The Contribution of Micro-Health Insurance to Equity and Sustainability in Rwanda

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Abstract

Many countries are looking to health insurance to improve access to medical care for low-income groups and to raise additional revenues for a depleted health sector. In Rwanda, concerns about a sharp drop in demand for medical services after the re-introduction of user fees in 1996, motivated the government to design and pilot-test micro-health insurance (MHI) in three districts. This thesis compares the performance of the current Rwandan MHI with the user fee system and against principles of egalitarian equity and sustainability. It draws from the economic and social literature related to health insurance, equity and sustainability; and uses cross-sectional routine and survey data collected on insured and uninsured population groups from health centres, MHI, households, patients and focus groups during the Rwandan pilot phase (7/1998-6/2000). It aims to contribute to the research on equity and sustainability in health financing and utilisation by evaluating and comparing the implications of MHI and of user fees for households and on the health sector. The analysis comprises three main components. First, it examines the demand for health insurance in a binary choice model. Second, following egalitarian equity principles and the minimum standard approach, it evaluates the impact of utilisation and financing of health care on the financial situation of insured and uninsured households. Third, it uses an econometric cost function that allows identification of payer-specific outputs to analyse and compare the cost and efficiency implications of MHI with capitation payment versus user fees in health centres, in order to test the hypothesis that providers adjust the treatment intensity to the expected payment mechanisms. Based on findings, a MHI insurance design is derived to scale up risk-pooling and improve equity and sustainability in the district health system.

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Acronyms

AJL	Aronson Johnson Lambert effect
ATP	Ability To Pay
CBHI	Community-Based Health Insurance
CPI	Consumer Price Index
DHS	Demographic Health Survey
DRG	Diagnosis Related Groups
EOS	Economies of Scale
EU	Expected Utility
FFS	Fee For Service Provider Payment
GDP	Gross Domestic Product
HC	Health Centre
HIPC	Heavily Indebted Poor Country
HLCS	Household Living Condition Survey
ILO	International Labour Organization
LCMS	Living Condition Measurement Survey
LMIC	Low and Middle Income Country
MHI	Micro Health Insurance
MHO	Mutual Health Organizations
MOH	Ministry of Health
MSA	Minimum Standard Approach
NGO	Non Governmental Organization
NHA	National Health Account
ONAPO	National Population Office in Rwanda
OLS	Ordinary Least Square
PAHO	Pan American Health Organization
PHR	Partnerships for Health Reform Project
PL	Poverty Line
PPA	Participatory Poverty Assessment
PPO	Preferred Provider Organization
PSU	Primary Sample Unit
PPS	Prepayment Schemes
ROSCA	Rotating Savings and Credit Association
RS	Reynolds-Smolensky index
RVF	Returns to the Variable Factor

RWF	Rwandan Francs
SES	Socio-Economic Status
SII	Slope Index of Inequality
SIS	Health Information System (Système d'Information Sanitaire)
SRRVF	Short-Run Returns to the Variable Factor
TR	Technical Report
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USD	United States Dollars
WB	World Bank
WHO	World Health Organization

Official period averages of nominal exchange rates: (Source: National Bank of Rwanda)

1999: USD 1 = Rwandan Francs (RWF) 335

2000: USD 1 = Rwandan Francs (RWF) 390

2001: USD 1 = Rwandan Francs (RWF) 440

Part I

Chapter 1: Introduction

Although additional resources were needed to reach the goal of "Health for All" by the year 2000, economic disturbances, currency devaluation, growing foreign debts, increasing fiscal deficits, and an upsurge in inflation have kept public health spending low in many low-income countries (Abel-Smith 1992; Wagstaff and Van Doorslaer 1998). In response to diminishing public revenues, medical providers started to charge user fees to patients to maintain revenue levels in the public sector. However, user fees have been criticized as insufficient to finance increasing medical costs and strengthen the health system's financial sustainability (Nolan and Turbat 1995; Gilson 1996).

At the same time, socio-economic crises have made household income volatile. In 1998, the share of the population who live on less than USD 1 a day was estimated at 46 percent in Sub-Saharan Africa, 40 percent in South Asia, and 16 percent in Latin America (World Bank 2000). Concerns arose about access to medical care among the poor when user fee levels caused an increasing proportion of the population to reduce their medical service use (Abel-Smith 1992; Gilson 1996; Bennett et al. 1998). Weakly defined and implemented exemption mechanisms have perpetuated the situation (Willis and Leighton 1995; Gilson 1996). These factors suggest that the current way health care is financed has not been effective in improving access to care and has caused many low- and middle-income countries (LMIC) to rethink the financing and organisation of their health care systems.

Many countries are looking to health insurance as an alternative mechanism for financing health care and as a way to improve access to medical care for low-income groups (Abel-Smith 1992; Diop et al. 1995; Bennett et al. 1998; Yip and Berman 2001). Health insurance collects funds to pool and reduce the individual financial risk caused by the uncertainty about future health status (Hurley 2000). Insurance lowers the out-of-pocket price for medical care at the time of purchase by smoothing payments across individuals and time (Barr 1992). However, the degree to which health insurance contributes to financial sustainability by reducing the financial pressure on public health care systems and improves access to care for the poor are empirical questions which have yet to be addressed by policy makers and research.

Different types of health insurance systems exist and have been influenced by country-specific health policy objectives, institutional and market contexts, the population's socio-economic and cultural backgrounds, and the demand for insurance. In middle-income countries with strong formal sector employment, compulsory, state-organized health insurance systems, and voluntary, private health insurance are predominant. These insurers contract with or provide medical care in public and private health facilities (World Bank 1992).

In low income countries, problems related to information and contract enforcement limit the effectiveness of insurance markets, and have caused the poor to devise their own informal pooling and lending mechanisms to protect themselves against financial risks. Commonly, these risk-protection mechanisms are referred to as micro-health insurance (MHI), community-based, community-managed, or community-financed insurance schemes, mutual health organisations, "mutuelles", or prepayment schemes (PPS).

Like standard health insurance, these risk-sharing schemes pool members' financial risk related to health by collecting small amounts of revenue from each member, to improve their financial access to health care and to raise resources for a financially depleted health sector (Bennett et al. 1998). Most of these informal risk-sharing mechanisms are: based on mutual, non-written agreements; monitored and enforced by group members; and organized on a community, a health facility's catchment area, cooperative, or workers' union level (Bennett et al. 1998). Besley (1995) sums them up as non-market institutions *"...that make little use of* *formal contractual obligations enforced through a codified legal system. There can, however, be well-defined rules of operation among the members of the institution, which are either embodied in a constitution or time-honoured tradition"*[1] (Besley 1995).

In Rwanda, concerns about a sharp drop in demand for medical services after the re-introduction of user fees in 1996, motivated the government to design and pilot-test micro-health insurance in three health districts before introducing it nationwide. Technical assistance was provided by the Partnerships for Health Reform (PHR) project. By offering insurance in a predominantly user fee financed health sector, the government aimed to improve access to health care, quality of care and contribute to the system's financial sustainability. Another objective was to have community representatives actively participate in designing their insurance schemes to ensure that MHI responds to the needs of this rural population (Schneider et al. 2000a).

Designing health insurance involves choices about insurance features to balance the tradeoffs between risk-sharing and incentives. While risk-sharing through health insurance leads to gains in form of better access to care, some insurance features set behavioural incentives to market agents, which may lead to inefficiency and endanger the financial sustainability of insurance (Arrow 1963; Zeckhauser 1970; Manning and Marquis 1996; Cutler 2000). These incentives arise because of asymmetric information: the inability of insurers to monitor the actions of the insured and the provider. They include adverse selection, moral hazard, and supply-side induced demand. Adverse selection is caused by individual enrolment when primarily high-risk individuals insure themselves, resulting in high-risk pools. Moral hazard occurs when the insured overuse medical services because they co-pay a reduced price for care at the time of use. Supply-side induced demand results when providers oversupply care as a result of being reimbursed based on the number of services provided under fee-for-service (FFS) provider payment. One way the insurer can respond to these incentives is to

[1] Pages 115-116.

shift part of the insurance risk to the insured and providers, who as a result will bear more risk than they would like (Cutler 2000).

An extensive body of literature describes issues related to design, organisation, functioning, and the financial performance of MHI (Abel-Smith and Dua 1988; Diop et al. 1995; Atim 1998; Bennett et al. 1998; ILO/PAHO 1999). In 2000, the ILO published an overview of 130 MHI schemes from 26 countries in Africa, Asia, and Latin America (ILO STEP 2000). Bennett et al. (1998) collected and evaluated information on the organisational, management, and financial features of 82 rural and urban non-formal sector health insurance schemes in Asia, Africa, and Latin America. Atim et al. (1998) gathered data from an inventory of 50 mutual health insurance schemes in six West and Central African countries[2] (Atim et al. 1998). A report on 15 health insurance cases examined the requirements related to institutional and economic factors to extend insurance coverage in developing countries (La Forgia and Griffin 1993). ILO/PAHO synthesized eleven case studies on micro-health insurance in Latin America and the Caribbean (ILO/PAHO 1999). In a more recent report, ILO evaluated the impact on health policy goals of 258 community-based health organisations (ILO 2002).

One common finding in these studies is the lack of data and analytical work on MHI. Hence, it is not surprising that in the absence of evidence on their effectiveness, the contribution of MHI to equity in financing and delivery of care or to sustainability in the health sector has been questioned.

In addition, many risk-sharing schemes have emerged without the necessary technical assistance during the design phase. This has resulted in insurance designs that cause inefficiency in the consumption and supply of care, and negatively affect the financial viability of MHI (ILO/PAHO 1999; Liu and Mills 1999). To protect their financial situation, some MHI tend to sacrifice equity goals by increasing premium levels and adopting measures

[2] Benin, Burkina Faso, Cameroon, Mali, Senegal, Togo.

to deter the sick from enrolling. As a result, poor households have been excluded from enrolment, as they cannot afford to pay increasing premiums and co-payments, or because they are economically active in the informal sector, where MHI is less likely to be offered (Abel-Smith and Dua 1988).

These concerns about the effectiveness of MHI have created a need for research on risk-sharing strategies to examine how MHI can become an effective alternative to user fees and contribute to health policy objectives including better quality of care, the efficient use of limited resources, equity in financing and utilisation of care, and sustainability in the health sector (Mills 1983; Diop et al. 1995; Bennett et al. 1998; Gilson et al. 2000).

This thesis aims to contribute knowledge about health insurance in a low-income context, and respond to this research need by assessing the performance of the Rwandan MHI against principles of equity and sustainability.

Equity in financing and utilisation of health care is defined according to the egalitarian equity principle: health care is financed according to households' socio-economic background; and medical care is allocated based on patients' health need promoting equality in health status (Wagstaff and Van Doorslaer 1998). A sustainable MHI is considered as a function of two components. First, an insurance design that sets incentives for efficient production and consumption of medical care, and for efficient MHI management; and second, a mix of funding from private, public and donor sources that ensures equity in health financing. Together, these components reflect a socially sustainable MHI, whose credibility will attract regular funds from donors and government to complement premium revenue and ensure equity in financing and covering of full operational cost on a sustainable basis (Uvin et al. 2000).

1.1 *Aims and objectives*

This thesis puts forward evidence on the Rwandan prepayment schemes and their impact on equity and sustainability in the health sector. It draws from the economic and social literature related to health insurance, equity and sustainability; and uses routine and survey data collected on insured and uninsured groups from providers, MHI, households, patients and focus groups in Rwanda over the period July 1998 to September 2000 to evaluate the contribution of the current MHI to equity in health financing and medical service use, to the protection of poor households' socio-economic situation against unforeseen financial shocks related to ill-health, and to sustainability in the health sector. Based on findings, a MHI design is proposed with risk-pooling on a district level.

Two specific objectives have guided the research:

Objective 1 - Based on the economic and social literature on decision-making under risk, health insurance, equity and the minimum standard approach and by using data collected during the Rwandan prepayment phase, to evaluate whether MHI responds to egalitarian equity principles in health financing and in medical service use, and protects the socio-economic situation of the poor against financial shocks related to ill-health.

> First, to identify socio-economic and demographic characteristics that determine the demand for MHI among households who have the option to insure or remain uninsured.
>
> Second, to examine the degree to which MHI contributes to horizontal equity in utilisation, compared to user fees.

Third, to quantify and compare the progressivity and redistributive effects of MHI and of user fees to see which system better responds to the egalitarian equity notion in utilisation and financing of health care.

Fourth, based on the minimum standard approach to evaluate and compare the impact of MHI and of user fees on households' socio-economic situation.

Objective 2 – To develop a sustainable risk-sharing design on a district level.

First, based on payer-specific cost analysis, to examine and compare the impact on recurrent cost and efficiency in health centres of MHI with capitation payment and of user fees paid by the uninsured.

Second, based on the equity, cost and efficiency results from the above analysis, to derive a MHI design for an eventual scale up of MHI coverage and benefits.

The literature and existing evidence from the Rwandan pilot phase experience are used to support the findings of this research. Previous PHR analysis on MHI membership and utilisation and financing conducted tabulated mean values by insurance status. Results were presented to the Ministry of Health and the project financer (Schneider et al. 2001a). This thesis differs from previous PHR analysis (see Annex Table 4).

The thesis contains eight chapters divided into four parts, and an appendix. The next Chapter begins with a literature review on concepts related to equity, sustainability, and health insurance, and derives the analytical framework. The third Chapter describes the study area, survey methods and data sources. Chapter 4 advances on the PHR report (Schneider and Diop 2001) by conducting additional specifications and checks on the demand for insurance. The analytical Chapters 5 and 6 are completely new. Chapter 5 evaluates the implications of MHI and user fees on horizontal equity in utilisation, the progressivity and the redistributive effect of health financing; and following the minimum standard approach, the extent to which MHI and user fees protect households' socio-economic situation against the financial risk related to ill-health. Chapter 6 uses an econometric approach to conduct a payer-specific cost-analysis in health centres. Based on these analytical results and a review of the scale up literature, Chapter 7 discusses overall findings and concludes with recommendations for policy-makers and implications for further research. The appendix contains information in support of the thesis; and a list of articles written on the basis of this analysis that have been submitted to peer-reviewed journals.

Chapter 2: Literature Review

This Chapter begins with an overview of the literature on theories related to equity, sustainability and health insurance, which leads to deriving the analytical framework.

2.1 *Equity in health financing and utilisation*

2.1.1 Theories of equity

Equity is a normative concept, grounded in the principle of distributive justice (Le Grand 1991). A distribution or allocation is "... *an assignment of objects to specific individuals*"[3] (Young 1994). According to Le Grand (1991), equity in a distribution needs to be evaluated considering an individual's personal choice-set between different goods. If goods are distributed unequally due to personal choice, then the result is not considered as inequitable. However, it will be inequitable if this happens for reasons beyond personal control, including individuals' socio-economic and initial endowment situation and to some extent their 'cultural' preferences. Also, chance or bad and good luck affect an individual's choice and how equitable a distribution is (Le Grand 1991).

A distribution involves three decisions: the amount to be allocated, the allocation rule, and an individual's reaction to the distribution (Young 1994). Applied to health, it implies identifying the amount of medical care made available to different groups (Gwatkin 2001), and defining how the burden of health financing is distributed among the population.

An allocation rule is a "... *method that allocates any given supply of goods among any potential group of claimants according to the salient characteristics of these claimants*"[4] (Young 1994). It invokes principles to justify the allocation. The three main distribution concepts are parity, proportionality, and priority. Parity means that all individuals are treated equally, mainly because they are equal. Under proportionality, differences among people are

[3] Page 7.
[4] Page 8.

recognized and service is provided in proportion to these differences. Priority causes the person with the greatest claim (e.g. the sickest) to receive the service (Young 1994). Health financing and delivery mechanisms can be designed such that they respond to parity, proportionality or priority rules.

Finally, an individual decides how to react to the allocation depending on his or her preferences (Young 1994). In circumstances of certainty or full information, individuals' choices are rational when determined by a rational set of preferences. However, due to asymmetric distribution of information in health care, patients tend not to be fully informed about their options (Arrow 1963). In addition, moral constraints, preferences shared within communities, power situations, and peer-pressure by others (Fukuyama 1995) may influence individuals' reactions to distributions and distributive outcome. In health, this may cause patients to receive inferior quality care with traditional healers instead of treatment by a professional medical provider.

Different equity theories suggest how goods can be distributed. They go back to Aristotle, who said that 'goods should be divided in proportion to each claimant's contribution' (Young 1994). Other notions are the utilitarian and the libertarian views, Rawls' theory of justice, and the egalitarian view.

All these theories, and most obviously utilitarianism, assign an important place to conceptions of individual good, welfare, or well-being, which tend to be measured by levels of utility or of preference-satisfaction. This preference-satisfaction view has been questioned. In applied work, more objective measures like income are used to proxy preference-satisfaction. Rawls' theory of justice proposes an alternative conception of well-being. Well-being is measured by an "index of primary social goods", which includes all-purpose goods such as rights, opportunities, wealth, income and education. This index does not serve as a proxy for utility level. Rather, it reflects a basis for reaching a social agreement on the important components of well-being (Hausman and McPherson 1993).

Sen (1997) sees Rawls' primary social goods approach as incomplete. He suggests that not only external goods, but also individuals' internal features and capabilities such as their health status, affect their well-being. Being in good health may be impaired by internal obstacles (being handicapped) and external ones (lacking the money to pay for care). Following Sen, well-being should be defined in terms of the set of "functionings" an individual achieves. It requires assigning relative weights to different capabilities and "functionings" (Sen 1997). These different approaches show that although income is by no means the only way to measure well-being, practically, it is one of the easiest.

Utilitarianism is distribution-indifferent and does not allow distinguishing between different individuals. It has an aggregative focus on equality, aiming to maximize some function of the sum of individuals' welfare. The assumption is that everybody's initial capacity is equal. Thus, everyone should be treated the same way in arriving at simple aggregates (Sen 2001). Utilitarianism implies allocating resources efficiently according to the likelihood of success, and in order to maximize social welfare. The utilitarian notion has been criticized as ethically questionable: it might impose harm on a few to improve the situation for many (Young 1994). Non-utilitarian views that emphasize the notions of fairness and justice understand fairness and justice in the sense of treating the interest of different individuals accordingly, which might involve avoiding harm to other people (Hausman and McPherson 1993).

The libertarian equity view is concerned with free choices. It advocates the distribution of goods according to individuals' choice and willingness to pay for the different type of goods they want. In health, free choice 'gives people the freedom' to purchase the kind and quality of health care they like and are willing to pay for (Wagstaff and Van Doorslaer 1993). This freedom can be limited by rights.

Rights may justify imposing a variety of duties on individuals. The right to health could be justified on the grounds of overall well-being, and invoke the duty of seeking care with professional medical providers only, which limits freedom of choice (Hausman and

McPherson 1993). This is relevant in a low-income context. Traditional healers could offer ambiguous quality of care and fail to inform people about the causes of illness. In such cases, the libertarian view of 'free provider choice' could be considered as dangerous, and individuals' care-seeking behaviour as driven by 'cultural preference', leading to inequitable distributions.

According to Rawls' theory of justice, a distribution should invoke a social minimum that is comparable to a basic "safety net" to those who cannot support themselves, or a minimum standard. This social minimum involves two principles. First, people have equal rights to the most extensive basic liberties (principles of priority of liberty). Second, social and economic inequalities should be to the greatest benefit of the least advantaged, and attached to positions open to all under fair equality of opportunity (difference principle) (Hausman and McPherson 1993).

The "maximin" interpretation of Rawls focuses on the difference principle. It suggests that society should maximize the primary goods for the least well-off representative individual. This would result in income of the least well-off being maximized, based on principles of justice and not of charity. Thus, Rawlsian justice and utilitarianism provide scope for redistributive activities to raise average welfare or to protect the least well-off (Hausman and McPherson 1993).

The egalitarian twin principle of equity is based on the Marxist principles 'from each according to his ability' and 'distribution according to need' (Wagstaff and Van Doorslaer 1993). The underlying rationale is that health is a precondition for people to live as human beings. Health is generally affected by unforeseen shocks and health care is perceived as the solution to restore health status following a shock (Culyer and Wagstaff 1993).

The egalitarians consider a system as equitable if it is financed according to individuals' income situation or ability to pay, and if treatment is distributed based on patients' need to achieve better health, as judged by providers and unrestricted by patients' income and wealth.

Individuals' 'ability to pay' as revealed by socio-economic status has always served as a base to define financial contributions, e.g. taxes (Wagstaff and Van Doorslaer 1993; Young 1994). 'Need' as expressed by reported illness or health status tends to be juxtaposed with treatment received; though this connection is controversial as the poor might ignore illness more (out of necessity) than rich individuals do (Van de Walle 1994).

Equity theories focus on the distribution of delivery and financing of health care, and are less concerned about the poverty implications of health care payments. But health and poverty are intertwined. An illness that is unprevented or untreated for reasons like poverty, rather than personal choice, has a particular negative relevance to equity (Sen 2001).

Poverty tends to be described by the ability to purchase a given bundle of goods in absolute terms, or by people's perception of the amount of money needed to get along in relative terms. Absolute poverty serves to derive a fixed poverty line (PL), comparable to a minimum living standard for survival, according to which the poor are classified below and the non-poor above the line (Deaton 1998). Financial shocks caused by ill-health may affect individuals' consumption as well as earning capacities, and push them into or further below the poverty line (Wagstaff 2001).

The minimum standard approach (MSA) is concerned with medical expenditures causing households' initial endowment or income to exceed or fall short of a threshold, defined in proportional or in absolute terms of income. A proportional threshold implies that health care payments do not exceed a pre-specified fraction of income, and excess spending would be considered as catastrophic. The poverty line is an example of a threshold defined as a minimum in terms of the absolute level of income (Wagstaff and Van Doorslaer 2001).

Based on the moral position that no one ought to spend more than a given fraction of income on health, the MSA aims to ensure that households have enough money to pay for other goods (Wagstaff and Van Doorslaer 2001). This position relies on basic human rights, such as the universal entitlement 'to a standard of living adequate for the health and well-being of oneself and one's family, including food, clothing, housing, and medical care'[5] (Pogge 2002). Thus, health financing action or inaction leading to poverty, or failure to respond to health financing conditions that perpetuate poverty, reflect violations of basic human rights (WHO 1978).

This thesis considers both the utilitarian and libertarian equity principles as inappropriate in the health insurance context researched. They may cause harm or grant access to medical care of ambiguous quality. Rawls' theory of justice is dismissed on the grounds that the focus of this thesis is on equity in financing and utilisation, rather than on procedural justice; however, it is recognized that the maximin interpretation of Rawlsian justice reflects egalitarian equity principles. The thesis applies the egalitarian view to examine equity in delivery and financing of health care, and the minimum standard approach to analyse the financial implications of health financing and whether MHI is a means to effectively protect households' income against financial shocks created by ill-health, compared to user fees.

2.1.2 Equity in health

Health is seen as a precondition for people to flourish as human beings. A population's health is affected by a set of proximate determinants including a country's accumulated 'stock of capital' like medical capital, sanitation, and access to safe water (Creese and Newbrander 1992); and citizens' financial and geographical access to quality care like surgery and treatment of infectious diseases (Wilkinson 1996); the distribution of financial and human assets among citizens; and community factors like social values, lifestyle, and attitude towards risk (Wagstaff 2001).

Health inequalities have widened within many societies and mostly to the disadvantage of the poor (Wagstaff 2001); and become an inequity problem if a society disagrees with the rich

[5] Article 25 of the Universal Declaration of Human Rights, approved and proclaimed as resolution 217 A (III) by the General Assembly of the United Nations on 10 December 1948.

receiving superior care. Health inequity is embedded in a larger understanding of justice (Sen 2001). It reflects the systematic differences across socio-economic groups in one or more aspects of health (Macinko and Starfield 2002), including achievement of health, the capability of achieving health, and the distribution of health (Sen 2001). Pursuing equity in health means eliminating health disparities between different socio-economic groups, which requires correcting the fundamental causes of disparities (Wilkinson 1996).

Thus, health inequalities cannot be surmounted by health financing reforms alone, but need to be addressed on a macro-economic level through broader socio-economic reforms. MHI may improve access to care and narrow the health inequity gap among its members over time. However, in Rwanda, detailed longitudinal data on health status would be needed to conclude on the association between MHI membership, members' health status and health inequalities. Health inequalities will therefore not be investigated in this thesis.

2.1.3 Equity in utilisation

The rationale for looking at equity in utilisation of medical care is based on the presumption that health care is the appropriate way to restore ill-health (Culyer and Wagstaff 1993). According to the egalitarian equity notion, equity in utilisation of care means that those in equal need use care equally. This implies that health personnel provide care according to patients' health status. As suggested by the priority principle, it results in preferential care for the severely ill, in order to reduce health differences between them and the less sick (Young 1994).

The egalitarian perception that equity in utilisation should not adversely affect the living standard of households serves as a link to equitable health financing (Wagstaff and Van Doorslaer 2001).

2.1.4 Equity in financing

The use of medical care can be expensive and endanger households' ability to purchase other goods and services they need to flourish as human beings, such as food or clothing (Culyer and Wagstaff 1993). In this thesis, a fair distribution of utilisation and financing of health care relies on two conditions: (1) the egalitarian equity principles of progressive health financing and utilisation of health care based on patients' health status; and (2) the minimum standards approach.

Following methods used in the taxation literature, equitable financing of health care can be based on horizontal and vertical equity concepts (Kakwani 1977; Aronson, Johnson and Lambert 1994). Horizontal equity in health financing implies that individuals with equal income make equal payments, independent of health status, gender, or place of residence (Wagstaff and Van Doorslaer 1993).

Vertical equity in financing recognizes that the initial income and wealth distribution is inequitable. The resulting financing policy aims to correct for these inequities by setting progressive income-dependent financing rates, with higher income groups contributing a higher rate of their income to health than poorer groups (Le Grand 1991). Regressive health financing (a growing share of income as income decreases) would contribute to inequitable health financing. For example, social insurance leans towards regressivity if it is a fixed proportion of earning up to a maximum (Van Doorslaer and Wagstaff 1993). The justification for using the progressive financing principle in this thesis is that the richer can absorb the costs of paying a higher rate more easily than the poor (Young 1994).

In the context of already high levels of poverty, it would be considered as unjust if health financing would have an adverse affect on poor households' disposable income and push them further into poverty. This has been suggested based on evidence from Asia, where user fee payments have pushed more near-poor into poverty and the poor further into poverty (Liu and Hsiao 2001; Wagstaff and Van Doorslaer 2001). Hence, in a very poor society, progressive health financing may be insufficient to protect the poor. Therefore, this thesis also uses the minimum standard approach to evaluate the impact of health financing on insured and uninsured households' socio-economic situation.

2.2 *Sustainability through MHI*

Whether a health financing mechanism is sustainable depends on the financial, organisational and institutional context, which is presented in this section.

2.2.1 Financial and organisational sustainability

The notion of sustainability has changed over time. In the seventies, donors argued that sustainability is *"the capacity of the health system to function effectively over time with minimum external input"*[6] (LaFond 1995). The term 'minimum external input' has been interpreted as health systems becoming self-reliant. From this donor point of view, a project was perceived as sustainable when - once initial start-up costs were financed by donors - governments take over donor responsibilities, including operational costs, and are able to cover project costs independent of donor assistance (LaFond 1995). This narrow, financial notion of sustainability has been mostly abandoned.

The focus has shifted from 'input' only to include sustainable 'output'. In 1995, the World Bank defined sustainable health financing as *"the capacity to generate, over time, sufficient, reliable resources to deliver continued and improved health for a growing population with a minimum of external inputs. It requires sufficient inputs into the health system, the effective and efficient use of these resources, and the delivery of services on a continuous basis"*[7] (World Bank 1998). This sustainability definition acknowledges the need for some external inputs and for capacity building *"to redress existing inefficiencies in resource use and to*

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[6] Page 17.
[7] Page 10.

enable any additional revenue to be used effectively over time..."[8] (Gilson 1996). It relates financial with organisational sustainability.

A definition from 1997 suggests that financial sustainability reflects "*the extent to which national or local health expenditures are funded from national resources, or more flexibly, as the medium to long term stability of a mix of funding sources*"[9] (McPake and Kutzin 1997). Such a funding mix includes taxation, social insurance contributions, user fees, private health insurance, and loans and grants from donors. The emphasis is on the stability of a funding mix, which can include external sources.

More recently, sustainability definitions focus on long-term donor financial commitment and strengthening of human, organisational and institutional capacity. Sustainable health services are defined as "... *operated by an organisational system with the long-term ability to mobilize and allocate sufficient resources for activities that meet individual or public health needs*" (Olsen 1998). The sustainability of health services is affected by (1) the socio-economic environment; (2) the health sector's activity profile such as the health services to be delivered; and (3) organisational capacities for service delivery (Olsen 1998).

This concept highlights the system's performance while acknowledging various constraints. It leads to the definition of 'social sustainability', meaning that an organisation is seen as socially sustainable if its credibility and quality of performance attract durable funds from donors and government to complement market-derived income to meet full operational cost on a sustainable basis (Uvin et al. 2000).

A sustainable health insurance scheme needs a large and growing membership pool. Insurance enrolment may be affected by consumers' trust in insurers' and providers' performance, as expressed by their adherence to professional practices and standards (Mechanic 1996). This trust-enrolment-sustainability link also highlights the fragility of

[8] Page 36.
[9] Page 40.

health systems when performance is weak. Consumers' placement of trust in insurance may be conditional upon consumers' trust in providers who contract with the insurance. Hence, withdrawing trust by one actor may have a domino effect throughout the system and threaten its sustainability (Coleman 1984).

Applied to the MHI context, organisational and financial sustainability are important issues. MHI tend to serve a population who is too poor to finance its own medical service use and insurance premium; and MHI mainly operate in low-income areas, where organisational and human capacity is limited and illiteracy rates are high (Bennett et al. 1998).

This suggests that the financial sustainability of MHI relies on the medium to long term stability of a mix of funding sources. In addition, as poor people lack resources, human capacity, information, and access to outside sources for help to run complex organisations, the organisational sustainability of MHI requires technical and financial assistance to develop organisational capacity and skills in management, administration, negotiation, information systems, and evaluation.

As resources are fungible, the financial sustainability of MHI should be monitored and evaluated within the broader health system. A health sub-system, such as MHI, might appear to be financially sustainable but in fact, could be drawing resources from other sources, including from uninsured patients (McPake and Kutzin 1997).

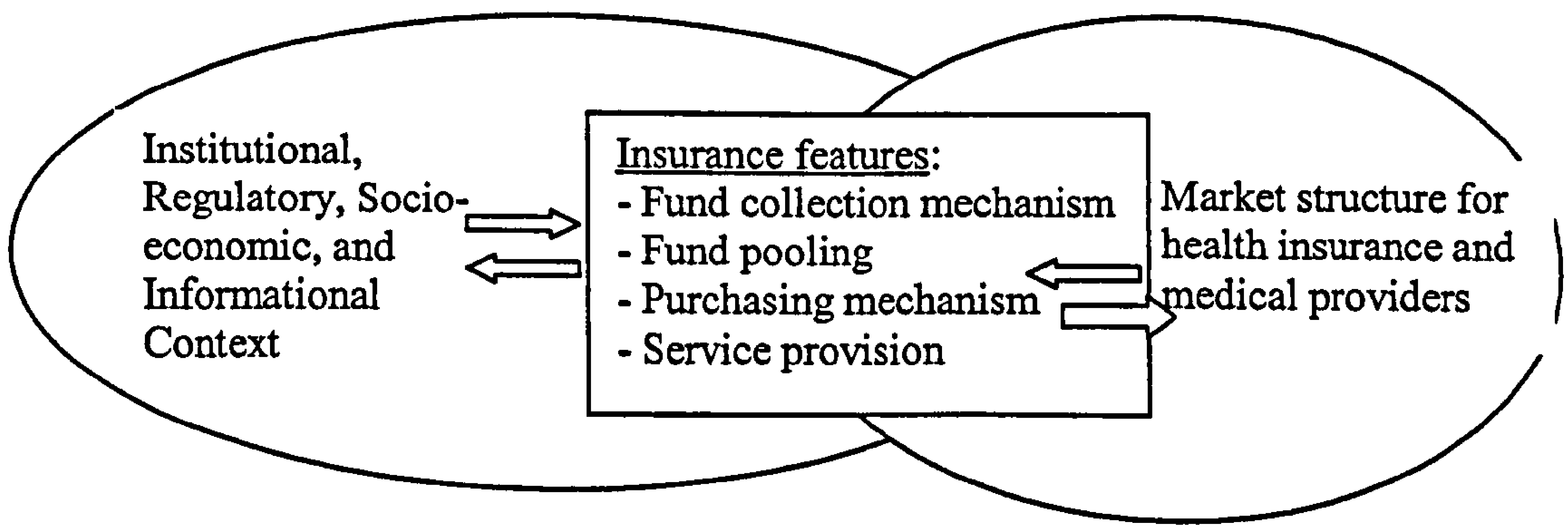
2.2.2 Sustainability within the institutional context

The market and institutional context within which a health system operates may affect its sustainability. The institutional context contains the formal rules and informal norms which define how agents interact in a market, and may support equitable health financing and the efficient use of resources (Mills et al. 2001). The market structure sets behavioural incentives to insurers, thereby influencing the extent to which they compete with each other for population groups and better quality providers (Kutzin 2001).

In the context of MHI, quality competition may be less relevant. This is because there are few MHI and providers in a local market and financial constraints limit poor consumers' choice of MHI and providers. But if competition does improve a system's effectiveness, then its absence highlights the importance of effective institutions.

Figure 2.1 visualizes this relationship. It depicts four insurance features (discussed in the next section) within the institutional context and the health market structure (Kutzin 2001).

Figure 2.1: Insurance within the institutional and market context



(Source: adapted from Kutzin, 2001)

To be sustainable within this environment, insurance should adapt to area- and trade-specific living and working conditions of its target population, and be responsive to political opinion leaders and the communities within which it operates (Bennett et al. 1998; Gilson et al. 2000; Wagstaff 2001). Governments play an important role by ensuring an institutional, administrative and legal framework that supports the sustainability of organisations.

Considering the socio-economic and institutional context within which MHI operates, a sustainability concept is derived for this thesis that sees MHI as a function of three components. First, an organizationally sustainable MHI relies on human capacity and organisational self-reliance. In a context of poverty and high illiteracy rates, this organisational component requires technical and financial assistance, and structures that develop and support existing capacities (e.g. MHI managers) on an ongoing basis. Second, the insurance design sets incentives for efficient production and consumption of medical care. Third, MHI attracts a mix of funding from private, public and donor sources that ensures equity in health financing.

Together, these components reflect a socially sustainable MHI meaning that technical and financial assistance targeted to skill and organisation building will enhance the quality of performance of member-managed and -owned MHI. The resulting MHI credibility will attract durable funds from donors and government to complement premium revenue and ensure equity in financing and covering of full operational cost on a sustainable basis.

2.3 MHI features and their relationship with equity and sustainability

Health insurance features include: fund collection, pooling, provider payment, and service provision (Kutzin 2001). They set behavioural incentives that affect equity and sustainability in health financing and delivery. Table 2.2 at the end of this section provides an overview.

2.3.1 Fund collection

Insurance funds include voluntary and compulsory premiums paid by individuals and employers, and subsidies from donors and governments (Kutzin 2001).

Due to the asymmetric distribution of information in health systems, premiums may set incentives to insurers and individuals that lead to adverse selection and risk selection (Mas-Collel, Whinston and Green 1995). Adverse selection by individuals is comparable with 'lemons' or inferior quality cars in an automobile market. Individuals know that they are 'lemons' or high risks, which they can hide from the insurer, who does not know whether the premium charged reflects individuals' risk level. Rational high-risk individuals aim to enrol at an average premium level that underestimates their risk (Akerlof 1970). Low-risks will opt for low premium with higher co-payments, or choose not to insure if the premium is too high relative to their risk status (Hurley 2000).

Individuals' self-selection allows insurers to estimate their loss probability, and select risks by encouraging or discouraging individuals from enrolling. Insurers' seeking of favourable risks is referred to as "cream-skimming", whereas "dumping" means shedding bad risks (Ellis 1998). Risk selection hampers equity objectives if the poor are high-risk patients and the premium becomes unaffordable for them (Rothschild and Stiglitz 1976).

Premiums are either calculated based on community rating, risk rating, or income (Barr 1992; Sheldon and Smith 2000). Adverse selection is problematic under community rating as all pay the same premium, independent of their health risk and income. Private insurers charge risk-based[10] premiums by accounting for consumers' risk of service use to prevent adverse selection and high risks from enrolling (Begg et al. 2000). Income-dependent premiums are defined independent of individuals' health. Like taxes, income-dependent premiums can be set as proportional or progressive rates of income. The purpose of progressively set rates is twofold: first, to ensure equity in health financing; and second, to redistribute finances within an insurance pool by cross-subsidising care from richer "low-service users" to poorer "high-service users" (Sheldon and Smith 2000). This latter objective may not be reached, if the richer happen to be high service users.

Insurance that serves a poor population is likely to generate insufficient revenue from total premiums to cover insurance expenditures, necessitating some form of external subsidy. Generally, governments subsidize the supply-side of medical care, mainly in hospitals, which

[10] Rates are generally defined proportional to individuals' expected cost based on observable characteristics, mainly gender and age. The US federal Medicare program, for example uses age, gender, welfare status, and county-of-residence adjusters to set prices to managed-care plans.

raises equity concerns if the poor use less subsidised care than richer groups (Castro-Leal et al. 2000).

An alternative mechanism for delivering a subsidy is through the demand-side by targeting the poor through subsidised insurance premiums. Subsidizing insurance of the poor can be justified by efficiency arguments related to the merit good nature of health insurance and the positive externalities generated by improved access to health care, which could prevent the spread of infectious diseases (Begg et al. 2000).

Although subsidies contribute to cost recovery and equity, MHI and providers still have the behavioural incentive to "cream-skim" or shift costs across different payers, for example by increasing premiums and co-payment levels for the insured, or user fees for the uninsured.

2.3.2 Pooling of insurance funds

Insurance pools and spreads different and independent financial risks related to illness over a large number of pool members, aiming to reduce each member's stake at risk (Begg et al. 2000). In voluntary health insurance, the pooling and collecting organisations are identical, whereas in a compulsory system, health insurers may pool funds and the government collects them (Kutzin 2001).

The insurance pooling equilibrium may become unstable due to adverse selection and cream-skimming, and endanger insurance sustainability. In a competitive market, a pooling equilibrium is unstable when other insurers bid away the low-risks by offering them a lower-price policy (Rothschild and Stiglitz 1976; Barr 1992). In practice, some pooling with heterogeneous individuals exists and high-risk, rather than low-risk, individuals are excluded from insurance, mainly due to pre-existing conditions. Nonetheless, insurers' risk-segregation in a given institutional setting will increase their contract costs (e.g. for establishing specific plans). Thus, only a limited number of plans will be offered in a local market, and some individuals may not find a welcoming insurance plan (Newhouse 1996), leading to equity concerns if these are mainly poor individuals.

Unstable pooling can be avoided by compulsory insurance, and limited in voluntary schemes by risk-adjusted premiums, group enrolment, waiting periods (e.g. of one month after enrolment before insured has right to use benefits), open enrolment, and by extending the enrolment time (Barr 1992).

2.3.3 Purchasing mechanisms

Purchasing is the transfer of pooled funds from the insurer to providers for contracted services provided to patients. This relationship is characterized by a multiple principal-agent problem, arising from asymmetric information. It involves delegation of responsibilities, decision-making authority and funds from an ill-informed principal (insurer) to a well-informed agent (provider) (Ellis and McGuire 1993). Both try to maximize their utility, while having asymmetric information, different attitudes towards risk, and different objectives (Mas-Collel et al. 1995).

Provider payment methods are either retrospective or prospectively defined. Under a retrospective or cost-based reimbursement (e.g. fee-for-service and per diem payment), insurers reimburse providers a negotiated price for each service provided. It imposes the financial risk on the insurer and gives no incentives to providers to improve their productivity. Rather, providers are encouraged to increase the quantity of services delivered, thereby contributing to patients' moral hazard behaviour and medical cost increases. Insurers will try to finance cost increases by setting higher premiums, or demand public sources to maintain financial viability (Barr 1992). Equity concerns arise if higher premiums exclude the poor from enrolment.

Prospective provider payments such as diagnosis related groups (DRGs) and capitation payments are lump-sum payments to providers. They are calculated by episode of illness, or by the size of population groups (Barr 1992). Prospective payment imposes the full financial risk on providers and sets the incentive to produce efficiently, that is to use the least expensive combination of inputs to produce a given amount and quality level of care (Barnum and Kutzin 1993). It discourages moral hazard behaviour and supply-side induced demand for care. But providers also have an incentive to avoid high cost patients if they receive the same capitation amount for each patient (Ellis 1998), and to under-provide care if patients are poorly informed and the marginal revenue of a service is less than marginal costs (Newhouse 1996). Risk-adjusted capitation payment reimburses providers higher amounts for more severely ill patients, independent of their socio-economic situation. This creates an incentive to provide the efficient level of services by reducing the returns to risk selection by providers.

Providers whose revenue sources come from several payment systems (e.g. user fees, fee-for-service, capitation, and patients' co-payment) have less incentive to be productive. Rather, they may try to shift costs across different payment systems (Newhouse 1996). If capitation payment does not cover providers' medical expenditures for the insured, providers may react by increasing user fees, aiming to cross-subsidize from uninsured to insured services. While such cost shifting will increase prices and limit access to care for the uninsured, it also sets an incentive to insure.

