, this study will therefore use the Asset Index as described above, and this means that equivalence scales will not be used as the asset wealth index is based on households of varying sizes. Concerning health care utilization, variables based on usage will be used rather than sheer expenditures in cash, and the type of usage in focus is maternal care at delivery.

Many of the variables in the household survey dataset used in this analysis concerns only *the last pregnancy* and therefore this paper focuses only on the effects on maternal care during the last pregnancy prior to the interview. The focus has been further narrowed down to include only Obs.ervations that concern pregnancies during the last *three years* prior to the time of the interview, which took place June-August 2000, February-July 2005 and December 2007 - April 2008. The reasons behind this is that the average birth interval in the last data collection was estimated to 3 years, that the interval between interviews is on average three to five years and that we want to minimize the effects of time. Thus the variables used in this study are those that are relevant to the individual's last pregnancy that took place within three years prior to the time of the data collection, which then regards the year intervals 1998-2000, 2003- 2005 and 2006-2008. Only the need and utilization variables have been limited to the three years interval while the non-need variables and those used in the asset index are assumed to relatively stable over time and are thus not processed the same way as the need variables.

As mentioned earlier, the implementation of the health insurance reform began in the three pilot districts, Gitarama, Byumba and Butare. Therefore the probit-regressions and indices will be computed for three groupings of data, one group regarding all regions, one for only the pilot regions and finally one regarding all regions except the pilot regions. When assessing the entire period this procedure allows the use of the pilot regions to form a control group and the rest of the regions to be considered as a treatment group which in the process not only will enable a clearer treatment effect but also reduce selection bias.

6.2 Components

When employing the analysis using the model outlined in the fifth section we will use the components described in the following paragraphs. The variables are divided into four different categories, namely utilization variables, income variables, need variables and non-need variables.

6.2.1 Utilization "y":

As utilization this study considers two types of maternity care utilization, type of skilled assistance present at delivery and place of delivery. Type of skilled assistance available at delivery has two alternatives, skilled assistance and no skilled assistance, and place of delivery has four alternatives, namely no health care, public, private and other health care facility that is used at the time of delivery. This study has focused on the type of facility that was most common in the oldest data set, *no facility at delivery* and *no skilled assistance,* which then are made into the two binary variables that constitute our utilization variables. These are chosen since it is interesting to see how this particular utilization has evolved over time, during and after the reform but also since the none-use of delivery health care is a cause of maternal morbidity and mortality and thus its reduction one of the main objectives with the health insurance reform.

6.2.2 Income or Wealth Index "β":

For the *asset index,* possession or access to one or more of the following assets is included: *electricity, radio, television (TV), fridge, bicycle, motorcycle/scooter (motorcycle), car/truck (cartruck)* and *telephone (phone).* A dummy for if the household's toilet facilities were shared (*sharedtoilet)* is also included. In addition, variables for type of floor material (*eartsand, dung, parquet, linoleum, cement, carpet, otherfloormaterial*), type of toilet facility (*flushtoilet, latrine, iplatrine, nofacility, otherfacility*) and source of drinking water (*pipedintodwell, pipedintocompound, publictap, openwellindwelingl, openwellinyard, openpublicwell, protectedwellindwelingl, protectedwellinyard, protectedpublicwell, spring, riverstream, pondlake, dam, rainwater, tankertruck, otherwater*) have been included since for instance a floor of ceramic tiles, a toilet that flush and drinking water that is pumped into the dwelling indicates a higher living standard and thus a higher wealth quintile than a floor of dung, a pit in the ground for toilet and drinking water from a pond or rain. Regarding type of cooking fuel *(cookelectricity, cooklpgnaturalgas, cookbiogas, kerosene, cookcoallignite, charcoal, cookfirewoodorstraw, cookdung, cookother*), biogas, for instance, is harder to access than wood and straw and thus this information can also be used as proxy for which wealth quintile the household belongs to.

6.2.3 Need Variables "γ":

When conducting the need standardization it is common practice to include the maximum number of health status variables available. The reason is that since there is a positive correlation between poverty and low health status, the poor tend to be overrepresented as health care users and this leads to more pro-poor results. The inclusion of additional health status variables remedies this to some extent. (van Doorslaer et al, 2008).

In our model for Rwandan maternal health care utilization we include need variables for *age* and age^2 in order to capture the U-shaped relationship between age and need of care. Age is expected to have a positive (at an increasing rate) impact on non-use of maternal health care need for the very young (below 20 years of age) and a negative (at a decreasing rate) impact on none-use for the older (above the later twenties). Nighttime blindness (*nightblindness*), which is a symptom of vitamin A deficiency (VAD), is also included. This is because VAD can lead to a series of harmful outcomes, for instance anemia that increases mortality and morbidity among pregnant women and therefore increases the need of health care at delivery. This variable is expected to have a positive impact on the utilization of maternal health care (Christian, 2002). Data on nighttime blindness coupled with data on problems with daylight vision (*daylight.vision.problem*) corrects for those individuals that have problems with their eyesight for other reasons. Further, since studies show that too short intervals in between births increases the risk of maternal mortality, fetal death, pre-term delivery, small for gestational age, neonatal death, and low birth weight, and the WHO recommends at least 18 months interval (WHO, 2005), a dummy representing below-recommended interval (*interval.under.18.m*), has been included as an additional need-variable. Finally, since the sample is limited to include only those women who were pregnant during the relevant period, the entire sample consists of individuals that has had need for the type of health care that is in focus in this study, and hence, this factor is incorporated in the dependent variable and is therefore not visible in the regression model above.

6.2.4 Non-Need Variables "δ":

When need standardizing the model we further included control (or non-need) variables are included accounting for number of eligible women in household (*eligible.women*)[4], which is defined as the number of women of age 18 or older and this variable is interesting from many points of view. Firstly, the greater the number of eligible women in the household in comparison to the number of eligible men in the household, the greater might the negotiating power for spending on maternal health care be for those that it concerns. In addition, this variable indicates the network of knowledge about pregnancy concerns (nutrition etc.) that is available to the

[4] Arguably, the variable number of eligible women could be considered to be a need variable too, and this dual categorization applies to some of the other variables too. However, in this study we have had to make a division and the categories above are the results of our reasoning.

respondent. This variable is thus expected to have a negative effect on the utilization of maternal care.

We further include type of place of residence (*type.of.place.of.residence)*, where urban and rural are the alternatives. These are interesting to include since they could concern the distance to health care facilities and if health facilities are more densely in urban areas, urban residents are more likely to visit health care centers than rural residents. Urban is hence expected to have a positive impact and rural hence a negative impact on maternal care use.

Highest level of education (*highest.level.of.education)* is also included and the alternatives range from no education *(no.education)* and primary level *(primary.education)* to higher level *(higher.education)*, which includes tertiary or higher level. According to the Grossman model, as outlined above, education should have a negative impact on health care expenditures (the better educated use health care more efficient than the poorly educated), however empirical studies have found the opposite effect so the expectations on the sign of the education-coefficient is twofold (Wagstaff, 1986).

Sex of household head (*sex.of.h.h.head*) is included since the gender of this person might affect the likelihood that funds for maternal care are granted, both male and female are expected to have a positive impact on maternal care but coefficient on female is expected to be somewhat higher. Relationship to household head (*relation.to.head*), which includes the alternatives: respondent is the head of household (*respondent.is.head*), respondent is a relative (*related.to.head*) and respondent is not related to the household head (*not.related.to.head*). This variable is also expected to have an impact since, for instance, if the respondent is closely related to him or her then the respondent is more likely to be prioritized in case of need for maternal care, thus if respondent is child to head she is more likely to get maternal care than if she is not related at all. The alternatives here differ slightly between the datasets for the different time periods, but are very similar on the whole.

Marital status, (*marital.status*), is included since it indicates if the respondent is acting together with someone or is alone regarding the decision whether to visit a health care facility or not. The alternatives are married (*married*) and not married (*not.married*), where the latter involves formerly married and never been married. The married-variable could have either a negative impact (where the husband encourages maternal care) or a negative impact (where he discourages

it), depending on gender equality, amongst other things. Whether the husband lives in household or not (*husband.in.h.h.*) is thought to be a control variable for marital status, thus if husband does not live in household then he is less likely to exert the – as described in the marital-variable – either positive or negative influence on the decision making on maternal care.

A variable for if the pregnancy was wanted at the time (*pregnancy .wanted*) is included and it has the alternatives: pregnancy wanted at the time (*pregnancy.wanted.then*) and pregnancy not wanted at the time (*pregnancy.not.wanted.then*), and if the pregnancy is wanted then there is greater likelihood that maternal care will be sough, thus the wanted-variable is expected to have a positive effect on maternal health care utilization, compared to if it was not wanted.

Gender of respondents children could have an effect on health care utilization since for instance, if the respondent already has many girls then the desire for a boy is much stronger which causes more spending on maternal health care in general. However since the sex selective abortions tend to be present chiefly in the Asian region then this variable has not been included. Also, the wanted-child effect is already adequately captured by the wanted-pregnancy variable presented above (Goodkind, Daniel, 1999).

In order to obtain comparable concentration indices and curves for 2000, 2005 and 2007/2008, certain otherwise very useful need and non-need variables from each dataset could not be included and of those that were included, some were dropped in the probit. This is something that reduces the explanatory power of the underlying regression and thus the reliability of the indices. It does, however, make it possible to compare the indices over time and to deduce if an improvement, towards equity, has been achieved.

7. RESULTS

7.1 Descriptive Analysis

7.1.1 Health Care Utilization

Health Care Utilization					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
2000					
no assistance at delivery	3754	.734	.442	0	1
skilled assistance at delivery	3754	.266	.442	0	1
no facility at delivery	3755	.704	.456	0	1
public facility at delivery	3755	.270	.444	0	1
private facility at delivery	3755	.021	.144	0	1
other facility at delivery	3755	.005	.067	0	1
2005					
no assistance at delivery	3966	.634	.482	0	1
skilled assistance at delivery	3966	.366	.482	0	1
no facility at delivery	3967	.676	.468	0	1
public facility at delivery	3967	.295	.456	0	1
private facility at delivery	3967	.016	.125	0	1
other facility at delivery	3967	.013	.113	0	1
2007/2008					
no assistance at delivery	2336	.381	.486	0	1
skilled assistance at delivery	2336	.619	.486	0	1
no facility at delivery	2326	.399	.490	0	1
public facility at delivery	2326	.570	.495	0	1
private facility at delivery	2326	.010	.101	0	1
other facility at delivery	2326	.021	.142	0	1

As can be seen above, the most frequently used type of health care at delivery has in fact been no health care at all. It has been most common to not give birth at a health facility and to not use any skilled assistance when giving birth. However, this pattern has changed over time and public health care and some type of skilled assistance has now become the most common ways of utilization.

The utilization patterns are different across the wealth quintiles, which can Obs.erved in table 11.4.7 to 11.4.9 in the Appendix. Over all, using private health care at delivery is a very rare alternative, while no health care is most common among the poorer quintiles. Among the richer

quintiles, public health care utilization is instead the most common. One striking Obs.ervation is that not utilizing any health care at delivery is much more common across the richer quintiles than utilizing a private alternative. This suggests a small private market for maternal health care at delivery in Rwanda. Over time, one Obs.erves that not utilizing any health care at delivery is becoming a more and more rarely chosen option, while public health care exhibits the opposite development. Skilled assistance at delivery is also increasing over time. At the end of the period, skilled assistance was used by a majority of the population in each wealth quintile, compared to earlier periods were not utilizing any skilled assistance was the most common alternative in all wealth quintiles except for the richest.

7.1.2 Type of Health Care Varying Between Regions

Type of Health Care Varying Between Regions

		Place of Delivery					
		2000		2005		2007/2008	
	Variable	Obs.	Mean	Obs.	Mean	Obs.	Mean
pilot regions	no facility at delivery	907	.744	957	.642	552	.406
	public facility at delivery	907	.246	957	.332	552	.562
	private facility at delivery	907	.004	957	.015	552	.004
	other facility at delivery	907	.006	957	.011	552	.029
other regions	no facility at delivery	2848	.692	3010	.687	1774	.397
	public facility at delivery	2848	.277	3010	.284	1774	.573
	private facility at delivery	2848	.027	3010	.016	1774	.012
	other facility at delivery	2848	.004	3010	.013	1774	.018
		Assistance at Delivery					
pilot regions	no assistance at delivery	907	.746	956	.564	553	.389
	skilled assistance at delivery	907	.254	956	.436	553	.611
other regions	no assistance at delivery	2847	.731	3010	.656	1783	.378
	skilled assistance at delivery	2847	.269	3010	.344	1783	.622

When assessing the pattern of health care at delivery for the pilot regions and the other regions respectively, see above table, one can see that the usage of public health care facilities at delivery initially is quite similar when comparing the pilot regions with the other regions. One can however Obs.erve an increase in utilization of public health in the pilot regions occurred between 2000 and 2005, while it remained fairly constant in the other regions. Over time, the difference has disappeared, with a delayed effect for other regions that caught up with the pilot regions in the period between 2005 and 2008. The utilization in 2007/2008 increased, in all regions, to a usage

rate of around 56%. Regarding skilled assistance, the pattern of utilization is the same for both groups of regions, with an increase in utilization over time, reaching around 60%.

7.1.3 General Socioeconomic Trends

If one examines health care utilization across the different highest education levels, use of any health care at delivery has increased over time in all education groups, see table 11.5.13-11.5.15 in the Appendix.

In general one cannot Obs.erve any pattern of urbanization over time, as the division of urban and rural residents has remained stable with a rural population of approximately 75%, see table 11.3.1-11.3.3 in the Appendix.

Concerning the level of education, the lowest level of education among the population has increased; see table 11.3.1-11.3.3 in the Appendix. The part of the population not having any education has decreased from around 27% to around 20%, while the part of the population having primary education has increased from 59% to 65%, as for the higher levels of education, they have remained fairly stable around 13%. When instead turning to education levels within the wealth quintiles, one see a clear pattern of higher education being connected to the richest quintiles and the lack of education being most present in the poorest quintiles, as is expected. One can however Obs.erve rising education levels in all quintiles over time; see 11.4.1-11.4.3 in the Appendix.

Finally, when assessing the age structure of the respondents one sees that this structure is similar over the years, see Appendix 11.7

To conclude one can see that education, wealth, type of place of residence and age of the respondents has remained relatively stable over the period in all the regions.

7.2 Probit Results

When examining the results overall periods and over all regions, which can be found in section 11.2 in the Appendix, one Obs.erves that they indicate that wealth seems to have a negative impact on the likelihood of not using any health care at delivery, thus, suggesting that utilization of health care is more frequent among the higher wealth quintiles. This is in line with our previously stated expectations and the theory outlined above.

Regarding age it generally has a negative effect on none-utilization for women in the ages around 29 to 31, which is the "older" age-span so this is in agreement with our expectations. This result might be explained by the increasing depreciation rate of the individual's health which regarding maternal care leads to risk for more complications at delivery resulting in a greater use of health care. Also, income tends to increase with age which could explain the reduction in none-use with age. However, this age induced decreased none-utilization occurs at a diminishing rate, possibly reflecting that fertility is decreasing with age.

Individuals giving births less than 18 months after the previous delivery seem less inclined to give birth without using any maternal health care. Since these individuals can be expected to have a greater need of care due to the complications associated with short time intervals between births it is reasonable that they have a higher usage of health care at delivery.

Regarding the vision problems, none of these appear to have any significant impact on the usage of maternal health care in general. However, when only analyzing the results from the pilot regions one Obs.erves that in these areas daylight vision problems seem to affect women to refrain from giving birth without utilizing any health care, while night blindness instead tend to have a positive effect. This result appears quite counterintuitive and is hence difficult to explain.

The number of eligible women in the household tends to have a negative effect on the likelihood of not using any health care at delivery. This can imply that the more eligible women that are present in the household, the more support there is for prioritizing maternal health care, both economically and time wise.

The strongest effect on health care usage appears to stem from the level of education, and this is especially true for the higher levels of education. This is not in line with theory neither if one regards health as an investment good nor as a consumption good. It is predicted that a higher level of education results in more efficient use of health care on average, thus reducing the demand. However, regarding health care associated with delivery, this concern a situation where health care usually is advised and where women with a higher education might have a higher ability to grasp this necessity. Additionally, a higher education level is often associated with a higher income and hence a better ability to pay for access to this type of care.

The availability to this type of care can be captured by the individual's type of place of residence and the expectation is that those residing in urban areas will have greater access and thus higher levels of utilization of health care. Our results confirm this expectation, as urban residents appear to be less inclined to give birth without using any maternal health care.

The most common effect of being related to the household head appears to be that the option of not using any health care is less favored compared to if the respondent herself is the head. This might be explained by that the respondent's health has higher priority if she is related to the decision maker of the household. This might be explained by that the decision maker prioritizes family members and relatives over herself in the context of maternal health care consumption.

If the household head is female then this appears to have a positive effect on using no health care at delivery. This is contrary to our expectations; however, the female head might possess knowledge of maternal care that could replace the need professional maternity care. If there had been a husband present in the household, he would most likely have been the head; hence having a female head could imply fewer income providers in the household. This could suggest that a household with a female head possesses fewer resources in terms of time and money that could be allocated to maternal care. When considering only the pilot regions, as can be seen in 11.2.2 and 11.2.5, one sees a positive effect that phases into a negative effect over time which might reflect a change in priority of maternal health care among female household decisions makers in these areas.

If the pregnancy was wanted at the time then this seems to appear affect the use of no maternal care negatively. This is reasonable if one assumes that if the child is wanted, the mother prioritizes care that reduces the risk of complications.

The effect of the husband living in the household appears to be dubious, as previously suggested the presence of the husband can have both positive and negative effect, possibly associated with the degree of gender equality. This effect seems to phase from a positive to negative effect over time, and this effect is even clearer when only considering the pilot regions.

When comparing the effects over time and between regions, which can be found in section 11.2.1-11.2.6 in the Appendix, one can see that education, and especially higher education levels, has increased its effect on utilization. The probability of not utilizing any heath care at delivery is

more and more negatively affected by the higher levels of education over time. The same is true for the pilot regions but the impact of education is larger in general in these areas. This pattern suggests that the well-educated tend to be the first in line to obtain delivery health care and this trend could contribute to inequity in utilization. The impact of wealth, however, has decreased over the years and belonging to the richest quintile does not appear to matter as much to the probability of not utilizing any health care at delivery as it did in early 2000s. However, wealth seems to matter more in the pilot regions than it does in the rest of the country as the effect of belonging to the richest wealth quintile is much stronger here.

Regarding type of place of residence, living in an urban area has not increased nor decreased in importance suggesting that nearness to a health facility and skilled personnel still appears to be of importance.

7.3 Horizontal inequity

7.3.1 Concentration Curves

When examining the changes in the concentration curves, 11.6.1 to11.6.6 in the Appendix, between 2000 and 2007/2008, one can see that the tendency of not utilizing any skilled assistance at birth is pro-poor, and this inequity has been amplified over time.

When instead considering the tendency of not to utilizing a health facility at delivery it also remains pro-poor but this inequity has decreased between 2000 and 2008.

If one only examines the variation of the concentration curves in the pilot regions, one Obs.erves a different pattern where the tendency of not utilizing any health care at birth moves from a pro-rich to a pro-poor inequality. The trend of the transition however approaches equity.

When instead turning to the other regions, one can Obs.erve a pattern of pro-poverty in the tendency of not utilizing any health care at delivery at the beginning of the estimation period. This pro-poor inequity is however mollified over time and approaches equity at the end of the period.

7.3.2 Concentration Indices

Utilization:	CI All Regions	Pilot regions	Other regions
		2000	
no facility at delivery	-0.062	.070	-0.086
no assistance at delivery	-0.029	.053	-0.054
	All Regions	**Pilot Regions**	**Other Regions**
		2005	
no facility at delivery	-0.032	-0.033	-0.030
no assistance at delivery	-0.031	-0.039	-0.029
	All regions	**Pilot regions**	**Other regions**
		2007/2008	
no facility at delivery	-0.044	-0.023	-0.046
no assistance at delivery	-0.036	-0.018	-0.040

The trends displayed by the concentration curves can be examined in more detail when assessing the obtained concentration indices in the table above. All indices indicate that Rwandan maternal delivery care has relatively low horizontal inequity, compared to for example maternal care in Bangladesh, as found by Houssain (2010). The same Obs.ervation can be made when comparing it to horizontal inequity in general health care in Rwanda, as outlined by Schneider and Hanson (2006). This could for example be a result of a higher prioritization of maternal health care in policies or in the household.

Out of the two investigated modes of utilization, place of delivery exhibits the greatest inequity, displaying a concentration index of -0.0622 for all regions in 2000. This inequity is however reduced to -0.0301 in 2008 and the same pattern of reduced inequity can be found for all regions concerning place of delivery. The concentration index for not using any assistance at delivery however has remained stable at a pro-poor index of around -0.03 for the entire country and for the case where one excludes the pilot regions. When only assessing the pilot regions one Obs.erves a different pattern. Here not using any care at delivery, both regarding assistance and place of delivery, is pro-rich with values of 0.0532 and 0.0697 respectively, in 2000. This could possibly stem from the small share of the population within these regions belonging to the richest wealth quintile. This pro-rich inequity however transformed into a pro-poor inequity in 2005, and remains pro-poor at an index of -0.0176 and -0.0229 respectively in 2008. One can however see that these regions also follow a pattern of decreased inequity, with indices approaching zero at the end of the study period.

8. DISCUSSION

8.1 Policy Implications

According to the results presented above, concentration indices suggest that not utilizing health care at delivery is pro-poor and if the aim is to reduce inequity by means of increasing the utilization among the poor, there a few factors that seem more important.

It is suggested that education, and especially education above primary level, is the strongest factor affecting utilization of maternal care at delivery. Therefore it could be of importance to improve female access to education in order for women to be able to comprehend information concerning maternal health and safety.

Further, it appears as if utilization is connected to age where older women tend to refrain from not utilizing delivery health care. For this reason, targeting younger women could be advisable.

Another factor worth to act upon is revealed when examining the effect on utilization of maternal care of living in an urban area. Our results indicate that urban residents tend to use more maternal health care compared to rural resident. If being an urban resident implies closeness to a health facility and that such closeness matters for utilization, then utilization in rural areas could be improved if health facilities were more accessible in these areas. Such access could be improved by more mobile health personnel, better infrastructure and an increased density of health facilities in rural areas.

An additional factor underlying utilization appears to be gender inequality. Improving gender equality could strengthen women's household positions, which could lead to a higher prioritization of maternal care within the household. This could make factors, such as if the husband lives in house or if the woman is related to the household head less important when it comes to the decision of delivery health care.