Providers may shift costs to the insured by increasing co-payment levels (Ellis 1990). Higher co-payment levels may limit moral hazard behaviour and enrolment choice in a competitive market; and create equity concerns if it limits treatment for the poor insured. It may also lead to contract re-negotiations between providers and insurers to adjust reimbursement rates, or limit the effect of mixed payment systems.

Thus, provider payments may set incentives that create inefficiencies and cost escalation. It leads to equity concerns if the less informed, among them the poor, are excluded from care.

2.3.4 Provision of health care services

Greater insurance coverage implies less risk bearing by the insured, who can buy more medical services than when paying user fees (Zeckhauser 1970; Cutler 2000). Providers use the money received from insurers to finance care allocated to insured patients. This allocation is characterized by asymmetric information: providers are better informed about diagnosis and treatment options than patients.

In the provider-patient relationship, insurance may create behavioural incentives that lead to inefficiencies, such as moral hazard and supply-side induced demand. Supply-side induced demand occurs when providers, knowing that patients do not pay the full price of treatment, have an incentive to increase the quantity as well as price of services provided, if they are reimbursed retrospectively (Hurley 2000). Moral hazard is treatment where marginal cost exceeds marginal benefit. It arises ex ante if insured individuals adapt a riskier behaviour and affect the probability of loss; and ex post if insured individuals affect the size of loss by inappropriate use of care as insurance reduces their expenditures (Zeckhauser 1970).

Moral hazard and supply-side induced demand threaten insurers' financial sustainability. Insurers will aim to limit related inefficiencies through demand-side cost sharing strategies, such as co-payments; or supply-side mechanisms (Hurley 2000). Patient co-payments affect care-seeking behaviour, but have little influence on providers' cost of care. Alternatively, some services may be excluded from insurance coverage, creating equity concerns if these services are mainly used by the poor. Supply-side cost sharing like capitation payment sets an incentive to providers to produce efficiently (Newhouse 1996). But it may also have negative quality effects on aspects of treatment not easily monitored by patients (Hurley 2000), which will most likely harm the less informed who tend to be the poor.

Table 2.2 presents an overview of the four insurance features and the underlying theories. The features can take different forms, which will result in different incentives to market agents and affect equity and sustainability in health care.

Table 2.2: Insurance features, incentives and equity and sustainability

Insurance features	Theoretical approach	Insurance financing features	Behavioural incentives caused by insurance features to market agents	Equity in demand for insurance and health care	Sustainability of health system
Fund collection	Asymmetric information Demand Expected Utility Equity in financing Minimum standard approach	Premium Co-payment	Consumers buy insurance if affordable	Improved access if premium and co-insurance affordable Inequity if premium unaffordable	Adverse selection by insured Risk-adjustment
		Demand-subsidies by donors and government	Subsidized enrolment for poor	Improved access for beneficiaries of subsidised premium	Subsidies ↑ insurance revenue Subsidies creates free riders and price distortion More poor members in bad health will lead to cost ↑ and premium ↑
Fund pooling	Asymmetric information Risk sharing	Risk-pooling Risk-spreading	Adverse selection Risk selection/cream skimming	Risk-adjusted premium may exclude the poor from insurance if high risk	Risk segmentation Adverse selection by consumers may cause risk selection by insurer
Purchasing mechanism	Principal agent Cost	Cost-based provider payment	Supply-side induced demand	Resulting cost increases may cause unaffordable premiums for poor	Inefficiencies in provision of care and cost increase
		Prospective provider payment	Risk selection Efficiency Cost-shifting to other payers	Providers skimping and dumping behaviour exclude the poor from access to care	Providers face ↑ in financial risk, which may lead to ↑ productivity Providers may shift cost in mixed payment system, leading to inefficiencies
Use of services	Agency Equity in utilisation	Benefit package	Moral hazard Supply-side induced demand	Equity in access ↑ depending on co-payment for insured	Moral hazard by insured Insurer will ↑ premium

2.4 Analytical framework: Equity and sustainability implications of MHI

Designing health insurance involves choices about different insurance features, which set financial incentives to providers and the insured. Insurance features can be designed such that they balance eventual losses and gains created by health insurance.

Zeckhauser (1970) uses a conceptual approach to compare the welfare loss from moral hazard and the welfare gain from increased risk-sharing and reduced uncertainty. He examines risk-sharing and appropriate insurance incentives and recommends defining insurance features (e.g. co-payment levels, benefit package) to prevent frivolous service use and over-expenditure (Zeckhauser 1970).

Manning et al (1987) replicate this 'optimal' insurance problem based on empirical data collected in the RAND study. Their findings uphold Zeckhauser's results: demand-side cost-sharing in form of an optimal co-payment rate should equalize the marginal gain from increased risk pooling and the marginal loss from increased moral hazard (Manning et al. 1987). Newhouse (1996) examines the supply-side, and suggests that tradeoffs between efficiency in the production of care and insurers' risk-selection behaviour can be affected by the amount of supply-side cost sharing, for example through prospective provider payment (Newhouse 1996).

The literature review on equity, sustainability and health insurance serves to derive the analytical framework employed in this thesis, presented in Figure 2.3. The tradeoffs created between welfare gains caused by reduced uncertainty and losses from risk-sharing are recognized. Given the equity and sustainability concerns related to micro-health insurance in a low-income context, this thesis examines three insurance features and their equity and sustainability implications in the current MHI design and in a scale up: first, insurance funds in form of premiums and subsidies; second, members' sharing of cost of the benefit package; and third, provider payment mechanism. The institutional, socio-economic and health situation in a health system affect these features, which is described in Chapter 3 in the context of the study area.

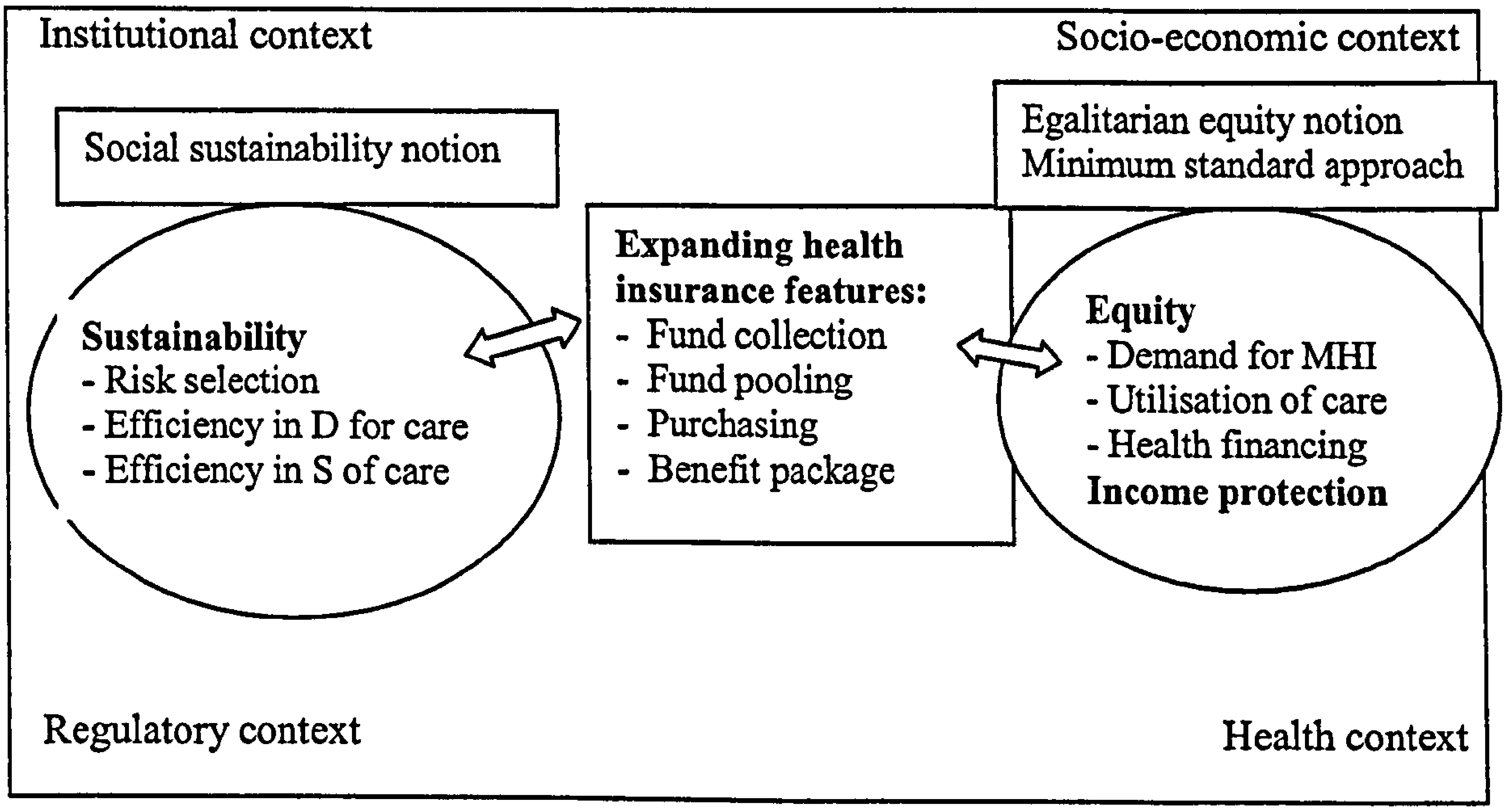
Greater equity implies that premium levels are set by considering households' socio-economic situation. On the other side, premium levels could induce insurers to prevent the poor from enrolling if their medical costs endanger insurance sustainability. Chapter 4 estimates the determinants of the demand for MHI, based on expected utility theory, and aims to understand whether premium levels exclude the poor from MHI.

MHI members' cost-sharing level in form of co-payment captures the tradeoff between gains though risk pooling and inefficiencies in the demand for care (e.g. moral hazard). But, patients' cost-sharing level may create inequities in service utilisation, and combined with premiums, cause regressive health financing. As a result MHI could fail to protect poor households' income against impoverishing health spending. Based on the egalitarian equity notion and the minimum standard approach, Chapter 5 examines whether MHI is a health financing tool that is equitable and protects members' socio-economic situation against financial shocks related to ill-health.

The sustainability of insurance is endangered by cost increases due to inefficient provision of care, which may cause insurers to prevent the sicker and the poorer from enrolling, or to shift the insurance financial risk to providers. This tradeoff between efficiency in the production of care and risk selection is captured by the amount of supply-side cost sharing through provider payment (Newhouse 1996). Chapter 6 examines the supply-side. The cost and efficiency implications of two provider payment mechanisms in health centres are compared: MHI with capitation payment and user fees paid by the uninsured.

The incentives created by these three insurance features ought to be balanced in order to achieve equity and sustainability. Based on the results from the three analytical chapters and a review of the literature on scaling up, Chapter 7 proposes an insurance design for an MHI scale up to improve equity and sustainability in the health district. Organizational and institutional implications are discussed.

Figure 2.3: Analytical framework



Chapter 3: Study Area, Survey Methods, and Data Sources

3.1 Socio-economic situation

With an estimated nominal Gross Domestic Product (GDP) per capita of USD 250 in 1999, Rwanda is one of the poorest countries in the world. Real GDP grew 6 percent in 1999, and real average annual growth has been projected to remain on this level until 2005. The annual growth rate of the Consumer Price Index (CPI) was 2 percent in 2000 and negative the year before (Ministry of Economics and Finance 2000). Annex Table 1 presents an overview of the Rwandan Economic and Development Indicators for the years 1998 – 2000.

Rwanda has a population of about 8 million, of which half are below the age of 20. The annual population growth rate was 2.8 percent in 1998, the same level as reported for sub-Saharan Africa as a whole. The average level of illiteracy is 44 percent among the adult population, ranging from 39 percent among the better-off to 51 percent among households in lowest consumption quintile. The religious composition of the population is estimated to be 5% Muslims, 95% Christians and 0.5% Animists (Ministry of Economics and Finance 2002). Before the 1994 genocide, according to the previous government, the population belonged to different ethnic groups: about 15 % Tutsis, 84% Hutus and 1% Twas (Pygmies); however, this ethnic identification system has been completely abandoned by the new government and replaced by the single category "Rwandans"[11].

[11] There is no information about whether religious or ethnic characteristics would affect people's care seeking behaviour or group enrolment.

Approximately 90 percent of Rwandans are active in agriculture, the most labour intensive and least productive sector, which produces approximately 37 percent of the country's GDP. Industry and manufacturing constitute about 23 percent of GDP and employ 2 percent of the labour force, whereas 7 percent works in the service sector producing 40 percent of GDP. Agricultural products, mainly coffee and tea, account for 80 percent of the country's exports. In spite of this, most agricultural activity remains at the subsistence level with produce consumed primarily by households and the community (Ministry of Economics and Finance 2000). A household survey conducted in 1983 describes the average land area farmed by Rwandan households as very small with 1.24 ha. Households produced an average value of agricultural product of USD 51 per capita per year, 90 percent of which was used for self-consumption (Muller 1997).

Rwanda is a heavily indebted poor country (HIPC). Since the 1994 civil war, Rwanda's economy has been recuperating mainly due to external resource inflow, and less to the recovery of domestic production. Rwanda's external and domestic debt rose rapidly from just under USD 400 million in 1985 to about USD 1 billion in 1996, and to USD 1.4 billion in total debt stocks (including arrears) by the end of 1998, equivalent to 72 percent of GDP. In 1997, Rwanda received almost twice as much external aid per capita (USD 42.6) as the sub-Saharan African average (USD 26). In 1998, the Rwandan government spent on a per capita basis USD 6.80 on debt service compared to USD 1.25 per capita on health care (Ministry of Economics and Finance 2000; Schneider et al. 2000b).

Income inequality has widened within Rwandan society and to the disadvantage of the poor. In 1983, Rwanda had one of the lowest Gini-coefficients (0.289) in sub-Saharan Africa[12]. In 2000, the Gini reached 0.451, indicating that the income distribution has not only become more unequal, but that inequality is among the highest in sub-Saharan Africa (Ministry of Economics and Finance 2002).

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[12] In 1983, the Rwandan Gini was 0.289. Source: Chen, Shao-hua, Gaurav Datt and Martin Ravallion. Is Poverty Increasing in the Developing World? Policy Research Department, the World Bank, Data Appendix, updated version, 1995, 40: 359-76

From 1994 until 1996, about 2 to 3 million of the population lived in refugee camps and were assisted by international organisations. In 1996, people began to migrate back to their areas, find a place to live, re-build houses, work their fields, and establish market activities. In 1998, the World Bank Poverty Note estimated that 70 percent of the Rwandan population fell below the poverty line. Compared to before the war, the poverty gap has increased with the poor becoming poorer (World Bank 1998).

The Household Living Conditions Survey (HLCS) was conducted in 1999-2001, and collected data on households' socio-economic and demographic situation, education, and health, etc. The HLCS estimates a national average level of consumption[13] of RWF 78,000 (USD 177 in 2001) per adult per year. There is a clear urban/rural poverty divide, with three times higher average consumption levels in urban compared to rural areas (Ministry of Economics and Finance 2002).

Two poverty lines (PL) were derived in the HLCS. The *overall poverty line* of RWF 64,000 (USD 145 in 2001) per adult per year is based on a consumption basket that reflects the minimum requirements of 2,500 kcal per adult equivalent per day and by adding an allowance for non-food, based on the average proportion of the budget devoted to non-food items by households around the poverty line. According to this PL measure, 66 percent of rural and 12 percent of Kigali urban residents are classified as poor. Most of those below the PL live in rural areas (98%). The depth of poverty – the average proportion by which the poor fall below the overall PL – is considerably higher in rural areas (42%) than in Kigali (26%) (Ministry of Economics and Finance 2002).

The *food poverty line* of RWF 45,000 (USD 102 in 2001) per adult per year is estimated based on the cost of purchasing a basket of food reflecting the average consumption pattern of the poorest 60 percent of the population identified by the overall PL. Based on the food

[13] Total consumption expenditures includes purchase of food and non-food items, consumption of own production, expenditures made in kind, the imputed rental value of owner-occupied dwellings and other imputed transactions.

poverty line, 46 percent of the rural and 5 percent of the Kigali population live in extreme poverty (Ministry of Economics and Finance 2002).

Poverty is highest and deepest among female-headed households, agricultural wageworkers, the unemployed, and those farming on their own account. Cattle-ownership is the most important socio-economic indicator in rural areas. The poorest own on average considerably fewer cattle (0.26) compared to households in the highest consumption quintiles (1.94). According to people interviewed in the HLCS participatory poverty assessment (PPA), the non-poor have advanced because they found paid employment, received credit from a bank, or became members of an association (Ministry of Economics and Finance 2002).

These findings from various data sources suggest that despite the immense influx of international monies, the economic situation for the poor, who are the large majority of the population, has even become worse in relative terms compared to before the 1994 war.

3.2 Health situation

The Rwandan government is the major provider of health services, with religious organisations being important partners, especially in rural areas. The role of for-profit private providers is still limited but has been growing, mostly in urban areas. Health care is provided at three levels, in two public referral hospitals, 28 district hospitals, and 283 health centres, 40 dispensaries, and nine health posts. Health centres serve an average population of 23,030 individuals, while a district hospital covers around 217,428 inhabitants (Schneider et al. 2000b).

Communicable diseases dominate the burden of illness in health centres where poor people seek care. The Ministry of Health (MOH) reports that of the 2.3 million patient contacts for curative care services at health centres, 88 percent are for malaria, fever, intestinal diseases, respiratory infections, pneumonia, and skin lesions. A population-based nutrition survey estimated that 43 percent of children below the age of five suffer from nutritional stunting (Ministry of Health 2002).

Rwanda's health sector is heavily donor-funded. Table 3.1 presents National Health Accounts (NHA) information from 1998 for the public and private health sector.

Table 3.1: Summary statistics Rwanda National Health Accounts (NHA) 1998

Total Health Expenditures (NHA 1998)	USD 99,931,321	
Total per Capita Health Expenditure, by sources of funds	RWF 4,019	(USD 12.68)
Public	RWF 396	(USD 1.25)
Private Out-of-Pocket	RWF 1,592	(USD 5.02)
International sources	RWF 2,030	(USD 6.40)
Total Health Expenditures as Percent of Nominal GDP	5 %	
Public	0.5 %	
Private Out-of-Pocket	2 %	
International	2.5 %	
Sources of Funds Distribution:		
Public	9.2 %	
Public Firms	0.7 %	
Private Out-of-Pocket	39.6 %	
International	50.5 %	
Uses of Funds:		
Public sector	66 %	
Church-owned sector	10 %	
Private sector	24 %	

Source: NHA Rwanda (Schneider et al. 2000b). Exchange Rate: USD1=RWF 317 in June 1998.

Total health expenditures are USD 12.7 per capita, which corresponds to about 5 percent of GDP. About half of the total health sector is donor-funded, and 40 percent by out-of-pocket spending. This leaves the government to finance the remaining 10 percent of overall health expenditures. About two-thirds of total health expenditures are spent in the public sector.

While health centres offer care to the majority of the population, only 11 percent of total health expenditures are spent on this primary health care level[14] (Schneider et al. 2000b).

User fees were initiated in Rwanda in 1978, at public and church facilities (Shepard et al. 1993). After the war, between 1994 and 1996, care was financed by external aid, and user fees were largely suspended. In 1996, providers in public and church facilities reintroduced fees at pre-war levels for services and drugs. From 1996 to 1999, utilisation of primary health care services dropped from 0.3 to 0.25 consultations per capita per year. To improve their financial accessibility to care, the rural population started to develop their own risk-sharing mechanisms: 'mutuelles' as people commonly call them. In response, the MOH identified financial accessibility to health care as a key problem requiring improvement by changing the way care was financed (Schneider and Diop 2001).

3.3 Development and implementation of Prepayment Schemes (PPS)

This thesis uses the Rwandan prepayment experience as a case study. In 1998, the MOH expressed concerns about the low utilisation rates in health facilities, and decided to develop and implement micro-health insurance (MHI)[15] as a pilot with four specific objectives. First, to improve the population's financial accessibility to care; second, to improve quality of care; third, to strengthen community participation in organizing and managing health care services; and fourth, to strengthen the financial sustainability in health facilities and MHI (Schneider and Diop 2001). The USAID-funded Partnerships for Health Reform (PHR) project,

[14] See Figure 4 in 1998 NHA Report for distribution of total health expenditures: 30% of total health expenditures occurs in district and tertiary hospitals and 28% at the MOH and in MOH vertical programs.

[15] Micro-health insurance schemes – referring to their membership size – are also called mutuelles, mutual health organisations, community-based health financing, or prepayment schemes, etc. In this thesis, I will use the terms MHI and PPS interchangeably.

administered by Abt Associates, provided technical and financial assistance to the MOH during the entire pilot phase.

The design phase of the Rwandan MHI started in 1999 and took place in collaboration with the MOH and the district population. At the central level, the MOH created a steering committee with representatives from the government, donors and NGOs. The committee selected three districts, Kabutare, Byumba and Kabgayi, to pilot-test MHI. Selection criteria for the districts were the extent of existing health infrastructure, the repeated demand for technical assistance from the population in developing MHI, and the district authorities' political will to participate in the pilot test. Altogether, the three districts have three hospitals and 54 health centres serving a rural population of about one million people, or one-eighth of the country's population (Schneider et al. 2000a).

During the MHI design phase, from March until June 1999, 28 workshops were held in the three districts, and up to 100 community representatives attended each workshop. Participants discussed and agreed upon the MHI organisational system and health insurance features, including provider payment, benefit package, membership categories and premium levels. The population attended community gatherings during which their representatives discussed the MHI design with them. Proposals stemming from district workshops and community meetings were shared with the central steering committee at the MOH, which provided feedback to the communities. This on-going discussion between the central and local level resulted in the final MHI design, and the development of legal, contractual, and financial tools to guide implementation. In addition, the workshops served to train about 300 participants to manage the 54 MHI systems (Schneider et al. 2000a). On July 1, 1999, each of the 54 public and church-owned health centres in the three districts signed a contract with one of 54 MHI. Thereafter, the district population started to enrol.

Under the auspices of the Rwandan law, MHI are deemed as mutual health associations, owned and managed by their members. Members meet at least once per year during their general assembly, share information, and elect their representatives for the MHI executive bureau. Each MHI is headed by its executive bureau with four volunteers (president, vice-president, secretary and treasurer), elected by and among all members during a general assembly. The MHI by-laws and contractual agreement with providers define in 17 articles the rules of collaboration between MHI and providers. These documents were accepted during the schemes' general assemblies in each district and signed by their representatives before their implementation in July 1999. Issues related to the contract enforceability and MHI management are discussed during the MHI general assembly.

On a district level, the MHI have formed a federation. Six members have been elected by and among all MHI executive bureau representatives in their general assembly to constitute the MHI district federation. The federation has signed a contract to become the partner to the district hospital and other authorities.

Table 3.2 presents the MHI design which, as a result of the discussions with the population, is slightly different in Kabgayi than in the two other districts (Schneider et al. 2000a).

Annual premiums were set to take account of the population's financial capacities and levels of existing user fees. At the time of enrolment, which can be at anytime during the year, citizens pay an annual premium of RWF 2,500 (USD 7.50 in 1999) per family of up to 7 persons to the secretary of the MHI affiliated with their "preferred" health centre. A higher premium for individual enrolment encourages group and household enrolment. This is intended to prevent the enrolment of only sick individuals (adverse selection) and the exclusion of high-risk patients (cream-skimming); and it inhibits men from joining as individuals before women and children. A one-month waiting period following enrolment was instated to discourage enrolment of individuals who need immediate medical care.

Table 3.2: Insurance features of Prepayment Schemes in Rwanda

<table>
<tr><th>MHI</th><th>Features</th><th>Kabutare and Byumba Districts</th><th>Kabgayi District</th></tr>
<tr><td rowspan="2">Fund Collection</td><td>Annual flat rate premium</td><td>Individual: RWF 2,000
Household: RWF 2,500 up to 7 people; if 8+ persons: RWF 530 for each additional person
Groups (with 8+ people): RWF 530/person</td><td>Individual: RWF 2,200.
Household: RWF 2,600 up to 7 people; if 8+ persons: RWF 550 for each additional person
Groups (with 8+ people): RWF 550 per person</td></tr>
<tr><td>Subsidies</td><td>None</td><td>For hospital care by donor</td></tr>
<tr><td rowspan="2">Risk-pooling</td><td>Management of risk-pool</td><td colspan="2">Executive bureau with members elected during members' assembly
Waiting period: one month after enrolment to discourage adverse selection</td></tr>
<tr><td>Risk sharing</td><td colspan="2">Health centre risk: MHI member pool (health centre catchment's area)
Hospital risk: on a district level</td></tr>
<tr><td rowspan="2">Provider Payment</td><td>Health Centre</td><td colspan="2">Capitation payment per month, calculated based on total number of members enrolled in MHI
Co-payment: RWF 100 per first curative visit to prevent moral hazard</td></tr>
<tr><td>Hospital</td><td>Per episode; and fee-for-service</td><td>Per episode of illness</td></tr>
<tr><td rowspan="2">MHI benefit package</td><td>In Health Centre (HC)</td><td colspan="2">Preventive and basic curative care, and hospitalization at health centre
Drugs on essential drug list of MOH
Ambulance transfer to district hospital if referred by nurse</td></tr>
<tr><td>District Hospital, covered with HC referral</td><td>Consultation with physician (FFS)
Overnight stay (FFS)
Full treatment per episode: Caesarean-Section (per episode)</td><td>Full treatment per episode:
Caesarean-Section
Paediatric cases (<5 years)
Malaria (>5 years)</td></tr>
</table>

Note: FFS=fee-for-service provider payment.

The MHI health centre risk is pooled and shared on a HC's catchment area level, and the hospital risk on a district-level. MHI keep their premium fund in a local bank account. The monthly MHI disbursement equals one-twelfth of the total premium fund, and is divided as follows. Each MHI withholds 5 percent of the monthly disbursement to pay for MHI administrative costs, and forwards 5 to 15 percent to the district MHI federation. The federation reimburses the district hospital for care provided to the insured. Each MHI pays its partnering health centre a monthly capitation payment, according to the total number of members enrolled. Members continue to pay user fees for hospital care not covered by MHI (drugs, surgery, exams) (Schneider et al. 2000a).

The MHI benefit package covers all services and drugs provided in a "preferred" health centre, and ambulance transfer to the district hospital, where Caesarean-sections, consultations and overnight stays are covered in Kabutare and Byumba. The Kabgayi hospital package is slightly different and covers the full episode of Caesarean-sections, malaria and all non-surgical diagnostics for children up to the age of five years. Health centres play a gatekeeper function to dissuade members and providers from frivolous use of more expensive hospital services, which are covered only with health centre referral. Members pay a 100 RWF (USD 0.30 in 1999) co-payment for a curative health centre visit, to limit moral hazard.

MHI Membership:

Table 3.3 presents enrolment numbers for the first four operational years, and annual enrolment rates based on the estimated population size. A total of 88,303 individuals enrolled during the first year (7/1999 – 6/2000). During the subsequent three years, membership continued to grow, though at a slower pace. Annex Table 2 lists all 54 MHI and their first year enrolment rates, which varied largely, ranging from 1 to 50 percent of the population in their target areas.

Table 3.3: MHI membership (1999 - 2003)

Total MHI Members	Byumba		Kabgayi		Kabutare		Total 3 Districts	
	Persons	% of pop	Persons	% of pop	Persons	% of pop	Persons	% of pop
Total population, June 2000	459,329		368,020		288,160		1,115,509	
MHI members June 2000, 1st year	48,837	11%	21,903	6%	17,563	6%	88,303	8%
MHI members, June 2001, 2nd year	45,185	10%	33,181	9%	15,186	5%	93,552	8%
Annual growth rate 2nd year	-7.50%		51.50%		-13.50%		5.90%	
MHI members, June 2002, 3rd year	67,448	15%	48,810	13%	17,714	6%	133,972	12%
Annual growth rate 3rd year	49.30%		47.10%		16.60%		43.20%	
MHI members, June 2003, 4th Year	100,734	22%	63,190	17%	25,722	9%	189,646	17%
Annual growth rate 4th year	49%		29%		45%		42%	

Note: Data Source: MHI enrolment data.

3.4 *Informal Payments by Patients to Providers*

The issue of informal payments made by patients to health care providers is an important one and discussed in previous PHR reports[16]. Health centres purchase drugs at the district pharmacy following the MOH recommendations. Health centres may add a 5 percent mark-up on their purchase price to arrive at the price at which they sell drugs to patients. Health centres use this profit to pay for other costs, such as staff and operational costs. The regular monitoring of drug prices in health centres has revealed that several health centres, mainly in Kabgayi, have added mark-ups that are considerably higher than the recommended 5 percent. This finding is supported when comparing providers' drug expenditures with patients' payments. For example, patient exit interview results from Kabgayi suggest that an uninsured

[16] Chapter 3.4 in PHR report TR 61 for extensive discussion.

patient pays on average 778 RWF for drugs per visit; while health centres declare average drug expenditures of 363 RWF for an uninsured visit. The difference reflects a mark-up or an informal payment of more than 100 percent on drugs. Since MHI covers all drugs and services at the health centre, insured patients should not be asked to pay this difference, and there is therefore a potential reduction in provider income associated with the replacement of fee-for-service patients with MHI-covered patients.

However, there is also additional income paid to providers under the MHI system. During the Rwandan pilot phase, health centres were advised by the MOH to pay a monthly quality bonus to all staff members from the capitation amount received from MHI. This bonus was supposed to depend on the health centres' performance with respect to the availability of drugs, the number of preventive and curative care consultations, administrative collaboration and the number of public health promotion meetings (e.g. on HIV/AIDS prevention) organised at health centres for the community (Schneider et al. 2000a). However, in practice the quality bonus of 5% of total capitation revenue has been paid to personnel in health centres independently of performance according to the suggested indicators. Hence, the resulting incentive is to increase the number of MHI members which will result in larger quality bonuses for staff.

Despite this bonus, providers could still try to charge informal payments to insured patients, for example by explaining that their health facility is experiencing financial problems. However, a MHI member has the option of presenting this issue for discussion with providers during the MHI general assembly.

On the positive side, the largest MHIs, Bungwe and Rushaki, have reported important additional income due to the large monthly capitation payment from MHI. They have used this surplus to finance latrine building in the community, purchase a sterilisation machine for the health centre, and to pay salaries of newly hired staff. Other health centres have used their financial surplus to subsidise the purchase of mosquito nets for MHI members.

3.5 Theory on survey methods

This section introduces issues on data and sampling methods that are relevant in the context of this thesis. Then, the data sources used are presented.

3.5.1 Survey data in low-income context

Assessing sustainability in a health system requires health facility and insurance data. In some countries, monthly summaries on utilisation and finance data are collected in health facilities by a health information system and stored centrally. However, in many health systems this central data collection does not collect data by patients' insurance status.

Analysis of the equity situation among insured and uninsured population groups requires data on households' socio-economic, demographic, health, and insurance situation (Akin et al. 1985). In low-income countries, this data has been collected in a number of large scale, population based surveys, among which the Demographic and Health Survey (DHS) and the World Bank Living Standard Measurement Survey (LSMS) are best known. Generally in surveys, the validity of data is influenced by respondent's self-perception, relative comparison system, and the length of the recall period (Grosh and Glewwe 1995).

Methodological issues arise related to the use of (1) non-cash income, (2) monetary and non-monetary consumption, and (3) assets when assessing socioeconomic status in low-income contexts. First, in the absence of income data, non-cash income is estimated as few rural households receive a regular monthly income from wages. Non-cash income includes agricultural home production and consumption, which may free up cash-income to be spent on discretionary goods, such as medical care. Assessing non-cash income is particularly relevant when providers and traditional healers accept in-kind payments (Akin et al. 1985).

Second, real consumption tends to be used as a proxy for household income, where cash and non-cash income of households is seasonal, and households live from subsistence farming. In addition, seasonal and transitory income shocks force households to smooth their consumption over bad and good times, which might result in surveyed households reporting their income for a certain period to be zero. Therefore, household consumption is separated into durable and non-durable goods, and detailed data may be collected on certain expenditure goods of interest, such as expenditures for health care, education, transport, food, and luxury goods (Deaton 1998).

The quality of consumption data has been criticized. It may be difficult to disentangle production from consumption. Rural households self-consume a large part of their production, and they use part of their production to pay in-kind for goods and services they buy. Generally, local market prices are used to value household production, which may generate additional measurement errors, with 'market prices' being different in different contexts (Deaton 1998).

Third, in the absence of consumption or income data, an asset indicator can be computed based on the present value of household assets, to serve as a proxy for household socio-economic status. Assets represent a potential claim to goods, which can be sold or mortgaged, and are generally positively related to past income. Asset variables pose methodological challenges. Their use as a proxy is based on the assumption of uniformity in taste and ignores the fact that households may prefer other investments, such as education. The present value of assets is calculated by adding up the respondents' estimates of the value of their personal assets owned (house, furniture, vehicles, etc). Asset ownership tends to correlate with the age of the household head. This might lead to underestimating cash income of younger household heads. For example a relatively high income-earning teacher might score comparatively lower than a farmer with a substantial amount of land but lower cash-income (Akin et al. 1985).

Researchers used principal component analysis to construct weighted indices of assets and housing characteristics to proxy wealth. Empirical results suggest that this method is at least as reliable as conventionally measured consumption expenditures (Filmer and Pritchett 2000).

3.5.2 Probability sampling

Survey tools collect data from a population sample. A household survey sample is generally selected from an existing sampling frame, which is a list of sampling units (e.g. households or villages) that are used as primary sample units (PSU). Sampling frames, such as a population census or labour force surveys, cover the entire survey universe, and prevent biased samples (Deaton 1998).

Sampling and non-sampling errors in surveys affect the validity of results. Sampling errors occur when outdated censuses are used as sampling frames, or when households living in a house are included in the sample while homeless people, who reflect the poorest in a society, are excluded. Sampling errors can be corrected for by increasing the sample size (Korn and Graubard 1999).

Non-sampling errors are caused by (1) measurement errors, (2) non-response errors, or (3) data coding and entry errors. Poorly designed questionnaires lead to measurement errors. Non-response errors occur because respondents are not a representative subset of the population. If data entry errors are at random, it does usually not bias the sample (Mukherjee et al. 1998; Korn and Graubard 1999). Regression analysis captures non-sampling errors in the error term (Deaton 1998).

The five sample techniques used to draw samples from a population include (1) simple random sample, (2) stratified random sample, (3) systematic random sampling, (4) cluster random sampling, and (5) multi-stage sampling (Korn and Graubard 1999).

The first three random sampling methods are most commonly used in mail or telephone surveys. In a simple random sample, each household or individual is selected with the same known probability. In a stratified random sample, the population is first subdivided into homogeneous subgroups, from which a simple random sample is drawn. Stratified sampling will lead to smaller variability within groups than within the population and yield more statistical precision than random sampling. Small subgroups can be randomly over-sampled and adjusted for in the analysis by weighting the subgroups by their proportionate sampling fraction. Systematic random sampling requires that the population (N) be listed in a random order. The sample (n) will be drawn from the ordered population by starting with an integer and by continuing by the interval size (k=N/n), which is the inverse of the sampling fraction (f=n/N)[17] (Korn and Graubard 1999).

In surveys with direct interviews, the preferred method is cluster or area sampling, in order to economize on survey cost. Cluster sampling can be combined with other sampling methods, yielding multi-stage sampling. The number of sampling stages depends on the sampling frame available and the sample population to be investigated (Deaton 1998).

Cluster sampling requires dividing the population into a number of clusters, which represent geographic areas. First, clusters are either selected by simple random or by systematic sampling. Clusters may vary in size, which can be controlled for by giving each cluster a selection chance, depending upon its size (e.g. number of households living in a cluster). In the second stage, the same number of households is selected within each cluster (Deaton 1998).

The standard two-stage cluster survey with a self-weighting design is compatible with a population survey in which each household has the same probability to be selected. If the probability of selecting a household differs across clusters, then the sample is not self-weighted and sampling weights are required. The weights are proportional to the inverse probability of a household being selected (Deaton 1998).

[17] For example, if the integer 4 is chosen and the interval size is 5, then the 4th, the 9th, the 14th, etc. unit would be sampled until the desired sample size is reached.

The cluster effect refers to the intra-cluster correlation between households, and its impact on regression analysis. The clustering of observations implies observations are not independent. Clusters in developing countries are often villages where households live close to each other and are ethnically and socio-economically similar. This similarity may cause positive correlation between observations leading to increased variances. The extreme case would be the case of identical households in a cluster, where the number of clusters would be the effective sample size and not the number of households sampled (Deaton 1998). STATA7 offers survey estimation commands (svy) to produce variance estimates based only on computations at the cluster level, allowing for correlation between sampling units within the cluster. The resulting variance estimates are approximately unbiased or biased towards larger standard errors (StataCorp 2001).

3.6 Data used in this thesis

The data used for this thesis were collected by the PHR project during the prepayment pilot phase (1998-2000) in three Rwandan districts[18]. PHR Rwanda developed and implemented an extensive data collection based on a quasi-experimental evaluation design to evaluate the performance of prepayment in reaching the four MOH objectives: improved access to care, quality, financial sustainability and community participation. The data collected include monthly routine data from health facilities and MHI; a household survey; a patient exit interview survey; and two focus group surveys. Annex Table 3 presents an overview of the data collection and Annex Table 4 lists the PHR reports that have been published based on this data with respect to the MOH objectives.

Data collection, cleaning and storage was done during the prepayment pilot phase in Rwanda. All routine and survey data collection tools and interviewer guides were taken from the Niger study on cost-recovery (Diop 1994) and adapted to the Rwandan MHI context. Routine and

[18] See Annex Table 3.

survey data were stored and analysed in Excel and SPSS 10 for previous analysis. Results of the prepayment pilot phase were presented to the MOH and the PHR project financer USAID.

3.6.1 Health facility data

Monthly data in health centres and district hospitals were collected over two years in five collection periods. The first period included the full base year before providers started to treat MHI patients (August 1, 1998–July 31, 1999). The remaining four data collections covered each of the four quarters of the pilot year from August 1, 1999 until July 31, 2000. Health centre managers and hospital administrators learned, during workshops, how to answer the questionnaires. Health facilities were asked to report service use by insured and uninsured patients, expenditures and revenues on a monthly basis. Health centres reported drug costs documenting the price paid and quantity bought at the district pharmacy, and valued drug donations based on district pharmacy prices. Each district selected supervisors to assist health centres in filling in the questionnaires.

If questionnaire responses were missing, a PHR agent would assist the responsible health facility staff person. Following the Niger example, the routine data entry form was set–up in Excel to store and analyse all routine data. Data entry was done by a PHR Rwanda local colleague, using Excel computer software. Descriptive analysis was conducted in Excel and results presented in a PHR Technical report (Schneider et al. 2001b).

3.6.2 MHI data

Since July 1999, monthly MHI data have been collected in each MHI and the three district federations. Information was collected on the composition of their executive bureau, number of new members, premium revenues, and their uses of funds. MHI executive bureau members were trained to fill in these questionnaires, and were supervised by their district federation and PHR. Data entry was done by PHR in Excel. Analysis was conducted in Excel and results presented in a PHR Technical report (Schneider et al. 2001b).

3.6.3 Household survey

The household survey used in this analysis was conducted in September 2000 by the Office National de la Population (ONAPO). Based on a weighted two-stage cluster design, the sample was drawn by selecting cells from the sampling frame used for the Rwandan DHS 2000. Cells that were primary sample units for the DHS were selected from sample cells identified for the Household Living Condition Survey (HLCS), conducted by the Ministry of Finance in 2000/1 (Ministry of Economics and Finance 2002).

The PHR household survey was divided into two strata according to the MHI enrolment rate of the population and with the objective of sampling 3,400 households: 2,500 households were sampled from stratum 1, consisting of cells with 10 percent and higher MHI enrolment rates; and 900 households were selected from stratum 2, consisting of cells with below 10 percent enrolment rates (Schneider and Diop 2001).

Each cell contains a different number of households. Therefore, cells were divided into sub-cells of 110 households. Overall, M_x households had to be drawn for inclusion in the sample of the strata x. The number of sub-cells SC_{xi} in a given strata x and cell i is:

(1) $SC_{xi} = M_{xi}/110$,

where M_{xi} is the number of households in cell i of strata x.

In a first step, cells (PSU) were sampled from the DHS frame with a probability proportional to the number of sub-cells per cell as defined in equation (2). The probability to include a cell i of strata x in the first draw from the list of PSU of the DHS is:

(2) $P_{1xi} = SC_x * (SC_{xi}/\Sigma_i SC_{xi}) = (M_x/110) * (M_{xi}/\Sigma M_{xi})$

Second, from each of these cells one sub-cell was drawn according to the probability defined in equation (3). The probability to include a sub-cell in the sample in the second draw at the level of cells selected in the first draw is:

(3) $P_{2xi} = 1/SC_{xi} = 110/M_{xi}$

All 110 households identified in a sub-cell and selected on the second level from a cell were interviewed. Combining equations (2) and (3) gives the probability of selecting a household in strata x:

(4) $P_x = P_{1xi} * P_{2xi} = (M_x/\Sigma_i M_{xi})$

The final weight of households for each cell results from multiplying P_x by the sampling fraction of the PSU of the DHS. The analysis is weighted by these final weights. The analysis controls for intra-cluster correlation by using survey estimation commands in STATA7 (StataCorp 2001).

Of the 3,400 households sampled from the DHS survey, 3,387 were identified and interviewed in the three districts with MHI (Byumba, Kabgayi, and Kabutare). Overall 3,139 questionnaires were valid and retained (93%). Among them are 354 MHI member households (Schneider and Diop 2001).