Also, as the variable wanted pregnancy affects the tendency to refrain from utilization negatively, one could focus on decreasing the occurrence of unwanted pregnancies and hence decreasing risk of delivery complications resulting from this non-use of care. This could perhaps be achieved by improved information regarding family planning and improved access to contraceptives.

These findings suggest that the mutual insurance system might have had a positive effect on inequity and that this effect has worked via increased public care.

Apart from the effects on inequity, the introduced insurance could also have positive effects on matters such as risk selection and free-riding, as mentioned in the theory section. These matters are not examined in this paper but could be of interest for future research.

8.2 Potential Impact of Health Reform

According to our probit results education, wealth, age and type of place of residence appears to have the greatest impact on care utilization, and according to theory and previous studies, (Scheneider & Hanson, 2006) health insurance also appears to matter to a great extent. Our Horizontal Inequity analysis results implied that the inequity in maternal health care has decreased. Since inequity is linked to level of utilization then it can be indirectly affected by education, wealth and type of place of residence and possibly also by health insurance. As we found that neither education, wealth, age structure nor type of place of residence had changed considerably during the periods examined, it indicates that the increased equity might have occurred due to the health insurance reform. The increase in utilization could also stem from other factors, such as an increase in availability due to investments in human resources in health care. However, such investments are of little use if the cost of utilization for an individual still is high, as was the case before the implementation of the insurance and the shortage of personnel is still an issue in many areas. Therefore the importance of insurance should remain, as parts of the population of Rwanda still are relatively poor. Investments in quality of health care are also, according to theory, positively affecting demand for health care. Hence, improvements in the health care quality might actually be one factor underlying the increase in utilization of public care, if this is connected to the health insurance.

Since public health care has been steadily increasing, with the expansion of the mutual health insurance, this might suggest that the implementation of the insurance schedule has had the intended effect on public health care utilization. It was also found that public health care in the first period increased more in the pilot regions than in the other regions and in the second period the other regions caught up with the pilot regions regarding usage of public health care. Since the health insurance system concerns public health care and was implemented firstly in the pilot

regions and secondly in the other regions, this pattern of public health care evolution appears to be linked with the insurance implementation.

8.3 Financing a Public Health Insurance

In order for a country to achieve universal coverage of its health care system at an affordable cost for each citizen, equity in financing must be taken into consideration. This implies that each person contributes to financing the system on the basis of ability to pay, not on the basis of his or her history of illness. Hence one must diversify away from user fees and the like and instead use funding that is pooled and prepaid, meaning that costs of the system are shared by all citizens and not borne by the individual at the time of illness (Carrin, James & Evans, 2005). In Rwanda this development has occurred by implementing the community based health insurance programme. The financing of the health sector in Rwanda has traditionally been at a low level where the largest sources of funding has stemmed from the government allocation to the Ministry of Health, but it started to increase after the war in 1994. The contribution of external financial assistance, mainly in the form of humanitarian rescue aid, has also grown considerably making the dependence on this type of financing quite substantial (Rwanda SPA Survey, 2007). When scaling up the community health insurance, there are problems of ensuring sufficient supply of health services in order to meet the increased demand that follows from increased enrolment and to supply these services efficiently (Rusa & Fritsche, 2007).

As for now, the main funding of the system comes from the membership contributions and in order for these to be able to support the system entirely one must mobilize the contributions as well as improving the payment capacity among the population and strategies for granting what is referred to as “mutual health insurance credit funds” has been implemented for this cause (Mutual Health Insurance Policy in Rwanda, 2004). One could also improve citizens access to credit used for financing insurance fees via for example micro-banking, especially in the case of very poor citizens as formal banks fail to provide these individuals with credit (Durairaj et al., 2009).

It might still be important, however, to finance parts of the system from external sources such as donors or international cooperation agencies (Mutual Health Insurance Policy in Rwanda, 2004). If the system is largely dependent on aid, one might need to implement financing instruments that can ensure this type of quality to the donors. One method that has been used is for instance Performance Based Financing where one links payment to the outputs or results delivered. This

tool has been used from 2001 and onward, starting with the implementation in the provinces of Cyangugu and Butare (Rusa & Fritsche, 2007).

One could also try different ways of financing these investments, via for example social impact bonds. Here one would form an outcome based contract where the government would commit to pay for parts of the health care system. Private investors would be used to finance interventions in the health care system while the interventions are delivered by the government. If these investments provide an improvement in social outcomes, the government pay the financial returns to the private investors, if no improvement is made, the investments are not recovered. This type of funding could be used to invest in prevention activities concerning health as well as early interventions in the health care system and it reallocates the risk of such interventions between both the private and public sector, making it easier to implement such investments (socialfinance.org, 2012). In the case of Rwanda, these external investments would probably be in the form of donations or goodwill as this is still a developing country. This could help the government diversify away from aid dependency, as well as being used as a tool for improved aid partnerships. In the context of aid it could be used as a tool to grant more donations if a successful method is implemented. The government can repay parts of the donations and instead be granted new ones for other projects. Social impact bonds could hence improve efficiency in delivering health care, as well as attracting new funding to invest in the Rwandan health care system.

9. CONCLUSION

Concerning the first part of the aim: *if the inequity of delivery care utilization in Rwanda has changed over the past decade*, the concentration indices produced suggest that there have been changes. The non-usage of health care facility at delivery, which exhibited the greater inequity has approached the equity line but remains pro-poor. The non-usage of skilled assistance at delivery has not changed, but also remains pro-poor. However, a different pattern is Obs.erved in the pilot regions. In these regions delivery care of both types started out pro-rich and became pro-poor with concentration values similar to the rest of the country. So it appears that there have been changes in inequity and these have been most pronounced in the pilot regions, where the health insurance program was implemented first.

Turning to the second part of our aim: *what factors that might have affected possible changes in this inequity and if the implemented health insurance system might somehow be linked to these changes*, our results indicate that maternal care at birth is affected especially by highest level of education, wealth and type of place of residence and these effects were even more pronounced in the pilot regions. We also found indications that the implementation of the health reform has had effect on the utilization of maternal care at birth as public health care was utilized to a much higher extent in the pilot regions during the first period, when the mutual health insurance only was implemented there and since there was an increase in utilization for both place of delivery and skilled assistance regardless of education level.

Hence, there seems to be reason to continue expanding the program as well as use the other instruments that can increase the utilisation of maternal health care at delivery, such as education, rural access to facilities, family planning and gender equality in order to reach the Millennium Development Goals as well as national goals concerning maternal mortality.

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11. APPENDIX

11.1 Variable description

Variable Description	
no assistance at delivery	no skilled assistance present at delivery
no facility at delivery	no health care facility at delivery
poorer	wealth quintile: poorer
middle	wealth quintile: middle
richer	wealth quintile: richer
richest	wealth quintile: richest
	reference variable: poorest wealth quintile
current age	current age of respondent
current age 2	current age of respondent in square
interval under 18 m.	in-between-births interval shorter than 18 months
daylight vision problem	problems with daylightvision
night blindness	problems with night blindness
eligible women in h.h[5]	number of eligble women in household
primary education	highest level of education:primary
higher education	highest level of education:higher
	reference variable: no education
urban	type of place of residence: rural
	reference variable: rural
related to h.h head	respondent related to household head
	reference variable: respondent is head
not related to h.h head	respondent not related (dropped by model)
female h.h head	head is female
	reference variable: male household head
pregnancy wanted then	wanted pregnancy
	reference variable: pregnancy not wanted at the time
husband in h.h	husband lives in house

11.2 Probit Results

11.2.1 Probit Results For No Health Care Facility At Delivery – All Regions

Variable	2000 Obs.313		2005 Obs.2755		2007/2008 Obs.1513	
no facility at delivery	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	.009	.230	.000	.166	-.032	.264
	.076		*.030*		*.037*	
middle	.096	.204	-.048*	.258	.009	.164
	.069		*.027*		*.043*	
richer	.057	.230	-.124***	.196	-.037	.225
	.069		*.031*		*.039*	
richest	-.177	.137	-.363***	.148	-.112**	.124

[5] h.h = household

	.158		*.037*		*.052*	
current age	-.115**	29.869	.019	31.510	.036*	31.091
	.053		*.013*		*.021*	
current age ^{2}	.002**	921.684	-.0002	1033.23	-.0005	1004.5
	.001		*.000*		*.000*	
interval under 18 m.	-.196**	.102	.012	.078	-.097*	.072
	.097		*.033*		*.049*	
daylight vision problem	.015	.077	-.040**	.138	.034	.058
	.102		*.017*		*.065*	
night blindness	-.099	.073	.010	.191	-.053	.063
	.116		*.010*		*.060*	
eligible women in h.h	-.058	1.236	-.061***	1.249	-.043	1.184
	.056		*.017*		*.030*	
primary education	-.075	.559	-.047**	.635	-.140***	.666
	.059		*.021*		*.031*	
higher education	-.266**	.102	-.316***	.087	-.318***	.084
	.125		*.043*		*.042*	
urban	-.143	.188	-.103***	.125	-.109***	.200
	.108		*.030*		*.035*	
related to h.h head	-.391***	.891	.340	.929	-.346	.966
	.042		*.219*		*.202*	
female h.h head	-.887	.115	.249**	.077	-.207	.039
	.016		*.068*		*.202*	
pregnancy wanted then	-.017	.319	-.013	.506	-.075***	.509
	.056		*.018*		*.027*	
husband in h.h	.422*	.910543	-.0556602	1.07514	-.193*	1.043
	.236		*.056*		*.109*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.2.2 Probit Results For No Health Care Facility At Delivery – Pilot Regions

Variable	2000 Obs.65		2005 Obs. 651		2007/2008 Obs.351	
no facility at delivery	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	-.029	.258	-.011	.180	.003	.288
	.109		*.062*		*.076*	
middle	.028	.303	-.047	.247	.015	.160
	.092		*.056*		*.091*	
richer	.105	.167	-.107*	.163	.026	.234
	.062		*.067*		*.081*	
richest	-.952***	.061	-.330***	.154	.019	.080
	.026		*.075*		*.119*	
current age	-.012	29.879	.042	31.937	.046	31.974
	.069		*.032*		*.047*	
current age 2	.0002	914.667	-.0005	1059.29	-.0007	1060.32
	.001		*.0005*		*.0007*	
interval under 18 m.	-.105	.106	.112	.071	-.150	.054

	.154		*.062*		*.108*	
daylight vision problem	-.318	.030	-.310***	.091	.004	.074
	.327		*.089*		*.124*	
night blindness	n/a	-	.195**	.060	-.171	.066
			.061		*.109*	
eligible women in h.h	-.124	1.182	-.084**	1.257	.066	1.137
	.098		*.035*		*.072*	
primary education	-.190**	.667	-.053	.642	-.160**	.707
	.077		*.046*		*.067*	
higher education	-.854**	.061	-.380***	.098	-.346***	.060
	.177		*.086*		*.078*	
urban	.232	.091	-.050	.195	-.153**	.185
	.079		*.053*		*.067*	
related to h.h head	n/a	-	.372	.917	-.690***	.972
			.2226818		*.0289578*	
female h.h head	.243	.121	.292**	.089	-.501***	.034
	.220		*.070*		*.026*	
pregnancy wanted then	-.025	.379	-.019	.530	-.066	.501
	.081		*.038*		*.055*	
husband in h.h	.982	.894	-.159	1.091	***-2.333	1.043
	.042		*.105*		*.277*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.2.3 Probit Results For No Health Care Facility At Delivery – Other Regions

Variable	2000 Obs.242		2005 Obs. 2104		2007/2008 Obs. 1162	
no facility at delivery	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	.031	.215	.003	.162	-.048	.256
	.088		*.035*		*.043*	
middle	.140	.182	-.049	.261	-.005	.165
	.072		*.031*		*.049*	
richer	.060	.248	-.131***	.206	-.060	.223
	.081		*.035*		*.044*	
richest	-.149	.161	-.381***	.146	-.148**	.137
	.178		*.042*		*.057*	
current age	-.165**	29.922	.012	31.377	.030	30.824
	.061		*.015*		*.024*	
current age ^{2}	.003**	926.938	-.0002	1025.16	-.0004	987.644
	.001		*.0002*		*.0004*	
interval under 18 m.	-.215**	.103	-.015	.080	-.090	.077
	.112		*.038*		*.055*	
daylight vision problem	.036	.083	-.022	.152567	.063	.052
	.106		*.018*		*.076*	
night blindness	-.163	.074	.004	.232	-.020	.063
	.139		*.010*		*.069*	
eligible women in h.h	-.026	1.256	-.056***	1.246	-.074**	1.199

	.061		*.019*		*.034*	
primary education	-.043	.533	-.045*	.633	-.138***	.653
	.068		*.023*		*.035*	
higher education	-.201*	.116	-.285***	.083	.301***	.091
	.134		*.050*		*.049*	
urban	-.252**	.219	-.119***	.103	-.094**	.205
	.127		*.037*		*.041*	
related to h.h head	-.407	.893	.314	.933	-.222	.964
	.176		*.293*		*.269*	
female h.h head	-.894	.116	.236	.073	-.178	.040
	.084		*.090*		*.226*	
pregnancy wanted then	-.038	.302	-.012	.499	-.084***	.512
	.069		*.020*		*.030*	
husband in h.h	.327	.913	-.028	1.070	-.111	1.043
	.257		*.065*		*.121*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.2.4 Probit Results For No Skilled Assistance At Delivery – All Regions

Variable	2000 Obs.313		2005 Obs.2754		2007/2008 Obs.1516	
noassistance	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	.0205	.230	.019	.166	-.045	.265
	.074		*.030*		*.037*	
middle	.108	.204	-.024	.258	-.017	.164
	.068		*.027*		*.042*	
richer	-.002	.230	-.118***	.196	-.060	.226
	.076		*.030*		*.038*	
richest	-.251*	.137	-.257***	.148	-.139	.123
	.157		*.037*		*.050*	
current age	-.071*	29.869	.015	31.509	.021	31.098
	.042		*.0139*		*.021*	
current age ^{2}	.001	921.684	-.0001	1033.18	-.0003	1004.9
	.0007		*.0002*		*.0003*	
interval under 18 m.	-.081	.102	-.042	.078	-.110	.073
	.091		*.036*		*.048*	
daylight vision problem	.030	.077	-.030*	.137	.045	.057
	.096		*.018*		*.065*	
night blindness	-.012	.073	.013	.191	-.058	.063
	.102		*.011*		*.059*	
eligible women in h.h	.015	1.236	-.043**	1.249	-.038	1.183
	.054		*.018*		*.030*	
primary education	-.095	.559	-.056***	.635	-.132	.665
	.057		*.022*		*.031*	
higher education	-.023	.102	-.290***	.087	-.293	.084
	.108		*.042*		*.042*	
urban	-.073	.188	-.098***	.125	-.101	.200

	.098		*.030*		*.035*	
related to h.h head	-.704***	.891	.415***	.929	-.293	.966
	.095		*.130*		*.232*	
female h.h head	-.916**	.115	.305***	.077	-.211	.039
	.038		*.049*		*.191*	
pregnancy wanted then	-.020	.319	.028	.505	-.075	.508
	.056		*.018*		*.026*	
husband in h.h	.902	.911	-.042	1.075	-.149	1.043
	.015		*.057*		*.109*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.2.5 Probit Results For No Skilled Assistance At Delivery – Pilot Regions

Variable	2000 Obs. 66		2005 Obs. 650		2007/2008 Obs. 351	
noassistance	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	.084	.258	.032	.18	.021	.288
	.131		*.063*		*.075*	
middle	.082	.303	.022	.246	-.067	.160
	.129		*.056*		*.088*	
richer	-.036	.167	-.144**	.163	-.048	.234
	.165		*.066*		*.079*	
richest	-.892***	.061	-.251***	.154	-.066	.080
	.034		*.074*		*.116*	
current age	.062	29.879	.025	31.934	.020	31.974
	.108		*.033*		*.046*	
current age ^{2}	-.001	914.667	-.0003	1059.15	-.0003	1060.32
	.002		*.001*		*.001*	
interval under 18 m.	-.023	.106	.158**	.071	-.213*	.054
	.165		*.070*		*.097*	
daylight vision problem	-.195	.030	-.220**	.091	.064	.074
	.429		*.097*		*.122*	
night blindness	-	-	.192**	.06	-.179	.068
	-		*.084*		*.102*	
eligible women in h.h	-.075	1.182	-.030	1.257	.040	1.137
	.141		*.038*		*.070*	
primary education	-.161	.667	-.117**	.643	-.182***	.707
	.107		*.048*		*.065*	
higher education	-.154	.061	-.390***	.098	-.282**	.060
	.346		*.076*		*.091*	
urban	.367	.091	-.069	.195	-.098	.185
	.068		*.056*		*.070*	
related to h.h head	-	-	.329	.917	-.701***	.972
	-		*.219*		*.031*	
female h.h head	.430	.121	.381**	.090	-.490***	.034
	.071		*.092*		*.030*	
pregnancy wanted then	-.003	.379	.001	.529	*-.058*	.501

	.106		*.040*		.054	
husband in h.h	.935***	.894	-.198*	1.091	-2.35***	1.043
	.026		*.115*		*.276*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.2.6 Probit Results For No Skilled Assistance At Delivery – Other Regions

Variable	2000	Obs. 242	2005	Obs. 2104	2007/2008	Obs. 1165
noassistance	dF/dx	x-bar	dF/dx	x-bar	dF/dx	x-bar
poorer	.031	.215	.015	.161	-.072*	.258
	.088		*.035*		*.042*	
middle	.139	.182	-.041	.261	-.015	.166
	.072		*.031*		*.048*	
richer	.060	.248	-.118***	.206	-.070	.223
	.081		*.034*		*.043*	
richest	-.149	.161	-.263***	.146	-.155***	.136
	.178		*.042*		*.056*	
current age	-.165**	29.922	.011	31.378	.017	30.834
	.061		*.015*		*.023*	
current age ^{2}	.003**	926.938	-.0001	1025.16	-.0002	988.197
	.001		*.0002*		*.0004*	
interval under 18 m.	-.215**	.103	-.095**	.080	-.097*	.078
	.112		*.041*		*.053*	
daylight vision problem	.036	.083	-.018	.152	.051	.052
	.106		*.019*		*.078*	
night blindness	-.163	.074	.006	.231	-.022	.063
	.139		*.011*		*.069*	
eligible women in h.h	-.026	1.256	-.050**	1.246	-.060*	1.197
	.061		*.021*		*.034*	
primary education	-.043	.533	-.038	.632	-.122***	.652
	.068		*.024*		*.035*	
higher education	-.201*	.116	-.249***	.083	-.289***	.091
	.134		*.049*		*.047*	
urban	-.252**	.219	-.089**	.103	-.106***	.204
	.127		*.0369*		*.040*	
related to h.h head	-.407	.896	.451**	.933	-.169	.964
	.176		*.176*		*.283*	
female h.h head	-.894	.116	.289**	.073	-.185	.040
	.084		*.061*		*.211*	
pregnancy wanted then	-.037	.302	.038*	.498	-.086***	.510
	.069		*.021*		*.030*	
husband in h.h	.327	.913	.006	1.070	-.062	1.043
	.257		*.065*		*.122*	

(*) dF/dx is for discrete change of dummy variable from 0 to 1
Significance: ***1%, **5%, *10%.
Standard errors in italics

11.3 Descriptive Statistics

11.3.1 General Variables Used in the 2000 Dataset

Variables Used in the Model: General					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
born9800	6539	.575	.495	0	1
no assistance at delivery	3754	.734	.442	0	1
skilled assistance at delivery	3754	.266	.442	0	1
no facility at delivery	3755	.704	.456	0	1
public facility at delivery	3755	.270	.444	0	1
private facility at delivery	3755	.021	.144	0	1
other facility at delivery	3755	.005	.067	0	1
poorer	9629	.244	.429	0	1
middle	9629	.155	.362	0	1
richer	9629	.200	.400	0	1
richest	9629	.200	.400	0	1
current age	10421	27.865	9.757	15	49
current age ^{2}	10421	871.662	595.174	225	2401
interval under 18 m.	5443	.094	.292	0	1
daylight vision problem	4935	.072	.259	0	1
night blindness	4933	.072	.258	0	1
eligible women in h.h	10421	1.74	.954	1	9
no education	10421	.272	.445	0	1
primary education	10421	.593	.491	0	1
higher education	10421	.135	.342	0	1
urban	10421	.262	.440	0	1
rural	10421	.738	.440	0	1
respondent is h.h head	10418	.198	.399	0	1
related to h.h head	10418	.751	.432	0	1
not related to h.h head	10418	.050	.219	0	1
male h.h head	10421	.634	.482	0	1
female h.h head	10421	.366	.482	0	1
pregnancy wanted then	896	.525	.500	0	1
pregnancy not wanted then	896	.475	.500	0	1
not married	10421	.531	.499	0	1

married	10421	.469	.499	0	1
husband in h.h	4871	.878	.327	0	1

11.3.2 General Variables Used in the 2005 Dataset

Variables Used in the Model: General					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
born0305	7045	.563	.496	0	1
no assistance at delivery	3966	.634	.481	0	1
skilled assistance at delivery	3966	.366	.482	0	1
no facility at delivery	3967	.676	.468	0	1
public facility at delivery	3967	.295	.456	0	1
private facility at delivery	3967	.016	.125	0	1
other facility at delivery	3967	.013	.113	0	1
poorest	10609	.231	.421	0	1
poorer	10609	.172	.377	0	1
middle	10609	.211	.408	0	1
richer	10609	.187	.390	0	1
richest	10609	.199	.400	0	1
current age	11321	28.307	9.761	15	49
current age ^{2}	11321	896.572	603.195	225	2401
interval under 18 m.	5922	.076	.266	0	1
daylight vision problem	5393	.135	.526	0	9
night blindness	5393	.191	.978	0	9
eligible women in h.h	11321	1.738	.939	1	7
no education	11321	.230	.421	0	1
primary education	11321	.662	.473	0	1
higher education	11321	.108	.310	0	1
urban	11321	.133	.340	0	1
rural	11321	.770	.421	0	1
respondent is h.h head	11320	.167	.373	0	1
related to h.h head	11320	.795	.402	0	1
not related to h.h head	11320	.038	.190	0	1
female h.h head	11321	.347	.476	0	1
male h.h head	11321	.653	.476	0	1
pregnancy wanted then	5391	.559	.496	0	1
pregnancy not wanted then	5391	.441	.496	0	1

married	11321	.482	.500	0	1
not married	11321	.518	.500	0	1
husband in h.h	5423	1.106	.308	1	2