The household survey contains two structured modules: a household and a curative care module. Individuals were interviewed in the national language, Kinyarwanda. The household module was addressed to the head of household to gather information on the household and members' socio-demographic and economic characteristics including household expenditures for consumption goods, health, and education, and MHI enrolment. The curative care questionnaire was addressed to household members who were sick in the two weeks prior to the interview. It elicited information on the incidence of sickness, prevalence of symptoms, utilisation of providers, and mode and amount of payment for medical care (see Annex B). Previous analysis has been conducted based on this household survey in SPSS 10 and presented in a PHR Technical report (Schneider and Diop 2001).

3.6.4 Additional information

Additional information is used in this thesis to interpret quantitative findings in the analytical chapters. This includes the PHR Rwanda focus group survey and results from a patient exit interview survey. These surveys have been analysed and presented in the PHR final report (Schneider et al. 2001a).

Part II: Equity

Equity is addressed in Chapter 4 by examining the socio-economic and demographic determinants of demand for MHI. Following principles of egalitarian equity and the minimum standard approach, Chapter 5 compares the implications of financing and utilisation for insured and uninsured individuals.

Chapter 4: Demand for MHI

4.1 Introduction

Many low- and middle-income countries promote MHI with the aim to improve equity in access to health care. However, little empirical information exists on the factors that affect poor households' decision to insure (ILO 2002). As the term "micro" indicates, MHI tend to be small, and cover a small percentage of the target population. Among the largest schemes are those founded under government initiative[19] (Atim et al. 1998; ILO/PAHO 1999).

The small size of many MHI suggests that there are factors that impede households from enrolling who otherwise would be inclined to insure. They include the flat-rate premium, which may be unaffordable for the poor; individuals' anticipated medical service use; cultural aspects; and their trust in the health care system (Abel-Smith and Dua 1988). The rationale for examining the demand for health insurance is that if insurance is meant to improve equity in access to care and enrolment remains voluntary, then barriers that limit insurance enrolment need to be understood and addressed by health policy.

Different decision-making theories exist and can serve to describe the insurance enrolment decision. Generally, insurance demand studies use expected utility theory to explain

[19] These include the MUGEF scheme in Ivory Coast with 117,118 members and 368,435 dependents in 1994; the Cosperanza Health Cooperative in Colombia with 42,000 beneficiaries; and the Trenque Lauquen Municipal Social Welfare Scheme in Argentina with 18,000 beneficiaries.

individuals' decision to insure or not insure. Under expected utility theory, the demand for insurance reflects individuals' risk aversion and demand for income certainty (Schoemaker 1982). This theory is silent about the association between households' socio-economic status and insurance enrolment. The poverty literature suggests that poor households are expected to become increasingly risk averse if they move closer to or further below the poverty line (Wagstaff 2000). As a result, they would be expected to insure.

Other economic and social theories can be used to further explain individuals' insurance enrolment decision. Among them are state-dependent utility, endowment effect, status quo bias, and regret and disappointment paradigms, prospect theory, and theories related to trust and social capital. This Chapter draws from these theories to examine the decision-making behaviour of households who have the option to insure or remain uninsured.

As part of the equity analysis, the focus is on the socio-economic factors that influence MHI enrolment. It aims to find out whether MHI excludes the poor from enrolment. Based on data collected from households at the end of the Rwandan prepayment pilot phase, bivariate and multivariate analysis is used to examine socio-demographic and economic factors that determine households' enrolment decision.

The empirical section is unique, mainly because it is based on survey data collected from insured and uninsured groups. The lack of detailed household-level data has caused other studies of community-based schemes to rely on aggregate data by studying the proportion of the population insured or insurance expenditures (Atim et al. 1998; Bennett et al. 1998; ILO/PAHO 1999).

Adverse selection has been identified as one of the main reasons contributing to the failure of many MHI (Abel-Smith 1992; Atim et al. 1998; Bennett et al. 1998; ILO/PAHO 1999). In this thesis, analysis of adverse selection in MHI is limited due to both data and substantive reasons. First, the data do not include variables which would allow the impact of adverse selection to be assessed comprehensively (e.g. hospitalisation or severe illness prior to purchase of MHI membership). Second, premiums for group and household enrolment categories are substantially cheaper than individual enrolment, which has encouraged group and household enrolment, and consequently mitigation of the risk of adverse selection. Third, from a policy perspective, adverse selection takes a different meaning in areas where the uninsured population reports curative visit rates as low as 0.2 visits per capita per year to health centres. In such a context, rather than being seen as a problem to be addressed through discouraging excessive utilisation, it should rather be seen as a priority for government to address by making sufficient resources available in the public health sector to treat high risk groups.

The next section presents a summary of the literature on the demand for health insurance; then a theoretical model of choice is derived, and applied to the Rwandan data. Bivariate analysis is used to describe and compare the characteristics of insured and uninsured households. Based on multivariate analysis, household demand for MHI is examined by estimating the influence of explanatory variables on the probability of MHI enrolment. Results are presented in section 4 and discussed thereafter. They inform a discussion about possible modification to the MHI design to allow it to better respond to overall equity and financial objectives, if the Rwandan government decides to scale up MHI.

4.2 Literature review

4.2.1 Overview of the literature on demand for health insurance

This literature review summarizes insights from economic and social theories on the factors that influence the decision-making process. A theoretical framework is derived to inform the analysis on the insurance demand. Empirical findings from other studies are presented.

Consumer Theory

Consumer theory assumes if consumers are perfectly informed, they maximize their utility as a function of consuming various goods, given relative prices, their income and preferences, which are related to social attitudes, custom and convenience. Consumers are price takers and able to rank their consumption bundles according to the perceived utility they give. They will pick the affordable bundle that maximizes their utility. Changes in prices and income influence whether and how much of different goods rational consumers will buy. Health insurance is expected to be a normal good with a positive income elasticity of demand. A price increase of a substitute for insurance – e.g. user fees – is expected to raise the insurance demand, as is a decrease in premium (Begg et al. 2000).

Decision-Making under Uncertainty

The decision to purchase insurance involves uncertainty. Among the theories that analyse decision-making under uncertainty are *expected utility, state-dependent utility, endowment effect, status quo bias, and regret and disappointment paradigms, and prospect theory.*

Under *expected utility (EU) theory*, insurance demand is a discrete binary choice between an uncertain loss that occurs with a probability like paying for an eventual health care bill when uninsured, and a certain loss like paying insurance premium (Manning and Marquis 1996). EU theory assumes that people are risk averse and make choices between probability distributions of wealth. Consumers who insure themselves are uncertain whether they will be ill or not. Insurance reduces their utility loss from being exposed to the risk of large health care payment. As a result of risk-pooling they can level out their consumption of health care over two different states– ill/not ill, which makes the aggregate outcome relatively certain. This certainty allows the insured to reach a higher utility in case of illness than without insurance. Thus, the insurance demand reflects individuals' *risk aversion and demand for certainty*. The more risk averse individuals are the more insurance coverage they will buy (Begg et al. 2000).

Expected utility theory has been criticized. Although it provides a framework to analyse factors influencing individuals' decision under uncertainty, three main weaknesses remain. First, when maximizing an outcome, individuals do not structure their choices as comprehensively as EU theory suggests, and they do not necessarily evaluate all possible events that may occur. Second, when making choices, individuals do not incorporate all information, such as linking probabilities with outcomes. Rather, sometimes they ignore low-probability events, or focus entirely on the loss, which highlights the importance of psychological factors in economic behaviour. And third, laboratory studies have shown that the model's prediction of choice behaviour is poor, and additional factors need to be included like the societal context about prudent behaviour or regret considerations (Schoemaker 1982). Although laboratory experiments indicate that some patterns of preferences are inconsistent with EU theory, this theory is most commonly used in models on decision-making under risk (Marquis and Holmer 1996). Nonetheless, other theories have emerged that aim to account for these weaknesses.

State-dependent utility theory suggests that consumers' utility level and tastes are influenced by their state, such as their health status. Depending on their state, people may have different degrees of risk aversion, which may influence their insurance demand (Phelps 1973). As the sick and healthy have different preferences, this would imply that it is not individuals' risk aversion that reflects their insurance demand but rather the *expected pay-off* they will receive when sick. The magnitude of this expected payoff depends on the state an individual is in when the enrolment decision is made. This result has implications for optimal insurance coverage. It suggests that as most people insure when they are healthy, their optimal coverage is below the full loss coverage, as the anticipated payoff is below the real loss in case of illness (Viscusi and Evans 1990; Mas-Collel et al. 1995). Hence, an individual's insurance demand is influenced by the anticipated need for medical care given the current state, and the magnitude of the related insurance pay-off in case of sickness (Phelps 1973).

Prospect theory is a descriptive model of decision-making under risk that questions the assumptions made on uncertainty and risk aversion by EU theory. In EU theory, choices are made about probability distributions over wealth, while in prospect theory the choice is about prospects of gains or losses. The point from which an individual perceives gains and losses to occur may influence the choice. Individuals assume an optimal risk level for every level of expected value. Gambles of equal expected value are judged in terms of their deviations of this optimal risk level. Prospect theory says that with respect to losses, people prefer uncertainty than certainty of the same magnitude. Also, they feel much more the displeasure of a loss than a pleasure from the same-sized gain (Kahnemann and Tversky 1979).

Applied to the insurance context, prospect theory suggests that people insure from a gain perspective and not because insurance provides certainty. Given a premium level, people will first assess their individual health risk level and the eventual deviations from it, (e.g. my health is bad and it could get worse, or it is about to improve). They may decide not to insure because of a gain prospect, they expect to pay less for their health risk and the deviation from it than for their insurance premium. This is a risk because the deviation from the health reference point may be greater than expected and cause a loss. It suggests that individuals are risk preferring with respect to losses. Individuals will only *demand insurance if the loss will occur with certainty*, and not because they are risk averse as suggested by EU theory (Kahnemann and Tversky 1979).

Cumulative prospective theory combines dependent utility and prospect theory, and suggests that people assign different weights to the probability that an event will occur. Empirical findings indicate that individuals tend to overweight small probabilities, whereas high probabilities are under-weighted. *Over-weighting of small probabilities* explains why people buy lotteries, and insurance. Individuals make choices between prospects in terms of weighted probabilities of losses and gains. Their decisions are influenced by weighted value maximization, where decision weights differ from probabilities and value is measured in terms of gains and losses (Tversky and Kahneman 1992). Applied to the insurance demand, cumulative prospective theory suggests that people insure because they overweight the small probability of the event of illness.

The *endowment effect* aims to explain why individuals are reluctant to purchase a good by describing the discrepancy between the buying and selling price. Presumably, decision-making is affected by individuals' risk aversion about something new. People perceive it as more painful to give something up than beneficial to achieve something new. Therefore, they tend to demand a higher selling price to give something up than they would be ready to pay for it. This may be because individuals perceive *forgone gains as less painful than an eventual loss* (Kahnemann et al. 1991), and they do not know whether the benefits of an alternative exceed the costs. It makes people stay with the old and well known. The endowment effect suggests that individuals insure if they perceive the benefits of insurance as higher than the cost related to giving up being uninsured.

Similar to the endowment effect, the *status quo bias* is another implication of risk aversion. Empirical findings indicate that people consider leaving a status quo as more detrimental than beneficial, and with an increasing number of alternatives to choose from, choices become more complicated and individuals tend to stay with the status quo (Kahnemann et al. 1991). Findings from a discrete choice experiment suggest that consumers prefer the status quo they are familiar with instead of undergoing an unknown, innovative medical procedure (Salkfeld et al. 2000).

This '*veil of experience*' appears to determine choices, especially when lacking full information on the alternative. The endowment effect and status quo bias indicate that utility is based on changes relative to a neutral reference point. *Preference orders* are not necessarily stable but rather *depend on current reference levels* (Kahnemann et al. 1991), like the status quo. Hence, people are risk averse about new situations. They might prefer not to insure because they are afraid to reach a lower utility level compared to being uninsured. At the same time, those who have been insured will reluctantly give it up.

Regret and disappointment theories are based on the assumption that people have a loss-aversion and conservative preferences. When making choices, individuals try avoiding regret and disappointment and do not just consider the eventual outcome, as suggested by EU theory. They factor in their *feelings of regret, in case the decision would have been wrong, and of disappointment, if the outcome does not correspond to what they have expected* (Bell 1982; Bell 1986). Individuals may prefer to remain uninsured because they could regret it or be disappointed if they will not benefit from insurance payout. Regret and disappointment theory may be combined with state-dependent utility theory: an individual in more fragile health state may factor in a "smaller amount of regret" when deciding about buying health insurance.

Poverty Literature

The poverty literature describes additional concepts that influence decision-making, namely poor households' *time preferences* and *risk aversion when moving closer to the poverty line.* Time preferences suggest that people with higher value for future protection than for current consumption are more likely to buy insurance (World Bank 2000). However, out of necessity, the poor may prefer present over future consumption, and will not insure.

Instead of insurance, poor households may choose alternative mechanisms to cope with the risk of illness. They may perceive shocks that are small but frequent such as transient illness as relatively easy to deal with and remain uninsured, because they have access to a money lender. Some households may draw from additional income sources including increased female and child labour force participation to cope with risk. Or they may decide to shift the risk among household members, although this may cause the weaker to carry a larger burden (Dercon 2000).

Households who have access to assets and markets may self-insure through precautionary building up of assets in good years to smooth consumption over bad times. It includes investing in livestock that can be sold when money is needed, as well as in the education of one family member for the hope of creating a wealthier relative who can be called on for emergency funding later on. However, these risk coping mechanisms have their limits in protecting the poor against the financial risk related to their health (Dercon 2000).

The poverty literature also describes that households become increasingly risk averse as they move closer to poverty, as any further drop in income can push them below the survival point (World Bank 2000). Thus, a higher demand for insurance would be expected if the poor perceive insurance as a means to protect themselves against impoverishment. But poor households need to be able to trust that their premium payments to an insurance fund will ensure their access to medical care during the enrolment period. This highlights the importance of information and transparency in insurance fund management for poor households. Their level of trust in the insurance system may motivate them to insure.

Trust and Social Capital

Trust has been defined as the expectation that arises among citizens of regular, honest and cooperative behaviour, based on commonly shared ethical norms and values (Fukuyama 1995). These norms include reliability, loyalty, solidarity, justice, professional standards and codes of behaviour. They are nurtured through tradition, and repeated interaction among people, and by a supportive institutional context that fosters trust (Fukuyama 2000).

The concepts of social norms and trust are related to social capital, though this association has been defined variously (Putnam 1993). This thesis follows Fukuyama's definition: social norms and values constitute the social capital of a society, and trust is a consequence of social capital. The strengthening of social capital is a key for communities to engage in collective actions and build organisations and social networks (Fukuyama 1995).

This suggests a positive relationship between the density of social capital and trust in a society and the demand for health insurance. However, a recent study conducted in Rwanda highlights the link between poverty and social capital. In areas with high levels of poverty, the study found that social capital has dwindled as described by acts of solidarity and mutual assistance (Colletta and Cullen 2000). As social capital is needed for engagement in collective actions, the lack of it would support arguments made by poverty literature that the poor are less likely to insure. On the other hand, it could also be hypothesised that less solidarity among family and friends will cause the poor to insure.

Table 4.1 summarises these different theories on decision-making. For each theory, it shows how individuals' tastes or preferences will affect their motivation to insure, such that they reach their desired outcomes as well as the factors that predict insurance purchase (column 3) or a decline of health insurance (column 4).

Factors that stimulate insurance demand include risk aversion, higher income levels, low insurance premiums and high user fees, knowing with certainty that a loss will occur, the over-weighting of occurrences with small probabilities, risk aversion against impoverishment, and trust in insurance.

Among the reasons for non-insurance are: low user fee levels, individuals' risk-seeking behaviour if losses are uncertain, their risk aversion against something new, higher value of current consumption, and conservative preferences, including the veil of experience and their dislike of eventual feelings of regret and disappointment. With their choice, people aim to increase their utility level versus a reference point, and prevent feelings of regret and disappointment.

Table 4.1: Summary of theories on insurance choice

Theories	**Motivation**	**Effects predicting purchase of insurance**	**Effects predicting decline of insurance**
Consumer choice	Maximize utility	High Y; high user fees; Low premium (insurance)	Low Y; high premium Low user fees
Expected Utility	Maximize expected utility through certainty	Uncertainty Risk aversion	Risk seeking
State-dependent utility		Weak health and anticipate high insurance payoff	Healthy and anticipate low insurance payoff

Prospect	Prospect of gain in reference to risk level	Prospect of loss in reference to risk level is certain	Prospect of loss is uncertain
Cumulative prospect	Prospect of gain	Over-weighting small probability of illness	Under-weighting probability of illness
Endowment / status quo / veil of experience	Higher utility versus reference point	Insurance benefits higher than costs of insurance and of giving up user fees	Risk-aversion against new and unknown
Regret and disappointment	Minimize regret and disappointment	Loss aversion, High probability of illness	Conservative preferences Low probability of illness
Time preferences	Maximize utility	High value of future protection	High value of current consumption
Poverty		High risk aversion when near poverty line	Unaffordable premium
Trust		Trust in insurance	Mistrust insurance

Note: Y=Income

Despite the criticism of EU theories, none of the other concepts has provided superior results based on empirical findings on individuals' real market decisions. But a model based on expected utility theory may yield inconsistent results if prospect theory better describes decision-making under uncertainty (Manning and Marquis 1996). Manning and Marquis (1996) conducted a robustness check between expected utility and prospect theory by including prospect theory terms in their model allowing for differential responses for gains and losses. Findings suggest that the two theories do not affect results significantly. Even if risk aversion is not the dominant motivation to insure, the influence of other factors in the choice process will not alter results. The following section presents empirical findings from other studies.

4.2.2 Empirical evidence

The empirical evidence on the demand for health insurance is rather limited. It has been mainly analysed by estimating consumers' price and income elasticities of the demand for insurance in the USA.

Phelps (1973) uses two data sets from the USA to estimate the demand for health insurance: first, a cross-sectional set of 1963 survey data; and second, time series data of total insurance benefits and premiums from 1929 to 1968 insurance industry publications. Based on cross-sectional data, Tobit regression results indicate that the insurance demand has a positive income elasticity of 0.8, and is very price-elastic with an elasticity of larger than unity. The cross-price elasticity of user fees on the demand for insurance yields contradictory results, suggesting that higher user fees do not necessarily lead to increases in the demand for insurance. Rather, the demand for insurance is positively correlated with education level, urban areas, and white households. The robustness of findings is checked by comparing the Tobit with OLS, yielding the Tobit technique as superior (Phelps 1973). However, other researchers find that the Tobit model behaves poorly in the presence of minor departures from the underlying model assumptions (Manning and Marquis 1996).

Based on time-series data, Phelps (1973) estimates insurance demand in an OLS model. Results indicate a positive relationship between insurance demand, income, user fee levels, and higher mean level of illness (represented by the age variable). There is a negative association between insurance demand and premium level. Based on these findings Phelps concludes that economic variables explain about 40 percent of the variation in insurance coverage (Phelps 1973). These findings are consistent with consumer theory, implying that low-income groups are less likely to insure than the better-off.

The RAND study collected data to analyse the demand for medical care in the USA. Marquis and Holmer (1996) examine the different theories of consumer choice and the assumptions about people's evaluation of outcome when making choices, based on data collected at the end of the RAND study. Study participants were randomly assigned to five different insurance coverage plans. In a self-administered interview, study participants were presented with three hypothetical offers to purchase additional insurance coverage. Findings from the discrete choice model suggest that consumers show inertia in plan choice, which may be interpreted by the status quo effect or veil of experience. The demand for insurance is price inelastic, and families consider losses smaller than USD 200 as irrelevant. It leads to the conclusion that when evaluating risky prospects in their demand decision, people evaluate them as gains and losses from a reference point (i.e. status quo or health risk) rather than as final wealth status. This result is in contradiction with expected utility theory (Marquis and Holmer 1996).

Manning and Marquis (1996) use an indirect utility function to estimate the price and income elasticities of the demand for health insurance in a limited information maximum likelihood model, and based on data collected at the end of the RAND insurance trial. Participants were asked to select from three hypothetical insurance plans with different co-insurance rates. This study expands on former studies that estimated the willingness to pay for hypothetical insurance by adding the value of medical care to the value of risk avoided in the purchaser's utility function. It implies that part of what consumers are willing to pay is attributable to the value of additional care they expect to receive when insured. Findings indicate that the willingness to enrol in a hypothetical health insurance is inelastic in income and price, with elasticities of +0.22 and -0.18, respectively. Robustness checks are conducted by using a discriminant function as a non-parametric alternative, yielding similar results (Manning and Marquis 1996).

While the demand for voluntary health insurance has been explored in industrialized countries by examining price and income elasticity of the insurance demand, there is virtually no evidence from developing countries. Using qualitative information, Bennett et al. (1998) evaluate the performance of 98 health insurance schemes that operate in informal markets in low- and middle-income countries. According to the schemes' risk-sharing spectrum, the schemes are grouped into two categories suggesting that in each category the decision to enrol is driven by different motives.

Table 4.2 presents an overview of these categories and their respective enrolment motives. Type I schemes cover high-cost, low-frequency hospital events for consumers who live in a larger catchment's area. It is suggested that the demand for Type I insurance schemes is driven by individuals' risk aversion and the risk of high hospital fees. Type II schemes operate on a community level and cover low-cost and high-frequency health centre care. Demand for Type II schemes may be driven by reasons such as altruism, solidarity, and improving the availability of quality care at local health centres. Adverse selection might be more of an issue in Type I, and moral hazard in Type II plans (Bennett et al. 1998).

Table 4.2: Demand motives for different risk-sharing spectrum

Insurance Issues	Type I Schemes	Type II Schemes
- Risk-sharing level	Beyond community	Within defined community
- Benefit package	Hospital care	Primary health care
- Enrolment motive	Risk-aversion	Community solidarity Paying when cash available
- Asymmetric information	Adverse selection	Moral hazard

(Source: adapted from Bennett et al. 1998)

Citizens' willingness to pay and join a hypothetical health insurance plan has been assessed in India. Findings suggest that households' willingness to join and to pay an annual enrolment fee is determined by factors related to socio-economic status and the geographical accessibility to the health facility (Mathiyazhagan 1998). Additional factors may affect insurance demand, such as education level, gender of the household head, assets and cultural variables.

Evidence from low-income countries shows that compared to the wealthier the poor are considerably less protected against risks of income fluctuations. To some extent this may be because risk-sharing mechanisms do not exist in low-income areas (Bennett et al. 1998). Problems related to information, contract enforcement and absence of formal insurance mechanisms have caused the poor to devise their own pooling and lending systems to protect themselves against financial risks (Besley 1995).

Most commonly, poor people pool their risks in "tontines" or rotating savings and credit associations (ROSCAs), and use the money to finance investments in production goods. ROSCAs exist all over the world[20]. Their number keeps growing due to a lack of formal institutions that guard the security of credits and savings. A number of individuals form a ROSCA by committing to regularly put a fixed sum of money to a common pot, which will be allocated randomly to one member until each member has won the pot once. It is assumed that individuals join ROSCAs because they have identical, inter-temporally additive preferences and that the eventual winning of the pot increases their expected utility at the time of joining. Their welfare rises because a financial intermediary, the ROSCA, reduces every member's utility cost of saving. Factors that contribute to individuals' demand to participate in ROSCAs include their *rational and forward-looking behaviour, risk aversion, the probability that their income may be hit by a non-synchronous shock, as well as different timing of consumption needs* (Besley 1995).

According to direct interviews conducted with poor individuals, institutional characteristics influence whether the poor perceive an institution as effective, which will influence their decision to join. People *value qualities, such as trustworthiness, participation, caring, compassion, respect, honesty, fairness, timeliness, access, hardworking, responsive support and contact with the institution.* If institutions lack these characteristics, they will not make a difference for the poor who will, as a consequence, not participate (World Bank 1999).

This analysis aims to fill the gap in empirical evidence on the demand for health insurance in low-income countries.

[20] They are called Tontines in Western Africa, Chit in India, Hui in Taiwan, and Kye in Korea.

4.3 *Model specification, methods and data*

4.3.1 Specification of demand function

The rationale underlying this analysis is that the demand for insurance is derived from the demand for health and health care, and depends on preferences and ability to pay the premium; and that health care is consumed to produce health status, which enters into utility. The analytical framework used is based on EU theory. The demand for health insurance is a discrete binary choice between an uncertain loss occurring with a probability when uninsured, and a certain loss of paying premium (Manning and Marquis 1996).

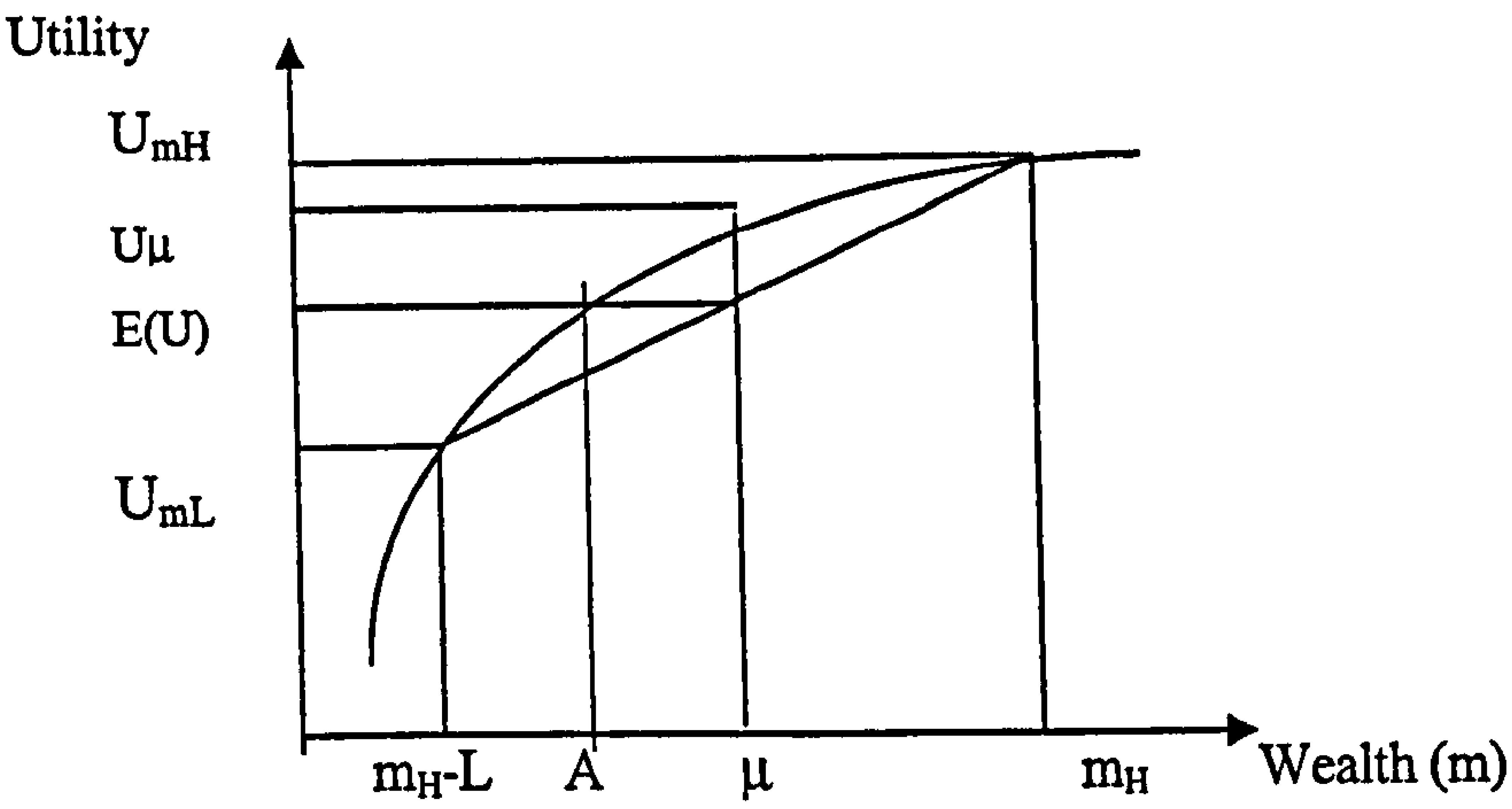
Figure 4.3 shows the welfare gain of demand for insurance by risk averse individuals. The concave utility curve reflects diminishing marginal utility (MU) of wealth (Hurley 2000). An insured person seeks to maximize her expected utility, given her level of wealth (m). An uninsured's expected utility is obtained from an uncertain wealth of (m_H) when healthy, or when sick (m_H-L). An uninsured healthy person with zero loss reaches a utility level of (U_{mH}) at wealth (m_H) with a probability of (1-π). If sickness and loss (L) happen with a probability of (π), then the person reaches utility (U_{mL}). Over time, the uninsured's expected average wealth will be (μ) that is ($m_H - \pi L$), yielding the expected utility level E(U) with an uncertain outcome, and at a risky wealth level of (A).

The corresponding expected utility function E(U) without insurance is:

(1) $E(U) = (1-\pi)\, U(m_H) + \pi\, U(m_H-L)$.

The first part $(1-\pi)\, U(m_H)$ in the equation describes the probable utility level reached at (m) and when healthy. The second part shows the corresponding utility level achieved when sick and accounting for the loss caused by paying out-of-pocket user fees (m_H-L) (Jack 1999).

Figure 4.3: **Welfare effects of demand for insurance under risk aversion**



(Source: Barr, 1998; Jack, 1999; Hurley, 2000).

To reach certainty in wealth (μ) instead of facing a risky wealth level (A), the uninsured may insure and pay an actuarial premium P that is equal to the expected loss πL (Hurley 2000):

(2) $P = \pi L$

Figure 4.3 shows an insured individual will be at a wealth level (μ), corresponding to wealth when healthy (m_H) minus premium (πL), and achieve with certainty a higher utility level ($U\mu$):

(3) $U\mu = u\,(m_H - \pi L)$

Thus, insurance is welfare-improving. It increases an individual's expected utility level by the amount of $U\mu$ - E(U). This result depends on the assumption that the utility of wealth is independent of health status. If state-dependent utility theory is right and the utility of wealth is health-state-dependent, then the optimal level of insurance is unknown (Hurley 2000).

4.3.2 Model definition

Purchasing a good or not is a binary choice. When purchasing insurance (or not), information is revealed about preferences for avoiding risk (Friedman 1974).

The analytical strategy employed in this analysis is based on equations (1) and (3). The binary choice model used is a logit regression estimated using maximum likelihood methods. The logit is the logarithm of the odds of being insured (MHI), reflected by the ratio of the number of insured households (MHI) to the number of uninsured households (1 – MHI). In a logit regression, the probability P_i of MHI enrolment is a sigmoid function of L_i, which is a function of the explanatory variables X (Mukherjee et al. 1998):

(4) $L_i = b_1 + b_2 X_{2i} + ... + b_k X_{ki}$

(5) $P_i\,(MHI) = F(L) = 1 / (1 + 1/e^{Li})$

The dependent variable demand for MHI will equal 1 if individuals insure, or zero otherwise. The model predicts the conditional probability P that MHI equals 1 for given values of the explanatory variables X_i, which represent a series of attributes that are assumed to correlate with choice, such as socio-economic, demographic, and health factors. Hence, (1-P) is the probability that MHI=0. Each estimated coefficient β_i depicts the change in the predicted logit as a result of a unit change in the corresponding explanatory variable, ceteris paribus. In the case of dummy variables, the explanatory variable is compared against its reference category (Mukherjee et al. 1998).

The probability of enrolling in MHI is a function of L, which is a function of a series of dummy and continuous variables: the district of Kabgayi, Byumba, male household head, age of household head, school attendance, large household size, household with pregnancy, household with small children, time distance to MHI, cattle, radio, bike ownership, and monetary expenditure per capita, which is used as a proxy for income.

The equation to be estimated is:

(6) $P_i\,(MHI) = F(L) = \alpha + \beta_1\,\text{Kabgayi} + \beta_2\text{Byumba} + \beta_3\,(\text{genhh}) + \beta_4\,(\text{d\_agehh}) + \beta_5\,(\text{d\_school}) + \beta_6(\text{d\_hh\_si}) + \beta_7(\text{hhpreg}) + \beta_8\,(\text{hhchild}) + \beta_9\,(\text{d\_time}) + \beta_{10}\,(\text{d\_cattle}) + \beta_{11}(\text{d\_radio}) + \beta_{12}(\text{d\_bike}) + \beta_{13}(\text{dquar\_1}) + \beta_{14}(\text{dquar\_2}) + \beta_{15}(\text{dquar\_3}) + \varepsilon$,

where the variables are defined in Table 4.4. ε is a random disturbance term, which includes the usual unobservable variables and any measurement errors of recorded quantities.

4.3.3 Model assumptions

The model of the demand for insurance relies on the following assumptions.

First, it is assumed that consumers' utility is defined as a function of health and the consumption of other goods, and that it is linear in the probabilities (Marquis and Holmer 1996).

Second, a consumer is assumed to have direct control over the choice variable, and certainty about the outcome, which is to be insured or not (Gertler and van der Gaag 1990).

Third, when purchasing insurance consumers do not know whether they will be sick or well (Manning and Marquis 1996). They act rationally, maximize their expected utility and objectively assess their health risk correctly, suggesting that they consider the insurance effect on the eventual demand for care (Phelps 1973).

4.3.4 Data and variables

This analysis is performed in STATA7. It uses household survey data collected in Byumba, Kabgayi and Kabutare, at the end of the first MHI operational year in October 2000. The data set includes 3,173 households, among them 356 insured households. Overall, these are

14,574 individuals. The questionnaire included questions, typically posed to the head of each surveyed household, on the households' socio-demographic, health, economic and insurance situation. It is assumed that the head of household makes the MHI enrolment decision. Thus, the household is the unit of analysis. A household is defined by all individuals who live and eat in the same house, including servants, relatives, and orphans.

Table 4.4 summarizes the variables and characteristics of the sample. Variables have been examined in histograms to identify skewness.

Table 4.4: Variable definition and descriptives (Household survey: 10/2000)

Variable Definition	Variable	Obs	Mean	Std. Dev.	Min	Max
MHI membership	MHI	3,173	0.112	0.316	0	1
District Kabgayi	Kabgayi	3,173	0.263	0.440	0	1
District Byumba	Byumba	3,173	0.521	0.500	0	1
District Kabutare	Kabutare	3,173	0.216	0.412	0	1
Gender HH head (Male = 1)	genhh	3,173	0.684	0.465	0	1
HH head 30 year+	d_agehh	3,164	0.798	0.400	0	1
Age HH head	agehh	3,164	43.262	15.546	14	94
HH head attended school	d_school	3,173	0.549	0.498	0	1
Level of study (0=None; 1=primary; 2=post primary; 3=secondary; 4=superior)	levstudy	3,173	0.677	0.762	0	4
HH size	rhhsize	3,173	4.699	2.337	1	18
HH with 5+ members	d_hh_si	3,173	0.477	0.500	0	1
HH head with pregnancy in hh	hhpreg	3,173	0.287	0.453	0	1
HH head with child<5 in hh	hhchild	3,173	0.575	0.494	0	1
HH < 30 min. to HC/MHI	d_time	3,173	0.335	0.472	0	1
HH with cattle	d_cattle	3,173	0.158	0.364	0	1
HH with radio	d_radio	3,173	0.342	0.474	0	1
HH with bike	d_bike	3,173	0.091	0.288	0	1
1st monetary expenditure quartile	dquar_1	3,173	0.250	0.433	0	1
2nd monet expenditure quartile	dquar_2	3,173	0.251	0.433	0	1
3rd monetary expenditure quartile	dquar_3	3,173	0.249	0.433	0	1
4th monetary expenditure quartile	dquar_4	3,173	0.250	0.433	0	1
Number of rooms in house	nbroom	3,149	3.263	1.170	1	9
Number of sheep in HH	nbsheep	3,173	0.332	0.995	0	16
Number of goats in HH	nbgoat	3,173	0.809	1.484	0	17

Number of cattle in HH	nbcattle	3,173	0.214	0.725	0	21
Monetary expenditure per capita per month (RWF)	rexpcap	3,173	3149.481	7460.573	0	192,950
Logarithm of monetary expenditure per capita per month (RWF)	LnExp	3,173	7.198	1.428	0	12.170
Squared logarithm of monetary expenditure per capita per month (RWF)	LnExp2	3,173	53.844	18.782	0	148.114
Reasons to enrol in MHI (1=cheap; 2=precaution; 3=other)	m332	339	1.876	0.641	339	1.876
Premium level seen by member (1=easy; 2=okay; 3=expensive)	m334	339	2.121	0.73	339	2.121
How paid MHI premium	m335	354	3.585	2.462	354	3.585
Member will re-enrol in MHI	m337	341	0.962	0.192	341	0.962
Reasons not to re-enrol in MHI (1=lack of money; 2=other)	m339	14	1.429	0.514	14	1.429
Why not MHI member	m340	2659	1.606	1.331	2659	1.606
Non-member will enrol	m341	2244	0.706	0.456	2244	0.706
Why non-member will not enrol (1=poverty; 2=expensive; 3=other)	m343	649	1.411	0.791	649	1.411

Note: Data source: household survey. Non-weighted data. Exchange Rate: USD 1=RWF390 in June 2000; USD 1=RWF460 in June 2002.

Dependent Variable

This is a binary variable: *MHI membership of a household* at the time of the interview (MHI).

Demographic Variables

The model includes dummies for gender (genhh) and age (d_agehh) of the head of the household, and for household size (d_hh_si). Rwanda reports a high rate of households headed by widows (22%), who are particularly exposed to poverty, illiteracy and low medical service use (Ministry of Economics and Finance 2002). Thus, male-headed households are expected to be better-off than female-headed households. If male gender turns out to be a significant enrolment factor it would suggest the poorer are less likely to enrol. The age cut-off point is 30 years for household heads, which is below the average age.

Households with three and more children tend to be poorer than smaller households (Ministry of Economics and Finance 2002). Therefore, this analysis uses a cut-off point for household size of 5 members, at an average household size of 4.5. It is expected that the annual premium of RWF 2,500 for households up to 7 individuals provides an incentive for large households to insure, although they may be poorer. If household size and income are inversely related and if larger households are more likely to enrol, it would imply higher enrolment probability among the poorer.

Health Variables

Two imperfect health indicators aim to identify households with potentially higher service use because of higher need: households with pregnant women (hhpreg), and households with children below 5 years (hhchild). These variables might capture potential adverse selection by members; and are consistent with predictions of state-dependent utility theory. It is expected that households with pregnant women and small children are more likely to insure. However, higher enrolment of these groups may have resulted from active member recruiting by nurses among pregnant women who sought preventive care services in health centres.

Geographic Variables

They include households' district of residence (Byumba, Kabgayi or Kabutare) to estimate residence specific factors associated with MHI membership, such as the districts' information campaign. The time distance to the health centre and MHI bureau (d_time) is analysed assuming that households who live within 30 walking minutes of the MHI bureau and health centre may know the staff, and may be better informed about MHI, which is expected to positively affect enrolment. Enrolment is highest in Byumba (see Table 3.3), presumably due to the active information campaign with district authorities.

Socio-Economic Variables and Their Robustness

Socio-economic measures include (1) assets and (2) monetary expenditure data.

Assets variables include whether the household head attended school (d_school); and households' investment and production goods, such as number of rooms (nbroom), ownership of cattle (d_cattle), sheep (d_sheep), goats (d_goat), radio (d_radio) and vehicles (d_bike). Survey interviewees live predominantly in clay and straw houses with clay or tin sheets roofs. Richer, as well as better-educated households are expected to live in houses with more rooms. Cattle, radio and bike ownership are signs of wealth. Small stock (sheep, goats, fowl) is mostly held for own-consumption and sales. Bicycles are costly and the only affordable vehicles for the rural population, though rather difficult to use in hilly areas. The distribution of assets in a population is generally skewed, which will affect the sample means (Deaton 1998).

In the absence of income and expenditure data, it is possible to construct an index of assets and housing characteristics to proxy wealth using principal component analysis. This approach has been validated with datasets that contain both asset and income data. Econometric results suggest that the asset index as a proxy of economic status is at least as reliable as conventionally measured consumption expenditures for use in predicting school enrolment (Filmer and Pritchett 2000). Deaton (1998) recommends that because of the lack of an adequate theory on how different socio-economic components should be combined into a single aggregated welfare measure, they should be kept separately. Thus, this analysis takes each asset variable as an alternative measure of socio-economic status to estimate the enrolment probability, as monetary expenditure is probably measured with some error.

In rural Rwanda, most people live from subsistence farming. They are exposed to seasonal and transitory income shocks, causing their income for some periods to be zero, and forcing them to smooth their consumption over bad and good times. Thus, monetary and non-monetary expenditure is a better measure of households' welfare (Deaton 1998).

This data set did not collect information on non-monetary expenditures. Therefore, households' total monetary expenditure during the four-week period prior to the interview serves as a proxy for household income. It is calculated by summing up households' monthly monetary expenditures spent at the market and outside the market (e.g. for rent, transport, tobacco), for school fees, and health, including transport costs to health facilities, fees paid for traditional and for modern medicine in health facilities and pharmacies.

The equivalence scale literature does not provide any satisfactory alternative on how to divide a household's expenditures by its members. While per capita values give too little to adults and too much to children, dividing household expenditures according to each individual's need may underestimate the true dispersion of consumption among them. The use of per capita values is best practice and considered as conceptually clearer (Deaton 1998). The Rwandan HLCS conducted in 2000 uses the same adult equivalence scale that was used in the 1983 National Budget and Consumption Survey. The scale contains different weights by gender and age group, giving higher values to women than men, due to women's longer work hours. The HLCS methodology does not describe the basis for the different weights[21]; but suggests conducting sensitivity analysis with respect to the choice of the equivalence scale in a subsequent stage (Ministry of Economics and Finance 2002). Applying an equivalence scale and estimating weights for different household members creates additional difficulties in Rwanda given the new household composition as a result of the genocide[22]. Therefore, in this analysis, monetary expenditures are reported on a per capita level (rexpcap), by dividing total monthly monetary expenditure for the total household by the number of household members.