11.3.3 General Variables Used in the 2007/2008 Dataset

Variables Used in the Model: General					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
born0608	4686	.502	.500	0	1
no assistance at delivery	2336	.381	.486	0	1
skilled assistance at delivery	2336	.619	.486	0	1
no facility at delivery	2326	.399	.490	0	1
public facility at delivery	2326	.570	.495	0	1
private facility at delivery	2326	.010	.101	0	1
other facility at delivery	2326	.020	.142	0	1
poorest	6915	.214	.410	0	1
poorer	6915	.235	.424	0	1
middle	6915	.151	.358	0	1
richer	6915	.202	.401	0	1
richest	6915	.198	.399	0	1
current age	7313	28.533	9.468	15	49
current age ^{2}	7313	903.757	590.175	225	2401
interval under 18 m.	3852	.077	.267	0	1
daylight vision problem	3512	.063	.243	0	1
night blindness	3509	.059	.236	0	1
eligible women in h.h	7313	1.651	.923	1	8
no education	7313	.206	.405	0	1
primary education	7313	.657	.475	0	1
higher education	7313	.137	.344	0	1
urban	7313	.270	.441	0	1
rural	7313	.730	.444	0	1
respondent is h.h head	7310	.157	.364	0	1
related to h.h head	7310	.807	.394	0	1
not related to h.h head	7310	.036	.186	0	1
female h.h head	7313	.313	.464	0	1
male h.h head	7313	.687	.464	0	1
pregnancy wanted then	3535	.545	.498	0	1
pregnancy not wanted then	3535	.455	.498	0	1

married	7313	.514	.500	0	1
not married	7313	.486	.500	0	1
husband in h.h	3738	1.077	.266	1	2

11.3.4 Variables Used to Construct the Asset Index in the 2000 Dataset

Variables Used in the Asset Index					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
piped into dwell	10167	.041	.199	0	1
piped into yard or lot	10167	.065	.247	0	1
public tap	10167	.303	.460	0	1
open public well	10167	.037	.189	0	1
protected well in yard	10167	.0002	.014	0	1
protected public well	10167	.056	.231	0	1
spring	10167	.369	.483	0	1
river or stream	10167	.054	.226	0	1
pond or lake	10167	.062	.242	0	1
dam	10167	.005	.069	0	1
rainwater	10167	.0001	.001	0	1
tanker truck	10167	.002	.044	0	1
bottled water	10167	.001	.014	0	1
other water	10167	.004	.059	0	1
flush toilet	10164	.026	.158	0	1
traditional pit	10164	.820	.384	0	1
ventilated improved latrine	10164	.123	.328	0	1
no facility	10164	.032	.174	0	1
electricity	10166	.128	.334	0	1
radio	10165	.447	.497	0	1
tv	10165	.063	.243	0	1
fridge	10158	.041	.198	0	1
bicycle	10082	.085	.279	0	1
motorcycle or scooter	10072	.010	.097	0	1
car or truck	10070	.025	.155	0	1
earth or sand	10154	.752	.432	0	1
dung	10154	.016	.124	0	1
wood planks	10154	.0005	.022	0	1
palm bamboo	10154	.0002	.014	0	1
ceramic tiles	10154	.002	.049	0	1
cement	10154	.227	.419	0	1
carpet	10154	.001	.024	0	1
other floor material	10154	.003	.051	0	1

telephone	10160	.032	.175	0	1
toilet shared	9777	.161	.368	0	1
cook electricity	10174	.004	.063	0	1
cook lpg or naturalgas	10174	.0003	.017	0	1
cook kerosene	10174	.0004	.020	0	1
cook coal or lignite	10174	.007	.083	0	1
cook charcoal	10174	.187	.390	0	1
cook fire wood or straw	10174	.799	.401	0	1
cook dung	10174	.001	.034	0	1
cook other	10174	.001	.038	0	1

11.3.5 Variables Used to Construct the Asset Index in the 2005 Dataset

Variables Used in the Asset Index					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
piped into dwell	11321	.011	.104	0	1
piped into compound	11321	.035	.184	0	1
public tap	11321	.248	.432	0	1
open well in dwelling	11321	.0004	.019	0	1
open well in yard	11321	.002	.047	0	1
open public well	11321	.130	.336	0	
protected well in dwelling	11321	.000	.009	0	1
protected well in yard	11321	.0004	.019	0	1
protected public well	11321	.059	.236	0	1
spring	11321	.309	.462	0	1
river stream	11321	.109	.311	0	1
pond or lake	11321	.062	.242	0	1
dam	11321	.008	.087	0	1
rain water	11321	.003	.051	0	1
tanker truck	11321	.0001	.009	0	1
other water	11321	.006	.076	0	1
flush toilet	11321	.019	.135	0	1
latrine	11321	.618	.486	0	1
improved platrine	11321	.312	.463	0	1
no facility	11321	.032	.176	0	1
other facility	11321	.0001	.009	0	1
electricity	11108	.081	.272	0	1
radio	11108	.512	.500	0	1
TV	11091	.048	.213	0	1
fridge	11104	.024	.154	0	1
bicycle	11089	.123	.329	0	1
motorcycle	11080	.007	.086	0	1

car or truck	11077	.017	.130	0	1
earth or sand	11321	.802	.398	0	1
dung	11321	.009	.092	0	1
parquet	11321	.0003	.016	0	1
linoleum	11321	.0001	.009	0	1
ceramic tiles	11321	.003	.059	0	1
cement	11321	.166	.372	0	1
carpet	11321	.001	.028	0	1
other floor material	11321	.0001	.009	0	1
telephone	11104	.017	.130	0	1
shared toilet	10680	.143	.350	0	1
cook electricity	11321	.001	.034	0	1
cook lpg or naturalgas	11321	.001	.027	0	1
cook biogas	11321	.0002	.013	0	1
cook kerosene	11321	.0001	.009	0	1
cook coal or lignite	11321	.004	.064	0	1
charcoal	11321	.096	.294	0	1
cook firewood or straw	11321	.877	.329	0	1
cook dung	11321	.003	.053	0	1
cook other	11321	.0001	.009	0	1

11.3.6 Variables Used to Construct the Asset Index in the 2007/2008 Dataset

Variables Used in the Asset Index					
	All Regions				
Variable	Obs.	Mean	Std. Dev.	Min	Max
piped into dwell	7313	.007	.082	0	1
piped into compound	7313	.056	.230	0	1
public tap	7313	.320	.466	0	1
open well in dwelling	7313	.0001	.012	0	1
open well in yard	7313	.002	.044	0	1
open public well	7313	.172	.377	0	1
protected well in dwelling	7313	.0004	.020	0	1
protected well in yard	7313	.0003	.017	0	1
protected public well	7313	.053	.223	0	1
spring	7313	.247	.431	0	1
riverstream	7313	.087	.281	0	1
pond or lake	7313	.039	.193	0	1
dam	7313	.005	.071	0	1
rain water	7313	.0003	.017	0	1
tanker truck	7313	.0001	.012	0	1
bottled water	7313	.0001	.012	0	1
other water	7313	.002	.039	0	1
flush toilet	7313	.020	.138	0	1

traditional pit toilet	7313	.432	.495	0	1
ventilated improved toilet	7313	.512	.500	0	1
no facility	7313	.022	.146	0	1
other toilet	7313	.003	.054	0	1
electricity	7237	.106	.307	0	1
radio	7244	.637	.481	0	1
TV	7224	.071	.257	0	1
fridge	7234	.025	.156	0	1
bicycle	7245	.131	.337	0	1
motrocycle	7239	.011	.103	0	1
car or truck	7243	.017	.130	0	1
earth or sand	7313	.771	.420	0	1
dung	7313	.009	.094	0	1
ceramictiles	7313	.003	.051	0	1
cement	7313	.202	.401	0	1
carpet	7313	.007	.082	0	1
telephone	6971	.138	.345	0	1
shared toilet	7230	.024	.153	0	1
cook biogas	7250	.0001	.012	0	1
cook kerosene	7250	.008	.090	0	1
cook coal orl ignite	7250	.127	.333	0	1
cook charcoal	7250	.861	.346	0	1
cook wood	7250	.002	.048	0	1
cook other	7250	.002	.041	0	1

11.3.7 Share of Population in Each Region in the 2000 Dataset

Variables Used in the Model: Regions

Other Regions

Variable	Obs.	Mean	Std. Dev.	Min	Max
cyangugu	10421	.081	.274	0	1
gikongoro	10421	.067	.251	0	1
gisenyi	10421	.059	.235	0	1
kibungo	10421	.084	.277	0	1
kibuye	10421	.069	.254	0	1
kigaliville	10421	.156	.363	0	1
kigalirural	10421	.102	.302	0	1
ruhengeri	10421	.081	.274	0	1
umutara	10421	.047	.211	0	1

Pilot Regions

Variable	Obs.	Mean	Std. Dev.	Min	Max
gitarama	10421	.087	.281	0	1

byumba	10421	.071	.257	0	1
butare	10421	.095	.294	0	1

11.3.8 Share of Population in Each Region in the 2005 Dataset

Variables Used in the Model: Regions					
Other regions					
Variable	Obs.	Mean	Std. Dev.	Min	Max
kigalitown	11321	.096	.294	0	1
kigalingali	11321	.083	.277	0	1
gikongoro	11321	.078	.268	0	1
cyangugu	11321	.089	.285	0	1
kibuye	11321	.081	.273	0	1
gisenyi	11321	.083	.276	0	1
ruhengeri	11321	.083	.276	0	1
umutara	11321	.079	.270	0	1
kibungo	11321	.082	.275	0	1
Pilot Regions					
Variable	Obs.	Mean	Std. Dev.	Min	Max
gitarama	11321	.082	.275	0	1
byumba	11321	.079	.270	0	1
butare	11321	.083	.277	0	1

11.3.9 Share of Population in Each Region in the 2007/2008 Dataset

Variables Used in the Model: Regions					
Other Regions					
Variable	Obs.	Mean	Std. Dev.	Min	Max
kigalitown	7313	.110	.313	0	1
kigalingali	7313	.085	.279	0	1
gikongoro	7313	.079	.270	0	1
cyangugu	7313	.083	.276	0	1
kibuye	7313	.080	.271	0	1
gisenyi	7313	.073	.267	0	1
ruhengeri	7313	.083	.276	0	1
umutara	7313	.081	.273	0	1
kibungo	7313	.083	.276	0	1
Pilot regions					
Variable	Obs.	Mean	Std. Dev.	Min	Max
gitarama	7313	.0903	.287	0	1
byumba	7313	.0650	.247	0	1
butare	7313	.0842	.278	0	1

11.4 Descriptive Statistics Based on Wealth Quintiles

11.4.1 Education Varying Among the Wealth Quintiles in the 2000 Dataset

Education Varying Among the Wealth Quintiles						
		All Regions				
	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no education	1937	.365	.482	0	1
	primary education	1937	.610	.488	0	1
	higher education	1937	.025	.156	0	1
poorer quintile	no education	2346	.383	.486	0	1
	primary education	2346	.592	.492	0	1
	higher education	2346	.026	.158	0	1
middle quintile	no education	1497	.296	.457	0	1
	primary education	1497	.650	.477	0	1
	higher education	1497	.054	.226	0	1
richer quintile	no education	1926	.207	.405	0	1
	primary education	1926	.671	.470	0	1
	higher education	1926	.122	.327	0	1
richest quintile	no education	1923	.076	.266	0	1
	primary education	1923	.472	.499	0	1
	higher education	1923	.451	.498	0	1