Previous analysis with this dataset stratified the sample based on household monetary expenditure into quartiles, and examined whether the insurance demand differs across

[21] Apparently, weights were chosen based on discussion between the Government and FAO in 1983.
[22] Many families have adopted several orphans and taken in survivors without family members. This makes it difficult to estimate whether an orphan or a distant relative are treated the same as other family members and to assign the relative weights.

quartiles. Logit regression results yielded insignificant differences between quartile coefficients on the enrolment probability (Schneider and Diop 2001). This may be related to the rather skewed distribution of monetary expenditures across quartiles (implying minimal differences between the bottom three groups).

Table 4.5 summarizes the statistics for monthly per capita monetary expenditures for all households at different percentile levels. The distribution is extremely right-skewed: most people have relatively low expenditures while fewer and fewer report larger amounts. About 75 percent of the sample spends below RWF 3,250 (USD 8.33 in 2000) per capita per month compared to the maximum amount of RWF 192,950 (USD 495 in 2000). Visual inspection of the data reveals that only 3 of 3,139 households report monetary expenditures higher than RWF 100,000 (USD 256 in 2000). In rural areas, such high amounts point to measurement errors, or to the situation of very few rich[23]. Some studies exclude outliers and trim the data set by one to five percent at the upper and lower end of a distribution (Deaton 1998). However, this study includes all data.

Table 4.5: Distribution of monthly monetary expenditures per capita

Monetary Expendit.	Min	10th Perc	25th Perc	50th Perc	Mean	75th Perc	90th Perc	Max
In RWF	0	275	637	1,492	2,904	3,250	6,250	192,950
In USD	0.0	0.71	1.63	3.83	7.45	8.33	16.03	495.1

Note: Data source: household survey weighted data (9/2000). Exchange Rate: USD 1=RWF390 in June 2000.

Table 4.6 examines the robustness of monetary expenditure as a socio-economic measure by comparing the distribution of monetary expenditures across deciles with the asset distribution (Deaton 1998). The first column ranks households in deciles, according to their monetary expenditure per capita. The other columns include average school level, various asset variables, and average household size across deciles.

[23] In the absence of an industry and service sector in this area, it could be that these household heads are local (high paid) employees of international organisations, or government employees with salary mark-ups paid by international organisations. Their health expenditure is paid by their employer.

Table 4.6: Socio-economic variables, by monetary expenditure decile

ME Decile	Monetary expenditure	Level school	Nbr cattle	Nbr goats	% own bike	Nbr rooms	Hh size
1	134.3***	0.41	0.08**	0.43**	2%	2.87	4.34
2	397.4***	0.44	0.19	0.61	4%	3.11	5.04
3	661.7***	0.44	0.27	0.75	6%	3.28	4.76
4	953.3***	0.64**	0.19	0.71	7%	3.33	4.62
5	1,314.4***	0.59	0.25	0.76	8%	3.42	5.14**
6	1,716.1***	0.69	0.26	0.80	9%	3.47	4.64***
7	2,336.7***	0.66	0.22	0.82	9%	3.53	4.76
8	3,258.0***	0.78	0.29	0.78	11%	3.54	4.76
9	4,889.3***	0.80	0.30	0.85	15%	3.47	4.39
10	14,416.9***	1.12***	0.39	0.86	24%**	3.79**	3.66***
N (Hh)	3,173	3,173	3,173	3,173	3,173	3,149	3,173

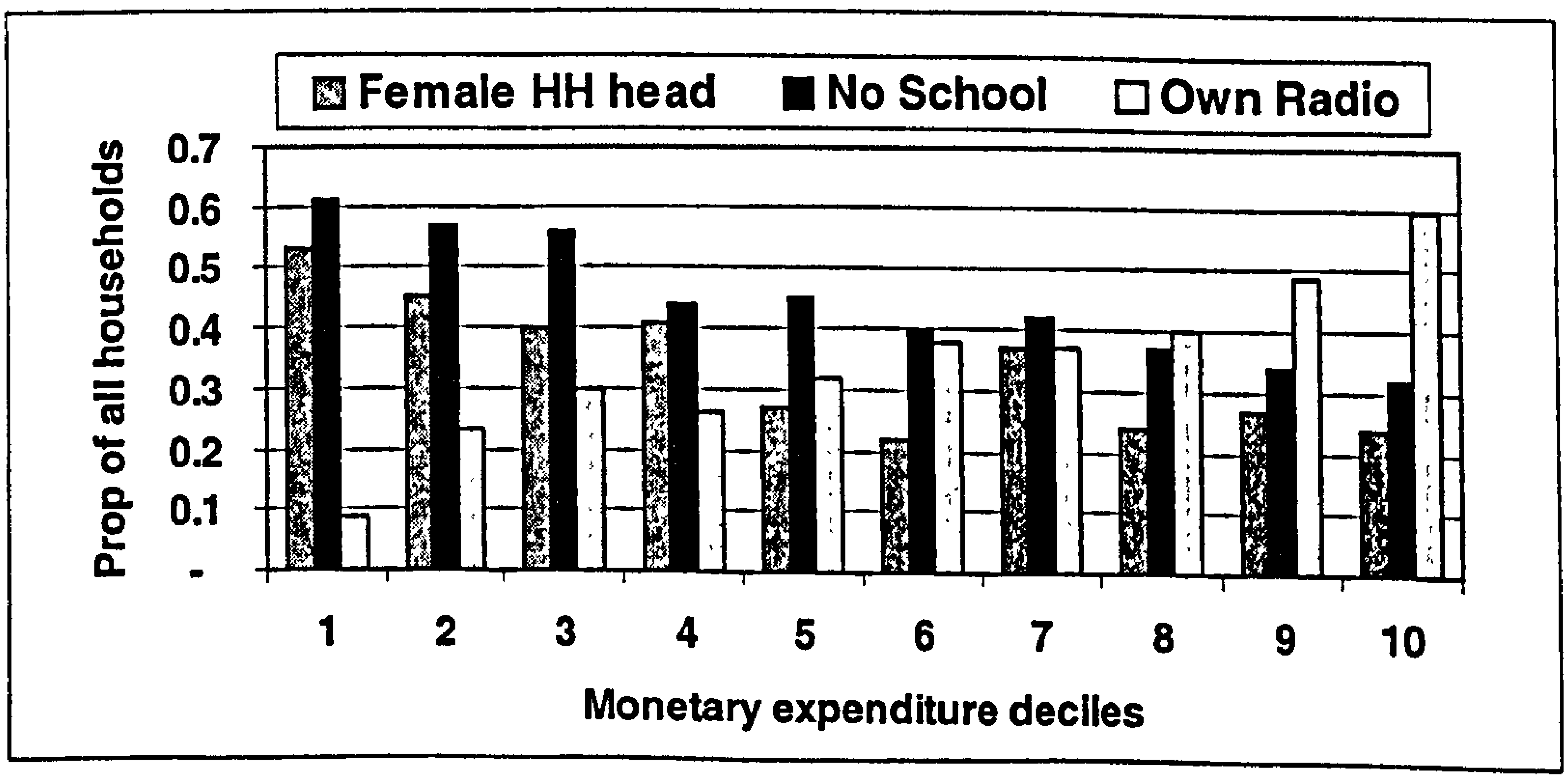
Notes: Figures are averages over all households in each decile; households are grouped by deciles of total monetary expenditures per capita per month in RWF. Level school: 0=no school, 1=primary, 2= >primary. t-tests were performed to compare the difference to the next higher decile. *** significant at 1 percent level ** significant at 5 percent level

All asset variables increase with higher monetary expenditure deciles, with the exception of 'household size', which significantly decreases in the top group. This relationship between monetary expenditure and household size is in line with findings from the HLCS where larger households were identified as poorer than smaller households (Ministry of Economics and Finance 2002). The gradients shown for assets across deciles are lower than for monetary expenditures. In all deciles households own small numbers of assets, suggesting that these rural households are quite poor. Even among top decile households, educational attainment is low. This asset distribution supports findings from other surveys, according to which 66 percent of rural households live below the consumption poverty line and only few rural households own assets (Ministry of Economics and Finance 2002). For example, cattle are culturally the most important asset in Rwanda. However, in this survey, only 16 percent of households interviewed own cattle. The average number of cattle owned by these 291 households is only 1.5. Similarly, households with goats only own on average 2 goats. This suggests that the distribution of assets across socio-economic groups is rather small in these rural areas.

Asset and educational variables only differ significantly between the bottom and top groups, and do not seem to have a significant impact on inequalities in the sample population. Three assets variables (cattle, goats, and bike ownership) show the same patterns of change, suggesting correlation among them with increasing deciles. Similarly, the average number of rooms correlates with household heads' educational level. Although monetary expenditure is a weak proxy for households' socio-economic background, this variable is retained for the analysis: first, it is in line with the distribution of asset indicators; and second, it appears to give a more pronounced description of households' socio-economic situation across deciles.

Household resources such as assets tend to be related to households' composition, including the greater earning ability of men (Deaton 1999). Figure 4.7 ranks households by their monetary expenditure deciles, against which three variables are distributed: the proportion of households headed by a woman, by an illiterate person, and the proportion of households with a radio. The graph suggests that households in lowest expenditure deciles are considerably worse off than the highest expenditure groups. The proportion of female and illiterate household heads tapers off significantly in upper expenditures deciles, while radio ownership increases markedly.

Figure 4.7: Gender, illiteracy and radio ownership, by decile



Note: F-test shows the significance of results across deciles. Female: F = 15.51, p<0.001; School: F = 4.76, p<0.001; Radio: F= 15.48, p<0.001.

Thus, overall with very few exceptions, these households are very poor. They have accumulated very few assets. The distribution of assets among them is fairly equal with the exception of differences between the top (9 and 10) and the bottom deciles (1 and 2). Households in the lowest expenditure deciles are more likely to be headed by a female or illiterate person, and have considerably fewer assets than the upper groups.

Monetary expenditures differ significantly across deciles. This comparison of the distribution of monetary expenditures with the distribution of assets across monetary expenditure deciles suggests that expenditure is a robust socio-economic indicator, against which MHI enrolment and equity in utilisation and financing of care will be analysed.

Throughout the analysis and for expository convenience, I will refer to households classified in the bottom monetary expenditure quartile Q1 as "poor", and the top quartile Q4 as "rich". This definition does not follow any of the usual definitions of poverty, which is based on the flow of consumption relative to some predetermined poverty thresholds like expenditures necessary for the consumption of a determined bundle of goods (Deaton 1998). The "rich" are not rich in absolute terms; in this rural context they are just less poor.

Data Limits

This household data set includes data on monetary but not on non-monetary expenditures. Rural households' production used for own-consumption and in-kind payments reflects an important proportion of total income, especially for poor households. Thus, monetary expenditure is biased towards the richer and using it as an income proxy will underreport socio-economic levels for the poorest. As a result, inequality findings from this data set should not be compared with other data sets or used for poverty analysis (Deaton 1998). Such a comparison may lead to the erroneous result that inequality is higher among these sample households.

The data on the "number of rooms" variable is incomplete and is excluded from the analysis to prevent a decrease in sample size. Overall, 24 households did not respond to the question, among them 20 uninsured households. Due to its correlation with rooms, the school attainment variable will serve as a proxy for households' socio-economic situation. The effect of including rooms was examined in the multivariate analysis. The significance of coefficients was unchanged; however, the model test statistics fare better when excluding it.

The analysis will not measure health and price related characteristics. Household survey data were collected at the end of MHIs' first operational year. Thus, information on members' self-reported health status (SAH) during the two weeks prior to the interview does not allow concluding on adverse selection among members who may have enrolled anytime during the year, up to 12 month prior to the interview. The two health variables (households with pregnant women or with small children) provide limited proxies for adverse selection.

There is only one MHI plan with identical premiums in the three districts. Thus, premiums are excluded from the demand function, and price elasticity of demand for MHI is not estimated. Though, it would be expected that the demand for MHI is highly price elastic for the poor.

4.3.5 Estimation procedures

This household survey was collected at the end of the first MHI year when about 8 percent of the three districts population was insured. It includes data from households who live in these districts, which are administratively divided into cells. A two-stage cluster survey design was applied. Section 3.5.3 describes the related sampling strategy.

The clustering of observations within sampling units implies observations are not independent, yielding error terms in the regression to be correlated across observations (Deaton 1998). Survey estimation commands (svydes) in STATA7 produce variance estimates that are approximately unbiased or biased towards larger standard errors. Though, model estimation problems may occur when the number of parameters exceeds the number of clusters (StataCorp 2001).

The analysis uses weighted data and STATA7 svydes commands, which allows defining the survey set at the onset. It includes (a) two strata areas depending on their average MHI enrolment rate[24]; (b) clusters, as defined by the 22 PSUs; and (c) the probability weight.

The analysis follows EU theory. Previous analysis showed no link between monetary expenditures or health variables and enrolment probability (Schneider and Diop 2001), which is contrary to findings from other studies (Morduch 1995; Townsend 1995). This analysis investigates previous results to ensure that they are not related to model misspecification or an artefact of the data. It contains six steps.

First, based on bivariate analysis, the uninsured and insured are compared on relevant characteristics by estimating the corresponding frequencies, mean values, and proportions. Bivariate analysis is limited as the association between enrolment and the variable of interest may be contaminated by omitted variable bias (Deaton 1998).

Second, multivariate analysis is used to obtain parameter estimates in a logit regression model for the probability of MHI enrolment, as shown in equations (4) and (5). The model building strategy starts with Models 1 to 3, and focuses on the specification of the monetary expenditure variable. Model 1 is estimated with monetary expenditure entering the regression in its categorical quartile form to compare whether the demand for MHI differs across quartiles. The second model fitted is linear in the logarithm of monetary expenditure (LnExp). Model 3 includes the quadratic form of the logarithm of monetary expenditure (LnExp2) in order to test for non-linearity of the effect of income (Mukherjee et al. 1998). Wald tests are performed to estimate whether the monetary expenditure variables are significantly different from zero in the equation (StataCorp 2001).

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[24] See section 3.3.

Third, two specification problems exist: heteroskedasticity and omitted variables. Heteroskedasticity causes inconsistent estimators and inappropriate covariance matrix. Although the analysis uses logarithmically transformed[25] continuous variables, it rarely results in a normal distribution. In models with limited dependent variables, like in logit models, the estimation of scale parameters cannot be separated from the estimation of location parameters, and as a result, it is not possible to separate the "regression" vectors from the "heteroskedasticity" vectors. This has so far limited a straightforward solution to deal with heteroskedasticity in binary choice models (Deaton 1998).

Omitting a relevant variable will cause inefficient coefficients estimates. The magnitude of any bias on the coefficients of the included variable depends on the correlation between the omitted and the included variables and on the magnitude of the true effect of the omitted variable on the outcome (Grosh and Glewwe 2000).

Specification tests are conducted to identify problems related to heteroskedasticity and poor fit. Residual analysis and diagnostic plots serve to examine the goodness of fit of the models. The Hosmer-Lemeshow Chi-square test is a residual analysis test for binary choice models. The closer the resulting Chi-square is to zero, the better the model fits the data. In a saturated model the Chi-square statistics will be zero since all residuals are equal to zero. Results are graphically examined to spot unusual data and check the goodness of fit of the model (StataCorp 2001).

Fourth, the model refinement strategy continues in a backward elimination process (Models 4-6). The model is gradually restricted by setting the least statistically significant variable coefficients to zero, until the test statistics identify the most parsimonious model that is identifiable, has a high goodness of fit, and is theoretically consistent and coherent (Mukherjee et al. 1998). According to the specification tests Model 6 appears to be the most

[25] See Chapter 6 in Literature Review on discussion of logarithmic transformation. In this household data set, each monetary expenditure observation has been increased by 1 RWF before logarithmic transformation to correct for zero value observations.

parsimonious model. Before interpreting the coefficients, a number of alternative specifications are tested (Models 7-9) to examine the effect on results of including and excluding variables such as rooms, children, and assets. Although some minor changes in estimated coefficients are observed, the test statistics confirm Model 6 as the preferred model.

Fifth, logit regression results of Model 6 serve to estimate marginal effects (ME) at the sample means. The ME of a series of explanatory variables X on the enrolment probability p can be written as the product of the marginal effect of L on p and of the marginal effect of X on L:

$$(7) \qquad \delta p / \delta X_k = dp/dL * \delta L/\delta X_k = f(L)\, \beta_k = \left(e^{-L} / (1 + e^{-L})^2\right) \beta_k$$

The ME is not constant as it depends on the value of L as described in equation (4), which depends on the value of the explanatory values X. Although most of the explanatory and the dependent variables are binary, estimating their ME as if they were continuous variables yields accurate results (Greene 2000).

Sixth, qualitative data from households describe their reasons to demand or decline MHI membership, which in light of the literature reviewed helps to test the internal coherence of the monetary expenditure variable if responses differ across the quartiles.

4.4 *Results*

4.4.1 Description of the sample group

Based on bivariate analysis, the socio-demographic and economic characteristics are examined across three groups: insured, uninsured and all households. Table 4.8 provides an overview. First, demographic characteristics are shown for household heads and the entire household, followed by socio-economic variables, including assets and monthly monetary expenditure per capita. Two-tailed t-test statistics are presented in the last column.

Table 4.8: Socio-demographic and –economics by MHI status, proportions

Proportion of	MHI Member (n 356)	Non-Member (n 2,817)	All HH (n 3,173)	t value
Household head:				
HH headed by man	82.3%***	64.7%	65.9%	5.19
HH head older than 30	80.1%	81.8%	81.7%	0.71
HH head with schooling	72.9% ***	53.0%	54.3%	6.55
Household:				
HH with pregnancy	35.4%**	24.9%	25.6%	2.29
HH with child<5	67.2%***	51.7%	52.8%	4.0
HH size 5+ individuals	62.7%***	43.8%	45.2%	5.38
HH is <30 min from HC	48.6%	37.6%	38.4%	0.81
Household asset ownership:				
HH owns radio	48.9%***	32.8%	34.0%	3.4
HH owns bike	18.5% ***	8.5%	9.3%	3.72
HH owns cattle	24.5%	17.7%	18.2%	0.98
Household monetary expenditure quartiles:				
HH in 1st (lowest) quartile	19.9%	26.1%	25.6%	1.82
HH in 2nd quartile	24.2%	24.7%	24.6%	0.19
HH in 3rd quartile	29.9%	25.0%	25.3%	1.63
HH in 4th quartile	26.1%	24.3%	24.4%	0.5

Note: Household survey, weighted estimates calculated with svyset. Figures are proportions over all households in each cell; e.g. if 82% of MHI member households are headed by men, then the remaining 18% are headed by women. Quartiles reflect per capita monetary expenditure and sum up to 100%. Two-tailed t-tests compare the average values of the insured with the uninsured sample. *** significant at 1 percent level, ** at 5 percent level.

The demographic comparison shows significant differences in gender and education with a high proportion of insured households headed by a man, or by a person with some schooling.

The second panel suggests a bigger share of insured households is from households with pregnant women, with children below 5 years, or from larger households. A markedly higher proportion of insured households own a radio or a bicycle.

The fourth panel shows the distribution of households by monetary expenditure quartiles. The distribution of insured households across quartiles increases with higher quartiles, but not monotonically. There is no statistically significant difference between the proportion of insured and uninsured in their respective quartiles.

Summary statistics on socio-demographic and economic variables are presented in Table 4.9 for insured, uninsured and all households. The two groups show similar (weighted) average ages of the household head, average numbers of cattle, and average monetary expenditure per capita per month in RWF. Insured households count on average significantly more individuals.

Table 4.9: Socio-demographic and –economics by MHI status, mean values

Mean values	MHI Member HH (n 356)	Non-Member HH (n 2,817)	All HH (n 3,173)	t
Age HH head, years	42.5	44.5	44.3	2.03
HH size, number of individuals	5.47***	4.5	4.6	4.67
Number of cattle owned	0.35	0.23	0.24	1.21
Number of cattle owned by cattle owners	1.4	1.3	1.3	1.22
Monetary expenditure (RWF), per month, per capita	3,362.9	2,868.6	2,909	0.94

Note: Household survey, weighted estimates calculated with svyset. HH = household; MC = Monetary expenditure per month per capita; Year 2000: USD 1=RWF 390; Two-tailed t-tests compare the average values of the insured with the uninsured sample. *** significant at 1 percent level, ** at 5 percent level.

Table 4.10 presents insured and uninsured households by monetary expenditure (ME) quartiles. In each quartile, mean values are shown for the size of households, the number of bikes, and household total monetary expenditure per capita per month. The t-statistics are in the last column.

Table 4.10: **Socio-economic measures by MHI status and by quartile**

Mean values	ME	MHI Member HH (n 356)	Non-Member HH (n 2,817)	All HH (n 3,173)	t
Household size	Q1	5.5**	4.6	4.7	2.41
	Q2	5.6	4.7	4.8	1.87
	Q3	5.8***	4.6	4.7	2.95
	Q4	4.8***	4.1	4.1	3.06
Bike owners	Q1	0.09	0.03	0.04	1.15
	Q2	0.13	0.06	0.07	1.38
	Q3	0.21***	0.09	0.10	2.89
	Q4	0.27	0.17	0.14	1.91
Monetary expenditure (RWF), per month, per capita	Q1	347	333	334	0.37
	Q2	1,007	1,050	1,047	0.88
	Q3	2,056	2,241	2,225	1.73
	Q4	9,367	8,154	8,247	0.86

Note: Household survey, weighted estimates calculated with svyset. HH = household, Q = monetary expenditure quartiles; Exchange rate: USD 1=RWF 390 in Year 2000; Two-tailed t-tests compare the average values of the insured with the uninsured sample. *** significant at 1 percent level, ** at 5 percent level.

The insured in lowest, third and highest quartiles count on average significantly more household members, than uninsured households. Insured households in third quartile are markedly more likely to own a bike compared to their reference group, the uninsured. The insured and uninsured report similar average monetary expenditure across all quartiles.

This descriptive comparison of household characteristics indicates that insured households differ significantly from the uninsured in regard of socio-demographic (larger household size, male household head, household with pregnancy and child<5) and socio-economic characteristics (household head with schooling, own radio, and bike). However, the two groups appear to be similar in regard of monetary expenditures and cattle ownership.

The following section uses multivariate analysis based on maximum likelihood procedures, to examine the independent effects of different variables, while controlling for the impact of others.

4.4.2 Logit regression results

To disentangle the determinants of MHI enrolment, a logit regression is estimated with the household head's insurance status as the dependent variable. The robustness of socio-economic variables is examined.

Table 4.11 presents three logit models with explanatory variables and their reference categories in the first two columns. Standard errors in parentheses and p-values are shown. Model 1 is based on equation (6) with monetary expenditures entering the equation in their quartile form. The robustness of quartiles is tested in Model 2 and 3. In Model 2, expenditures enter the equation in its continuous, logarithmically transformed form (LnExp). The insignificant coefficient suggests no relationship between enrolment probability and expenditure. In Model 3, even after allowing for non-linearity by including the quadratic term of the logarithm of monetary expenditure (LnExp2), both monetary expenditure coefficients are not significantly different from zero.

The three models show similar results for the magnitude and significance of coefficients, as well as tests of goodness of fit. In all three models, five variables affect the MHI enrolment probability significantly compared to their reference categories: Byumba residence, household head attended school, households with pregnant women, households live within 30 minutes of the health facility, and bike owners. These coefficients appear to be robust to the inclusion of a differently structured monetary expenditure variable. In Model 3, with a quadratic term of the expenditure function, larger household size is an additional significant enrolment factor. In all three models, monetary expenditures and some relevant asset variables (radio and cattle) are not significant, suggesting correlation with significant variables (bike and school), and raising concerns about multicollinearity between variables.

Table 4.11: **Model 1-3: Logit regression results for enrolment probability**

Explanatory Variable	Reference Category	Model 1 Logit Coef.	Model 1 Std. Err.	Model 1 P	Model 2 Logit Coef.	Model 2 Std. Err.	Model 2 P	Model 3 Logit Coef.	Model 3 Std. Err.	Model 3 P
Kabgayi	Kabutare	1.272	(0.645)	0.063	1.285	(0.654)	0.064	1.271	(0.649)	0.064
Byumba	Kabutare	2.863	(0.576)	0.001	2.860	(0.577)	0.001	2.860	(0.577)	0.001
Male hh head	Female	0.295	(0.206)	0.168	0.316	(0.203)	0.136	0.315	(0.202)	0.134
HH head, 30+	<30 years	0.200	(0.233)	0.403	0.191	(0.229)	0.414	0.189	(0.229)	0.418
HH head with school	Illiterate	0.637	(0.135)	0.001	0.645	(0.129)	0.001	0.646	(0.131)	0.001
HH size 5+	HH size <5	0.372	(0.182)	0.055	0.380	(0.19)	0.059	0.393	(0.178)	0.039
HH with pregnancy	No pregnancy	0.505	(0.205)	0.023	0.501	(0.205)	0.024	0.501	(0.205)	0.024
HH with child <5	No small child	0.127	(0.217)	0.566	0.128	(0.224)	0.573	0.139	(0.213)	0.521
<30 min to HC	30+ min	1.437	(0.482)	0.007	1.443	(0.479)	0.007	1.437	(0.478)	0.007
Cattle	No cattle	0.258	(0.406)	0.531	0.272	(0.411)	0.515	0.276	(0.413)	0.512
Radio	No radio	0.314	(0.196)	0.124	0.319	(0.194)	0.116	0.311	(0.198)	0.132
Bike	No bike	0.617	(0.2)	0.006	0.611	(0.195)	0.005	0.594	(0.188)	0.005
LnExp		-	-	-	-0.084	(0.076)	0.278	-0.223	(0.313)	0.485
LnExp2		-	-	-	-	-	-	0.011	(0.023)	0.634
Quartile 1	Quartile 4	0.267	(0.232)	0.263	-	-	-	-	-	-
Quartile 2	Quartile 4	0.244	(0.221)	0.282	-	-	-	-	-	-
Quartile 3	Quartile 4	0.235	(0.235)	0.329	-	-	-	-	-	-
_cons		-6.743	(0.713)	0.001	-5.974	(0.638)	0.001	-5.572	(1.203)	0.001
Nbr obs		3164			3164			3164		
Pop size weight		3212.48			3212.48			3212.48		
F		(15, 6) 55.93			(13, 8) 52.43			(14, 7) 61.28		
Prob > F		0.0001			0.0001			0.0001		
Log likelihood		-654.969			-654.96			-654.71		
LR chi2		313.37			313.37			313.88		
Prob > Chi2		0.0001			0.0001			0.0001		
Pseudo R2		0.193			0.193			0.1934		
Hosmer-Lemeshow Chi2(10)		10.33			6.79			9.7		
Prob > Chi2		0.4119			0.7448			0.4663		

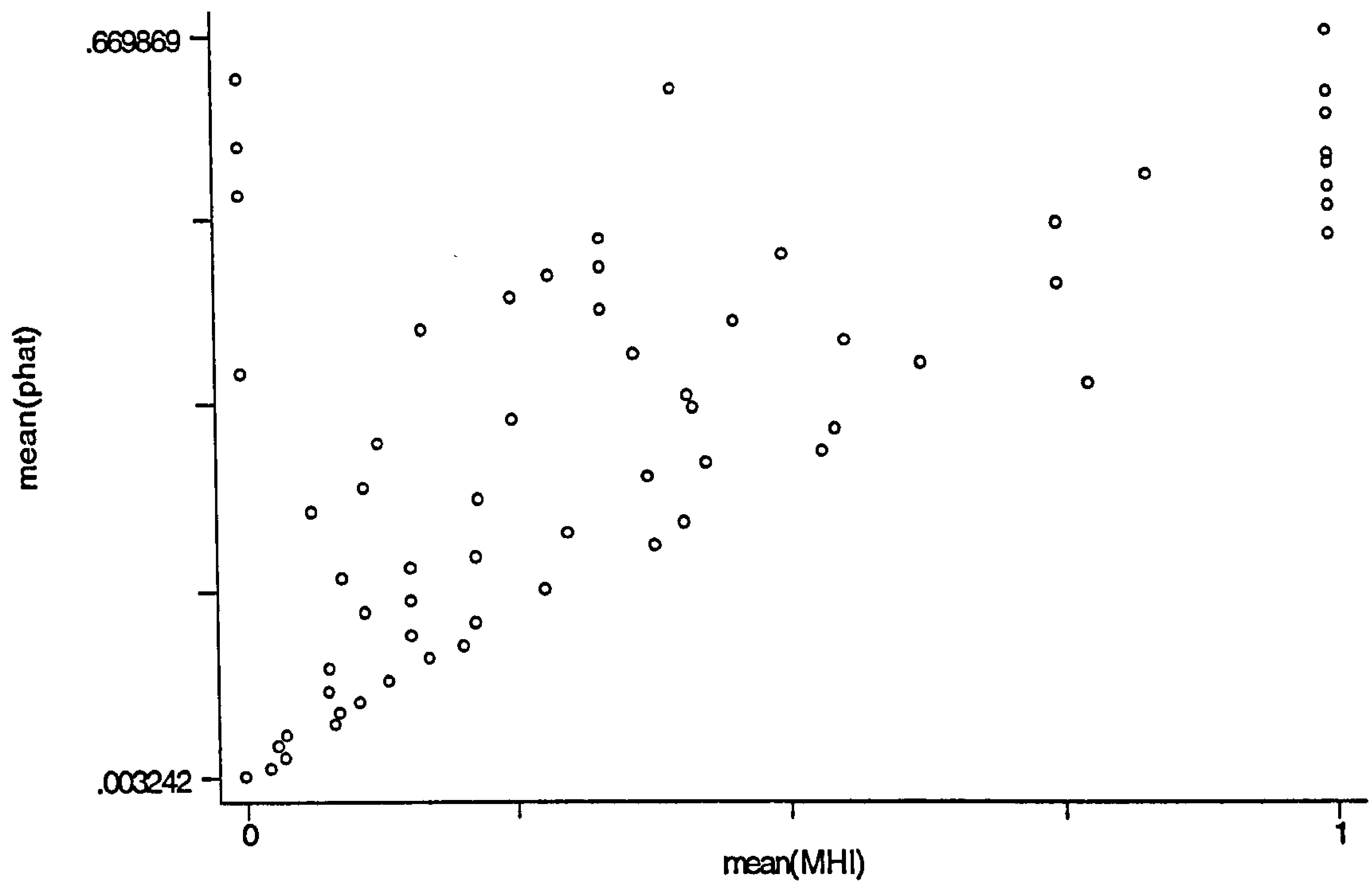
Note: Household Survey Data (10/2000) weighted estimates calculated in STATA7 svylogit. HH=Household, HC=Health Centre. Svylogit reports t-tests. P values show significance levels. Standard errors are in parenthesis.

The test statistics for the three models show significant results for the F test (or Chi2 test), the log likelihood and the LR Chi2. The Hosmer-Lemeshow Chi2 test examines the goodness of fit of the models. The data are ordered on the predicted probabilities and regrouped into ten equal size groups (StataCorp 2001). The three models report similarly insignificant Chi2, suggesting that the residuals are close to zero. Thus, the three models cannot be rejected and fit the data well.

Despite similar results and no indication for an association between expenditure and the enrolment probability in Model 2, this comparison suggests that Model 3 fits the data best. It has six significant explanatory variables that correlate with enrolment, and smaller standard errors.

The goodness of fit for Model 3 is depicted in Figure 4.12. The diagnostic plot is a scatter of the mean of the leverage of the covariant patterns (phat), against the mean value of the enrolment probability. The small circles on the graph are household groups that have the same characteristics or the same covariant pattern (Mukherjee et al. 1998). There is heteroskedasticity with increasing variance once the mean of the MHI variable goes beyond the cut-off point of about 0.125. Four circles fit the model particularly poorly. They are situated on the left-hand side far above the horizontal axis, where the dependent variable (MHI) equals zero, while the model predicts an enrolment probability of nearly 0.6. These are uninsured households who have characteristics like school attendance or Byumba residence, which according to the model predict MHI membership.

Figure 4.12: Model 3: Covariant pattern analysis on enrolment probability



The correlation matrix for Model 3 is shown in Table A4.1. As expected, correlation is high between monetary expenditure variables, and relatively high between the pregnancy and child variable. However, it seems low between assets, gender and school variables. It suggests that more complex patterns of multicollinearity may affect parameters or standard error estimates, and could undermine correct inference (Deaton 1998). Although on a low level, the radio variable seems to be the variable that correlates most with other socio-economic indicators including gender, education and assets. Bivariate analysis suggested high correlation between gender, school, bike and radio.

Due to concerns about multicollinearity and insignificant monetary expenditures and asset variables (radio and cattle), the socio-economic measures used in these models are checked. It leads to a test of Model 3 based on stepwise elimination of socio-economic variables that appear to have a non-significant effect on the enrolment probability, or seem to correlate with more relevant variables. These correlations have been described in Table 4.6 in section 4.3.4.

The robustness test aims to reach a model with a reasonably well overall test statistic and significant relevant explanatory variables. Models 4 to 6 are shown in Table 4.13.

Table 4.13: Model 4-6: Logit regression results for enrolment probability

		Model 4			Model 5			Model 6		
Explanatory Variable	Reference Category	Logit Coef.	Std. Err.	P	Logit Coef.	Std. Err.	P	Logit Coef.	Std. Err.	P
Kabgayi		1.259	(0.640)	0.063	1.296	(0.652)	0.061	1.288	(0.651)	0.062
Byumba	Kabutare	2.855	(0.578)	0.001	2.851	(0.570)	0.001	2.863	(0.577)	0.001
Male hh head	Female	0.279	(0.201)	0.180	0.330	(0.212)	0.135	0.341	(0.192)	0.091
HH head, 30+	<30 years	0.205	(0.234)	0.393	0.208	(0.227)	0.371	0.180	(0.232)	0.446
HH head with school	Illiterate	0.614	(0.132)	0.001	0.640	(0.132)	0.001	0.662	(0.126)	0.001
HH size 5+	HH size <5	0.401	(0.179)	0.036	0.423	(0.186)	0.034	0.425	(0.174)	0.024
HH with pregnancy	No pregnancy	0.491	(0.207)	0.028	0.489	(0.203)	0.026	0.547	(0.203)	0.014
HH with child <5	No small child	0.141	(0.226)	0.541	0.130	(0.206)	0.533	-	-	-
<30 min to HC	30+ min	1.421	(0.471)	0.007	1.434	(0.461)	0.005	1.448	(0.486)	0.007
Cattle	No cattle	0.254	(0.415)	0.546	-	-	-	0.271	(0.405)	0.512
Radio	No radio	0.276	(0.195)	0.173	0.346	(0.229)	0.147	0.303	(0.194)	0.135
Bike	No bike	0.575	(0.198)	0.009	0.627	(0.154)	0.001	0.600	(0.186)	0.004
LnExp		-	-	-	-0.211	(0.322)	0.519	-0.212	(0.321)	0.517
LnExp2		-	-	-	0.011	(0.023)	0.657	0.010	(0.024)	0.677
Quartile 1		-	-	-	-	-	-	-	-	-
Quartile 2		-	-	-	-	-	-	-	-	-
Quartile 3	Quartile 4	-	-	-	-	-	-	-	-	-
_cons		-6.520	(0.633)	0.001	-5.620	(1.222)	0.001	-5.571	(1.195)	0.001
Nbr obs		3164			3164			3164		
Pop size weight		3212.48			3212.48			3212.48		
F		(12, 9) 74.68			(13, 8) 69.78			(13, 8) 72.81		
Prob > F		0.0001			0.0001			0.0001		
Log likelihood		-655.911			-655.76			-655.0139		
LR chi2		311.49			311.79			313.28		
Prob > Chi2		0.0001			0.0001			0.0001		
Pseudo R2		0.1919			0.1921			0.193		
Hosmer-Lemeshow Chi2(10)		14.19			16.29			10.29		
Prob > Chi2		0.1643			0.0915			0.4156		

Note: Household Survey Data (10/2000) weighted estimates calculated in STATA7 svylogit. HH=Household, HC=Health Centre. Svylogit reports t-tests. P values show significance levels. Standard errors in parenthesis.

Model 4 regresses current MHI enrolment on the same explanatory variables as Model 3, though the two monetary variables *LnExp and* $LnExp^2$ are excluded based on their non-significant[26] and small coefficients. Coefficient results and test statistics are similar as in Model 3. Model 3 yields a lower Lemeshow Chi2 suggesting that it fits the data better than Model 4, which is abandoned.

Model 5 excludes the *cattle dummy*, due to its non-significance in Model 3, and its eventual correlation with male gender and bike ownership. However, in a rural society, cattle may be a good asset indicator. Its exclusion does not affect other coefficients and their significance. Monetary expenditure remains insignificant. Model 5 has a high Lemeshow Chi2, significant at a 10 percent level, indicating that Model 3 fits the data better.

Model 6 excludes the *child variable* due to its non-significance in Model 3 and correlation with pregnancy. The same coefficients are significant as in Model 3, including male gender at a 10 percent significance level. Expenditures remain insignificant. Model 6 has higher coefficients than Model 3, lower standard errors, and higher F-values and Log likelihood statistics. Although the Lemeshow Chi2 is slightly higher, the Chi2 value is insignificant. Based on a more pronounced gender variable and better test statistics, Model 6 is considered as fitting the data better than Model 3. The child variable seems to correlate with other variables (e.g. pregnancy), and excluding it leads to more distinct coefficients for other variables. Table A4.2 shows the correlation matrix for Model 6. Results are similar as in Model 3.

Figure 4.14 shows the diagnostic plot describing the goodness of fit for Model 6. Comparing the pattern of Models 6 and 3 suggests that there is similar heteroskedasticity. The number of poorly fitting covariate patterns in the upper left-hand side is four. Based on the above test statistics and higher coefficients, Model 6 is judged to be the best (most parsimonious) model.

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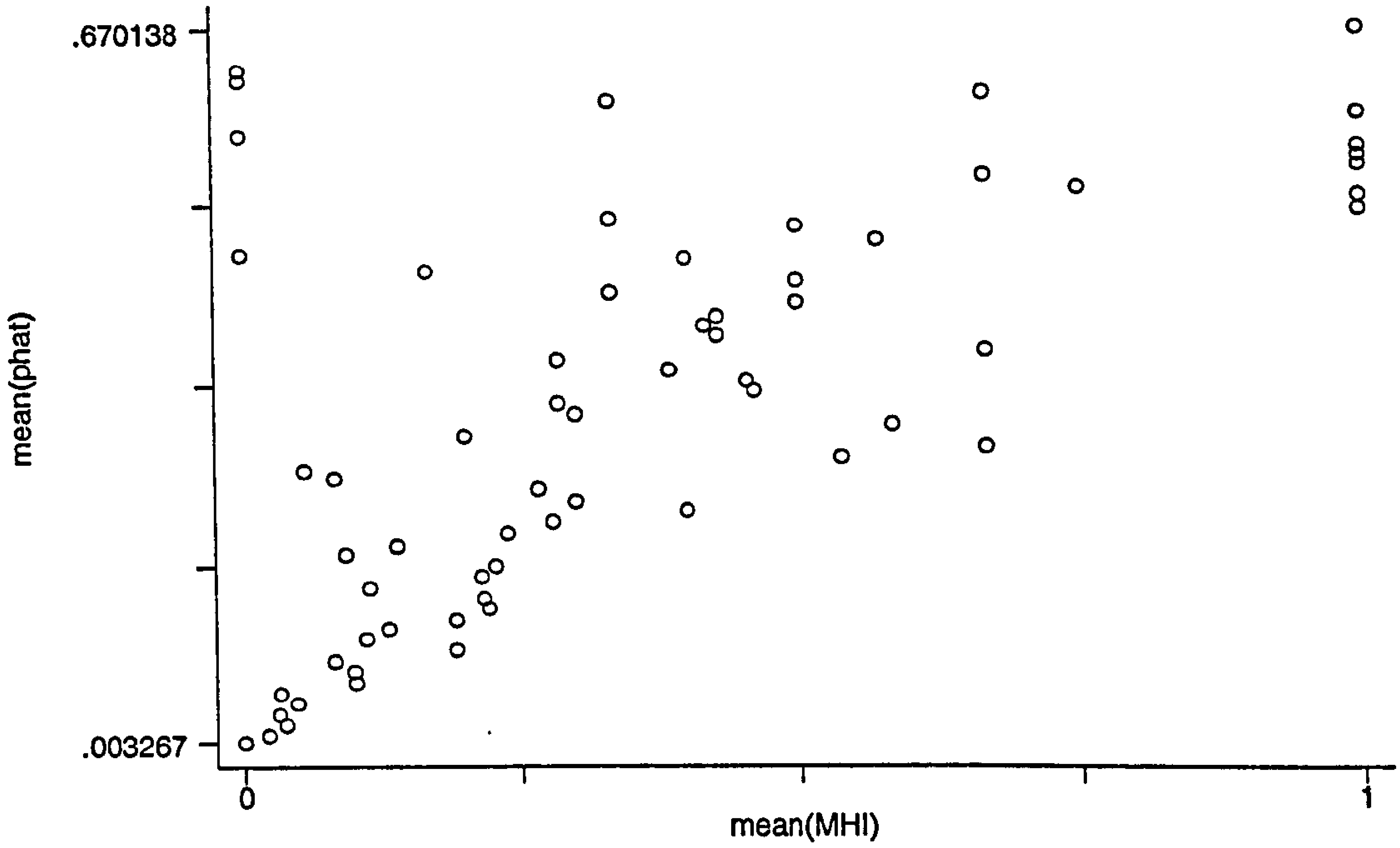
[26] Adjusted Wald test: joint hypothesis: LnY=0.0 and LnY2=0.0; $F(2, 19) = 1.04$, $Prob>F= 0.37$.

Figure 4.14: Model 6: Covariant pattern analysis on enrolment probability



Alternative model specifications were also tested using the backward elimination strategy. Model 7 continues with Model 3. It *adds the room variable* and excludes *children*, which results in a smaller sample size, and significant Kabgayi and room variables; expenditures remain insignificant. The test statistics suggests Models 3 and 6 fit the data better. Model 8 includes rooms, but excludes *cattle and child.* The Hosmer-Lemeshow Chi2 is significant, suggesting a poor fit of this model. Similar poor fits occur when variations of this model are estimated. Model 9 excludes all asset variables (*cattle, radio, bike, rooms*), though expenditures remain insignificant. Excluding all assets variables would cause loss of relevant information. Based on the test statistics Model 9 is refuted.

The above nine models share the same five explanatory variables that are significantly associated with the enrolment probability: Byumba residence, household head attended school, <30 minutes walking distance to the health facility, bike ownership and household with pregnancy. Large household size tends to become a significant indicator when the quadratic term of the logarithm of expenditure (LnExp2) is included, indicating non-linearity in expenditure. The coefficients in all nine models are robust to the exclusion of asset and monetary expenditure variables.

Model 6 is chosen as the model that fits the data best based on its low standard errors, test statistics, insignificant Lemeshow Chi2, and the covariant patterns shown in Table 4.1. It has six variables that significantly affect the enrolment probability, among them geographic, demographic and asset variables that are highly relevant in the Rwandan socio-economic context. The next section interprets these results in terms of their economic significance.

4.4.3 Marginal effects

This section uses the coefficients of Model 6 to quantify the marginal effect $\delta p/\delta X_k$ of a change in an explanatory variable on the probability of MHI enrolment (Dougherty 2002). Table 4.15 presents in the second column the marginal effect for each explanatory variable at the means of the variable. The marginal effect of a dummy variable measures the effect on the probability of moving from one level to the other.

Table 4.15: Marginal effects for MHI enrolment probability, at mean value

Explanatory Variable	dp/dx	Std. Err	z	P>|z|	X
Kabgayi	0.084	0.063	1.330	0.185	0.263
Byumba	0.161	0.045	3.600	0.001	0.520
Male hh head	0.015	0.008	1.890	0.059	0.684
HH head, 30+	0.008	0.010	0.800	0.422	0.799
HH head with school	0.031	0.007	4.460	0.001	0.550
HH size 5+	0.021	0.009	2.300	0.021	0.477
HH with pregnancy	0.029	0.012	2.510	0.012	0.287
<30 min to HC	0.090	0.039	2.300	0.022	0.335
Cattle	0.014	0.023	0.610	0.540	0.157
Radio	0.015	0.010	1.460	0.144	0.342
Bike	0.036	0.016	2.290	0.022	0.092
Ln(Exp)	-0.010	0.015	-0.650	0.514	7.198
Ln(Exp)2	0.000	0.001	0.420	0.675	53.853

Note: All explanatory variables and their reference categories are shown in Table 4.13.

Findings suggest that the effect on the enrolment probability is dominated by geographic variables. The MHI enrolment probability increases by 0.16 when living in Byumba. This effect is 0.08 higher in Kabgayi compared to Kabutare. The enrolment probability increases by 0.09 for households that live within 30 minutes of a health facility/MHI, at the sample means of all variables. The effect on the enrolment probability is not as pronounced for demographic and socio-economic variables. The enrolment probability increases by 0.03 after a household head attended school; by 0.015 for male-headed compared to female-headed households; and by 0.036 for households after they own a bike. A pregnancy increases households' enrolment probability significantly by 0.029, at the mean of all other variables. The marginal enrolment effect of monetary expenditure is tiny and not different from zero, implying no economically significant effect on the probability of enrolment.

The following section draws from responses on households' enrolment or non-enrolment reasons to help interpreting the above results.

4.4.4 Reasons to demand or decline MHI

Survey participants were asked about their reasons to demand or decline MHI. Results are presented for insured and uninsured households according to their monetary expenditure group.

MHI Members' Choice

MHI member households were asked three questions: first, the reasons why they have enrolled in MHI; second, their perception of the premium level; and third, whether they intend to re-enrol. According to the literature, factors that induce consumers to insure are risk aversion, higher income levels, low insurance premiums and high user fees.

Table 4.16 presents insured households' answers to the open question about their enrolment reasons across monetary expenditure quartiles. Responses do not differ significantly across quartiles. Precaution is the main enrolment reason, pointing to members' risk aversion. Only about one-fifth among the poorest enrolled because MHI premium is not expensive.

Table 4.16: Reasons to demand MHI, by quartile

Why MHI member	Q1	Q2	Q3	Q4	Total
Prudence	67%	55%	62%	44%	57%
Not expensive	19%	33%	32%	33%	30%
Other	14%	11%	6%	23%	13%
Total %	100%	100%	100%	100%	100%
Total N	60	83	80	116	339

Note: Wald (Pearson) Uncorrected Chi2(6) =11.12; Adjusted F(6, 13) = 1.34; P < 0.3

Households were asked whether they find premium 'easy to pay', 'affordable' or 'too expensive'. Insured households differ significantly across monetary expenditure quartiles in their perception of the MHI premium level (Table 4.17). More than half of households in the lowest quartile Q1 said that premium is too expensive.

Table 4.17: Perception of annual MHI premium level, by quartile

MHI premium level	Q1	Q2	Q3	Q4	Total
Easy to pay	3%	15%	22%	32%	19%
Affordable	38%	53%	52%	41%	47%
Too expensive	59%	32%	26%	27%	35%
Total%	100%	100%	100%	100%	100%
Total N	60	83	80	116	339

Note: Wald (Pearson) Unadjusted Chi2(6) =36.4; Adjusted F(6, 13) = 3.1; P < 0.05

Interviewees were given several options to respond to the question of how they have financed MHI premium (Table 4.18). Responses do not differ significantly across quartiles. Members are most likely to pay the premium by using their savings, followed by selling agricultural products, joining a tontine or borrowing money. One-third among the poorest quoted other means. It could be that among them are the 3,000 poor widows, children, indigents and orphans who had benefited from subsidised enrolment with premiums paid by local churches.

Table 4.18: How paid for MHI premium, by quartile

How paid premium	Q1	Q2	Q3	Q4	Total
Own savings	37%	38%	45%	58%	45%
Family helped	1%	1%	1%	1%	1%
Borrowed money	8%	9%	5%	3%	6%
Tontine membership	5%	2%	13%	6%	7%
Sold agricultural products	10%	27%	10%	16%	16%
Sold fowl	8%	1%	1%	1%	2%
Other (e.g. paid by churches)	32%	23%	24%	14%	23%
Total %	100%	100%	100%	100%	100%
Total N	60	83	88	123	354

Note: Uncorrected Chi2(18) = 44.4; Design-based F(4.75, 80.73) = 1.8; P < 0.11

The endowment effect suggests that due to the 'veil of experience' people would rather stay with what they have. While this would be a reason for non-members to remain uninsured, the insured would most probably re-enrol when their membership expires. Table 4.19 shows that almost all insured household intend to re-enrol.

Table 4.19: Re-enrolment, by quartile

Member will re-enrol in MHI	Q1	Q2	Q3	Q4	Total
No	5%	2%	4%	4%	3%
Yes	95%	98%	96%	96%	97%
Total %	100%	100%	100%	100%	100%
Total N	58	83	81	119	341

Note: Pearson Uncorrected chi2 (3) =1.39; Design-based F(2.04, 36) =0.4; P < 0.7

Members cited their main reason not to re-enrol in MHI (Table 4.20). Those who intend not to re-enrol are among the poorest. They are unsure whether they will be able to pay premium.

Table 4.20: Main reason not to re-enrol in MHI, by quartile

Why members will not re-enrol	Q1	Q2	Q3	Q4	Total
Not sure to have money	83 %	50 %	0 %	33 %	57 %
Other	17 %	50 %	100 %	67 %	43 %
Total %	100 %	100 %	100 %	100%	100 %
Total N	6	4	1	3	14

Note: Too few observations to conduct significance test

The above findings suggest that enrolment reflects members' risk aversion, which is equally prevalent across all monetary expenditure groups. However, the poor may have encountered additional economic hardship to pay the premium and enrol in MHI.

Non-Members' Choice

Non-members were asked about their current non-enrolment reasons and their future MHI enrolment intention. According to the literature on decision-making under uncertainty, factors that induce consumers to remain uninsured are: their risk aversion against something new; time preferences resulting in higher value for current than eventual future consumption; the veil of experience; or anticipation of eventual feelings of regret and disappointment in case MHI will not respond to their needs.

Non-members responded to an open question about their main reasons for non-enrolment. Table 4.21 shows that poverty is mentioned most often across all quartiles. Poor households in Q1 and Q2 mention poverty significantly more often than the top group. Some of the richer households were not informed about MHI or provide other reasons, including the limited benefit package.

Table 4.21: Non-members' current non-enrolment reasons, by quartile

Why not MHI member	Q1	Q2	Q3	Q4	Total
Poverty	91%	85%	80%	61%	80%
Pro-rata payment not possible	0%	1%	1%	2%	1%
HC quality of care	0%	1%	4%	3%	2%
Not informed about MHI	4%	8%	8%	14%	8%
Other	4%	5%	7%	20%	9%
Total %	100%	100%	100%	100%	100%
Total N	691	668	667	633	2659

Note: Pearson Uncorrected chi2 (12) = 234.345; Design-based F (4.19, 83.70) = 9.6036; P < 0.001

Non-members were asked about their future MHI enrolment intentions (Table 4.22). More than two-thirds of them plan to insure. However, responses differ significantly across quartiles. The intention to enrol tapers off significantly in the lowest monetary expenditure quartile.

Table 4.22: Non-members' future enrolment plans, by quartile

Non-member will enrol in MHI	Q1	Q2	Q3	Q4	Total
No	47%	29%	23%	25%	31%
Yes	53%	71%	77%	75%	69%
Total %	100%	100%	100%	100%	100%
Total N	598	559	543	550	2250

Note: Pearson Uncorrected chi2 (3) = 94.6845; Design-based F (1.58, 31.69) = 11.5466; P < 0.001

Asked about their main reason not to insure (in an open question), poverty has been mentioned significantly more often by the bottom than the top groups (Table 4.23). Households in higher monetary expenditure quartiles mentioned high premiums as a reason for non-enrolment. Maybe they do not perceive themselves as poor but the price as too high pointing to eventual price or cross-price elasticity in MHI demand. Other reasons for non-enrolment were mostly cited by richer groups, and include reasons such as the limited benefit package, which should be expanded to cover hospital care. This argument points to state-dependent expected utility theory, suggesting that the expected insurance pay-off affects households' enrolment decision.

Table 4.23: Non-members' future non-enrolment reasons, by quartile

Why non-member will not enrol	Q1	Q2	Q3	Q4	Total
Poverty	91%	89%	68%	41%	77%
Premium too expensive	0%	0%	8%	8%	3%
Other	9%	11%	24%	51%	20%
Total %	100%	100%	100%	100%	100%
Total N	256	156	121	116	649

Note: Uncorrected chi2 (6) = 138.869; Design-based F (3.29, 65.80) = 30.0445; P < 0.001

The above findings suggest that across monetary expenditure groups, risk aversion or precaution is the main reasons for enrolment; and the poorest perceive the current premium as too expensive. Most households use their own savings to pay premium and they plan to re-enrol. Among non-members, poverty is the main reason for non-enrolment and mentioned significantly more often by the poorest, who may have been forced to pay for other more pressing goods, such as food and clothing.

These findings reassure through the clear separation of responses across quartiles that monetary expenditure is a robust socio-economic indicator. They suggest that although the MHI demand appears to be inelastic with respect to monetary expenditures, households in lowest monetary expenditure quartiles may have endured additional economic hardship to insure and mitigate their financial risk related to their health. It also suggests that monetary expenditure, despite its robustness as a socio-economic indicator, should be complemented in interpreting findings in the demand and equity analysis by a significant indicator that is related to income like education or gender of the household head or bike ownership. The former two are easier to measure[27]. As gender and school attendance are strongly correlated, one of the two variables would be sufficient for the analysis.

4.5 Discussion

This Chapter assessed the relationship between the MHI enrolment probability and households' socio-demographic and –economic characteristics based on household survey data collected in three Rwandan districts. The analysis of the determinants of the demand for health insurance in a low-income context was based on economic and social theories, and focused on the relationship between enrolment and household economic status. Expected utility theory suggests that the demand for insurance reflects individuals' risk aversion and demand for income certainty. Considering poor households' credit constraints, a positive relationship is expected between socio-economic status and insurance enrolment. However, in a low-income context, it might be that households who move closer to the poverty line become more risk averse and are therefore more likely to insure.

[27] Bikes are easy to hide, while gender and school attendance are more obvious characteristics.

This analysis expected a positive relationship between insurance enrolment and household socio-economic background. Findings from other studies suggested that although the poor may very likely be more risk averse, they are less likely to insure because they face credit constraints and have more pressing needs, like food, than worrying about securing eventual future medical care (Townsend 1995; Wagstaff 2001). In addition, the poor may rely on solidarity from family and friends to smooth out consumption over time and protect their socio-economic situation against financial shocks related to ill-health (Dercon 2000).

The analysis in this Chapter found no relationship between MHI enrolment and household income proxied by monetary expenditures; and that about 90 percent of the target population of 1 million chose to remain uninsured during the first operational year of MHI. While poverty was the main non-enrolment reason, precaution was the main reason members gave for enrolling in MHI, and this finding was independent of their monetary expenditure classification.

This suggests that households express similar risk aversion across socio-economic groups, but that the annual MHI premium is unaffordable for the large majority of the target population even though the data suggest that the demand for MHI is unrelated to monetary expenditure.

Bivariate analysis revealed that the insured are from larger, male-headed households or from households with pregnant women or small children. In addition, insured household heads report higher probabilities of school attendance, and radio or bike ownership. Insured and uninsured households appear to be similar in terms of monetary expenditures and cattle ownership.

Findings from multivariate analysis imply a positive relationship between MHI enrolment probability and households' geographical characteristics (residence in Byumba, within 30 minutes of health facility/MHI bureau), demographic characteristics (large household size, households with pregnancy), and socio-economic characteristics (household head attended school, ownership of bike). Relevant asset variables (radio and cattle ownership) seem not to correlate with the probability of MHI enrolment, nor does monetary expenditure, which serves as an income proxy. Examination of marginal effects suggests that geographic variables have the largest effect on MHI enrolment probability (district of residence and distance to the health facility/MHI). Variables, including pregnancy, education of the household head, household size, and asset indicators have a substantially smaller effect.

These results are not unambiguous in relation to the theories and findings from other studies. If the hypothesised positive relationship between enrolment and households' socio-economic background is correct, then it is of interest to identify why this has not been observed in these data. Reasons related to statistical methods, the data, and omitted variables may have contributed to the attenuation of the monetary expenditure effect. These are discussed by considering possible relationships between socio-economic status variables, not captured in the results, and by presenting arguments about why enrolment is equally likely across the socio-economic groups. It is also possible that the hypothesis is not correct. This discussion of findings should help identifying the most valid interpretation.

Statistical issues, such as measurement errors, limited variation in the monetary expenditure variable, and correlation between variables may have contributed to the attenuation of the estimated coefficient on monetary expenditure. First, monetary expenditure is likely to have been measured with error, which decreases the precision with which parameters are estimated (Deaton 1998). However, clear gradients, though not always monotonic, in asset ownership across monetary expenditure groups were identified when comparing asset and monetary variables. In the logit model, monetary expenditures never appear to have a significant effect on the enrolment probability, and this is even the case when all assets variables are excluded. This suggests that there is not too much measurement error in expenditure, which would support the result of the analysis.

Second, there may be limited variation in the monetary expenditure variable across the sample households, implying that the population is equally poor, which would support the empirical finding. Although some people may own a bike or have some more school years, this may not affect their monetary expenditure situation, simply because access to income generating resources is limited in areas with little economic development. Findings from the Household Living Condition Survey support this observation: about 66 percent of rural residents live below the consumption poverty line (Ministry of Economics and Finance 2002).

Third, there is no consistent relationship between enrolment and different socio-economic measures. This could be due to correlation among education, gender and assets variables that leads to insignificant results among relevant socio-economic variables and inconsistencies. This would be against the above finding. However, the correlation matrix, and the relatively low standard errors of coefficients do not necessarily identify a high correlation problem, nor does the stepwise dropping of asset variables affect the association between enrolment and monetary expenditures, which supports the above result.

One possible explanation for the empirical findings could be that the relationship between MHI enrolment and monetary expenditures is better described by a threshold effect. The survey sample may not contain enough households who reach the required threshold for monetary expenditures to have a significant effect on enrolment. If the 'true' relationship is a threshold, then it is possible for there to be no linear relationship over the estimated range. This would support the above finding. Identifying such a threshold would require a larger sample, together with more variation in income.

Besides statistical and data issues, omitted variables may have contributed to the rejection of the hypothesis. Omitted variables include individual trust in MHI, the possibility to benefit from traditional solidarity mechanisms, subsidised enrolment of poor households, favourable premium for large households, non-monetary expenditures, individual health status, and user fees paid when uninsured.

First, as described in the literature on trust in organisations, the poor have all interest to protect their income against financial risks and not to engage in risky investments (World Bank 2000). This is supported by focus group survey statements. Based on previous experience, some households have adopted a "wait and see" strategy, and will only insure once the MHI has built a reputation of trustworthiness (ONAPO 2000). This could also explain the wide range of enrolment in the 54 MHIs (see Annex Table 2): MHIs with a reputation of trustworthy management may have attracted more members. Omitting mistrust as an explanatory variable will bias the monetary expenditure coefficient downwards, if the poor are more likely to mistrust MHI. Additional data would be needed to conclude whether individual trust in MHI varies across socio-economic groups. Also, MHI enrolment has increased over time (see Table 3.3), suggesting that people increasingly perceive MHI as trustworthy organisations.

Second, there may be an absence of traditional solidarity mechanisms, which has led to relatively higher uptake of insurance among the poor. In addition, as suggested by a study on social capital in Rwanda, traditional solidarity acts among family members and neighbours appear to have dwindled since the 1994 genocide, partly due to increased poverty (Colletta and Cullen 2000). The omission of a variable on traditional solidarity mechanisms may have contributed to the attenuation of the monetary expenditure effect if the poor are more likely to use these mechanisms to protect themselves against financial shocks. Though, whether these solidarity mechanisms contribute to equity in access and financing of health care, and are therefore an alternative to health insurance, would have to be further investigated, particularly in areas of high levels and intensity of poverty.

Third, about 3,000 poor individuals, among them orphans, and poor female-headed households, have benefited from financial support by local churches that paid their MHI premium. As these payments were made without identifying the insured as being "sponsored", it will be impossible to identify these MHI members. Such demand-side subsidies targeted to poor households might have contributed to the insignificant monetary expenditure variable. However, the number of female-headed households with subsidised enrolment was not large enough to cause female gender to become a significant enrolment determinant. Rather, without subsidies, female-headed households might be severely underrepresented among the insured.

Fourth, the omission of non-monetary expenditures data results in a skewed distribution of monetary expenditure. Providing that the poor have a relatively larger share of non-monetary expenditures, using total monetary and non-monetary expenditure distribution in the analysis would result in an even smaller coefficient, and support the above result on income inelastic demand for MHI.

Fifth, the data set lacks information on health status prior to enrolment. HIV prevalence is about 11 percent in rural and urban areas. Households with one and more sero-positive individuals may have become poor over time due to high total health expenditures for more frequent medical service use. Adverse selection by poor households with HIV-positive individuals may have led to higher MHI enrolment among the poor, as overall, paying premium is cheaper than paying user fees. In this case, the omission of HIV status may have biased the monetary expenditure variable downwards.

Sixth, the data set does not account for any institutional factors such as providers' monopolist price-setting behaviour that may have influenced poor households' enrolment decision. Uninsured patients who seek care usually pay user fees and an "under the table" fee, which creates additional uncertainty for the uninsured patient about the total price to be paid for care. The prospect of knowing the out-of-pocket (OOP) amount (fixed co-payment) may have affected the enrolment decision. As the poor are more price-sensitive, a slight increase in user fee related payments might cause them to insure. If the poor are more likely to be asked to pay "under the table" fees than the better-off, then the omission of information about such additional payments may have biased the monetary expenditure variable downwards.

It could also be that the above inconsistent result on the hypothesised relationship between monetary expenditure and MHI enrolment is related to the choice of the underlying theory. If the data are in conflict with the theory, then the commitment to consumer theory and expected utility theory should be revisited (Greene 2000). This analysis assumed that consumers are risk averse and they maximize expected utility with objectively correct assessments of risk. But for example, if state-dependent expected utility theory applies, then the richer may have remained uninsured because their expected pay-off from MHI may not be 'good enough' for them to enrol. They might prefer to insure with a health insurance that covers more expensive hospital care provided by physicians, instead of just basic medical care in health centres.

The analysis in this Chapter used data on an insurance enrolment decision in a low-income context. However, theories of decision-making under uncertainty are not based on real market decisions of the type examined in this Chapter. If prospect theory or the status quo effect was to apply, or if there is some divergence between consumers' subjective and objective risk assessment, this could have contributed to inconsistent results. Though, other studies found that even if risk aversion is not the dominant motivation to insure and other theoretical concepts may play a role, their influence in the choice process will not affect results significantly (Manning and Marquis 1996). This argument would support the above result of income-inelastic demand for MHI.

The discussion of the above results in relation to the hypothesis and the underlying theories highlight the limits of this analysis. First, weaknesses inherent to the data set have contributed to some extent to the attenuation of the monetary expenditure coefficient. Second, the theories based on which the analysis was conducted were developed and tested in Western contexts. They may not necessarily be appropriate in a low-income population group, and may have contributed to inconsistent results. Though, the influence of other theoretical concepts might not necessarily change the above result significantly.

These issues bring to light several points for further research in contexts of high levels of poverty. First, if expected utility theory is to be applied in low-income settings, then research on economic theories should be tested in the relevant real market situation. Second, a cross-section survey is limited in interpreting households' expenditures as some may be financing their current consumption by borrowing money, from their own savings, or from current income. Therefore, a household survey panel data set spanning over several years that includes data on income, savings and expenditure would allow assessing the long-run impact of insurance on households' socio-economic situation. Third, data that allow assessing the cross-price elasticity of demand between MHI and user fees could shed more light on households' enrolment behaviour.

Based on the discussion of the results of this analysis, it can be concluded that although the data suggest an inelastic demand for MHI with respect to monetary expenditures, and risk aversion is equally prevalent across socio-economic groups, the current annual premium level is most likely unaffordable for the majority of poor households. To attain more certainty about their financial situation and to protect themselves against unforeseen financial shocks related to illness, the poor who have insured have most likely endured additional economic hardship.

These poor households are often headed by a woman or an illiterate person, and they own significantly fewer assets than households in higher monetary expenditure groups. They may have chosen to enrol in MHI because they have already used all their potential income sources to make a daily living, including child and female labour, and because they rely less on spontaneous acts of solidarity among neighbours, as they are less able to reciprocate solidarity due to their poverty. It leads to the recommendation that some form of means testing should be used in setting the MHI premium.

The next Chapter will elaborate on the relationship between health expenditure and household economic status and provide additional information to support this recommendation. It examines equity implications of health financing and utilisation of care among insured and uninsured households by focusing on the degree of horizontal equity in utilisation, the share of household income going to finance health care, and eventual re-ranking in the move from the pre- to the post-health payment income distribution. The minimum standard approach serves to evaluate households' socio-economic situation before and after health spending.

4.6 *Annex: Correlation matrices*

Table A4.1: Correlation Matrix for Model 3

	Kabgayi	Byumba	genhh	d_agehh	d_school	d_hh_si	hhpreg	hhchild	d_time	d_cattle	d_radio	d_bike	LnExp	LnExp2
Kabgayi	1.000													
Byumba	-0.622	1.000												
genhh	-0.042	0.104	1.000											
d_agehh	0.054	-0.093	-0.141	1.000										
d_school	0.031	-0.031	0.242	-0.202	1.000									
d_hh_si	-0.008	0.056	0.193	0.263	0.073	1.000								
hhpreg	0.077	-0.048	0.203	-0.179	0.154	0.088	1.000							
hhchild	0.075	-0.032	0.246	-0.076	0.179	0.283	0.406	1.000						
d_time	-0.249	-0.248	-0.044	0.021	0.115	-0.034	-0.007	0.017	1.000					
d_cattle	0.222	-0.184	0.097	0.095	0.071	0.176	0.007	0.052	-0.040	1.000				
d_radio	0.109	-0.133	0.205	-0.006	0.245	0.135	0.067	0.086	0.153	0.238	1.000			
d_bike	0.019	-0.030	0.157	-0.059	0.164	0.105	0.053	0.092	0.034	0.164	0.305	1.000		
LnExp	0.079	-0.066	0.179	-0.151	0.229	-0.058	0.070	0.025	0.120	0.109	0.283	0.186	1.000	
LnExp2	0.088	-0.073	0.178	-0.160	0.234	-0.088	0.062	-0.002	0.136	0.106	0.302	0.206	0.966	1

Table A4.2: Correlation Matrix for Model 6

	Kabgayi	Byumba	genhh	d_agehh	d_school	d_hh_si	hhpreg	d_time	d_cattle	d_radio	d_bike	LnExp	LnExp2
Kabgayi	1.000												
Byumba	-0.622	1.000											
genhh	-0.042	0.104	1.000										
d_agehh	0.054	-0.093	-0.141	1.000									
d_school	0.031	-0.031	0.242	-0.202	1.000								
d_hh_si	-0.008	0.056	0.193	0.263	0.073	1.000							
hhpreg	0.077	-0.048	0.203	-0.179	0.154	0.088	1.000						
d_time	-0.249	-0.248	-0.044	0.021	0.115	-0.034	-0.007	1.000					
d_cattle	0.222	-0.184	0.097	0.095	0.071	0.176	0.007	-0.040	1.000				
d_radio	0.109	-0.133	0.205	-0.006	0.245	0.135	0.067	0.153	0.238	1.000			
d_bike	0.019	-0.030	0.157	-0.059	0.164	0.105	0.053	0.034	0.164	0.305	1.000		
LnExp	0.079	-0.066	0.179	-0.151	0.229	-0.058	0.070	0.120	0.109	0.283	0.186	1.000	
LnExp2	0.088	-0.073	0.178	-0.160	0.234	-0.088	0.062	0.136	0.106	0.302	0.206	0.966	1.000

Chapter 5: Equity in Utilisation and Financing and the Minimum Standard Approach

5.1 Introduction

Several researchers have investigated the equity impact of alternative systems of financing and delivery of care in OECD countries, USA and Canada. Although MHI has been suggested as an alternative to user fees to improve access to care, its impact on improving equity in health financing and service use has rarely been examined in low-income countries. Such an analysis is justified, particularly if MHI is criticised as having a small equity impact, due to the limited benefit package, leaving an important part to be paid by patients (Kutzin 1998).

According to egalitarian equity principles, a health system is equitable if financial contributions have some relationship with individuals' socio-economic situation, and if medical care is distributed based on patients' need to achieve better health, as judged by the health professional. The underlying rationale is based on four presumptions: health is seen as a precondition for people to flourish as human beings; health is subject to potentially large and unforeseen 'shocks', which rarely happen due to the deliberate choice by the individual concerned; health care is seen as the appropriate way to restore health status after a shock like illness; and, medical care can be expensive and endanger households' ability to purchase other goods and services they need to flourish as human beings, among them food, shelter or clothing (Culyer and Wagstaff 1993).

Health care utilisation may be sufficiently costly to endanger households' income situation. It may be considered as unfair if health expenditure causes household income to fall beyond a certain threshold such as the poverty line. Hence, in an environment characterized by high degrees of poverty, the egalitarian view may not be enough to examine whether MHI protects the income of the poor against expensive health care use. The minimum standard approach examines the extent to which health insurance protects household income against falling below a threshold because of health care payments (Wagstaff and Van Doorslaer 2001).

This Chapter introduces the literature on methods used to examine equity in utilisation and financing of health care, and the minimum standard approach. The related theories were presented in Chapter 2. By drawing from these methods, the purpose is to examine and compare (1) whether MHI has improved equity in utilisation and financing of health care for the insured compared to the uninsured; and (2) whether MHI is a means to protect the income of the poor against high health care expenditures. The contribution of MHI to equity in financing and delivery of health care and to income protection depends on the insured's medical service use, the MHI premium level and co-payments, and the benefit package covered by MHI. The analysis uses the same cross-sectional household survey as in the previous Chapter.

The Chapter is organized as follows. Section 5.2 introduces the literature related to measuring equity in utilisation and financing of health care and on the minimum standard approach. Then, the analytical framework is derived. Section 5.3 shows how these methods are used empirically in this Chapter. Section 5.4 presents results and the last section discusses findings in combination with results from the previous Chapter on the demand for MHI.

5.2 Literature review

Assessing health-related inequities poses methodological problems, mainly because measures of illness, health and need are hardly objective and tend to be biased given respondents cultural and socio-economic background. It requires defining 'equal health' as well as the quantity and the nature of the goods and services to be distributed.

5.2.1 Defining key variables

This section begins with defining four key variables: ability to pay (ATP), need for health care, health, and utilisation.

In countries with established tax-systems, *ability to pay* is mostly proxied by households' pre-tax income, which can be adjusted by assets as well as capital income data. In developing countries, measures based on monetary and non-monetary consumption and not income, serve as ATP proxies (Deaton 1999). In the literature, the term pre-payment income is used to describe household income before any health care related payments have incurred; that is income gross of (or including) health care payments. Analogously, post-payment income reflects household income after health care payments have been made; also termed income net of health care payments (Wagstaff and Van Doorslaer 1998).

Need for health care tends to be equated with ill-health, as the sicker need more care to recover (Culyer and Wagstaff 1993). Alternatively, need could be defined in terms of one's capacity to benefit from health care. This latter measures 'need' in terms of the health status that will be affected rather than in terms of health care needed. A third definition describes need from a marginal perspective: "*the amount of resources required to exhaust the capacity to benefit*", suggesting that if capacity to benefit is zero, so is need[28] (Wagstaff and Van Doorslaer 1998).

Assessing *health status* to define patient need requires morbidity data on an individual level, gathered in health interview surveys. Blaxter (1989) proposes a morbidity concept by classifying morbidity measures in three conceptual models: the *medical model* defines health as a deviation from physiological norms; the *functional model* defines health as a deviation from the ability to perform normal tasks; and the *subjective model* assesses individuals' self-assessed health (SAH) status. The various morbidity questions from a health survey are categorized according to the concept they are derived from. Questions about chronic illness

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are derived from the medical model; questions about sufferings from a limiting chronic illness are derived from the functional model; and questions about individuals SAH (e.g. "Do you think your health is good, quite good, or not so good?") are derived from the subjective model (Blaxter 1989).

Wagstaff and Van Doorslaer (1993) measure cross-country health differences in Europe, by using the morbidity concept suggested by Blaxter. Illness concentration indices of inequality are examined for each of the three different morbidity measures in a cross-country comparison. Findings suggest that the degree of inequality depends on the morbidity measure chosen. Inequality in health tends to be strongest in the subjective model with SAH measures, and where differences in health across income groups are influenced by individuals' different risk attitudes (Wagstaff and Van Doorslaer 1993). This reflects critically on the validity of self-reported morbidity measures, and needs to be considered when analysing health status and inequalities, and comparing SAH across various countries and socio-economic groups.

Other studies assess health inequalities based on comprehensive indices. The McMaster Health Utility Index (HUI) describes individuals' overall functional health, including eight attributes: vision, hearing, speech, ambulation, dexterity, emotion, cognition and pain. A single numerical value, between zero and one is assigned for all possible combinations of these self-reported health attributes, a score of one indicating perfect health (Wagstaff and Van Doorslaer 2002).

In low-income contexts, need is often proxied by individuals' SAH status. For example, health measures, like self-reporting of medical conditions can be used where individuals have regular contacts with health personnel; however, this is rather rare in low-income settings. Also, some activity measures appear to be less valid in low-income settings as poor people don't have the luxury to let health compromise their daily work. These measures include whether one's health has affected activities of daily living; the number of bed days; and time spent away from work (Case and Deaton 2002). In addition, the SAH variable may cause inconsistent estimates if it is correlated with unmeasured initial health endowments (Wagstaff and Van Doorslaer 1998).

Despite these problems, SAH reported on an ordinal scale has been found as a valid measure to proxy ill-health or health status. Based on data from South Africa and the USA, Case and Deaton (2002) run ordered probit regressions. Findings suggest that health worsens with age; though women 'age' less rapidly than men, and SAH deteriorates sharply with age among the poor. SAH is recommended as a health status proxy as long as there is no other method that allows identifying the 'illness threshold' of individuals, and by recognizing that the cut-off points between 'fair' and 'poor' health varies across individuals (Case and Deaton 2002).

Utilisation of health care (e.g. number of visits per capita per year) serves to proxy two concepts in the literature: "access to care" and "receipt of treatment". These two concepts are linked. Access reflects the *opportunity* to seek care, which is influenced by financial (price and income) and geographical conditions, while treatment depends on the *availability of this opportunity* and whether a person has *chosen to use* them. Access affects utilisation, which is expected to influence health status (Wagstaff and Van Doorslaer 1998).

5.2.2 Measuring horizontal inequity in utilisation of health care

The four key approaches in assessing equity in health service utilisation are: regression analysis, Le Grand's approach, and direct and indirect standardization.

Regression analysis

The degree of inequity in utilisation can be tested by regressing individuals' utilisation of medical care on a series of explanatory variables that may affect their service use, including health, socio-demographic and economic characteristics. Formally, this can be written as:

(1) $m_k = \alpha_0 + \pi_1 y_k + \pi_2 h_k + \pi_3 x_k + \varepsilon_k$,

where m_k is medical utilisation of person k, y_k reflects socio-economic variables, h_k is a health variable, x_k captures demographic factors, ε_k is an error term, and π are coefficients (Wagstaff and Van Doorslaer 1993).

The regression approach may serve to derive an inequity index. It has been applied in the RAND study (Manning et al. 1987); and in a study on the Egyptian School Health Insurance Program (SHIP) examining the SHIP's impact on equity in access to care (Yip and Berman 2001). Also, previous analysis conducted by PHR used a regression approach to compare utilisation by insurance status and socio-economic groups (Schneider and Diop 2001).

While the regression approach can be used to test for the presence of inequity, it does not allow quantifying the extent of inequity. For example, a comparison of treatment received by different socio-economic groups indicates nothing about inequity in delivery, given their different health status. Thus, regression analysis tends to be used in combination with other approaches (Wagstaff and Van Doorslaer 1993).

Le Grand's Approach

Le Grand suggests comparing equity in utilisation across groups with the groups' corresponding share of 'need', which tends to be proxied by SAH status. In the absence of utilisation data by health and socio-economic status, studies have proxied utilisation by the relative share of public health expenditures that went to different groups. Horizontal equity means that the share of expenditures going to each group corresponds to the share of illness reported in this group (Wagstaff and Van Doorslaer 1993). A caveat needs to be made on the use of expenditures as a proxy for utilisation. This approach may be feasible in a centrally funded health system where the amount of health expenditures going to different socio-economic groups can be tracked, and the paying government source can be identified. But it may be difficult in health systems with mixed payment systems and where financial data are limited.

Inequity according to Le Grand can be quantified by measuring inequality in morbidity in the illness concentration curve (L_{ill}), which serves as a benchmark to assess the expenditure concentration curve. The illness concentration curve plots the cumulative proportion of the population ranked according to their socio-economic status (R) against the cumulative proportions of illness proxied by SAH. The illness concentration curve coincides with the 45-degree line if illness is equally distributed across the socio-economic groups. It will lie above the diagonal if the poor are sicker than the rich (Wagstaff and Van Doorslaer 1993).

The illness concentration index C(ill) is a measure of relative inequality. C is defined analogously to the Gini coefficient, as minus twice the area between the concentration curve L_{ill} and the diagonal (Wagstaff and Van Doorslaer 1993).

(2) $C(ill) = 1 - 2 \int L_{ill}(R)\, dR$

C(ill) ranges from –1 (when only the most disadvantaged are ill) to +1 (when only the wealthiest are ill). The score is 0 when all socio-economic groups have the same probability of illness, independent of their economic status (Wagstaff and Van Doorslaer 1993).

Where utilisation is proxied by health expenditure (T), the health expenditure concentration curve L(T) is formed by plotting the cumulative share of (T) on the vertical axis against the cumulative proportion of households ranked by pre-payment income (x) on the horizontal axis. L(T) is above the 45-degree diagonal if the low-income groups are more extensive users of health care than the better-off. L(T) lies below L_{ill} if the poor receive less of total health expenditures than the rich. The expenditure concentration index C(T) is defined like C(ill) (Wagstaff and Van Doorslaer 1993).

Using Le Grand's method, the degree of horizontal inequity (HI_{LG}) in utilisation reflects the difference between the expenditure concentration index C(T) and the illness concentration index C(ill). A positive HI_{LG} result suggests that the rich receive a larger medical expenditure share compared to their illness share; whereas a negative result implies the poor receive a larger medical expenditure share compared to the their illness share (Wagstaff et al. 1989; Wagstaff and Van Doorslaer 1993).

Studies have used Le Grand's equity measure as a point of departure, mainly because of its implicit assumption that the non-sick as identified by SAH will not use care. If individuals across socio-economic groups perceive their health differently, this may result in a bias towards detecting inequity favouring the rich (who might seek care although not sick). Also, measures based on the simple association between health and income may be contaminated by the systematic variation of other factors with income, such as demographic and geographic characteristics, which could vary across socio-economic groups and affect the allocation of medical care (Wagstaff and Van Doorslaer 1993). Two standardized methods have been proposed as alternatives to quantify inequity: the *direct* and the *indirect* standardization-based index.

Direct standardization

The *direct* standardization-based approach is based on grouped data. It divides a population sample into income groups and computes need-standardized medical care for each group to identify the amount of care people in each group would have received if they had the same need (Wagstaff and Van Doorslaer 1998).

The distribution of medical care by income is captured by the medical care concentration curve $L_M(R)$, which graphs the cumulative proportion of medical care (m) against the cumulative proportion of the sample population (R), ranked by income. The medical care concentration index C_M, defined analogously as the Gini and corresponding to $L_M(R)$ indicates the degree of inequality in the distribution of medical care. The extent of inequity is assessed by computing standardized health care utilisation by income groups in a regression and based on standardizing variables such as age and gender. The degree of horizontal inequity results from comparing the standardized concentration curve $L^{+}_{M}(R)$ with the diagonal. It can be measured as twice the area between $L^{+}_{M}(R)$ and the diagonal, or as (Wagstaff and Van Doorslaer 1993):

(3) $$HI\ (dir) = 1 - 2 \int L^{+}_{M}(R)\, dR = C^{+}_{M}$$

where C^{+}_{M} is the concentration index for directly standardized medical care. It is defined as twice the area between $L^{+}_{M}(R)$ and the diagonal. HI(dir) ranges from –1 (inequity favours the poor if <0) to +1 (inequity favours the rich if >0), and is 0 when standardized utilisation is distributed equally; or if $L^{+}_{M}(R)$ crosses the diagonal, which may arrive if the top and bottom groups have higher $L^{+}_{M}(R)$ than the middle group. Inequity favouring one group could then eventually offset another group (Wagstaff and Van Doorslaer 1993).

This approach has been applied in a comparative study on eight OECD countries, though with limited results (Van Doorslaer et al. 1999). The direct standardization based inequity approach has disadvantages: the value of C^{+}_{M} depends on the number of income groups; and the degree of horizontal inequity can only be used as an equity measure if need for medical care does not vary with income. If need does vary with income, it has to be compared to the degree of inequality in need, which is done in the indirect standardization method (Wagstaff and Van Doorslaer 1998).

Indirect standardization

The *indirect* standardization-based approach aims to compare the actual distribution of use with the distribution that would be expected given the distribution of need. This is estimated as the need-expected distribution of medical care. Based on individual-level data, the approach predicts the amount of medical care m^{*}_{k} a person k would have received if she had been treated as others with the same 'need' characteristics. The figure m^{*}_{k} is computed in a regression model as the predicted values saved from an equation where utilisation is regressed on a vector of need indicators (Wagstaff and Van Doorslaer 1998). It reflects the need (N) for medical care (m), or need-expected utilisation. The concentration index of need

C_N (i.e. indirectly standardized care) is defined based on the concentration curve for need, $L_N(R)$:

(4) $C_N = 1 - 2 \int L_N(R)\, dR$

The extent of horizontal inequity HI(indir) is assessed by comparing the concentration curve of need-expected utilisation $L_N(R)$ with the curve for actual utilisation of medical care $L_M(R)$. If $L_N(R)$ lies above $L_M(R)$, horizontal inequity favours the rich, and vice versa. HI(indir) is twice the area between the need and the medical care concentration curves, computed by the difference between the concentration index for actual care C_M and C_N (Wagstaff and Van Doorslaer 1998):

(5) $HI(indir) = 2 \int (L_N(R) - L_M(R))\, dR = C_M - C_N$,

A positive (negative) value suggests horizontal inequity favouring the better-off (worse-off). A zero value for HI(indir) suggests medical care and need are proportionately distributed across income distributions. The method requires graphing the curves to see whether a zero result is due to crossing curves or due to their coinciding with the diagonal (Van Doorslaer et al. 2002).