11.4.2 Education Varying Among the Wealth Quintiles in the 2005 Dataset

Education Varying Among the Wealth Quintiles						
		All Regions				
	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no education	2446	.323	.468	0	1
	primary education	2446	.657	.475	0	1
	higher education	2446	.021	.143	0	1
poorer quintile	no education	1823	.262	.440	0	1
	primary education	1823	.699	.459	0	1
	higher education	1823	.039	.194	0	1
	Variable	Obs.	Mean	Std. Dev.	Min	Max
middle quintile	no education	2236	.232	.422	0	1
	primary education	2236	.718	.450	0	1
	higher education	2236	.050	.218	0	1
richer quintile	no education	1988	.216	.412	0	1
	primary education	1988	.718	.450	0	1
	higher education	1988	.066	.249	0	1

richest quintile	no education	2116	.082	.275	0	1
	primary education	2116	.555	.497	0	1
	higher education	2116	.363	.481	0	1

11.4.3 Education Varying Among the Wealth Quintiles in the 2007/2008 Dataset

Education Varying Among the Wealth Quintiles

All Regions

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no education	1477	.286	.452	0	1
	primary education	1477	.691	.462	0	1
	higher education	1477	.023	.150	0	1
poorer quintile	no education	1626	.235	.424	0	1
	primary education	1626	.709	.455	0	1
	higher education	1626	.057	.231	0	1
middle quintile	no education	1046	.219	.414	0	1
	primary education	1046	.722	.448	0	1
	higher education	1046	.059	.236	0	1
richer quintile	no education	1395	.186	.390	0	1
	primary education	1395	.706	.456	0	1
	higher education	1395	.108	.310	0	1
richest quintile	no education	1371	.077	.266	0	1
	primary education	1371	.487	.500	0	1
	higher education	1371	.436	.496	0	1

11.4.4 Type of Place of Residence Varying Among the Wealth Quintiles in the 2000 Dataset

Type of Place of Residence Varying Among the Wealth Quintiles

All Regions

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	rural	1937	.972	.166	0	1
	urban	1937	.028	.166	0	1
poorer quintile	rural	2346	.955	.208	0	1
	urban	2346	.045	.208	0	1

	Variable	Obs.	Mean	Std. Dev.	Min	Max
middle quintile	rural	1497	.926	.261	0	1
	urban	1497	.074	.261	0	1
richer quintile	rural	1926	.749	.434	0	1

	urban	1926	.251	.434	0	1
richest quintile	rural	1923	.072	.258	0	1
	urban	1923	.928	.258	0	1

11.4.5 Type of Place of Residence Varying Among the Wealth Quintiles in the 2005 Dataset

Type of Place of Residence Varying Among the Wealth Quintiles						
	All Regions					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	rural	2446	.924	.265	0	1
	urban	2446	.062	.240	0	1
poorer quintile	rural	1823	.869	.337	0	1
	urban	1823	.113	.316	0	1
middle quintile	rural	2236	.863	.344	0	1
	urban	2236	.111	.314	0	1
richer quintile	rural	1988	.867	.340	0	1
	urban	1988	.109	.312	0	1
richest quintile	rural	2116	.337	.473	0	1
	urban	2116	.273	.446	0	1

11.4.6 Type of Place of Residence Varying Among the Wealth Quintiles in the 2007/2008 Dataset

Type of Place of Residence Varying Among the Wealth Quintiles						
	All Regions					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	rural	1477	.876	.330	0	1
	urban	1477	.124	.330	0	1
poorer quintile	rural	1626	.841	.366	0	1
	urban	1626	.159	.366	0	1
middle quintile	rural	1046	.860	.348	0	1
	urban	1046	.141	.348	0	1
richer quintile	rural	1395	.812	.391	0	1
	urban	1395	.188	.391	0	1
richest quintile	rural	1371	.262	.440	0	1
	urban	1371	.738	.440	0	1

11.4.7 Health Care at Delivery Varying Among the Wealth Quintiles in the 2000 Dataset

Health care at Delivery Varying Among the Quintiles

All regions

Place of Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no facility at delivery	766	.849	.359	0	1
	public facility at delivery	766	.150	.357	0	1
	private facility at delivery	766	.001	.036	0	1
	other facility at delivery	766	0	0	0	0
poorer quintile	no facility at delivery	873	.833	.373	0	1
	public facility at delivery	873	.159	.366	0	1
	private facility at delivery	873	.005	.068	0	1
	other facility at delivery	873	.003	.059	0	1
middle quintile	no facility at delivery	611	.799	.401	0	1
	public facility at delivery	611	.185	.389	0	1
	private facility at delivery	611	.008	.090	0	1
	other facility at delivery	611	.008	.090	0	1
richer quintile	no facility at delivery	736	.667	.472	0	1
	public facility at delivery	736	.322	.468	0	1
	private facility at delivery	736	.008	.090	0	1
	other facility at delivery	736	.004	.064	0	1
richest quintile	no facility at delivery	540	.211	.409	0	1
	public facility at delivery	540	.667	.472	0	1
	private facility at delivery	540	.115	.319	0	1
	other facility at delivery	540	.007	.086	0	1

Assistance at Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no skilled assistance at delivery	765	.846	.361	0	1
	skilled assistance at delivery	765	.154	.361	0	1
poorer quintile	no skilled assistance at delivery	872	.820	.384	0	1
	skilled assistance at delivery	872	.180	.384	0	1
middle quintile	no skilled assistance at delivery	613	.798	.402	0	1
	skilled assistance at delivery	613	.202	.402	0	1
richer quintile	no skilled assistance at delivery	736	.698	.459	0	1
	skilled assistance at delivery	736	.302	.459	0	1
richest quintile						
	no skilled assistance at delivery	539	.423	.495	0	1
	skilled assistance at delivery	539	.577	.495	0	1

11.4.8 Health Care at Delivery Varying Among the Wealth Quintiles in the 2005 Dataset

Health care at Delivery Varying Among the Quintiles

All regions

Place of Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no facility at delivery	885	.798	.402	0	1
	public facility at delivery	885	.177	.382	0	1
	private facility at delivery	885	.007	.082	0	1
	other facility at delivery	885	.018	.133	0	1
poorer quintile	no facility at delivery	661	.746	.436	0	1
	public facility at delivery	661	.236	.425	0	1
	private facility at delivery	661	.007	.087	0	1
	other facility at delivery	661	.011	.102	0	1
middle quintile	no facility at delivery	903	.735	.441	0	1
	public facility at delivery	903	.247	.432	0	1
	private facility at delivery	903	.004	.066	0	1
	other facility at delivery	903	.013	.115	0	1
richer quintile	no facility at delivery	724	.644	.479	0	1
	public facility at delivery	724	.333	.472	0	1
	private facility at delivery	724	.010	.098	0	1
	other facility at delivery	724	.014	.117	0	1
richest quintile	no facility at delivery	557	.314	.465	0	1
	public facility at delivery	557	.609	.488	0	1
	private facility at delivery	557	.070	.255	0	1
	other facility at delivery	557	.007	.084	0	1

Assistance at Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no skilled assistance at delivery	886	.735	.442	0	1
	skilled assistance at delivery	886	.265	.442	0	1
poorer quintile	no skilled assistance at delivery	660	.703	.457	0	1
	skilled assistance at delivery	660	.297	.457	0	1
middle quintile	no skilled assistance at delivery	902	.683	.466	0	1
	skilled assistance at delivery	902	.317	.466	0	1
richer quintile	no skilled assistance at delivery	724	.590	.492	0	1
	skilled assistance at delivery	724	.410	.492	0	1
richest quintile	no skilled assistance at delivery	557	.354	.479	0	1

	skilled assistance at delivery	557	.646	.479	0	1

11.4.9 Health Care at Delivery Varying Among the Wealth Quintiles in the 2007/2008 Dataset

Health care at Delivery Varying Among the Quintiles

All regions

Place of Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no facility at delivery	502	.474	.500	0	1
	public facility at delivery	502	.490	.500	0	1
	private facility at delivery	502	.006	.077	0	1
	other facility at delivery	502	.030	.170	0	1
poorer quintile	no facility at delivery	556	.432	.496	0	1
	public facility at delivery	556	.545	.499	0	1
	private facility at delivery	556	.004	.060	0	1
	other facility at delivery	556	.020	.139	0	1
middle quintile	no facility at delivery	356	.449	.498	0	1
	public facility at delivery	356	.534	.500	0	1
	private facility at delivery	356	0	0	0	0
	other facility at delivery	356	.017	.129	0	1
richer quintile	no facility at delivery	482	.388	.488	0	1
	public facility at delivery	482	.583	.494	0	1
	private facility at delivery	482	.010	.101	0	1
	other facility at delivery	482	.019	.136	0	1
richest quintile	no facility at delivery	302	.195	.397	0	1
	public facility at delivery	302	.752	.433	0	1
	private facility at delivery	302	.046	.211	0	1
	other facility at delivery	302	.007	.081	0	1

Assistance at Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
poorest quintile	no skilled assistance at delivery	505	.455	.499	0	1
	skilled assistance at delivery	505	.545	.499	0	1
poorer quintile	no skilled assistance at delivery	560	.413	.493	0	1
	skilled assistance at delivery	560	.588	.492	0	1
middle quintile	no skilled assistance at delivery	358	.422	.495	0	1
	skilled assistance at delivery	358	.578	.495	0	1
richer quintile	no skilled assistance at delivery	483	.367	.482	0	1
	skilled assistance at delivery	483	.634	.482	0	1

richhest quintile	no skilled assistance at delivery	302	.189	.392	0	1
	skilled assistance at delivery	302	.811	.392	0	1

11.5 Descriptive Statistics Based on Region

11.5.1 Wealth Varying Between Regions in the 2000 Dataset

Wealth Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	poorest quintile	2450	.234	.423	0	1
	poorer quintile	2450	.253	.435	0	1
	middle quintile	2450	.201	.401	0	1
	richer quintile	2450	.226	.418	0	1
	richest quintile	2450	.087	.282	0	1
other regions	poorest quintile	7179	.190	.392	0	1
	poorer quintile	7179	.241	.426	0	1
	middle quintile	7179	.140	.347	0	1
	richer quintile	7179	.191	.393	0	1
	richest quintile	7179	.238	.426	0	1

11.5.2 Wealth Varying Between Regions in the 2005 Dataset

Wealth Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	poorest quintile	2574	.253	.435	0	1
	poorer quintile	2574	.187	.390	0	1
	middle quintile	2574	.213	.409	0	1
	richer quintile	2574	.179	.383	0	1
	richest quintile	2574	.169	.375	0	1
other regions	poorest quintile	8035	.223	.417	0	1
	poorer quintile	8035	.167	.373	0	1
	middle quintile	8035	.210	.408	0	1
	richer quintile	8035	.190	.393	0	1
	richest quintile	8035	.209	.407	0	1

11.5.3 Wealth Varying Between Regions in the 2007/2008 Dataset

Wealth Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions:	poorest quintile	1655	.238	.426	0	1
	poorer quintile	1655	.249	.433	0	1
	middle quintile	1655	.175	.380	0	1
	richer quintile	1655	.242	.428	0	1
	richest quintile	1655	.097	.296	0	1

other regions	poorest quintile	5260	.206	.405	0	1
	poorer quintile	5260	.231	.421	0	1
	middle quintile	5260	.144	.351	0	1
	richer quintile	5260	.189	.392	0	1
	richest quintile	5260	.230	.421	0	1

11.5.4 Education Varying Between Regions in the 2000 Dataset

Education Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no education	2640	.264	.441	0	1
	primary education	2640	.642	.480	0	1
	higher education	2640	.094	.291	0	1
other regions	no education	7781	.275	.447	0	1
	primary education	7781	.576	.494	0	1
	higher education	7781	.149	.356	0	1