This indirect standardization approach has been applied in studies based on data from OECD countries (Van Doorslaer et al. 1998) and from the Netherlands (Wagstaff and Van Doorslaer 1998) to compare the relative degree of horizontal inequity in utilisation across different health care systems. In the OECD study, the degree of horizontal equity in the use of physician visits is examined in a two-part model by testing for the extent of any systematic deviations from horizontal equity by income level. First, a logit model predicts the possibility of any service use with general practitioner (GP) and medical specialist services; and second, a truncated negative binomial count predicts the conditional expected value of positive utilisation (Greene 2000; Van Doorslaer et al. 2002). Factors, like insurance status are included in the 'need' standardization process to examine to what extent the association between an individual's utilisation and her relative rank in the income distribution is confounded by variables other than need proxies. Need is proxied by a vector of nine age dummies (defined by nine age groups) and four dummy variables for self-assessed health. Results suggest significant inequity favouring the rich in the utilisation of specialist care, irrespective of insurance coverage and of specific delivery system characteristics of the countries studied (Van Doorslaer et al. 2002).

This methodological review shows that there is a trend of measuring inequity in utilisation by combining multivariate analysis with equality measures to predict utilisation, need and health expenditures and compute the corresponding concentration indices and curves based on the predicted values. Horizontal inequities in utilisation are then computed by comparing the differences between the respective indices for actual use and need, or need-adjusted utilisation, across different socio-economic groups.

5.2.3 Measuring inequity in health financing

An analysis on equity in utilisation includes equity in health financing, as an equitable distribution of utilisation should not have an adverse effect on the distribution of disposable income (Culyer and Wagstaff 1993). In this thesis, equitable financing of health care is based on vertical equity concepts, which recognizes that the initial income and wealth distribution is inequitable (Wagstaff and Van Doorslaer 1993). Equity in health financing is examined based on the degree of progressivity, that is the extent to which the better-off pay a larger proportion of their total monetary expenditures on health care than the poor (Kakwani 1977; Aronson et al. 1994); and on the redistributive effect of health care payments, by computing the difference between pre- and post-health income (Van Doorslaer et al. 1999).

Progressivity effect: The Kakwani index

Progressivity in health financing is defined in terms of departure from proportionality. The Kakwani's index K(T) of progressivity of health payment (T) on pre-payment income[29] (x) reflects twice the area between the Lorenz curve for pre-payment income, L(x), and the concentration curve for health care payments L(T). The Lorenz curve for pre-payment income L(x) graphs the cumulative percentages of total income received against the cumulative percentages of individuals ranked by their income level, starting with the poorest. The Gini reflects twice the area between the Lorenz curve and the 45-degree line. It ranges between 0 (total equality) and 1 (perfect inequality) (Kakwani 1977; Wagstaff and Van Doorslaer 1998).

The Kakwani index is the difference between the concentration index for health care payments C(T) and the Gini for pre-payment income (x):

(6) $\text{Kakwani}(T) = C(T) - \text{Gini}(x)$

The Kakwani ranges from -2 to 1. A positive K(T) suggests that L(T) is below the Lorenz curve (Wagstaff and Van Doorslaer 2001), indicating progressivity in health financing; while a negative value indicates regressivity in financing (Van Doorslaer et al. 1999).

[29] Following the literature, the term pre-payment income will be used, describing income gross of (or including) health care payments. That is income before any health care related payments have been made.

Redistributive effect: The Reynolds-Smolensky index

The redistributive effect is measured by the Reynolds-Smolensky (RS) index. It shows the change in income inequality associated with the move from the pre-payment to post-payment income[30] distribution. The RS(T) is defined as twice the area between the Lorenz curve for pre-payment income L(x) and the concentration curve for post-payment income L(x-T) (Wagstaff and Van Doorslaer 2001):

$$(7) \qquad RS(T) = Gini(x) - C(x - T),$$

where C(x-T) is the concentration index for post-health payment income. RS(T) is positive if the Lorenz curve is below L(x-T), suggesting that health care payments reduce income inequality. A negative RS(T) value indicates regressivity and pro-rich distribution. The RS(T) and the Kakwani index are associated:

$$(8) \qquad RS(T) = \{1 / (1-t)\} * \text{Kakwani index},$$

where (t) is the health payment share of pre-payment income (t=T/x). The redistributive effect increases with the degree of progressivity on pre-payment income (Wagstaff and Van Doorslaer 2001). RS(T) shows that the amount of redistributive effect caused by health expenditures depends on its progressivity and by the proportion (t) of income taken up for health care.

The above methods are based on the assumption that health care expenditures does not lead to re-ranking of individuals when moving from pre- to post-health-payment income, and that the redistributive effect is due to progressivity. An alternative measure of the redistributive effect of health care payments on income is derived from the tax and public finance literature (Van Doorslaer et al. 1999).

[30] Post-payment income is income after health care payments have been made.

Redistributive effect: Aronson/Johnson/Lambert

The consequences of variation in health expenditures at each income level are examined by the redistributive effect developed by Aronson/Johnson/Lambert (AJL). It allows treating equity in health financing as an income redistribution problem (Wagstaff 2001).

The AJL redistributive effect depends on four factors: first, the progressivity of health financing; second, the proportion of income used for health care; third, horizontal inequity in raising health care revenues; and fourth, the extent of re-ranking among households in the distribution from before to after health care payment income (Van Doorslaer et al. 1999).

Formally, the redistributive effect (RE) consists of three components: vertical equity V, horizontal equity H, and re-ranking R. Where income inequality is measured by the Gini, the RE reflects the difference between the Gini for pre- and the Gini for post-payment income:

(9) $RE = V - H - R = \text{Gini}(x) - \text{Gini}(x\text{-}T)$,

where: $V = \{t / (1\text{-}t)\} * \text{Kakwani}(T)$; $H = \sum \alpha \text{ Gini } F(x)$; $R = \text{Gini}(x\text{-}T) - C(x\text{-}T)$.

The redistributive effect (RE) is positive if the Lorenz curve of post-payment income lies above the pre-payment income curve, indicating that health payments reduce income inequality. V reflects verticality in the income redistribution: the extent at which people with different pre-payment income end up paying similar shares of their income for health care.

H describes the extent to which people with similar pre-payment income pay similar proportions of their income to health care. Households are divided into groups of prepayment expenditure equals. H is defined by the Gini F(x) for post-payment income of households with income x, weighted by $\alpha(x)$, which is the product of the population share and post-payment income share for these households.

R captures the degree of re-ranking in the move from pre-health to the post-health income distribution, by comparing the post-health Gini with the post-health concentration coefficient.

R is zero if there is no re-ranking (Wagstaff 2001). This method was used to measure inequity in health care finances in OECD countries (Aronson et al. 1994; Wagstaff and Van Doorslaer 1997).

The AJL redistributive effect is applied in a study based on Vietnam household survey data from 1993 to 1998. Households are divided into groups of pre-payment equals by expressing pre-payment income as a multiple of the overall poverty line (PL). Inequality measures are computed to estimate the redistributive effect of health expenditures on income. Results suggest that since the introduction of social health insurance, the redistributive effect has decreased by about 50 percent from 1993 to 1998, which is mostly attributable to a reduced degree of regressivity in health financing (Wagstaff and Van Doorslaer 2001).

This review of methodologies used to study equity in financing shows that the relevant inequities can be quantified by the Kakwani index and two different redistributive effects. Progressivity describes how unequal the share of health expenditures is across income groups, while the redistributive effect examines whether health expenditures are equally distributed by quantifying vertical and horizontal inequity, and the extent of re-ranking (Wagstaff and Van Doorslaer 2001).

However, even if health care is financed according to egalitarian equity principles, the total amount spent on health may still be "too large" for the poor, and considered as unfair. This is addressed by the minimum standard approach. It examines to what extent poor households' socio-economic situation is protected against financial shocks under a health financing system.

5.2.4 Minimum standard approach

The minimum standard approach (MSA) is concerned with health payments falling short or exceeding a threshold, which is either defined in proportional or absolute terms of income. A threshold proportional to income aims to ensure that households' health care expenditures as a fraction of income do not exceed this threshold. Otherwise, they are considered as "catastrophic" (Wagstaff and Van Doorslaer 2001). However, this does not show to what extent catastrophic payments cause hardship.

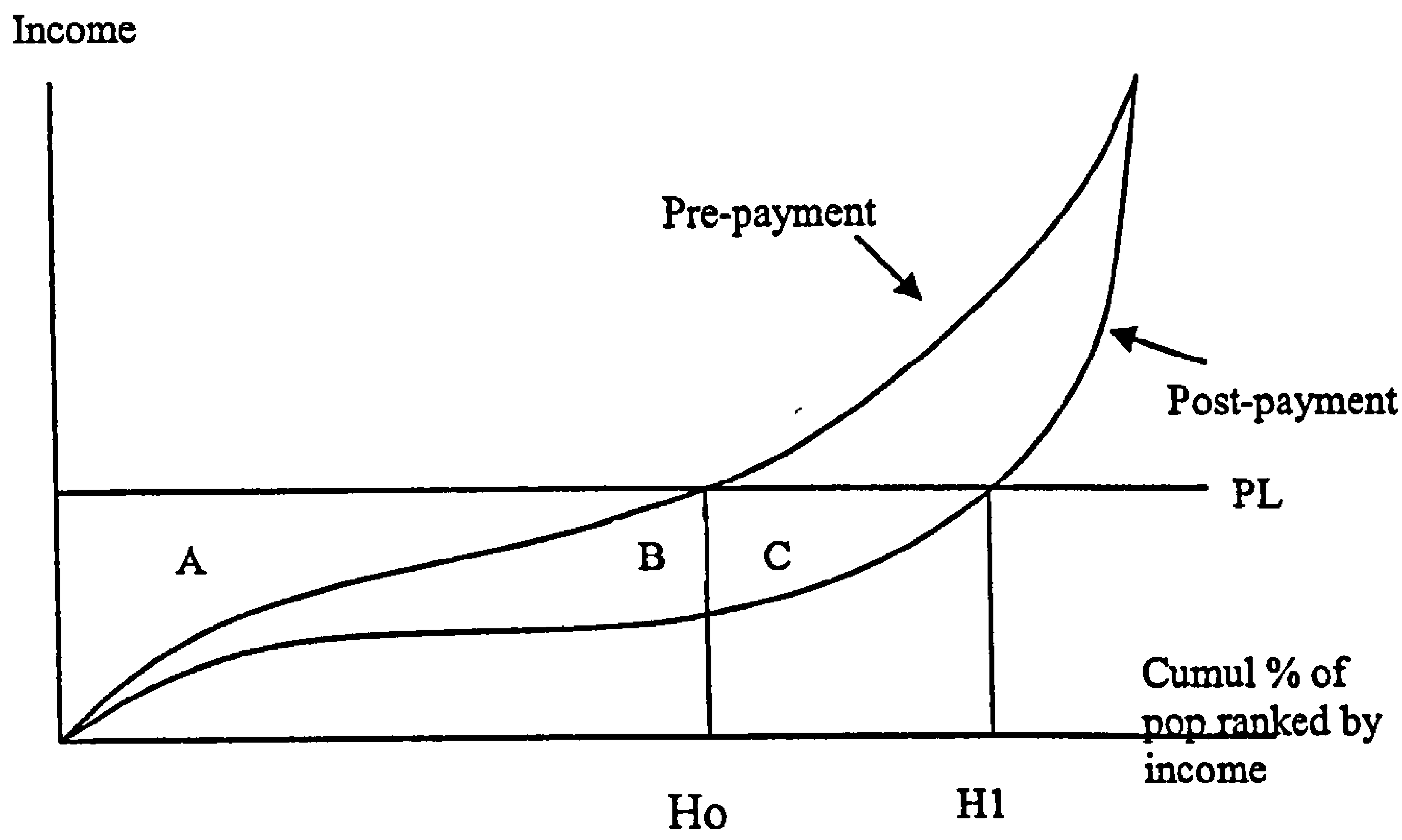
A minimum threshold in terms of absolute levels of income, i.e. the poverty line (PL), aims to ensure that in the long-run, health care payments do not push households into poverty, or further into poverty[31] (Wagstaff and Van Doorslaer 2001). Two quantitative poverty measures serve as benchmarks: the headcount and the poverty gap. The headcount ratio shows the proportion of the population below the PL. The poverty gap reflects the average shortfall from the PL. It allows examining the effect of transfers among the poor, such as from the poorest to the less-poor (Deaton 1998).

The Pen's parades[32] visualize the impoverishment effect of health payments. The Pen's parades plot household incomes before and after health payment along the y-axis against households ranked by pre-payment income against the x-axis. Reading off the parades at the poverty line gives the number of households living below poverty: the poverty headcount (Litchfield 1999). It allows assessing the variations of health payments within the same income groups by comparing their socio-economic status before and after they had medical expenditure (Aronson et al. 1994).

[31] In other socio-economic contexts another appropriate minimum level may be chosen.
[32] Named after the Dutch economist Jan Pen who invented it: "Parade of dwarfs and a few giants". The original Pen's Parades were conceptualized by comparing the incomes of every individual in a population. In practice comparing incomes at every income level is too laborious; hence some degree of aggregation is usually employed to compare quantiles. Note, the Pen's parades are different than the Lorenz curve, which plots on the x-axis the cumulative fraction of individuals ranked by their increasing income against the cumulative proportion of income on the y-axis.

Figure 5.1 shows the Pen's parades, by plotting income before and after health payments along the y-axis against households ranked by pre-payment income along the x-axis (Wagstaff and Van Doorslaer 2001).

Figure 5.1: Pen's parade, income before and after health expenditures



Note: adapted from Wagstaff and van Doorslaer (2001). PL=poverty line, hh=households.

The poverty impact of health financing depends on the degree of progressivity as well as on the share of income absorbed by health payments. A higher share of income absorbed by health payments will increase the poverty impact of health and push the post-payment Pen parade down (Wagstaff and Van Doorslaer 2001).

The poverty impact of health payments can be measured by the changes in the poverty head count and in the poverty gap. At the intersection between the respective parades and the poverty line, the headcount ratio is shown, before health payments (Ho) and after health payments (H1). The area between the PL and the pre- and post-payment parade reveals the poverty gap before (A) and after (A+B+C) health spending. Area B reflects the deepening poverty with the already poorer falling further into poverty; whereas area C corresponds to the additional poverty including the non-poor falling below the PL (Wagstaff and Van Doorslaer 2001).

Formally, the poverty impact of health care payment can be expressed as follows. If an individual's pre-payment income is defined by x, then P(pre) is the number of households below the PL. It takes the value of 1 if a household's pre-payment income x is below PL, which defines a household as poor; and zero otherwise. It leads to the *pre-payment poverty headcount*, which is (Wagstaff and Van Doorslaer 2001):

(10) $H = 1/N \sum P(pre) = \mu(p\ pre)$, where N is the sample size.

The pre-payment poverty gap is denoted by g(pre), and equal to x-z(pre) if x<z(pre), and zero otherwise. The *average prepayment poverty gap* is derived:

(11) $G(pre) = 1/N \sum g(pre) = \mu(g\ pre)$.

The *normalized pre-payment poverty gap* is:

(12) $NG(pre) = G(pre) / PL(pre)$,

and the *mean positive pre-payment poverty gap* is:

(13) $MPG(pre) = \sum g(pre) / \sum P(pre) = \mu(g\ pre) / \mu(p\ pre)$,

this results in the average poverty gap:

(14) $\mu(g\ pre) = \mu(p\ pre) * MPG(pre)$.

The measures for post-payment are derived analogously. It leads to the definition of the poverty impact (PI) measures of health expenditures (Wagstaff and Van Doorslaer 2001):

(15) $PI(H) = H(post) - H(pre)$; $PI(G) = G(post) - G(pre)$; $PI(NG) = NG(post) - NG(pre)$.

This method has been applied to examine how health expenditures have added to poverty in Vietnam. Findings suggest that some households are clearly pushed further into extreme poverty by OOP payments, while others are pushed below the extreme PL. The more frequently occurring outpatient payments had a larger poverty impact than hospital payments (Wagstaff and Van Doorslaer 2001).

This last finding is particular interesting. Many MHI in low-income countries cover hospital care only, aiming to protect the poor against "catastrophically expensive" hospital payments. Though, these are less likely to occur than outpatient care provided in basic health facilities. It creates doubts about whether MHI with hospital-coverage will protect households' income. Thus, before introducing MHI into a user fee financing system, a comparative analysis of the poverty impact of hospital and of outpatient expenditures may help defining an MHI benefit package to protect the poor against financial shocks related to their health.

5.2.5 Analytical framework

The analytical framework uses inequality and PI measures to examine the extent to which MHI compared to user fee payments responds (1) to egalitarian equity criterion in utilisation and financing of health care, and (2) to the minimum standard principle with respect to households' financial impact of health spending.

The characteristics of a health care system influence the distribution of health care among people, which type of service they use and the distribution of health care payments (Wagstaff and Van Doorslaer 2001). Table 5.2 describes the relevant health system characteristics for insured and uninsured patients, which may affect to what extent systematic deviations from an equitable distribution of utilisation and financing of health care may occur. The first column lists the provider characteristics in the three districts: payment in public and church-owned HC, their gatekeeper function, ambulance transfers, the care provided at the hospital, and supply-side subsidies. The second column describes insured patients' conditions with respect to these characteristics. For example, MHI pays HC a monthly capitation payment and insured patients pay a RWF 100 (USD 0.30) co-payment per episode of illness. HC play a gatekeeper function for insured patients, whose hospital treatment is only covered by MHI with health centre referral. The third column describes these conditions for the uninsured.

Table 5.2: Equity relevant health system characteristics and provider incentives

Characteristics	MHI Patients	Uninsured Patients
Payment for care in public and church-owned health centre (HC)	Members pay MHI annual enrolment fees based on which, MHI pays capitation payment to HC. All services and drugs on essential drug list free for insured patients at the point of delivery, except of co-payment of RWF100 per episode of illness	Patients pay user fees based on FFS for each consultation (RWF200), each service and drug at the point of delivery. An average of 2-5 percent of patients is exempt from payment.
HC gatekeeper	Yes	No
Ambulance transfer	Paid by MHI if referred by HC, through capitation amount paid to the HC	User fee paid by patient (about RWF2500 per transport to hospital)
Payment for care in district hospital (DH)	MHI covers consultation, overnight stay and full episode (incl. drugs) of C-section in 2 districts; while full episodes of C-section, malaria and children below 5 are covered. Patients pay OOP for care not covered by MHI (like uninsured).	Patients pay user fees based on FFS for all services and drugs at point of service delivery.
Supply-side subsidies	All facilities receive subsidies from donors and government in form of salaries for public employees, salary mark-ups, and drug donations.	

Given these characteristics, the first part of the analysis examines the degree to which MHI contributes to horizontal equity in utilisation, compared to user fees. The second part evaluates the progressivity and redistributive effects of MHI and user fees, to see which system better meets egalitarian equity criteria. The third part uses the minimum standard approach to compare the impact of MHI and of user fees on household income. The data set does not dispose of a longitudinal data. Therefore, the poverty impact of health care payments cannot be examined. The PL will serve as a threshold income for purely comparative reasons.

5.3 *Model, data and variable definitions*

5.3.1 Data set

The analysis uses the same cross-sectional household survey data as in Chapter 4. The survey consists of three modules: a household, a curative care and a preventive care module. The curative module includes questions on individuals' health care utilisation and expenditures, health status, demographic and socio-economic information and on MHI status. In order to qualify to be interviewed in the curative module of the household survey, one of the following two questions had to be responded positively: (1) "Were you sick, did you have an accident or an injury in the past two weeks?" (2) "Did you have a headache, diarrhoea, fever, or any coughing in the past two weeks?"[33] A significantly higher share of the uninsured (27%) than the insured (21%)[34] qualified for the curative part.

The equity in utilisation analysis uses data collected from 376 insured and 3,459 uninsured sick individuals (total 3,835 persons) interviewed in the curative module. This information is linked with the household module to examine socio-economic and demographic characteristics. The analysis of equity in financing and the minimum standard approach uses all 3,139 households interviewed in the household survey, among them 354 insured and 2,785 uninsured households. The household is taken as the sharing unit for monetary expenditure.

Table 5.3 presents the variables used in the analysis. Variables have been visually examined in histograms to identify skewness.

[33] These symptoms reflect the infectious diseases patients are usually suffering from. Rural people tend to describe their ill-health by "fever", independent of the medical diagnosis.
[34] Pearson uncorrected Chi2(1) = 20.44; $p < 0.001$.

Table 5.3: Variable definition and descriptives

Variable Definition	Variable	Obs	Mean	Std. Dev.	Min	Max
Curative module of hh-survey:						
Patient MHI member	MHIpat	3835	0.10	0.30	0	1
Patient gender (1=male)	genPat	3835	0.44	0.50	0	1
Patient age	agePat	3835	24.18	20.70	0	98
Patient age 0-5 years	d_agepat	3835	0.24	0.43	0	1
Patient (age 6+) with school	d_schpat	2912	0.60	0.49	0	1
Pregnant (female 15-49 age)	pregnant	1022	0.26	0.44	0	1
Ave household size	rhhsize	3835	5.32	2.33	1	15
SAH before care (1=not serious; 2=serious; 3=very serious)	SAH	3835	1.84	0.67	1	3
SAH dummy (0=not serious)	d_SAH	3835	0.68	0.47	0	1
4 and more days in bed due to illness before seeking care	Beddays4+	3835	0.78	0.42	0	1
1+ professional care visit	visit1	3835	0.18	0.38	0	1
Hospitalized of those with care.	d_HDcare	857	0.11	0.31	0	1
Radio in HH	d_radio	3835	0.36	0.48	0	1
Bike in HH	d_bike	3814	0.10	0.31	0	1
Cattle in HH	d_cattle	3835	0.18	0.39	0	1
Monetary expenditure per capita per month (+1)	rexpc_1	3835	2740.6	4970.5	1	148251
Monetary expend quartiles	Yquartile	3835	2.52	1.09	1	4
Total OOP per episode of illness	RWFepill	3835	459.6	1,311.6	0	20,000
Health expenditures per visit	rdep_visit	689	1638.9	2429.7	0	20,000
Household module of household survey:						
OOP+ Premium p/cap p/month	OOP_Ppc	3139	194.7	978.7	0	26000
MHI premium per insured HH p/m	MHIpremhh	354	208.3	0.0	208.3	208.3
MHI premium per cap p/month	MHIpremPC	354	50.0	34.1	17.4	208.3
HH monthly health expenditure-all	rexp8	3139	765.8	3634.1	0	121900
Health expenditure p/c p/m- all	rexp8pc	3139	189.0	978.4	0	26000
Pre-payment monetary expenditures gross OOP+ Premium per cap per month	PreYpc	3139	3173.6	7500.6	0	192950
Post- payment monetary expenditures net OOP+ Premium per cap per month	PostYpc	3139	2978.9	7161.2	0	192950
Monetary expenditure share of OOP+ Premium p/cap p/month	sh_OOPYpc	3112	0.060	0.144	0	1

Note: Data source: household survey, and curative care module (9/2000). Non-weighted data. OOP=Out-of-pocket health payments. Exchange Rate: USD1=RWF390 in June 2000; USD1=RWF460 in June 2002.

5.3.2 Limits related to data and variables

It is worth highlighting upfront several issues related to the data and variables used: (1) monetary expenditures; (2) health expenditures; (3) utilisation; (4) health status; (5) measurement errors, (6) omitted variable bias and heterogeneity.

First, household *monetary expenditures* are recorded over a period of one month. Household monetary expenditure includes payments made at the local village market (for food and non-food items), and other household expenditures like rent, transport, tobacco; school fees, and OOP payments for health care. It excludes premium paid for MHI, as this was not an item asked in the one-month window of the questionnaire. The per capita amount (rexpc_1) is calculated by dividing total monetary expenditure of a household by the respective household size (rhhsize). This monthly per capita amount is used as proxy for pre-health payment income and a socio-economic status (SES) ranking variable for individuals. Households are grouped into quartiles (Yquartile) based on this variable. Two main limits exist: annualising a monthly amount and the inclusion of health spending.

Annualising these monthly amounts by multiplying times twelve will lead to overestimates for households who had payments during the reporting period and to underestimates of all households who reported zero expenditure during this time (Van Doorslaer et al. 1999). For example, 15 households, reported zero-value observations for all monetary expenditure components, indicating that they had no cash flow during the month prior to the interview. The National Population Office suggested that this might truly reflect households' socio-economic situation, as much rural trade still takes place in non-monetary terms. To circumvent the zero-value problem for monetary expenditure without losing observations, each observation of monetary expenditure variable is increased by one, which will not affect the shape of the distribution (Deaton 1998). While this is inappropriate for conducting individual household level estimates, the method is acceptable for estimating and comparing group averages and assessing progressivity (Van Doorslaer et al. 1999).

Total monetary expenditures represent a welfare measure prior to payment for health care. This requires the assumption that health payments does not affect saving decisions. In a low-income context, this assumption may be unrealistic and would have to be examined in a longitudinal data set. However, as the focus is on assessing the degree of proportionality between health payments and monetary expenditures, total monetary expenditures gross or net of health care spending can be used (Wagstaff and Van Doorslaer 2001).

Second, four different measures of *health expenditures* are used:

(a) Total health expenditures per episode of illness in the two-week recall period prior to interview (RWFepiIl) (see Tables 7.1 and 7.2 in (Schneider and Diop 2001)). It includes any payments made by the household for care received before visiting a provider (i.e. home care, drugs at pharmacy and local drug vendors, traditional medicines), at the first visit, and for other providers, transport costs, and insured patients co-payment of RWF 100 per health centre visit.

(b) Total health expenditures per visit to a health centre (rdep_visit), including patients' payment made for consultation, drugs, lab-test, and insured patients' co-payment; but excludes MHI premium.

(c) Monthly health expenditures per household (rexp8) is a component of total monthly monetary expenditure. It includes health expenditures made by the household during one month associated with treatment and diagnosis of illness and injury, drugs and services purchased at providers and pharmacy, inpatient services, values paid to traditional healers, transport costs, and co-payments made by the insured. MHI members were not explicitly asked to include eventual premium payments in this monthly amount. As MHI premium is paid annually, they most likely have not remembered this amount as a monthly expenditure. To make members' and non-members total monthly health expenditures comparable, a fourth variable is generated.

(d) Total health expenditures per capita per month (OOP_Ppc) includes total health expenditures paid by a household per month (rexp8) plus one-twelfth (RWF 208) of households annual MHI premium (MHIpremhh) for insured households. The annual MHI premium is divided by 12 to make health expenditures comparable for the two groups, though it does not reflect reality. Payment by monthly instalment is not an option for paying the MHI premium. Also, it is erroneous to attribute one-twelfth of premium to the health expenditures of the 3,000 non-identifiable poor individuals who did not pay premium but were sponsored by churches and other community members (see Section 4.5). Hence, health financing results for total health expenditures should be interpreted with caution. Per capita values are computed by dividing total household amounts by the household size (rhhsize), resulting in monthly premium per MHI member (MHIpremPC) and in per capita monthly health expenditures (rexp8pc).

Studies conducted in OECD countries encountered severe data limits when estimating the health financing burden across income groups. It has led researchers to use data from other surveys conducted in a different year (e.g. UK), or to impute household expenditures for insurance premiums based on econometric estimates of the income-elasticity of demand for insurance derived from a different data set (e.g. Switzerland) (Wagstaff and Van Doorslaer 1992).

Third, *utilisation* is proxied by the professional provider visit dummy (visit1), which was assessed based on the question "Did you visit a professional provider (doctor, nurse, health centre, hospital, private clinic, or dispensary) outside of the house to treat your illness in the last two weeks?" A hospitalisation dummy (d_Hdcare) describes whether the patient with provider contact had been hospitalised at the district hospital. Visit has a skewed distribution with the majority of sick reporting zero visits in the 2-week interview period. Due to the seasonality of infectious diseases (e.g. malaria, respiratory infections during raining season), this visit probability reflects the time, when the survey was conducted, and does not lend itself for annual interpretation[35].

A potential problem with the curative questionnaire is that it is addressed to household members who were sick in the two weeks prior to the interview. There are no questions regarding hospitalisation during the last year before the interview took place or on any long-term illness or disability individuals may suffer. This may have affected the analysis of the actual level of utilisation of insured services: if there is adverse selection of more seriously sick individuals into MHI, then without this adverse selection, utilisation levels might be lower.

Fourth, health is proxied by individuals' *self-assessed severity (SAH)* of an episode of illness during the two weeks prior to the interview. This question was only addressed to sick individuals interviewed in the curative module. It reflects the categorical response to the health survey question: "Before receiving care, did you think the sickness was 'not serious', was 'serious', was 'very serious' or you did not know?". Based on the responses, a SAH dummy variable is computed (1=serious/very serious sick; and 0= not seriously sick). Compared to other studies, this SAH measure is very limited, and should not be used for comparison with results reported in other studies. It mainly reflects sick individuals' self-perception of their severity of illness during a two-week time period. This is a weak indicator. Self-reporting of health conditions in areas where individuals have few contacts with health personnel has limited validity (Case and Deaton 2002).

Fifth, zero-value observations and missing data point to *measurement errors* of an unknown magnitude. Some genuine data variation across households may not be picked up in the estimation process. In some cases the reported value may be close to the true value, and in other cases the degree of data reliability could be low (Van Doorslaer et al. 1999). When

[35] Annual visit rates have been analysed based on monthly utilisation data collected by insurance status, in all health facilities and for totally 2 years. Results are presented in the PHR Technical Report No. 61.

inequality is measured, as in this analysis, genuine dispersion needs to be separated from measurement errors. Measurement errors will result in less precise estimates of inequality levels (Deaton 1998). However, there is no reason to expect that the occurrence of measurement errors could be different among the insured or uninsured, implying that it should not affect the comparative results between the two groups.

Finally, problems of *omitted variable bias* and *heterogeneity* exist. Omitted variable bias occurs when relevant explanatory variables that could affect the dependent variable are excluded from the regression. Heterogeneity bias arises, for example, from the unobservable health endowment, which induces correlation between observable and unobservable arguments when health is regressed on utilisation. Estimates of health expenditures from household surveys are potentially subject to both recall bias and small sample bias due to the infrequency with which some payments are made. Whether estimates in the distribution of health payments are biased depends upon whether reporting health expenditures is systematically related to income, which is the case in this analysis. Once more, insured and uninsured households should be equally exposed to these problems, which should limit the effect on comparative results.

5.3.3 Variables and estimation procedures

Bivariate and multivariate analysis has been conducted with this data set and presented in a PHR report. Results indicate markedly higher utilisation rates for medical care among the insured compared to the uninsured. While utilisation is not linked to socio-demographic and economic indicators among the insured, the probability of service use increases with higher socio-economic status among the uninsured. A logit regression conducted with all insured and uninsured individuals served to test for the presence of inequity in the probability of using health services. The regression for the full sample indicates a significant effect of MHI membership on the visit probability[36].

Previous analysis tabulated mean values for health expenditures by socio-economic and insurance status. Uninsured patients report markedly higher OOP payments per episode of illness than MHI members. However, insured households – and especially those in the two lower quartiles - spend a significantly larger share of their total monetary expenditures on health including premium than the uninsured. This is related to two reasons: members' annual MHI premium and the uninsured not using health care[37] (Schneider and Diop 2001). Comparing mean values is not enough to inform on the progressivity in health financing (Wagstaff and Van Doorslaer 1992).

This Chapter expands on previous findings and examines the extent of inequity in utilisation and financing of health services, and the protection of income through MHI. This time, the analysis is conducted by insured and uninsured groups to assess inequities within each group. Analysis is performed in STATA7 with weighted data. The robustness of findings is tested by comparing the consistency of results estimated by different inequality measures.

The analysis begins with the description of the sample group to identify who among the insured and uninsured reported sickness and as a consequence sought medical care. The bivariate relationship is examined between sick individuals' insurance status and measures of socio-demographic, health and economic status. Then ordinary least square (OLS) serves to describe in a single regression how the mean number of visits for insured and uninsured sick individuals varies with their demographic, health or geographic situation.

[36] See Table 5.10 in PHRplus Technical Report No. TE002.
[37] See Table 7.3 in PHRplus Technical Report No. TE002.

Equity in Utilisation:

Measuring equity in utilisation requires morbidity and socio-demographic data on an individual level. The unit of the utilisation analysis is the sick individual interviewed in the curative module of the household survey.

The analysis examines the degree to which horizontal equity in utilisation is attained, with those in equal need reporting equal utilisation. It aims to ascertain to what extent the actual distribution of visits among the insured and the uninsured reflects their corresponding distribution of need for such care. The extent of any systematic deviations from this equity principle is tested.

The analytical strategy employed is based on state-dependent EU theory, which has been introduced in the previous Chapter. It is assumed that the insurance status of a sick individual is linked with the utilisation probability; implying that insurance ought to be treated as an endogenous variables. As the focus is on horizontal inequity, this is not further investigated (Van Doorslaer et al. 2002).

The robustness of the following three measures will be compared.

First, the association between inequality in monetary expenditure and utilisation is examined by evaluating mean expenditure values and two inequality measures (the Gini and Atkinson measures) by subgroups of sick insured and uninsured individuals, who use or do not use care, by using the STATA7 ineqdeco command (StataCorp 2001).

Second, following Le Grand (Wagstaff and Van Doorslaer 1993), horizontal inequity in the distribution of (a) the SAH dummy (as a proxy for need) reflecting the fraction of seriously/very sick individuals; and (b) actual utilisation is examined, by insurance status and monetary expenditure quartile. Monetary expenditures serve as the income proxy. Estimates include mean visit numbers and the fraction of individuals who are seriously/very seriously sick; and concentration indices for the SAH dummy C(d_SAH), and for actual visits C_M to quantify the degree of inequality related to monetary expenditures in the SAH and visit variable, for insured and uninsured individuals. Concentration indices are computed in STATA7 based on covariance results between the relevant variable, and the individual's fractional rank in the per capita household monetary expenditure distribution in 2000. Standard errors will not be computed as there is no appropriate way to compute them for concentration indices with weighted data[38]. The degree of horizontal inequity (HI_{LG}) in utilisation reflects the difference between the visit concentration index C_M (used instead of expenditure concentration index C(T)) and the SAH concentration index C(d_SAH).

Third, the indirect standardization-based method serves to derive a measure of need for medical care. Several variables indicating a greater need for health care are used as standardizing variables in two separate logit regressions. First, the need-standardized probability of service use is proxied by the SAH dummy (0=not seriously sick; 1=serious and very seriously sick) only; and second, the visit dummy is regressed on additional need variables that might affect the visit probability.

A binary choice model serves to estimate individuals adjusted visit probability based on weighted data and by insurance status. In a logit regression, the dependent variable takes the value of 1 if individuals report a visit during the two weeks prior to the interview, or zero otherwise:

(16) $P_i\,(\text{visit}) = 1 / (1 + 1/e^{L_i})$

(17) $L_i = b_1 + b_2 X_{2i} + \ldots. + b_k X_{ki}$

where, X_{ki} represents a set of variables that are assumed to reflect the expected need for care and influence a sick person's (k) visit probability P(visit).

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[38] See Quantitative Techniques for Health Equity Analysis – Technical Note #7.

In the first logit model, the visit probability is regressed on the SAH dummy:

(18) $P_i(\text{visit}) = F(L) = \alpha + \beta_1 (\text{d\_SAH}) + \varepsilon$

The predicted values are saved and concentration indices for actual visit C_M and for SAH-standardized visits C_M(d_SAH) are derived. SAH as the only need proxy may cause biased results if individuals across socio-economic groups perceive their health differently, or if other factors affect their care-seeking behaviour, independent of their health status (Wagstaff and Van Doorslaer 1993).

Therefore, the second standardization approach includes additional need indicators among the explanatory variables. In Rwanda, it is expected that the visit probability could be higher if the patient is male, a small child, pregnant, has already spent 4 or more days in bed, and being seriously/very seriously sick. The visit probability adjusted by need characteristics is estimated in a logit model for insured and then, uninsured sick individuals:

(19) $P_i(\text{visit}) = F(L) = \alpha + \pi_1 (\text{genPat}) + \pi_2 (\text{d\_agepat}) + \pi_3 (\text{pregnant}) + \pi_4 (\text{bedday4+}) + \pi_5 (\text{d\_SAH}) + \varepsilon$

where gender (genPat) equals 1 if male; the age dummy (d_agepat) takes the value of 1 if the sick individual is 0-5 years old; a pregnancy dummy (pregnant) is 1 if the sick was pregnant during the interview or the year prior to the interview; a (bedday4+) dummy that equals 1 if the sick individual had spent four and more days in bed due to illness before seeking care; and the SAH dummy.

Having obtained the predictions, need-standardized concentration indices C_N are derived for MHI members and the uninsured (Wagstaff and Van Doorslaer 1993). The extent of horizontal inequity in utilisation HI(indir) is assessed by comparing each group's concentration index on the share of actual utilisation C_M with its share of need-expected utilisation, as expressed by C_N:

(20) $HI(\text{indir}) = C_M - C_N$

A positive (negative) value suggests horizontal inequity favouring the better-off (worse-off); while a zero value suggests medical care and need are proportionately distributed across income distributions. Concentration curves are not shown, as these indices yield clear results[39].

Equity in Financing:

The unit of the health financing analysis is the household, which is the sharing unit for total monetary and health expenditures. The Kakwani index serves to assess progressivity through departures from proportionality in the relation between health care payments and total monetary expenditures. Based on the Reynolds-Smolensky and the AJL index the redistributive effect of MHI and user fees is compared (Van Doorslaer et al. 1999).

First, the progressivity of health financing is assessed for insured and uninsured groups, based on the Kakwani index presented in equation (6). It reflects the difference between the health expenditure concentration index C(T) and the Gini for pre-payment income Gini(x). Pre-health payment monetary expenditure per capita per month (PreYpc) reflects total household monthly monetary expenditures before health care spending plus the monthly MHI premium for insured households. Total health expenditures per capita per month (OOP_Ppc) include total monthly household health expenditures (rexp8) plus one-twelfth of annual household MHI premium (MHIpremhh) for insured households. Equity implications are discussed.

Second, the redistributive effect of health financing between pre- and post-payment income is estimated with the Reynolds-Smolensky (RS) index, as shown in equation (8). The monthly share of total monetary expenditures spent on health (sh_OOPYpc) is computed by dividing total health expenditures per capita per month (OOP_Ppc) by pre-payment monetary expenditures per capita per month (PreYpc).

39 Comparing the two groups would require manipulating the household survey micro-data into groups and then construct concentration curves in Excel; though, aggregating micro-data causes less precise results.

Third, the redistributive effect in health financing following the AJL approach is computed by insurance status (equation 9) and by comparing the two Ginis of income before and after health expenditures.

Estimating the horizontal inequity component of the AJL effect would require sub-dividing the sample into different socio-economic groups, which will not be computed, mainly due to three reasons. First, it is difficult to disentangle re-ranking from horizontal inequity as the latter causes re-ranking; second, measuring horizontal inequity would require dividing the sample into groups of prepayment equals, which is limited by the small sample size of MHI (Wagstaff and Van Doorslaer 2001); and third, the focus is on vertical health financing in terms of progressivity defined as departure of proportionality. Therefore, only the aggregated value is presented for the AJL redistributive effect and the re-ranking component R as defined in equation 9.

Minimum Standard Approach:

The household is the unit of the analysis. The minimum standard approach serves to examine the extent to which health spending pushes insured and uninsured household income below or further below the poverty line. Longitudinal data would be needed in order to assess the poverty impact of health care payment. However, this analysis uses a cross-sectional data set, which leads to the assumption that all costs are borne in the same period, and there is no consumption smoothing by borrowing or lending (Wagstaff and Van Doorslaer 2001).

Therefore, the PL is used as a minimum standard for purely comparative reasons. The analysis compares the mean levels of households' monetary expenditures before and after health spending for the two groups. As the purpose is to compare two different financing systems against this PL, it will not affect the result of estimating the relative change in the head count nor the poverty gap among the different groups. However, the data do not allow results to be interpreted in a poverty context.

The minimum level is defined by the broad-based consumption poverty line (PL) of RWF 4,920 per month per adult in the year 2000 as defined in the HLCS (see Section 4.3.4) (Ministry of Economics and Finance 2002). Comparing the PL "per adult" from the HLCS with monetary consumption "per capita" will cause a larger proportion of households of the latter group to be poor. Hence, the result should not be interpreted in this sense. Rather, the purpose is to compare insured and uninsured monetary expenditures before and after health expenditures with respect to the PL. Therefore, the HLCS "per adult" total consumption measure is retained for comparison with the "per capita" monetary expenditures used in this household survey.

Two key variables serve to estimate the income impact of health financing with respect to the PL: the monetary expenditure variable captures the households' living standard and serves as a proxy for income; and the health care payment variable. Monthly per capita income before (PreYpc) and after health spending (PreYpc – rexp8pc) are normalized by the monthly PL per adult of RWF 4,920. Pre-payment monetary expenditure normalized by PL is:

(21) $X(pre)_{PL} = (PreYpc) / PL$,

Post-payment expenditure normalized by the PL equals:

(22) $X(post)_{PL} = X(pre)_{PL} - (rexp8pc/PL)$,

where (rexp8pc) reflects total household health expenditures per capita per month. Equations (21) and (22) are computed for insured and uninsured households. The same PL is used in both equations. The post-payment PL can be lower if the PL includes health spending; however, empirically this is difficult to disentangle. Applying a post-payment PL after health spending would reveal the number of households drawn out of poverty because they did not incur any health expenditures; though this is less relevant in this analysis.

The Pen's parades (see Figure 5.1) provide a framework for examining and comparing monetary expenditures before and after health payments for user fees and for MHI. The parades are plotted in two separate graphs for the full sample of 354 insured and a random sample of 354 uninsured households. The large number of uninsured households makes it difficult and too laborious to visualize and compare the impact among the uninsured based on the full sample.

The Pen's parades in Figure 5.1 provide the impression that households keep the same rank in their pre- and post-payment income distribution. But in reality this is not the case and re-ranking occurs after health expenditures. The analysis aims to visualize re-ranking by first computing the relevant measures in STATA7, sorting the households by pre-payment income and copying both the pre- and post-payment income variables into Excel. Then "paintdrop" charts are drawn. It allows a visual inspection of which households are drawn below the PL and where they are located in the pre-payment income distribution.

The poverty head count ratio and the poverty gap are computed and examined for insured and uninsured households following equations (10) – (15).

5.4 Results

First bivariate analysis examines the stability of significant variables. Second, equity in the distribution of utilisation and of health financing is compared. Then, the minimum standard approach evaluates the income impact of health financing by insurances status. The robustness of findings is tested by comparing the results across different measures.

5.4.1 Description of the sample group

The socio-economic and demographic characteristics of the households included in this analysis have been presented in Section 4.4.2 of this thesis. This section presents findings derived from bivariate analysis for insured, uninsured and all sick individuals interviewed in the curative care module. Table 5.4 suggests that among the individuals who experienced illness, the insured differ from the uninsured in several respects. A markedly higher proportion among sick insured than uninsured has some schooling, is pregnant, reports a provider visit, or owns a radio or a bike.

Before seeking care, the sick insured stay a significantly shorter period in bed than the uninsured, although both report similar SAH status. A markedly lower proportion of the sick insured has been hospitalised; and they report considerably shorter hospital stays than the uninsured. This could be related to their smaller sample size, the health centre gatekeeper function, or a less severe case-mix due to faster access to care for people who are insured.

The insured in third monetary expenditure quartile report a significantly lower per capita amount than the uninsured, suggesting that the latter are better-off. These characteristics of sick individuals reflect to some extent the overall distribution of insured and uninsured households (see Tables 4.8 and 4.9).

Table 5.4: Socio-demographics and –economics, proportions and means

Characteristics of Sick Individuals	Sick Individuals: Insured (n 376)	Uninsured (n 3,459)	All Sick (n 3,835)	t-test or F-test
Demographics				
Male Gender	43.3%	42.2%	42.3%	n.s.
With School (age >5)	76.2%***	60.3%	61.2%	F(1, 20) = 25.37
n (individuals age >5)	280	2,632	2,912	
HH within 30min of HC	18.4%***	5.8%	6.6%	F(1, 20) = 9.6
In Age group 0-5 years	24%	23%	23%	n.s.
Mean Age, years	24.8	24.5	24.5	n.s.
Health				
Pregnant (age 15-49)	49.6%***	22.8%	24.3%	F(1, 20) =16.36
n (pregnant)	95	927	1,022	
Health (SAH) before care				F(1.79, 35.7) = 6.1; p<0.01
- not seriously sick	42.3%	30.4%	31.1%	
- seriously sick	41.7%	52.5%	51.9%	
- very seriously sick	16.1%	17.1%	17.1%	
Had 1+ visit in past 2 weeks	45.3%***	14.6%	16.5%	F(1, 20) = 38.11
Hospitalised (of individuals who sought care)	3.5%***	16.1%	14.3%	F(1, 20) =15.79
n(hospitalised)	185	672	857	
Mean nbr days in bed before care	4.6**	5.6	5.5	t = 2.44
Mean nbr days hospitalised	4.1***	11.5	11.24	t = 2.98
Ownership of assets, proportion of households				
Radio	50.1%**	35.30%	36.20%	F(1, 20) = 5.03
Bike	17.7%**	10.5%	11%	F(1, 20) = 5.01
Cattle	28.6%	20.1%	20.6%	n.s
Monetary expenditures, per capita per month, mean values RWF				
All Sick , RWF	2,750	2,706	2,709	n.s.
Quartile 1 (lowest), RWF	398	342	344	n.s.
Quartile 2	1,011	1,072	1,069	n.s.
Quartile 3	1,997**	2,273	2,252	t = 2.68
Quartile 4	7,077	7,214	7,206	n.s.

Source: Curative module of household survey. Weighted data, estimates conducted in STATA7 with svytab and svymean commands. Pearson and Wald t-tests were performed. *** Sign at 1 percent level (P<0.01). ** Significant at 5 percent (P<0.05). * Significant at 10 percent level (P<0.10).

Table 5.5 describes the mean number of visits by sick individuals' socio-demographics and health characteristics and by insurance status. The last column presents t-values on significance of the difference between insured and uninsured. Significance levels are also tested within groups. Sick MHI members report significantly higher visit rates than the uninsured across all sub-groups.

Table 5.5: Number of visits, by socio-demographics, means

Characteristics	Insured (n 376)	Uninsured (n 3,459)	t-values
All sick individuals	0.45***	0.15	5.13
Demographics			
Female	0.42***	0.14	3.83
Male	0.50***	0.16	6.1
6 years and older	0.45***	0.13	5.08
0-5 years	0.46***	0.19	3.04
With School	0.45***	0.15	4.76
No School	0.45***	0.11	4.5
Health Status			
Not very sick	0.22***	0.05	4.29
Sick	0.64***	0.15	7.71
Very sick	0.61***	0.3	3.02
t-value (diff not sick – sick)	(t=8.02; p<0.01)	(t=5.9; p<0.01)	
t-value (diff sick – very sick)	n.s.	(t=7.4; p<0.01)	

Source: Curative module of household survey. Weighted data, estimates conducted in STATA7 with svymean commands. Wald t-tests compare difference within insurance status group, t values in brackets. *** Significant at 1 percent level; **significant at 5 percent level of significance.

Table 5.6 presents mean and inequality measures of monetary expenditures for sick individuals, and by insurance status. All sick individuals report similar mean monetary expenditure per capita. However, total monetary expenditure appears to be more equally distributed among MHI members, as shown by the lower Gini and Atkinson measures, indicating higher inequalities in monetary expenditures among the sick uninsured.

Table 5.6: Inequality measures all sick individuals

Sick Individuals	Monetary Expenditure RWF	Gini	Atkinson measures		
			ε = 0.5	ε = 1.0	ε = 2.0
MHI (n 376)	2,751	0.538	0.244	0.417	0.683
Uninsured (n 3,459)	2,708	0.567	0.275	0.495	0.950
All (n 3,835)	2,730	0.566	0.273	0.491	0.948

Note: Data source: Curative module household survey weighted data from 9/2000. Mean monetary expenditure per capita per month in RWF. Exchange Rate: USD1=RWF 390 in 6/2000. ε is Atkinson inequality aversion parameter.

This comparison of sick individuals based on bivariate analysis indicates that the sick insured and uninsured groups differ significantly in regard of socio-demographic (patient attended school), health characteristics (pregnancy, less bed-days before care, less severe SAH, more visits, fewer hospital care), and economic characteristics (own radio, bike, cattle, lower monetary expenditure when in third quartile).

The two groups are similar with regard to the gender and age distribution and overall monetary expenditures. The Gini and Atkinson measures suggest a slightly more equal distribution of monetary expenditure among insured sick individuals.

5.4.2 Equity in utilisation of health care

Horizontal inequity in utilisation of medical care is examined by insurance status. The focus is on the distribution of three key variables: (1) monetary expenditure per capita per month; (2) utilisation of medical care, and (3) sick individuals' self-assessed health (SAH) status. Three different HI measures are estimated. The section begins by comparing monetary expenditures for users and non-users of care, depending on their insurance status. It is of interest to identify differences in income inequality in the four groups.

Table 5.7 presents mean values and the Gini and Atkinson measures for monetary expenditures of sick individuals. Results are first shown for MHI members with and without a provider visit, and then for the uninsured. Among MHI members, users and non-users of health care report similar mean monetary expenditure levels (t=1.17; p=0.3), Gini (3% lower for users) and Atkinson indices. This suggests no link between the level and distribution of monetary expenditure and utilisation in the insured group.

The uninsured with visit report markedly higher per capita expenditures than those without visit (t=4.32; p<0.001). Uninsured users show a more equal distribution of monetary expenditure than uninsured non-users, as expressed by lower Gini and Atkinson measures.

Table 5.7: Income mean and inequality, by visit, by MHI status

Mean and inequality measures	MHI member		Uninsured individual	
	With visit (n 171)	No visit (n 205)	With visit (n 518)	No visit (n 2,941)
Monetary expenditure per cap per month (mean) RWF	3,085	2,542	3,674	2,474
Gini of monetary expend	0.523	0.540	0.471	0.580
Atkinson ε = 0.5	0.228	0.254	0.185	0.289
Atkinson ε = 1.0	0.406	0.420	0.355	0.511
Atkinson ε = 2.0	0.696	0.667	0.831	0.953

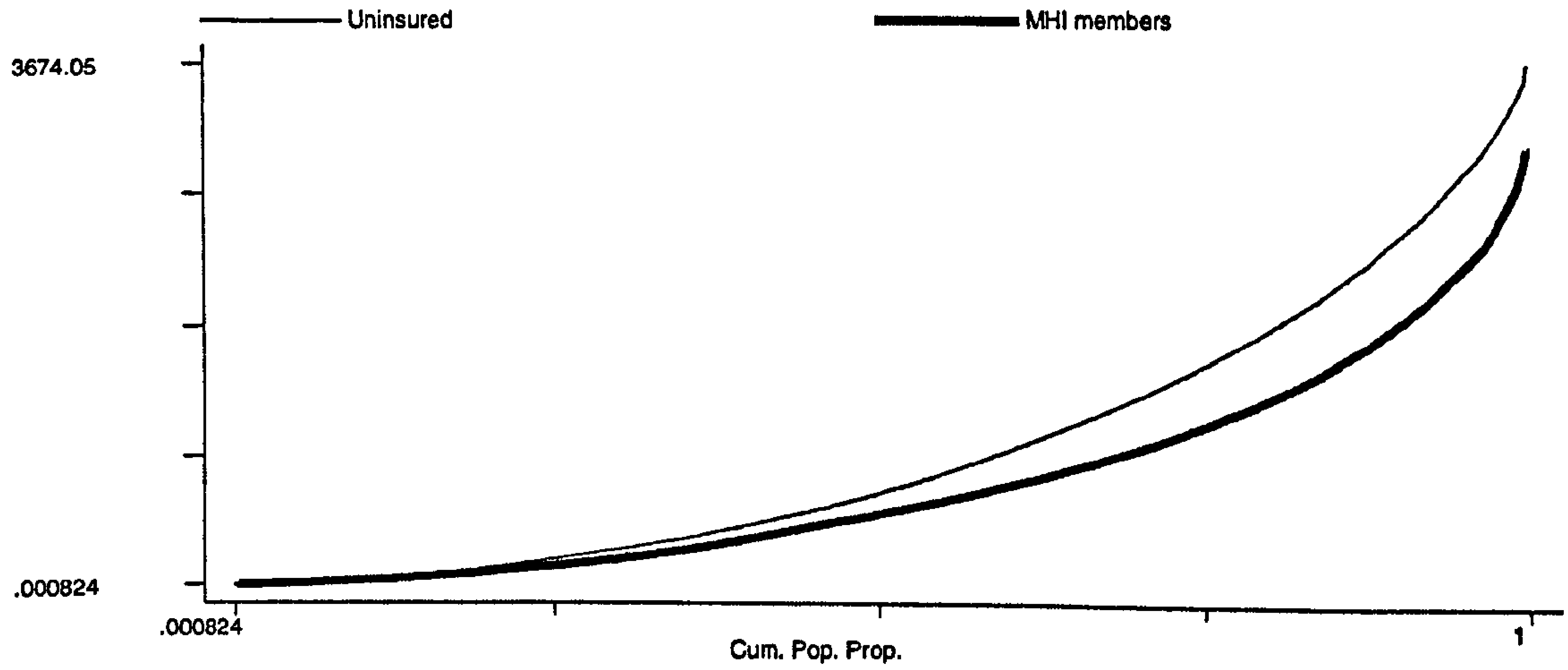
Note: Data source: Sick individuals interviewed in curative module. Weighted data from 9/2000. Estimates conducted in STATA7 with svymean and ineqdeco by subgroup commands. Exchange Rate: USD1=RWF 390 in June 2000. ε is Atkinson inequality aversion parameter.

This comparison indicates that the worse-off among the uninsured are excluded from care. Irrespective of their insurance status, users report higher average monetary expenditures per capita and a more equal monetary expenditure distribution than non-users of care. Comparing the four different mean monetary expenditures in Table 5.7 (for insured an uninsured with and without visits) with their corresponding deciles' asset and education variables as shown in Table 4.6 in Section 4.3.4, suggests that these households fare similarly with respect to assets and education level of the household head.

Figure 5.8 shows the generalized Lorenz curves based on monetary expenditures for sick insured and uninsured individuals with visits (second and fourth column in Table 5.7). Generalized curves are used as an alternative to Lorenz curves due to the different means and aggregates of the distribution. The generalized curve shows the cumulative share of the monetary expenditure variable multiplied by its mean, which affects the scale but not the shape of the curve.

The Lorenz curve for sick uninsured with visit is above the MHI curve: the pre-payment income distribution of uninsured users dominates the insured users distribution. This finding is in line with the above lower Gini for the uninsured. It implies that uninsured users have more monetary expenditure resources in total, or are better-off than insured users of care (Deaton 1998).

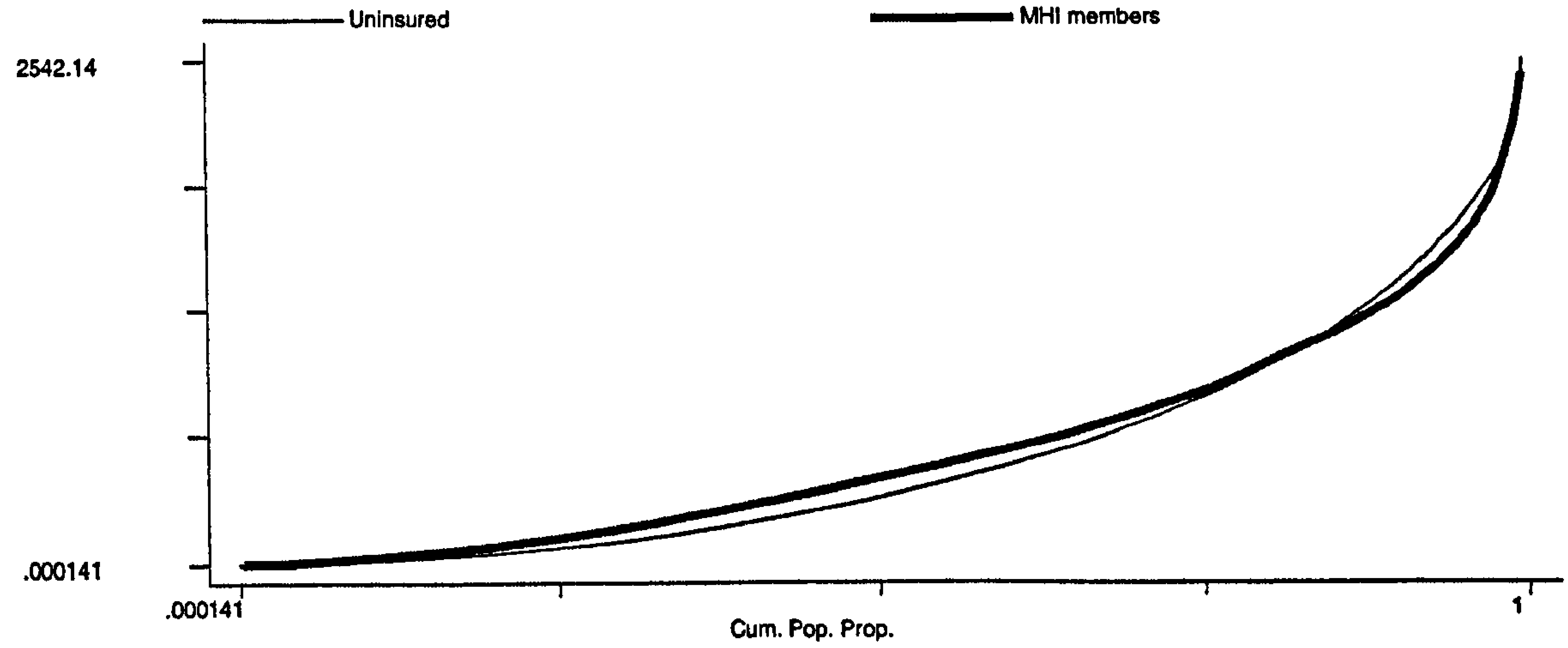
Figure 5.8: Generalized Lorenz curves: Sick with visit



Note: curative module household survey (9/2000). Cumulative monthly monetary expenditure per capita is computed in STATA7, with weighted data, and glcurve command. Sample population is sick individuals with at least 1 provider visit. Ranked by monetary expenditure per capita. Uninsured above MHI curve.

Figure 5.9 shows the "other side", that is the generalized Lorenz curves for sick individuals without visit, by insurance status (third and fifth column in Table 5.7). The insured curve lies above (or dominates) the uninsured curve for the lower 80 percent of the population. Then the curves intersect, and the inverse is the case. It suggests that the poorer 80 percent of insured individuals without visit are slightly better off in terms of monetary expenditures compared to the uninsured without visit.

Figure 5.9: Generalized Lorenz curves: Sick without visit



Note: Curative module household survey (9/2000). Cumulative monetary expenditure per capita is computed in STATA7, with weighted data, and glcurve command. Sample population is sick individuals without visit. Ranked by monetary expenditure per capita. MHI curve above uninsured curve until crossing.

These comparisons imply that the insured and uninsured individuals, independent of their use of medical care, differ in their distribution of monetary expenditures while they report similar mean levels of monetary expenditures. Among the uninsured, users have a more equal socio-economic distribution, mainly because the poorest are excluded from care. This supports above findings from bivariate analysis on monetary expenditures by MHI status and visit (Section 5.4.1).

Actual utilisation of medical care

The second key variable is actual utilisation of medical care, proxied by the visit dummy (visit1). The concentration index is computed for MHI and for user fees with corresponding mean numbers of actual visits. The purpose is to examine whether MHI increases utilisation of care, or if it just leads to an equal distribution of utilisation among the insured, but at a similarly low mean level to that in the uninsured group.

Table 5.10 presents mean visit values by insurance status and across monetary expenditure quartiles. The insured in all four quartiles report significantly higher values than the uninsured. The difference between insured visits across quartiles (Q1 vs. Q4) is insignificant; but highly significant for the uninsured.

The corresponding medical care concentration indices C_M are zero for the insured, suggesting no inequality in utilisation related to monetary expenditures. However, the 0.27 value for the uninsured points to visit inequality, implying that the better-off report more visits than the poor uninsured.

Table 5.10: Actual visits, mean and inequality measures

	Mean Visit by Monet Expend Quartiles					
Actual Visits	**Low Q1**	**Q2**	**Q3**	**Q4**	**All sick**	C_M
MHI (n 376)	0.40	0.35	0.49	0.54	0.453	0.079
Uninsured (n 3459)	0.06	0.13	0.14	0.26	0.146	0.270
All sick (n 3835)	0.07	0.14	0.17	0.27	0.165	0.243
t (diff MHI - NM)	3.41	2.44	4.22	4.22	5.13	
p-value	0.003	0.024	0.001	0.001	0.001	

Note: Curative module household survey weighted data from 9/2000. Estimates conducted in STATA7 with svymean, glcurve and cor commands. T-test between insured and uninsured tests the significance in difference within quartile. Difference between Q1 and Q4 are insignificant for MHI ($t = 1.22$, $p<0.2$) but significant for uninsured ($t= 8.22$, $p<0.001$).

Need for health care, proxied by SAH

The third key variable 'need for care' is proxied by the SAH dummy as defined by sick individuals interviewed in the curative module. It provides the information to compare whether MHI yields equal utilisation for equal need and irrespective of individuals' monetary expenditures.

Table 5.11 presents SAH values by insurance status and across monetary expenditure quartiles; as well as respective concentration indices for the insured and uninsured C(d_SAH). The fraction of sick individuals with serious/very sick SAH status is similar for insured and uninsured within each quartile; but overall, a significantly larger proportion of the uninsured consider themselves as seriously/very seriously sick ($p<0.014$).

The corresponding concentration index for illness C(d_SAH) is zero in both groups, suggesting no inequalities in SAH with regard to monetary expenditures. Though, the slightly negative concentration index for the uninsured indicates some pro-rich inequalities in self-assessed health in this group.

Table 5.11: SAH, fraction and inequality measures

	Fraction SAH by Quartiles					
Need proxied by SAH dummy	Q1	Q2	Q3	Q4	All sick	C(d_SAH)
MHI (n 376)	0.537	0.522	0.585	0.682	0.586	0.045
Uninsured (n 3459)	0.710	0.691	0.701	0.688	0.697	-0.009
All sick (n 3835)	0.703	0.681	0.692	0.688	0.691	-0.006
t (diff MHI - NM)	1.53	1.92	1.97	0.14	2.69	
p-value	0.141	0.07	0.063	0.891	0.014	

Note: Data source: Curative module household survey weighted data from 9/2000. Estimates conducted in STATA7 with svymean and cor commands. Proxy for need is SAH dummy, where sickness was: '0=not serious', and '1=serious/very serious'. T-test between insured and uninsured tests the significance in difference within quartile. Difference between Q1 and Q4 are insignificant for MHI ($t = 1.23$; $p<0.2$) and for uninsured ($t = -1.37$, $p<0.19$).

Le Grand's Approach

Using Le Grand's method, the degree of horizontal inequity (HI_{LG}) in utilisation reflects the difference between the visit concentration index C_M and the SAH concentration index C(d_SAH) shown in Tables 5.10 and 5.11 (Van Doorslaer et al. 2002). The resulting HI_{LG} in utilisation is 0.034 for insured sick individuals; 0.278 for the uninsured; and 0.249 for the entire sample.

The positive HI_{LG} result for the uninsured suggests that the rich uninsured receive a larger medical visit share compared to their illness or SAH share. The zero HI_{LG} result for MHI member individuals implies horizontal equity in utilisation among the insured: medical care is distributed based on their needs and independent of their socio-economic background.

This approach is based on the assumption that only persons who are sick will receive health care. In reality, care-seeking behaviour may be affected by additional factors. If they correlate with monetary expenditures, then the simple association between health and monetary expenditures could be contaminated by the systematic variation of other factors (Wagstaff and Van Doorslaer 1993). The indirect standardized method serves as an alternative to quantify inequity and check the consistency of the above results.

Indirect Standardization of Need

Indirectly standardized horizontal inequality measures are derived based on actual and need-standardized probability of visits estimated in logit regression models as defined in equations (18) and (19). Three concentration indices are computed, and corresponding mean values are shown.

First, C_M, based on actual visits (m);

Second, a simple SAH-adjusted visit probability is estimated in a logit regression following equation (18). The SAH-adjusted visit probability m(SAH), the concentration index C_M(SAH), and the horizontal inequity index is computed HI(SAH). Logit regression results are presented in the Annex Table A5.1.

Third, a logit model serves to estimate a need-adjusted visit probability m(need+) following equation (19). Need is proxied by male gender, age to identify children 0-5 years; pregnancy; four and more days in bed due to illness; and the SAH dummy. C_M(need+) is the concentration index for need standardized visits, and HI(need+) the corresponding horizontal inequity index (see equation 20). Logit regression results are presented in Annex Table A5.2.

Table 5.12 presents results for insured and uninsured sick individuals. MHI members report significantly higher visit rates compared to the uninsured, independent of the adjustment method. Standardization does not affect the values for actual visit (m), SAH standardized mean visits m(SAH), and need standardized visit probability m(need+). This finding indicates that the variables used to indirectly standardize the visit probability do not yield any relevant differences in the insured and uninsured groups.

For insured individuals, SAH and need-adjusted concentration and horizontal inequity indices are zero, suggesting equal utilisation for equal need and SAH.

For the uninsured, substantial inequity in utilisation remain, independent of their need and SAH status. Their SAH- and need-adjusted concentration indices (C_M(SAH) and C_M(need+)) show that an equal visit distribution would have been expected given their distribution of SAH and need. The resulting considerably higher HI indices HI(SAH) and HI(need+) suggest that the distribution of visits favours the rich uninsured, even when controlling for health status using SAH and predicted need.

Table 5.12: Horizontal inequity in utilisation, by MHI status

HI indices	MHI	Uninsured	p-values
Actual visits			
Actual mean visit (m)	0.453	0.146	p<0.001
C_M: Concentration index for actual visits	0.079	0.270	
SAH-adjusted visit probability			
m(SAH): SAH standardized mean visit	0.458	0.147	p<0.001
C_M(SAH): SAH adjusted concentration index	0.018	-0.001	
(1) HI (SAH) = C_M – C_M(SAH)	0.061	0.271	
Need-adjusted visit probability			
m(need+): Need adjusted mean visit	0.453	0.146	p<0.001
C_M(need+): Need adjusted concentration index	0.042	0.008	
(2) HI (need+) = C_M - C_M(need+)	0.037	0.261	
N (sick individuals)	376	3459	

Source: Curative module of household survey. Weighted data, estimates conducted in STATA7 with svymean, svylogit, cor commands. SAH enters both equations as a dummy (not so sick vs. sick and very sick). Need standardized for age, gender, pregnancy, bed days, and SAH dummy.

Overall, the different methods used in this section confirm the robustness of findings: Even if the visit probability is adjusted by variables that would indicate a greater need for health care, there are strong financial barriers among the uninsured caused by user fees that lead to horizontal inequity in utilisation. This is not the case among MHI members. Their actual distribution of visits matches the distribution of their health status and their need for care.

5.4.3 Equity in health financing

This section presents results on equity in health financing, by insurance status, and on a household level. The progressivity of health financing is assessed in terms of departure from proportionality based on the Kakwani index as defined in equation (6). The redistributive effect is estimated first by the Reynolds-Smolensky (RS) index as shown in equation (8), and by the AJL effect (equation 9).

Table 5.13 shows summary measures for insured and uninsured households. For the insured, total health expenditures include MHI premium and OOP (col 3); for uninsured, this is only OOP payments (rexp8pc) (col 4). For the insured, total health expenditures per capita per month (column 3) is divided into monthly MHI premium per capita (column 1), and OOP health expenditures per capita per month (column 2). Monthly MHI premium is imputed and does not reflect the actual situation of an annual premium. For MHI members, the amounts in columns 1 and 2 are reported separately to identify eventual inequities related to the premium or OOP level. The fifth column shows the values for the full sample population.

The previous section identified significant differences between the insured and uninsured in terms of mean visit levels and equity in utilisation. Results in Table 5.13 suggest that insured and uninsured households report no significant differences in their pre-payment income, proxied by their total monetary expenditures, including MHI premium. Per episode of illness, MHI members report significantly lower OOP expenditures (including visit) than the uninsured ($p<0.01$).

Table 5.13: Inequity effect of health financing, by MHI status

Column number:		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	**Name**	**MHI prem**	**MHI OOP**	**MHI total**	**NM total**	**All**	**t**	**% diff**
x = (PreYpc)	Monet exp p/c p/m incl health + MHI premium[40]			3418.1	2884.2	2922.5	1.01	
OOP(ill)	OOP per illness		497	497	1987	1745	5.41	
T(month) = (OOP_Ppc)	Health exp pc per month (RWF)	48.1	144.7	192.8	202.6	201.9	0.14	
t =T/x (%)	Monetary exp share of T	5.77%	3.3%	9.05%	6.1%	6.3%	1.85	
Gini(x)	Gini for pre-payment monet exp (x)		0.621	0.621	0.605	0.611		3%
C(T)	Concentration index for T		0.645	0.497	0.652	0.641		
Kakwani (T)	Kakwani index of progressivity of T on x: C(T) - Gini(x)		0.024	-0.124	0.046	0.030		
x-T	Post-health payment monet expend net T p/c p/m (RWF)		3273.4	3225.3	2681.6	2720.6	1.05	
C(x-T)	Concentration index for post-payment monet expendit vis-à-vis x		0.581	0.589	0.609	0.609		
RS(T)	Reynolds-Smolensky index of redistributive effect for OOP		0.025	-0.137	0.049	0.032		
Gini(x-T)	Gini post-payment monet exp (x-T)		0.620	0.629	0.615	0.616		2%
R	Re-ranking degree: Gini(x-T) – C(x-T)		0.039	0.040	0.006	0.008		
AJL effect	Redistributive effect: Gini(x) - Gini(x-T)		0.0008	-0.0078	-0.0092	-0.0053		-3%
N	Nbr of HH			354	2785	3139		
N(s,v)	Nbr of sick individ. with visit			171	518	689		

Note: Data source: Household survey and curative module household survey. Weighted data from 9/2000. MHI total = MHI premium + MHI OOP. NM total = NM OOP. Estimates conducted with svymean, inequal, glcurve and cor commands. Mean monetary expenditure in RWF. Exchange Rate: USD1=RWF 390 in 6/2000. T-test significance level in difference of mean values between totals for MHI and NM (non-members): % change shows the difference between MHI insured and the uninsured.

[40] Note: this per capita monetary expenditure amount includes all health related expenditures including MHI premium for the insured. It serves as a proxy for pre-payment income.

The difference in total monthly health expenditures per capita (OOP_Ppc) between the two groups is insignificant. The average income share t of total health expenditures is lower for uninsured than for MHI households. This is mainly because of members' MHI premium payment, which reflects almost 6 percent of their total monetary expenditures (col 1). Once premium is paid, MHI members report a lower share of total income that goes to monthly OOP payments (3.3%) than the uninsured (6.3%). The Gini(x) of pre-payment income is equally positive for insured and uninsured households, indicating a distribution of monetary expenditure favouring the rich in both groups.

The Kakwani index measures the progressivity of health care payments on pre-payment income. The Kakwani is zero for insured (col 2) and uninsured OOP (col 4), but slightly negative for total MHI health expenditures, including MHI premium (col 3). While the zero values suggest proportionality in health financing for OOP paid by user fees and MHI, the negative value for total MHI indicates regressivity in total health expenditures.

This Kakwani result needs to be interpreted cautiously. The uninsured result does not reflect equity but is rather caused by the large proportion of them with zero health expenditures due to their exclusion from care when sick. All insured households, on the other hand, have some health expenditures consisting of their flat-rate annual MHI premium, which causes regressivity in health financing. Hence, this regressive result for total MHI indicates that the annual MHI premium level is too high for poor households and should be lowered for the poor to reach a positive Kakwani index and progressivity in health financing.

This result is also potentially problematic due to two reasons: first, the data limits and second, the appropriateness of the Kakwani index. As described in Section 5.3, the proportionality of health financing is analysed based on household monetary expenditures for consumption. This information was collected for one month and has been annualized to reflect annual monetary expenditures. It results in imputing annual expenditures of zero for those households who had no expenditures during the interview month. This could provide an erroneous impression. While it is very well possible that some households never have cash and only live from trading goods and services, most people do have at least some cash expenditures during the year. Since the MHI premium can be paid at any time of the year, whenever the household has cash available, attributing one-twelfth of MHI premium to these zero-expenditure households may provide a regressivity result that is mainly due to the data limits. It highlights the importance of using longitudinal data sets with regular follow-up interviews to conduct health financing analysis. Similarly, the Kakwani index reflects the difference between two measures generally assessed based on longitudinal data: the concentration index for health care payments C(T) and the Gini for pre-payment income (x). Future research could focus on whether the Kakwani index is an appropriate measure of equity when using one month of cross-sectional data, and thereby contribute knowledge on when these indices are appropriate.

The redistributive effect as expressed by the Reynolds-Smolensky RS(T) index shows the change in income inequality associated with the move from the pre-payment to post-payment income[41] distribution due to health care payments. The degree of the redistributive effect RS(T) is zero for insured and uninsured OOP (columns 2 and 4), suggesting that OOP spending und MHI and user fee have no impact on the income distribution after health spending. However, the negative value for total MHI including premium (col 3) indicates a pro-rich income redistribution among MHI members, which, again, is caused by the annual MHI premium.

This RS(T) gives the impression that MHI contributes to a more unequal post-payment distribution than user fees, which is misleading. The poor sick uninsured are not having any health expenditures because they are excluded from care. While MHI contributes to horizontal equality in utilisation, the MHI premium level yields regressivity in health financing and a pro-rich redistribution in the post-payment income. This cautiousness in the interpretation highlights the limits of the methodology.

[41] Post-payment income is income after health care payments have been made.

The Kakwani and Reynolds-Smolensky indices assume that there is no re-ranking when moving from pre- to the post-payment expenditures and that the redistributive effect is caused by progressivity only. However, in reality, re-ranking most likely occurs. Some households' rank in the pre- and post-payment distribution may be different, because at given income level, they pay different amounts for health care.

Therefore, the Aronson (AJL) effect is computed, following equation 9. For both groups the magnitude of redistribution for total health spending (col 3 and 4) is miniscule and negative, suggesting that the Lorenz curve for post-payment income would lie below the Lorenz curve for pre-payment income. Total health expenditures (including premium) contribute to income inequality for insured and uninsured households (Wagstaff and Van Doorslaer 2001), although the insured used care about four times more often when sick. The zero AJL value for MHI OOP expenditures nearly coincides with the Reynolds-Smolensky index. This means that OOP health expenditures for insured households are not related to re-ranking in the move from the pre-payment to post-payment income distribution, which is confirmed by the zero result for the re-ranking degree. Hence, among the insured, any pro-rich redistribution after health payments is due to the MHI premium level.

Combining results on equity in utilisation and health financing leads to three key findings. First, MHI members pay about four times less for an episode of illness than the uninsured. Thus, it is not surprising that MHI members receive significantly more visits for equal need for care. MHI contributes to horizontal equity in utilisation among insured, who report similar utilisation for similar need, irrespective of their monetary expenditure situation. However, user fees create inequity in utilisation as need-adjusted utilisation is positively related to monetary expenditure.

Second, as a result of their exclusion from care, total health financing represents a lower share of total monetary expenditures among the uninsured. Consequently, the different health financing equity indicators suggest that user fees would cause proportionality in health financing and no redistributive effect on pre-payment income. This is due to the poor sick uninsured not seeking care.

Third, total health expenditures for the insured are slightly regressive and represent a higher share of total pre-payment income than for uninsured households. The annual MHI premium caused this result. However, the Aronson effect suggests that the redistributive effect of health expenditures is miniscule for both groups, which is impressive given that the insured use care considerably more often.

It can be concluded that MHI with utilisation at a significant higher and equitable level has decreased horizontal inequity in utilisation, resulted in a lower share of income being paid OOP, and caused a similar negligible redistributive effect as user fees, which create horizontal inequities in utilisation. This OOP result is comparable to findings from the Vietnam study, where based on estimates of the redistributive effect of health expenditures on income, it was suggested that since the introduction of social health insurance, the redistributive effect has decreased over time, which was mostly attributable to a reduced degree of regressivity in health financing (Wagstaff and Van Doorslaer 2001). On the other hand, annual MHI premium reflect an important proportion of poor households income, and causes regressivity in total health financing among insured households. This finding confirms results from previous analysis, as well as concerns raised in Chapter 4 about the high MHI premium level.

5.4.4 Minimum standard approach

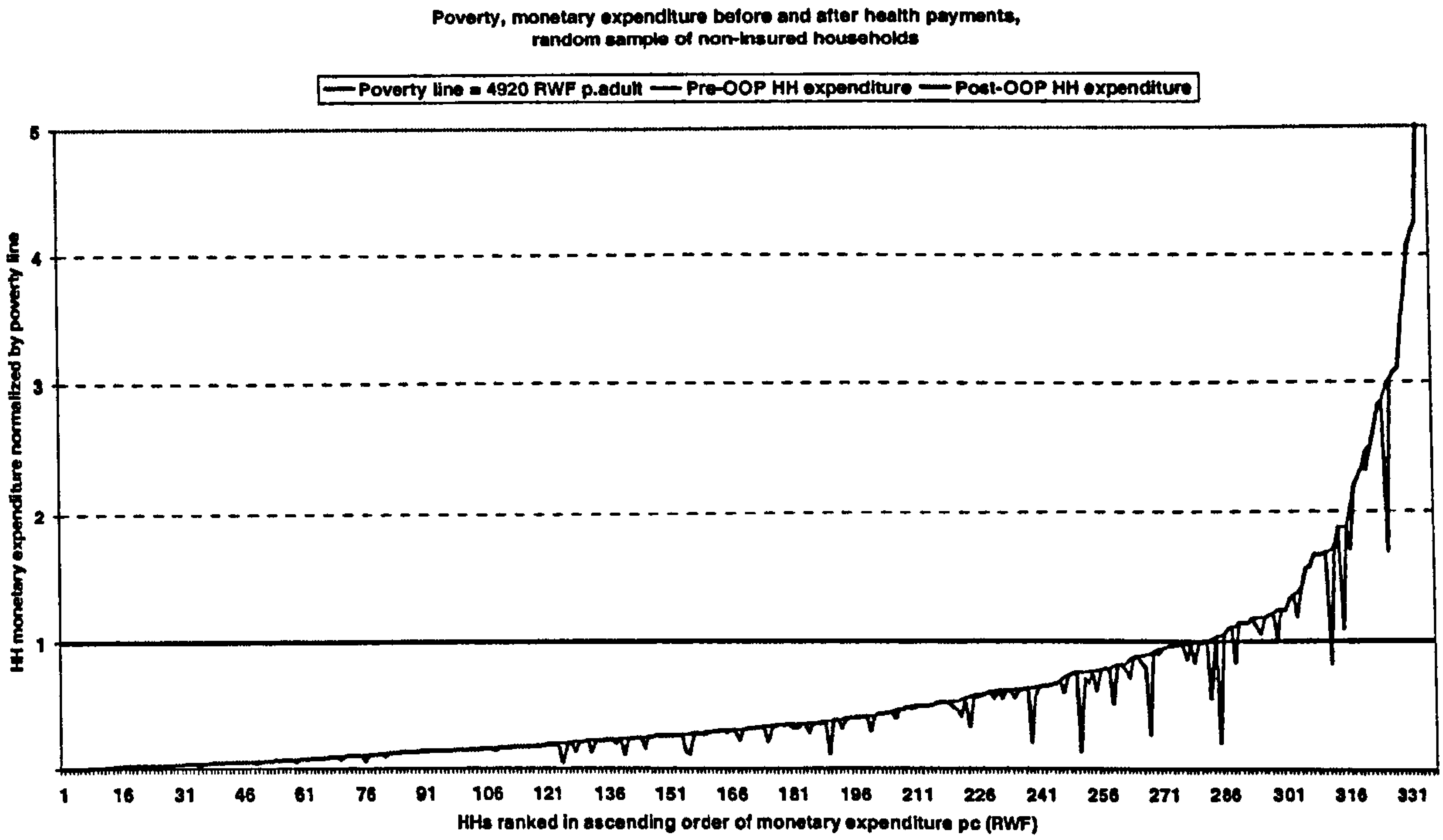
In a low-income context, analysing the distribution of health expenditures is not enough to reach a conclusion about fairness in financing. Instead of equity principles, the poverty relevance of health care payments may be more important. In the long run, health expenditures may have an impoverishing effect, and threaten households' ability to purchase food and other important goods. This analytical approach applies a short-term concept. It uses a cross-sectional dataset and assumes that all costs are borne in the same period. It thus ignores options of consumption smoothing over time, by borrowing and lending.

Fairness in payments for health care suggests that in the short run, OOP health expenditures should not push household income below or further below the PL. Rather, health policy should protect household income against dropping below a minimum standard level. This section aims to identify to what extent this objective is reached by user fees and by MHI. The minimum is defined by the year 2000 HLCS consumption PL of RWF 4,920 per month per adult and set in terms of the absolute level of household pre-payment expenditure (Ministry of Economics and Finance 2002). Mean levels of monetary expenditures are compared for insured and uninsured households for before and after health care spending, and against the PL. Due to these survey-specific differences in the two income proxy variables, this result should not be used to compare poverty in the household survey against poverty in the HLCS.

The Pen's parades plot household pre-payment monetary expenditures before health expenditures along the y-axis against households ranked by pre-payment expenditures along the x-axis (Wagstaff and Van Doorslaer 2001). Figure 5.14 shows the Pen's parade for a random sample of uninsured households, and Figure 5.15 for all MHI households. The random sample of uninsured households equals the sample size of MHI households, to make the graphs comparable.