11.5.5 Education Varying Between Regions in the 2005 Dataset

Education Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no education	2768	.215	.410	0	1
	primary education	2768	.686	.464	0	1
	higher education	2768	.100	.300	0	1
other regions	no education	8553	.235	.424	0	1
	primary education	8553	.654	.476	0	1
	higher education	8553	.110	.313	0	1

11.5.6 Education Varying Between Regions in the 2007/2008 Dataset

Education Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no education	1751	.204	.403	0	1
	primary education	1751	.699	.459	0	1
	higher education	1751	.097	.296	0	1
other regions	no education	5562	.207	.405	0	1
	primary education	5562	.644	.479	0	1
	higher education	5562	.149	.356	0	1

11.5.7 Type of Place of Residence Varying Between Regions in the 2000 Dataset

Type of Place of Residence Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	rural	2640	.873	.333	0	1

	urban	2640	.127	.333	0	1
other regions	rural	7781	.692	.462	0	1
	urban	7781	.308	.462	0	1

11.5.8 Type of Place of Residence Varying Between Regions in the 2005 Dataset

Type of Place of Residence Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	rural	2768	.7905	.4071	0	1
	urban	2768	.2085	.4063	0	1
other regions	rural	8553	.7638	.4248	0	1
	urban	8553	.1089	.3115	0	1

11.5.9 Type of Place of Residence Varying Between Regions in the 2007/2008 Dataset

Type of Place of Residence Varying Between Regions						
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	rural	1751	.790	.407	0	1
	urban	1751	.210	.407	0	1
other regions	rural	5562	.711	.453	0	1
	urban	5562	.289	.453	0	1

11.5.10 Type of Health Care Varying Between Regions in the 2000 Dataset

Type of Health Care Varying Between Regions						
	Place of Delivery					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no facility at delivery	907	.744	.437	0	1
	public facility at delivery	907	.246	.431	0	1
	private facility at delivery	907	.004	.066	0	1
	other facility at delivery	907	.004	.074	0	1
other regions	no facility at delivery	2848	.692	.462	0	1
	public facility at delivery	2848	.277	.448	0	1
	private facility at delivery	2848	.027	.161	0	1
	other facility at delivery	2848	.004	.065	0	1
	Assistance at Delivery					
pilot regions	no skilled assistance at delivery	907	.746	.435	0	1
	skilled assistance at delivery	907	.254	.435	0	1
other regions	no skilled assistance at delivery	2847	.731	.444	0	1
	skilled assistance at delivery	2847	.269	.444	0	1

11.5.11 Type of Health Care Varying Between Regions in the 2005 Dataset

Type of Health Care Varying Between Regions						
	Place of Delivery					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no facility at delivery	957	.642	.480	0	1
	public facility at delivery	957	.332	.471	0	1
	private facility at delivery	957	.015	.120	0	1
	other facility at delivery	957	.012	.107	0	1
other regions	no facility at delivery	3010	.687	.464	0	1
	public facility at delivery	3010	.284	.451	0	1
	private facility at delivery	3010	.016	.127	0	1
	other facility at delivery	3010	.013	.115	0	1
	Assistance at Delivery					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no skilled assistance at delivery	956	.564	.496	0	1
	skilled assistance at delivery	956	.436	.496	0	1
other regions	no skilled assistance at delivery	3010	.657	.475	0	1
	skilled assistance at delivery	3010	.344	.475	0	1

11.5.12 Type of Health Care Varying Between Regions in the 2007/2008 Dataset

Type of Health Care Varying Between Regions						
	Place of Delivery					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no facility at delivery	552	.406	.492	0	1
	public facility at delivery	552	.562	.497	0	1
	private facility at delivery	552	.004	.060	0	1
	other facility at delivery	552	.029	.168	0	1
other regions	no facility at delivery	1774	.397	.489	0	1
	public facility at delivery	1774	.573	.495	0	1
	private facility at delivery	1774	.012	.111	0	1
	other facility at delivery	1774	.018	.133	0	1
	Assistance at Delivery					
	Variable	Obs.	Mean	Std. Dev.	Min	Max
pilot regions	no skilled assistance at delivery	553	.389	.488	0	1
	skilled assistance at delivery	553	.611	.488	0	1
other regions	no skilled assistance at delivery	1783	.378	.485	0	1
	skilled assistance at delivery	1783	.622	.485	0	1

11.5.13 Type of Health Care Varying Among Education Levels in the 2000 Dataset

Health care Varying Among Education Levels

All Regions

Place of Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
no education	no facility at delivery	1178	.858	.349	0	1
	public facility at delivery	1178	.132	.338	0	1
	private facility at delivery	1178	.004	.065	0	1
	other facility at delivery	1178	.006	.077	0	1
primary education	no facility at delivery	2120	.717	.451	0	1
	public facility at delivery	2120	.270	.444	0	1
	private facility at delivery	2120	.010	.099	0	1
	other facility at delivery	2120	.003	.053	0	1
higher education	no facility at delivery	21	0	0	0	0
	public facility at delivery	21	.667	.483	0	1
	private facility at delivery	21	.333	.483	0	1
	other facility at delivery	21	0	0	0	0

Assistance at Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
no education	no skilled assistance at delivery	1179	.8507	.357	0	1
	skilled assistance at delivery	1179	.149	.356	0	1
primary education	no skilled assistance at delivery	2119	.736	.441	0	1
	skilled assistance at delivery	2119	.264	.441	0	1
higher education	no skilled assistance at delivery	21	.381	.498	0	1
	skilled assistance at delivery	21	.619	.498	0	1

11.5.14 Type of Health Care Varying Among Education Levels in the 2005 Dataset

Health care Varying Among Education Levels

All regions

Place of Delivery

	Variable	Obs.	Mean	Std. Dev.	Min	Max
no education	no facility at delivery	1062	.780	.415	0	1
	public facility at delivery	1062	.193	.395	0	1
	private facility at delivery	1062	.009	.097	0	1
	other facility at delivery	1062	.018	.133	0	1
primary education	no facility at delivery	2553	.685	.465	0	1

	public facility at delivery	2553	.294	.456	0	1
	private facility at delivery	2553	.010	.099	0	1
	other facility at delivery	2553	.011	.104	0	1
higher education	no facility at delivery	21	0	0	0	0
	public facility at delivery	21	.667	.483	0	1
	private facility at delivery	21	.333	.483	0	1
	other facility at delivery	21	0	0	0	0

Assistance at Delivery

Variable		Obs.	Mean	Std. Dev.	Min	Max
no education	no skilled assistance at delivery	1062	.734	.442	0	1
	skilled assistance at delivery	1062	.266	.442	0	1
primary education	no skilled assistance at delivery	2552	.634	.482	0	1
	skilled assistance at delivery	2552	.366	.482	0	1
higher education	no skilled assistance at delivery	21	.095	.301	0	1
	skilled assistance at delivery	21	.905	.301	0	1

11.5.15 Type of Health Care Varying Among Education Levels in the 2005 Dataset

Health care Varying Among Education Levels

All regions

Place of Delivery

Variable		Obs.	Mean	Std. Dev.	Min	Max
no education	no facility at delivery	528	.557	.497	0	1
	public facility at delivery	528	.415	.493	0	1
	private facility at delivery	528	.002	.044	0	1
	other facility at delivery	528	.026	.161	0	1
primary education	no facility at delivery	1569	.382	.486	0	1
	public facility at delivery	1569	.589	.492	0	1
	private facility at delivery	1569	.008	.087	0	1
	other facility at delivery	1569	.022	.146	0	1
higher education	no facility at delivery	23	.044	.209	0	1
	public facility at delivery	23	.870	.344	0	1
	private facility at delivery	23	.087	.288	0	1
	other facility at delivery	23	0	0	0	0

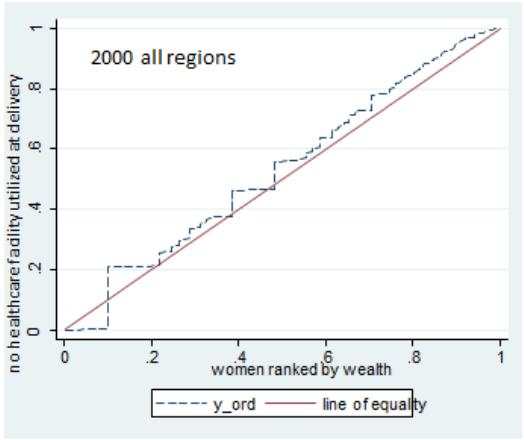
Assistance at Delivery

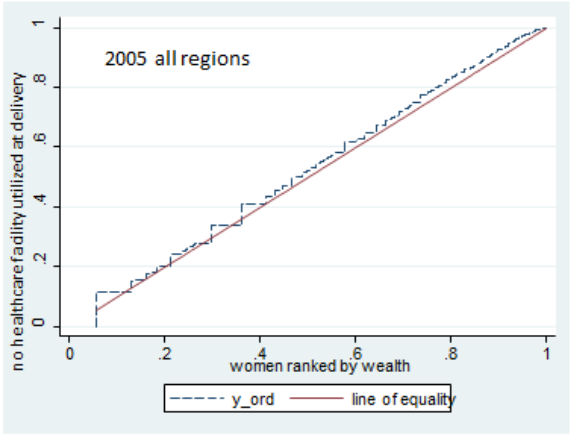
Variable		Obs.	Mean	Std. Dev.	Min	Max
no education	no skilled assistance at delivery	530	.530	.500	0	1
	skilled assistance at delivery	530	.470	.500	0	1

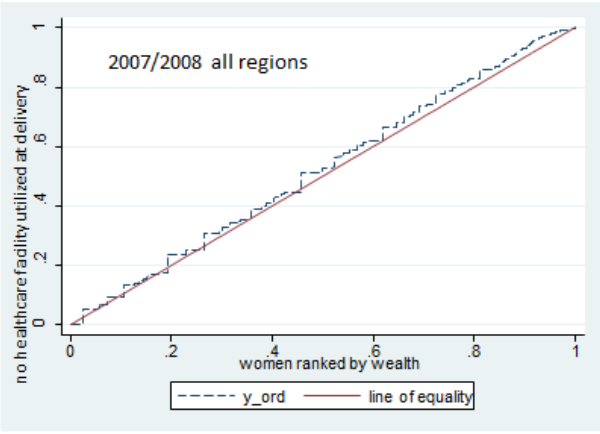
primary education	no skilled assistance at delivery	1576	.366	.482	0	1
	skilled assistance at delivery	1576	.635	.482	0	1
higher education	no skilled assistance at delivery	23	.044	.209	0	1
	skilled assistance at delivery	23	.957	.209	0	1

11.6 Concentration Curves

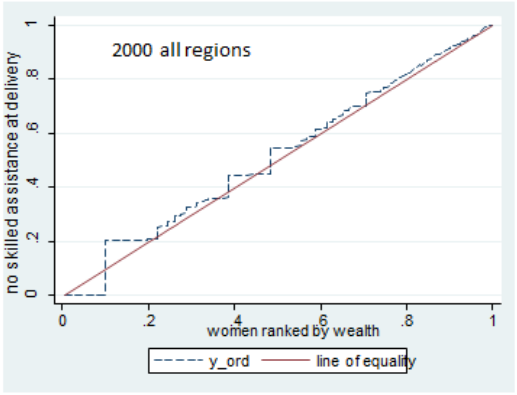
11.6.1 No Health Care Facility at Delivery – All Regions

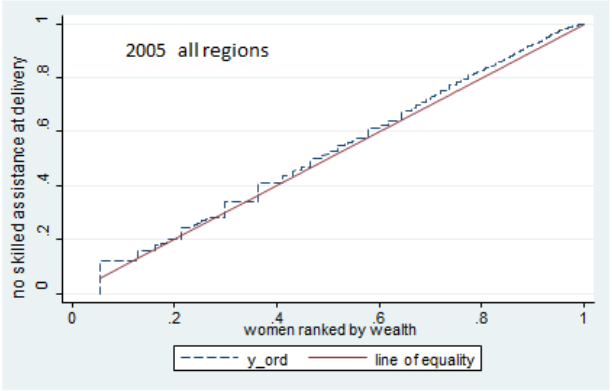


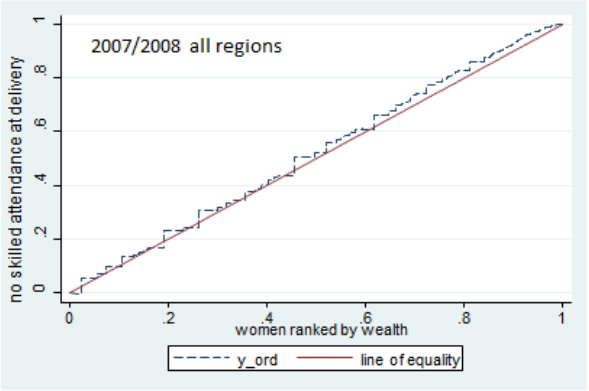




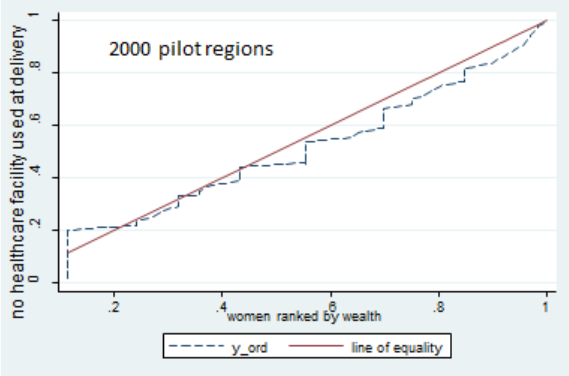
11.6.2 No Skilled Assistance at Delivery – All Regions

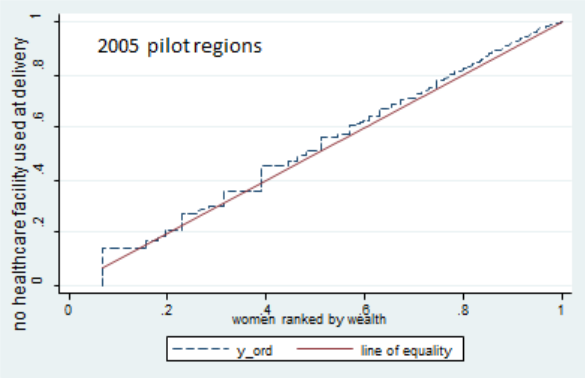


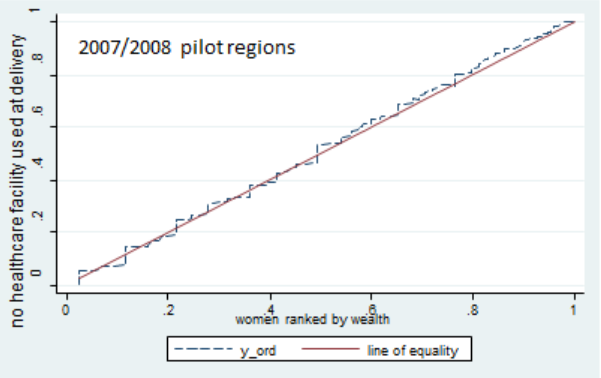




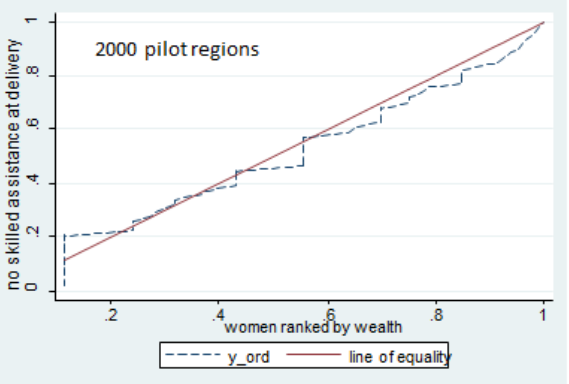
11.6.3 No Health Care Facility at Delivery – Pilot Regions

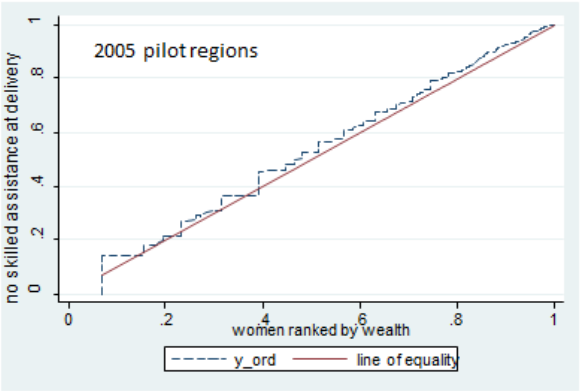


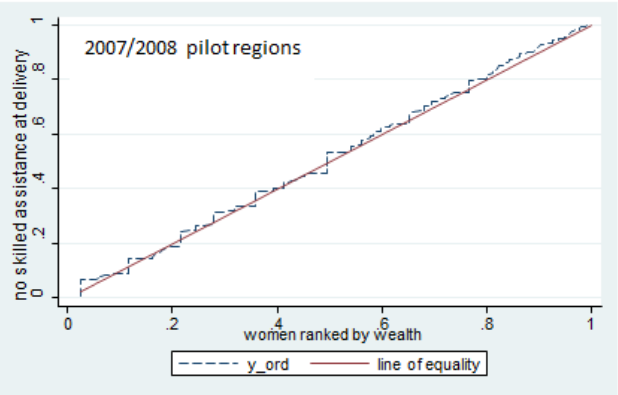




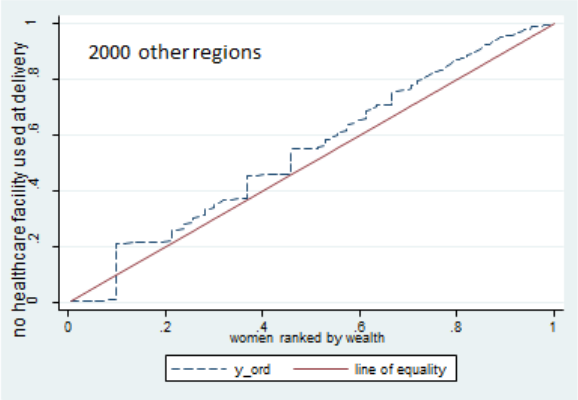
11.6.4 No Skilled Assistance –Pilot Regions

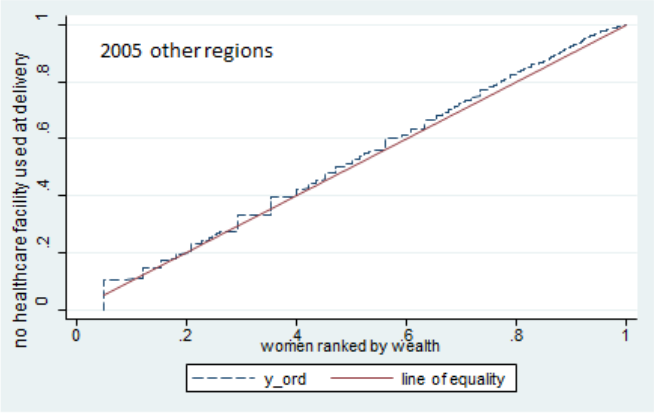


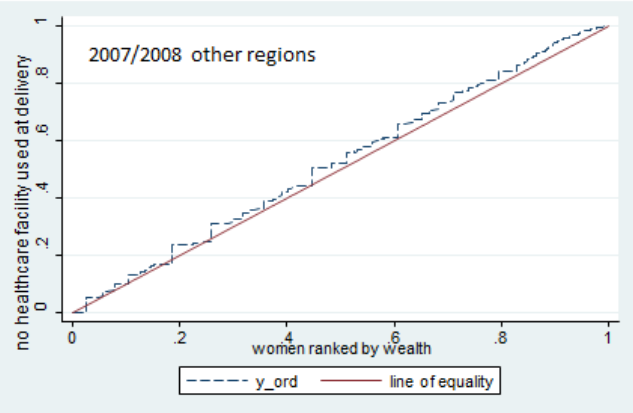




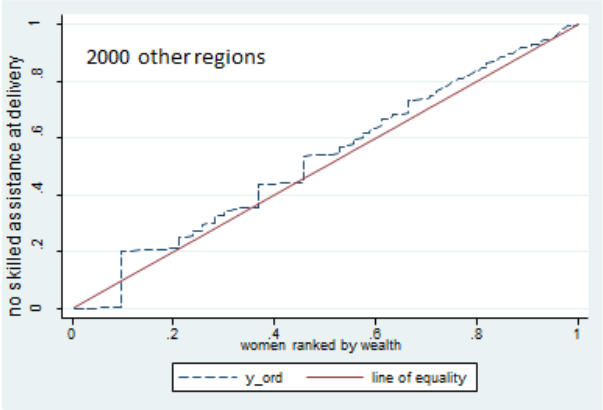
11.6.5 No Health Care Facility at Delivery – Other Regions

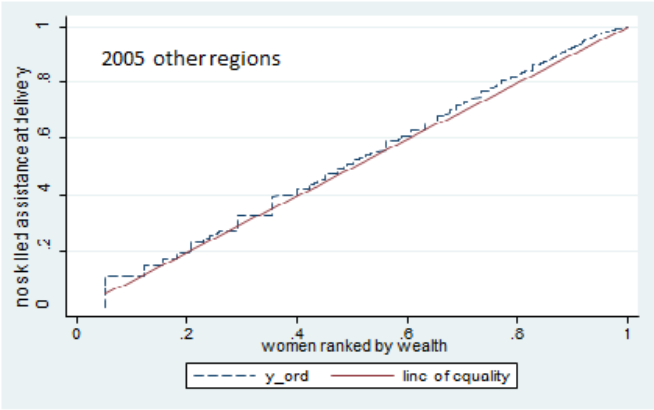


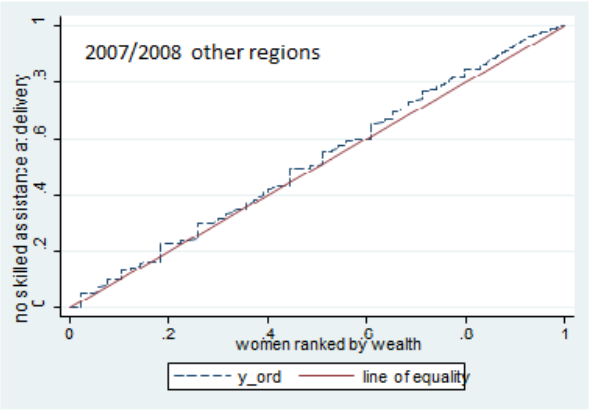




11.6.6 No Skilled Assistance at Delivery – Other Regions







11.7 Age Structure of Respondents