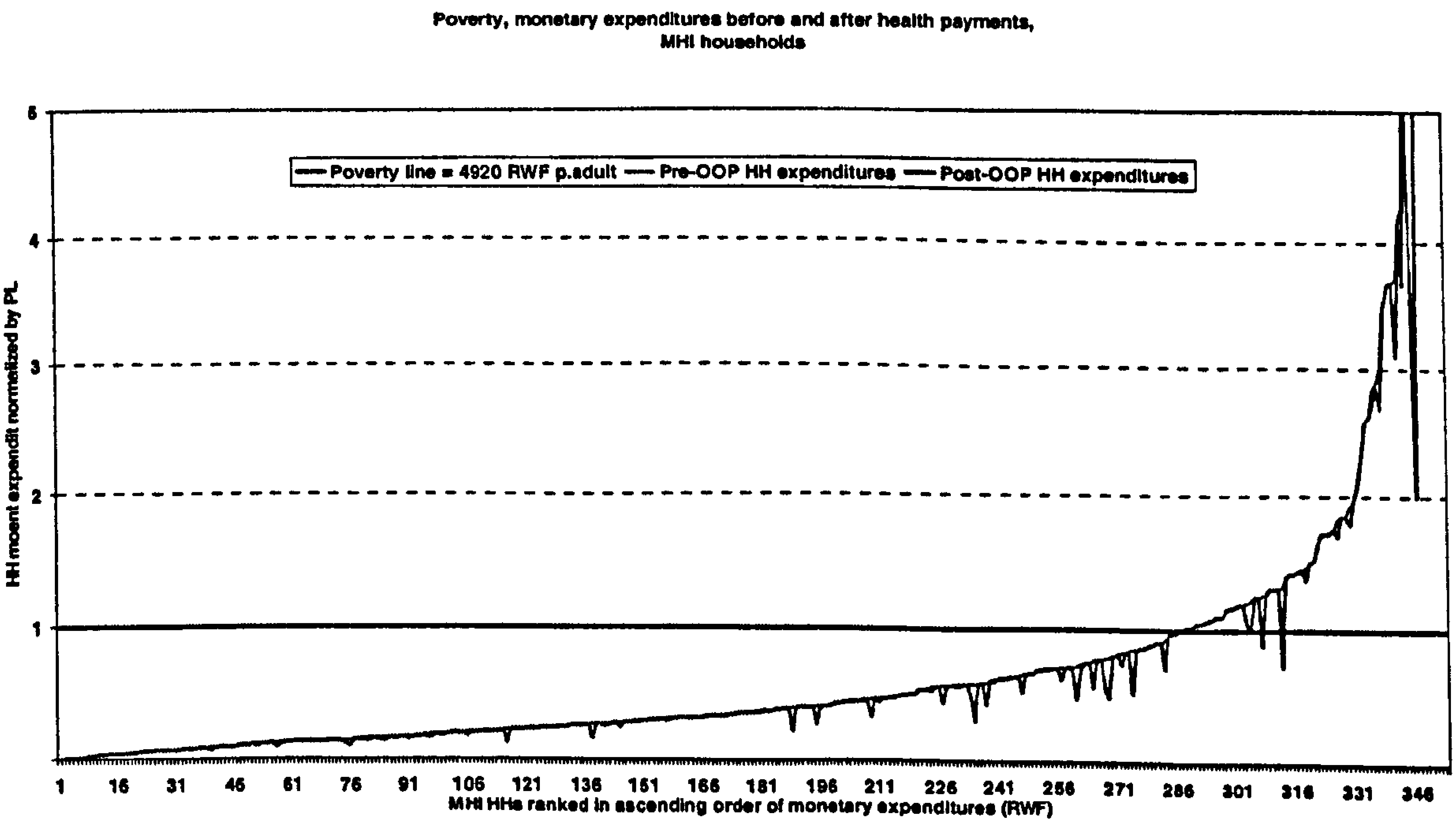
The Pen's parades are drawn as in "paintdrop" charts to identify eventual re-ranking in household pre- and post-payment income distribution after health expenditures. Households' pre- and post-payment monetary expenditures are normalized by the PL. Overlaid on the chart are "paintdrops": households' OOP health expenditures (rexp8pc), resulting in their post-payment position. It allows a visual inspection of which households are drawn below the PL and where they are located in the pre-payment income distribution.

Figure 5.14: Pen's parade, random sample of uninsured households



Note: Data source: household survey (9/2000).

Figure 5.15: Pen's parade, full sample of MHI households



Note: Data source: household survey (9/2000).

The charts show that independent of their insurance status, the majority of households are already below PL. In some cases, their total monetary expenditures are clearly pushed further into poverty by OOP payments. In other cases, household income drops below the PL having started out above it "before" OOP health payments. Comparing the random uninsured sample with the insured group suggests that MHI is more effective than user fees in protecting household income against falling below the PL.

However, insured households who seek care still have to pay a co-payment per visit, fees for hospital care not covered by MHI, and transport costs to facilities. Figure 5.15 shows that these expenditures cause some of the insured monetary expenditures to drop below or further below the PL. Hence, in the long run the current MHI coverage may not be enough to protect household income against poverty. This result is compatible with findings from Vietnam, where the more frequently occurring outpatient payments, not covered by insurance, had clearly pushed some households further into or below the extreme poverty by OOP payments (Wagstaff and Van Doorslaer 2001).

Table 5.16 shows additional poverty measures that help interpreting these graphical findings. The headcount ratio identifies the proportion of the population below the PL. The poverty gap reflects the average shortfall from the PL. First, outpatient and inpatient utilisation rates are shown for individuals stemming from households who are below poverty line. The insured classified below the poverty line report significantly higher utilisation rates for outpatient and inpatient care than the uninsured.

The poverty headcount ratio shows that before OOP expenditures, 81 percent of insured households and 86.6 percent of uninsured households are below the poverty line. OOP health expenditures increase the headcount ratio by 0.6 percentage points for MHI and by 1.3 percentage points for uninsured households. Comparing monetary expenditure per capita with a PL defined by monetary and non-monetary consumption expenditure per adult provides the erroneous result that a larger proportion of households interviewed in this household survey live below the PL compared to the national rural average of 66 percent.

Table 5.16: OOP spending in terms of the PL, by MHI status

	MHI	Uninsured
Consumption PL per adult per month (RWF)	4920	4920
N (households)	354	2785
P(pre): Nbr of households < PL before health	287	2412
P(post): Nbr of households < PL after health	289	2447
Utilisation rates of sick below PL		
Outpatient utilisation rate in health centres, per capita	0.43***	0.13
Inpatient utilisation rate in hospitals, per capita	0.37***	0.1
Poverty headcounts		
H(pre-payment): P(pre) / N	81.1%	86.6%
H(post-payment): P(post) / N	81.6%	87.9%
PI(H): Increase of headcount ratio, %-points	0.6	1.3
Poverty gap		
G(pre-payment) (RWF)	2628	2856
G(post-payment) (RWF)	2687	2953
PI(G) (RWF)	59	97
Normalized poverty gap		
NG(pre): G(pre)/PL	53.4%	58%
NG(post): G(post)/PL	54.6%	60%
PI(NG): Increase of normalized poverty gap	1.2%	2%

Note: Data source: household survey (9/2000). Estimates computed in STATA7. Weighted data. See equations (10) – (15) in section 5.2.3 for definition of poverty measures. *** Significant at 1 percent level of significance (P<0.001).

The normalized poverty gap increases due to OOP health expenditures by 1.2 percentage points for insured and 2 percentage points for uninsured households. For the insured, OOP health payments (due to the use of care not covered by MHI) increased the number of poor Rwandan households by 0.7 percent (=0.6/81.1); and for the uninsured by 1.5 percent. The relative impact is slightly greater on the normalized poverty gap, with relative impact shares of 2.2 percent for the insured and 3.4 percent for the uninsured.

The above findings suggest that for insured households health expenditures have a smaller impact on the headcount and the normalized poverty gap than for uninsured households. However, the latter report significantly fewer in- and outpatient visits and inequity in utilisation.

If there is adverse selection in the current MHI, then without adverse selection the paintdrops in Figure 5.10 would be smaller, suggesting that MHI protects the insured even better against unexpected health expenditures.

Longitudinal data would be needed to examine over time, the relative importance of health payments in the poverty context. Nonetheless, these findings suggest that the uninsured avoid seeking care in order to prevent that health payments endanger their ability to purchase food and other important goods.

Table 5.13 has shown that on average, MHI members pay RWF 497 per episode of illness, which includes co-payment, transport cost to the facility, and health expenditures for home care, drugs bought at pharmacy, and care not covered by the MHI benefit package (see Table 7.1 in (Schneider and Diop, 2001) for detailed break-down of expenditures by socio-economic group and insurance status). Richer MHI members pay more than those in lower monetary quartiles (RWF 966 vs. less than RWF 200). This could be because the richer insured are willing to pay additional amount for care not covered by MHI, including hospital care and drugs excluded from the MOH essential drug list. This leads to equity concerns, suggesting that current MHI coverage may not be great enough to ensure horizontal equity in utilisation of not-covered care.

5.5 Discussion

The aim of this Chapter was first, to review the literature on methods of measuring equity in utilisation and financing of medical care and of the minimum standard approach; and second, to employ these methods to compare utilisation and financing of health care for insured and uninsured groups. This is done using data from households and sick individuals interviewed in the 2000 household survey conducted by PHR in three Rwandan districts.

The egalitarian equity principle and the minimum standard approach serve as the standards against which equity is measured in this analysis. The egalitarian equity principle says that a system is equitable if it is financed according to individuals' socio-economic situation, and if medical care is distributed based on patients' need to achieve better health, as judged by the health professional and unrestricted by patients' income and wealth (Wagstaff and Van Doorslaer 1993).

Many low-income countries do not aspire egalitarian equity principles, and the minimum standard definition may be more important. The focus is then on the extent to which health care payments force household income below a minimum threshold, such as the poverty line (Wagstaff and Van Doorslaer 2001), in which case household income and their ability to purchase other goods and services including food, shelter or clothing would be endangered (Culyer and Wagstaff 1993).

The main findings presented in this Chapter on equity in utilisation and health financing and the minimum standard approach can be summarized as follows:

First, the analysis has used different measures to examine equity in utilisation and health financing among insured and uninsured households. The results suggest that sick insured individuals report a markedly higher visit rate than the uninsured. The Le Grand horizontal inequity index HI_{LG} is positive for the uninsured suggesting that the rich uninsured receive a larger medical visit share compared to their illness share. The zero HI_{LG} result for MHI members implies horizontal equity in utilisation: medical care is distributed independent of their socio-economic background. This finding is supported by indirect standardization methods. Even when controlling in the estimation of the visit probability for other factors that would indicate a greater need for health care, user fees create horizontal inequity in utilisation: visits strongly correlate with individuals' socio-economic background. For the insured, the distribution of visit probability matches their distribution of their health status and the need for care. Hence, MHI contributes to equity in utilisation.

Second, analysis of equity in health financing implies that at a markedly higher visit rate, MHI members pay on average considerably less per episode of illness than the uninsured. The Kakwani index is zero for OOP for the insured and uninsured implying proportionality in OOP financing in both systems; but slightly negative for total MHI health expenditures, when MHI premiums are included. This negative result points to regressivity in total MHI health expenditures due to MHI premium; but is to some extent also caused by the one-month income proxy with some households reporting cero expenditures, and should be interpreted with caution. Similarly, the RS index is negative for total MHI including premium, suggesting a pro-rich income redistribution among MHI members. Again, this is due to the annual MHI premium level. Insured and uninsured OOP payments seem to create no redistributive effect, as the RS(T) degree is zero. The Aronson (AJL) redistributive effect is miniscule and negative for both groups: total health payments slightly contribute to income inequality among the insured and uninsured; which is related to premium levels among MHI members. Although the insured use care about four times more often when sick, the AJL and re-ranking indices are zero for MHI OOP payments. Thus, MHI OOP does not appear to contribute to any re-ranking or income inequality.

The equity findings lead to the conclusion that MHI with utilisation at a significantly higher level leads to horizontal equity in utilisation. However, MHI premium levels appear to be too high for the poor and lead to regressivity in health financing and some re-ranking. On the other hand, user fees cause strong horizontal inequities in utilisation at a lower mean level.

The poor uninsured are excluded from medical care, which gives the misleading impression that user fees cause proportionality in health financing and no redistributive effect on pre-payment income. Hence, it is important to combine analysis on equity in utilisation and financing of health care.

Finally, the minimum standard approach compares the two health financing mechanisms. The analysis examines households' socio-economic situation in terms of the poverty line. The focus is on whether MHI and user fee health financing systems protect household income against dropping below the PL. Findings suggest that OOP spending has a similar small impact on the headcount and the normalized poverty gap for insured and uninsured households, although the latter report significantly fewer provider visits. It could be that the poor uninsured chose not to use care because they fear that paying for care might endanger their ability to purchase other goods and services. Thus, compared to user fees, MHI better protects poor households' monetary expenditures against financial shocks caused by OOP payments; and this is despite a considerably higher utilisation level by MHI members.

This analysis has limits related to the data set, measurement errors, and methods that have not been used. Although the analysis follows the methods used by other researchers, the findings presented in this Chapter do not lend themselves to comparison with results from studies that use differently defined data and variables, and are conducted in a different socio-economic context. In particular, the analysis relied on two simply defined key variables, which are rather limited compared to measures used in other studies. These two variables include individuals' SAH health status before they sought care, which serves as a proxy for health status, and monetary expenditures as a proxy for household income.

Measuring inequality requires that genuine dispersion be separated from measurement errors. But measurement errors are inherent in every data set. They lead to the situation that some genuine data variation across households is not picked up in the estimation process (Van

Doorslaer et al. 1999). However, it would be expected that less precision would equally affect insured and uninsured groups, and thus not impact the comparative results.

Several analytical methods have not been applied in this analysis. For example, the health financing section only looked at vertical equity, whereas horizontal inequity issues have not been investigated. Estimating the horizontal component of the Aronson index could have done this. However, this method requires sub-dividing the sample into different socio-economic groups to estimate inequality measures with decomposition by subgroups. Due to the small number of insured patients this detailed analysis is not conducted, and only the aggregated value for the AJL is presented.

The section on the minimum standard definition evaluates health financing in the context of poverty. However, the analysis uses a cross-sectional data set, which does not allow concluding on the poverty impact of health payment. Longitudinal data would be needed to examine the poverty impact of health payments and households' income smoothing over time.

Findings from this and the previous Chapter on the enrolment probability can be combined. First, MHI responds to overall equity principles in utilisation and OOP health financing related to the episode of illness. However, total MHI health expenditures including premium causes regressivity in health financing, while MHI OOP health expenditures cause proportionality. This is due to the high share of monetary expenditures going to MHI premium payments, and the limited MHI benefit package, which excludes most hospital care. In addition, the "paintdrop" charts indicate that some insured households' pre-payment income drops below and further below the poverty line due to their OOP spending. These results lead to several suggestions for scaling up an equitable MHI design in Rwanda.

First, to reach progressivity in health financing, the MHI premium could be subsidised for households in the two lowest monetary expenditure quartiles, and/or the current flat-rate premiums could be replaced by an income-dependent premium.

Second, to protect monetary expenditures of poor households against OOP payments for care not covered under MHI, the current limited MHI benefit package should be expanded to a benefit package that covers all services and drugs offered by public and church-owned hospitals and health centres within a health district. This would imply a premium increase, which could negatively affect enrolment. Therefore, additional finances are required and eventual cross-subsidies from the better-off to the worse-off within a society.

Before incorporating these suggestions into an MHI scale up design, the following Chapter examines the financial sustainability implications of MHI in health facilities.

5.6 Annex

Table A5.1: SAH-adjusted visit probability, for members and non-members

Explanatory variable	Reference category	Sick MHI Members			Uninsured Sick Individuals		
		Logit coef.	Std. Err.	P>|t|	Logit coef.	Std. Err.	P>|t|
d_SAH	Not very sick	1.727	0.225	0.001	1.385	0.143	0.001
_cons		-1.253	0.213	0.001	-2.858	0.223	0.001
Nbr obs		376			3,459		
Pop size weighted		185.2197			2,945.03		
F		(1, 18) 58.78			(1, 20) 93.54		
Prop >F		0.0001			0.0001		

Note: Curative module household survey. Weighted estimates computed in STATA7, svylogit

Table A5.2: Need-adjusted visit probability, for members and non-members

Explanatory variable	Reference category	Sick MHI Members			Uninsured Sick Individuals		
		Logit coef.	Std. Err.	P>|t|	Logit coef.	Std. Err.	P>|t|
Male patient	Female	0.684	0.354	0.069	0.219	0.165	0.200
d_agepat		0.220	0.282	0.447	0.459	0.175	0.016
pregnant		1.302	0.512	0.020	0.312	0.247	0.221
d_bed 4+day	< 4 days	-0.594	0.395	0.150	0.210	0.291	0.479
d_SAH	Not very sick	1.884	0.207	0.001	1.423	0.159	0.001
_cons		-1.417	0.412	0.003	-3.287	0.405	0.001
Nbr obs		376			3,459		
Pop size weight		185.2197			2,945.03		
F		(5, 14) 14.28			(5, 16) 20.44		
Prop >F		0.0001			0.0001		

Note: Curative module household survey. Weighted estimates computed in STATA7, svylogit

Part III: Sustainability

Chapter 6: The Financial Impact of MHI with Capitation and of User Fees in HC

6.1 Introduction

Many governments in low- and middle-income countries have promoted MHI, with the aim to raise additional resources for a financially depleted public health sector. Most of these insurance schemes reimburse providers by fee-for-service payment (Bennett et al. 1998). Few attempts exist to understand the contribution of MHI to financial sustainability in a health sector (Barnum and Kutzin 1993). Such an analysis is justified on the grounds of efficiency arguments, related to the consumption and production of medical care. MHI has been criticised for creating perverse financial incentives to providers and the insured; and for drawing resources from other sources (Bennett et al. 1998). Eventual cost increases due to inefficient production or consumption may lead providers and insurers to shift costs to other sources and select risks (Barr 1998). This tradeoff between efficiency and risk selection can be balanced by the provider payment mechanism (Newhouse 1996).

The MHI in Rwanda is unique in the sense that the chosen provider payment is capitation per member per month in health centres instead of fee-for-service (see Table 3.2). As a result, health centres receive both a capitation amount per member from MHI and user fees from uninsured patients. In addition, donors and the government subsidize the supply of care. Hence, the focus in this Chapter is on the financial implications of user fees and of MHI with capitation payment in health centres. The financial situation in hospitals is not examined due to the limited benefit package (see Table 3.2) in hospitals and the lack of comprehensive hospital data.

The theory about the responsiveness of public providers to financial incentives is weak. There is little evidence on public provider behaviour in general, and there is even less evidence about the impact of different provider financing systems on behaviour, costs and efficiency of public providers in developing countries (Barnum and Kutzin 1993).

The principle-agent problem that characterizes the provider-insurer relationship suggests that providers respond to financial incentives, and treat patients according to their payment status. Under capitation, provider revenue per patient is unrelated to the resources expended in treatment. This encourages providers to manage their financial risk by maintaining costs low and becoming more efficient; by shifting costs to other payers; and by 'dumping' and 'skimping' potentially high-cost patients (Ellis and McGuire 1993). Capitation payment for insured patients implies that these patients would receive care such that related costs remain on average below the capitation payment. On the other hand, user fees implies user-fee paying patients, who can afford it, to receive better quality and more resource intensive care, leading to higher marginal costs (Dor and Farley 1996).

If payment-specific treatment is technically feasible for providers, then this would leave room for cost savings in the treatment of insured patients. But, differentiated treatment by payment type may simply not be practicable for providers and considered as medically unsound. It may be easier for providers to follow standard treatment protocols for all patients (Dor and Farley 1996).

Also, payment-specific treatment would suggest that a range of treatment is medically acceptable and within standards of quality of care. 'Medical appropriateness' tends to be subject to debate, and leads to 'appropriate treatment' within a quality range that is assumed to be constant across providers (Dor and Farley 1996). Thus, these are vague concepts and difficult to assess making interpretation of cost differences difficult. While more intense treatment could signify either quality care for a more severe case-mix that is accurately treated, or oversupply of care to patients; less intense treatment leading to low marginal costs could mean undersupplying care to patients, greater efficiency, or a less severe case-mix of patients. Concerns arise if treatment results in care that is beyond the medical acceptable range.

Using data from Europe and the USA, studies have estimated cost functions for private providers to assess their technical and economic efficiency, including average and marginal costs, as well as the extent of economies of scale and scope (Scott and Parkin 1995). Findings from the few payer-specific studies conducted in the USA suggest that providers behave as economic agents and adjust treatment intensity according to the expected payer-specific revenue from different sources (Dor and Farley 1996).

In the absence of detailed provider data to assess the impact of insurance, analysis on MHI tends to report descriptive information on finances and membership (Bennett et al. 1998; ILO 2002). As most insurance schemes reimburse providers on a FFS basis, a comparative analysis on the impact of prospective payment mechanisms on provider cost and efficiency has not been conducted yet in low-income countries.

This analysis aims to add to empirical evidence on payer-specific cost analysis. It examines the impact of alternative payment mechanisms on provider recurrent cost in public and church-owned health centres in Rwanda, by comparing the cost and efficiency implications of (1) MHI with capitation payment versus (2) user fee payment by the uninsured. It aims to determine whether HC shift costs of treating insured patients to other payers, instead of adjusting costs and improving the intensity of treatment.

The hypothesis is that HC respond to incentives set by capitation payment, leading to less resource-intense treatment within a given range of quality of care, which – ceteris paribus – results in lower marginal costs for treating insured patients. Providers' less intense treatment of insured patients may not necessarily result in worse quality from a patient and medical standard point of view, but rather increase economic efficiency. This hypothesis implies that providers can adjust payer-specific treatment intensity within the medically acceptable quality of care range, such that marginal revenue equates marginal cost. It suggests that HC do not necessarily shift treatment costs of insured patients; but rather, providers adjust costs in response to incentives set by the payment system (Dor and Farley 1996).

In addition, as the financial risk of insurance caused by members' adverse selection decreases with growing MHI pool size, a negative relationship is hypothesised between total recurrent cost in health centres and MHI pool size.

The analysis uses monthly data collected from August 1999 until July 2000 from 52 health centres, where insured and uninsured patients receive treatment. The focus is on the HC cost structure, and the cost impact in HC of the two payment systems. The robustness of the results is tested by using two different functional forms of a cost function: a translog and a log-linear cost model. Average and marginal costs and returns to the variable factor are estimated to examine HC capacity to accommodate an eventual higher demand for care, with an increasing proportion of the population insured. In anticipation of a MHI scale up, findings may help identify the degree to which capitation payment enhances efficiency in the provision of care.

The following section introduces the literature on provider behaviour, provider cost functions and structure, and empirical evidence from other studies. Then, the study area is presented. Section 4 describes the methods and data used. Section 5 presents results and checks their robustness. Findings are interpreted by drawing from additional data sources from households and focus groups collected in Rwanda.

6.2 *Literature review*

6.2.1 Behaviour and cost functions in health care

This section begins with an introduction to the provider behaviour in the context of different payment systems. Then, it discusses issues related to accounting-based and econometric cost functions and the cost minimization assumption made. Thereafter, empirical evidence is presented on cost implications of efficiency, quality of care, and risk-selection behaviour by providers.

Provider Behaviour

The goals and decision-making process of non-profit health care providers are not well described by the conventional profit maximization model of the competitive market. Various alternative models have tried to explain the incentives of non-profit providers (Barnum and Kutzin 1993). Generally, it is hypothesised that providers select a resource-mix for treatment within the technically feasible set and subject to budget constraints, which depend on the provider payment system (Weisbrod 1991).

While it is expected that FFS payment lead to higher quality and quantities of care (Dor and Farley 1996), prospective payment encourages providers at the margin to use production processes that reduce cost rather than improve quality of care (Weisbrod 1991; Ellis and McGuire 1996). The institutional framework may constrain providers from reducing costs by reducing quality, for example through law liability for medical malpractice, and professional ethics and codes (Weisbrod 1991). But this is less likely in developing countries. Rather, in a resource constrained context, it is to be expected that given the imperfection of the agency relationship between providers and patients, providers might reduce dimensions of quality that are difficult for insurers and patients to monitor (Ellis and McGuire 1996).

In the absence of a clear model of provider behaviour, it is rather difficult to interpret the link between cost and output in health care markets.

Cost Functions

Most cost studies apply short-run variable cost functions. They provide a better picture of costs for a specific point of time than long-run functions (Wouters 1993), and assume costs to be minimized with respect to specific inputs (Scott and Parkin 1995).

Cost studies use financial and production data to analyse costs, which are either generated in a step-down or an aggregated data approach. The latter uses average costs data based on aggregated central records. The step-down approach uses providers as the unit of analysis to estimate average cost of outputs (e.g. unit cost per visit) based on detailed cost and production process data. Fixed costs are allocated to the specific production functions and final service categories according to explicit allocation criteria; while treatment costs are attributed to the service category where they occur (Barnum and Kutzin 1993).

In econometric analysis, total costs tend to be assessed in two common cost function specifications: 'ad hoc' cost functions and production theoretic cost functions. 'Ad hoc', accounting-based cost or 'unit' cost studies are based on a linear function of possible cost determinants. Accounting studies generate a point in time estimate of total costs at a given output level, assuming that marginal costs are constant, and resulting in a direct and simple relation between an increase in an input component and a rise in total costs (Barnum and Kutzin 1993).

Econometric cost functions are based on production-theoretic models and rely on the duality principle between production and cost functions. They serve to examine how total costs change in response to changes in service mix, inputs, factor prices, and scale of operations (Barnum and Kutzin 1993). The assumption is that firms minimize costs given their input factors and prices (Scott and Parkin 1995).

Models such as the Cobb-Douglas or transcendental logarithmic (translog) form assume that variables enter the equation multiplicatively rather than additively (Pindyck and Rubinfeld 1991). Non-linear cost functions allow marginal costs to vary with the level of production

(Breyer 1987), yielding information on economic and technical efficiency (Barnum and Kutzin 1993). Due to the inherent restriction of unit elasticities of factor substitution in log-linear cost function, the translog function is mainly used in models with multi-product firms. The translog function allows unrestrictive modelling of elasticities of substitution. The model's flexible form causes them to differ at every data point (Greene 2000).

Cost Minimization Behaviour

In the context of studying public or private non-profit providers, the behavioural restriction of cost minimization imposed on models by the econometric cost function has weaknesses (Barnum and Kutzin 1993). Under certain institutional regimes, providers cannot or do not have the necessary incentives to minimize costs, particularly in the public sector or under FFS reimbursement. Cost-minimizing behaviour may be affected by the separation of ownership and management, as well as the lack of a competitive benchmark for performance comparison (Somanathan et al. 2000).

According to Hansen and Zwanziger (1996), cost minimization is not in conflict with non-profit behaviour theories and the not-for-profit nature of public hospitals. It requires that providers are interested in using their resources efficiently to maximize the size of the output, consisting of quantity, quality, provider satisfaction, etc. (Hansen and Zwanziger 1996).

Wouters (1993) recommends testing the cost minimization assumption when identifying inefficiencies in production. In a cost analysis of Nigerian health faculties, she selects 24 facilities that appear to be technically efficient based on the criterion of at least 600 visits per health worker per year. An efficiency index comparing facilities' marginal productivity of high- and low-paid staff with their respective salary levels is computed to estimate eventual deviations from cost-minimizing behaviour. Findings indicate that overstaffing and underutilization of facilities contribute to inefficiency. The insignificant efficiency variable implies that deviations from cost minimization leave total cost unaffected (Wouters 1993).

A study of the Sri Lanka public health sector finds significant levels of variation in efficiency across facilities. Cost-minimization appears to be limited due to labour market conditions, such as an excess of physicians, and government rules affecting the choice of input factors. Low levels of public funding leads to input constraints resulting in low salaries and demotivation (Somanathan et al. 2000).

Eakin and Kniesner (1988) find that the cost minimization assumption may yield misleading results when analysing the demand for hospital input factors in the USA. However, output factors are less sensitive to this assumption. Hence, cost-minimizing cost functions may be employed, even without necessarily assuming cost-minimizing behaviour (Eakin and Kniesner 1988).

6.2.2 Empirical evidence

The empirical application of translog models is limited by (i) small sample size, (ii) the absence of good data on factor prices, and (iii) zero-value observations. First, the increased flexibility through adding explanatory variables in their quadratic and interaction forms is gained at the cost of losing degrees of freedom, which is problematic at a small sample size. Explanatory variables could be aggregated into summary variables; though, this might result in aggregation of potentially heterogeneous variables. Second, the absence of reliable data on input prices leads to estimating the translog function under the restriction of linear homogeneity of factor prices, which may cause multicollinearity. Studies tend to ignore input prices if these are similar for all providers or if factor substitution is not calculated. Third, zero-value observations result in undefined explanatory variables. The zero-value problem can be circumvented in three possible ways: first, excluding zero-value observations; second, substituting zero-values by a small number, generally by one's; or third, a Box-Cox transformation of all zero-values variable (Scott and Parkin 1995; Greene 2000)[42].

The usefulness of the translog cost function has been tested in a cost study based on data from 76 Scottish NHS hospitals. The small sample size limits the number of explanatory variables. Zero-output values are substituted by one's; and explanatory variables are normalized before logarithmic transformation. Parameter results suggest that inpatient and outpatient discharges affect total costs significantly. Total cost is an increasing function of interventions and bed. The interaction term between outpatient visit and beds is negative and significant, implying that the outpatient impact on total costs depends negatively on the number of inpatient beds (Scott and Parkin 1995).

Despite satisfactory results of a number of specification tests, the authors assume that their translog cost model is misspecified due to several insignificant explanatory variables, a highly significant intercept, and an unusually high R^2, implying a model close to identity. The sensitivity of the results is tested by first running the same model on a different year data set; then, different cost function specifications are used, and insignificant explanatory variables are dropped, using backward stepwise regression. Finally, the model is run with interaction and squared variables excluded. All these different regressions produce the same test results (Scott and Parkin 1995).

These findings suggest that the multicollinear and deterministic nature of the model could be due to limited variation in the way NHS hospitals produce their output, reflecting the similarity in how NHS hospitals are managed and financed. Hence, stochastic analysis might be inappropriate when deterministic behaviour is implicit and the authors recommend exploring the use of a nonparametric technique (Scott and Parkin 1995), which does not assume a specific distributional form of the error term nor of the structural relationship

[42] The Box-Cox transformation uses maximum-likelihood estimation to find the non-specified parameters in a regression model. It results in a cost model with a generalized translog functional form.

between the dependent and the explanatory variables. However, nonparametric procedures require a large sample size (Kennedy 1997; Greene 2000).

Few cost studies have been conducted in low-income contexts. Most employ an accounting-based approach to estimate average costs per service unit and compare provider performance and relative efficiency, as well as cost-effectiveness of alternative interventions and economically efficient cost-recovery policies. The number of econometric cost studies is limited due to reasons such as provider data deficiencies that are too large to be absorbed in error terms; the unrealistic assumption of cost minimization; and the lack of a clear model of hospital behaviour to interpret the relation between cost and output (Barnum and Kutzin 1993).

Wouters (1993) applies the translog form of the generalized Cobb-Douglas bi-product cost function to estimate average, and marginal costs, economies of scale and scope in 24 Nigerian health facilities that appear to be technically efficient. Results suggest that most providers operate below technically efficient activity levels; and staff is not used in a cost-minimizing way. In addition, facilities are operating below inpatient capacity, and reach a higher productivity level for outpatient than for inpatient care (Wouters 1993).

Somanathan et al (2000) use a Cobb-Douglas function to examine efficiency based on data collected in 85 public sector facilities in Sri Lanka. Findings reveal a wide range of average costs per bed-day among facilities, which appears to be attributable to different occupancy rates, low output levels and an excess of physicians. Marginal costs are below average costs, indicating increasing returns to the variable factor and production levels on the downward slope of facilities' average cost curve. Thus, raising output would decrease average costs (Somanathan et al. 2000).

Other studies conducted in low-income contexts suggest that providers rarely have disceconomies of scale, which could threaten their sustainability. Rather, their technical inefficiencies tend to be related to poor drug storage, inadequate drug prescriptions and staff inflexibility, leading to waste of limited resources and production below capacity. It has been recommended to reduce inefficiencies by introducing institutional changes that address behavioural incentives set by financing mechanisms (Barnum and Kutzin 1993). This has led to concerns about whether efficiency-enhancing incentives could negatively affect the quality of care and cause patients to be excluded from care.

Presumably, higher levels of quality care affect provider cost. Studies have evaluated the structural quality dimension in health care by describing the resources needed to provide care (Wouters 1991). The Nigerian analysis proxies quality of care by drug availability in facilities, assuming that better drug availability increases quality and total costs. Findings reveal that structural quality affects cost negatively, which is interpreted as a result of more efficient drug supply management (Wouters 1993). In Sri Lanka, physical quality is assessed by the facility's cleanliness, and structural quality encompasses the availability of equipment and drugs needed to provide services. The insignificant quality coefficient in the production function suggests that higher structural quality is not linked to lower production output level. Similar results from the cost function indicate that the level of structural quality does not seem to affect health facility cost (Somanathan et al. 2000).

Researchers have evaluated the cost impact of different provider payment systems. The RAND study examines whether HMO providers' lower service use and lower treatment costs is caused by more efficient treatment or by providers' risk-selection of healthier members under prospective provider payment. Findings suggest that due to the financial incentives related to the payment system, HMOs provide a less intensive style of inpatient care than other plans; indicating a range of technically feasible treatment styles which could be used to increase efficiency in the production of care (Manning et al. 1987).

Dor and Farley (1996) employ a generalized translog model and data from 331 US hospitals, to estimate a multi-product cost function in which case-mix adjusted outputs by provider payment source are treated as distinct outputs, in order to identify whether providers vary the intensity of interventions in response to patients' payment sources. Findings suggest that patient treatment costs vary widely, and that these differences are systematically related to expected payment source. More generous insurance payment tends to be related to higher marginal costs compared with less generous payers such as Medicaid. The study concludes that providers behave as economic agents and are able to respond to financial incentives, thereby allocating resources accordingly on a case-by-case basis and within the range of what is clinically acceptable. Increasing insurance coverage will lead to increases in payer-specific resource-intensity, and will not necessarily be used to pick-up cost-shifting from other payment sources (Dor and Farley 1996).

6.2.3 Cost and revenue structure

Cost studies generally examine the cost structure, including marginal and average costs, as well as the extent to which scale and scope economies are generated (Barnum and Kutzin 1993). These concepts are introduced and their purpose in this analysis is explained.

Marginal Costs

Marginal costs (MC) reflect the change in total costs (TC) at each output level (Q) as output increases by one more unit (Begg et al. 2000). MC are estimated at the mean value of an output level holding other outputs constant:

(1) $MC_i = \delta TC/\delta Q_i$

where MC_i is the marginal cost of producing an additional unit of the i[th] output (Barnum and Kutzin 1993).

Dor and Farley (1996) estimate payer-specific MC based on generalized translog model results and at different output levels. In a translog function, MC is the elasticity of total cost with respect to payer-specific output ($\delta lnTC/\delta lnQ_i$) multiplied by the average cost for each output, or the payer-specific total costs C_i divided by the total number of payer-specific services Q_i provided (Scott and Parkin 1995). The null hypothesis is that marginal costs are equal for the different payment sources. Findings suggest that significant differences between payer-specific MC depend on the point of output at which MC are evaluated, leading to the suggestion that providers discriminate patients' treatment intensity by payment source depending on their output level (Dor and Farley 1996).

Average Costs

In a single-product firm, average costs (AC) are simply defined as $C(y_i)/y_i$, which is the total cost to produce output y_i divided by the quantity of y_i produced. In multi-product firms, there is no single meaningful definition of AC per output, mainly because there is no meaningful way to aggregate different types of services into a single output measure, and because total costs are influenced by the composition of the output-mix as well as the scale effect (Kass 1987).

Average incremental costs (AIC) is the multi-product firm analogue of average costs and is defined as the difference between the cost of producing all outputs (at some specified levels) and the cost of producing all of these outputs except the one being examined, e.g., $C(y_1, \ldots, y_k) - C(0, y_2, \ldots, y_k)$. The incremental cost of y_i is divided by the quantity of the output y_i in order to compute the AIC of this selected output (Grannemann et al. 1986), which is:

(2) $$AIC_1 = TC(Y_1, Y_2, \ldots, Y_k) - TC(0, Y_2, \ldots, Y_k) / Y_1$$

This equation shows that total costs (TC) are allocated to one selected output Y_1, which becomes problematic, when various outputs represent different shares of the total workload.

Dor and Farley (1996) evaluate AIC for payer-specific outputs. The analysis yields implausible results, which leads them to examine economies of scale by comparing payer-specific MC at different production levels. Dranove (1998) uses AC calculated in a step-down approach, which was done by the Office of Health Planning and applied consistently across providers. Kaas (1987) uses unit costs to describe AC per visit for each service category in home health care.

Somanathan et al (2000) estimate AC to analyse operating efficiency in health facilities in Sri Lanka. The direct accounting-based allocation method serves to attribute total recurrent costs to inpatient and outpatient departments. Physicians' salary costs are allocated to inpatient and outpatient departments in proportion to their relative total hours worked in the two departments, respectively. The same time-based allocation method is used to distribute overhead costs. Drug costs are attributed to inpatient and outpatient based on a sample of 50 drugs issued in the two departments. The AC estimations are calculated by dividing total department cost by the number of total services provided in this department. Comparable estimates occur, although not consistently, when calculating AIC based on Cobb-Douglas parameters (Somanathan et al. 2000).

Economies of Scale and Returns to the Variable Factor

Along the AC curve, scale measures refer to the output level of a firm. They identify whether output levels should be changed to reach economic efficiency. In the long run, a firm can adjust all inputs when changes occur, whereas in the short run, only partial adjustments are possible (Begg et al. 2000). Economies of scale (EOS) is a long-run cost concept, while in the short-run, returns to the variable input factor (RVF) are estimated (Barnum and Kutzin 1993).

EOS measures the effect on cost C when output Y(i) increases generally, while the output mix remains unchanged and all inputs are allowed to vary (Barnum et al. 1995):

(3) $$\mathrm{EOS} = (1 - \sigma_C) / \Sigma\, \sigma_{C,\, Y(i)}$$

where $\sigma_{A,\,B}$ reflect the elasticity of A with respect to B (Barnum et al. 1995).

Short-run RVF measures the effect on costs of a general increase in output when the output mix and bed size - as a proxy for scale - remain fixed.

Short-run product-specific returns to the variable factor (SPRVF) measures the effect on costs of a proportional increase in all inputs on the output of the i^{th} product while the level of output of all other products remains constant (Barnum and Kutzin 1993). There is no unambiguous definition of SPRVF, as there is no simple definition of the concept of AC in multi-product firms (Scott and Parkin 1995). SPRVF are calculated by dividing AIC_1 of the specific variable by its MC_1 (Barnum and Kutzin 1993):

(4) $SPRVF_1 = AIC_1/MC_1 = C(y_1) / y_1 \ (dC/dy_1)$

SPRVF exist if the result is greater than one (Barnum and Kutzin 1993).

Scale measures are estimated along the average cost curve. Increasing AC with larger output size indicate decreasing return to scale, which is often related to more complex management or additional investment in larger firms (Begg et al. 2000). Increasing return to scale along the average curve's downward slope indicate that average costs fall with increasing output, leading to more efficient use of idle capacity (Dranove 1998). At the optimal short-run point, firms yield constant returns to the variable factor when MC equal AC (Barnum and Kutzin 1993).

Several studies analyse EOS. Dranove (1998) uses semi-parametric methods to estimate EOS in hospital cost centres when hospitals with different discharge volumes create mergers. EOS are estimated by varying costs parametrically with predictors such as wages, and non-parametrically with the output variable, such as discharges. The relative costs per discharge are expressed by unit costs and compared across hospitals' different cost centres at different discharge volumes. The relative percentage comparison of unit costs across discharge levels point to important scale economies. Hospitals with 7500 discharges have about 6% lower costs per discharge than hospitals with 5000 discharges (Dranove 1998).

Dor and Farley (1996) examine scale effects by comparing product-specific MC values by payment source at different levels of patient discharges (at 75, 90, 110 and 125 percent of the mean values of total discharges). They find payer-specific differences in MC caused by payer-specific differences in treatment intensity. Medicaid MC are substantially lower but rise with facility size while other payer-specific MC (Medicare and private insurance) decrease, implying that providers modify treatment intensity to adjust MC to the expected reimbursement level (Dor and Farley 1996).

This overview of the literature related to production costs in health shows that studies have tested the validity of different structural cost functions to estimate how explanatory variables affect total provider cost. Although it may be difficult for providers to minimize cost, deviations from the cost-minimizing assumption made in econometric cost functions should not significantly affect cost results. Findings on efficiency concepts suggest that output levels, quality of care, and payer-specific financial incentives affect costs. The absence of a meaningful definition of AC in a multi-product firm has led others to estimate scale economies based on the accounting based step-down direct allocation method and by varying MC and AC across different output levels.

6.3 Providers in study area

The study area covers three Rwandan health districts (Byumba, Kabgayi and Kabutare) with 54 heath centres, of which each contracts with one MHI. The analysis is limited to 52 HC, of which 58 % are publicly owned, and 42 % are church-owned. Two HC are excluded due to incomplete data.

Rwandan health centres are multi-product firms. Nurses provide basic care to insured and uninsured patients. Service delivery is influenced by the availability of medical infrastructure and input factors, by the population's overall health and socio-economic conditions, and by the incentives set by the health financing system. HC total costs consist of personnel (52%) and drug costs (32%).

Expressing each intervention's relative share of total activities is an imperfect aggregation (Kass 1987). However, it shows that HC total workload includes curative consultations[43] to insured patients (10%), and to uninsured patients (35%), child vaccination (42%), which is provided at no charge to patients independent of their insurance status, and prenatal care consultations (8%). Inpatient care is relatively less important, and provided by 47 of 52 HC. On average, HC have 5 beds. Inpatient services constitute about 5% of total interventions (insured admissions (0.4%), uninsured admissions (3.7%), insured deliveries (0.1%), and uninsured deliveries (0.9%)).

Assuming that HC are staffed and geographically located to provide 0.5 consultations per inhabitant per year, then the average HC should provide 10,437 consultations per year. This is almost twice as much as the reported annual average of 5,946 consultations. In 2000, only 8 of the 52 HC surpassed the assumed norm, implying that 44 operated below capacity.

HC revenue stems from government, donors and the population. Donor and government subsidies contribute about 30% of total HC revenue in form of salaries of government-posted nurses[44] and drugs. Providers depend on revenue from the population (70% of total revenue in church and 62% in public facilities) to pay for their operating costs.

Revenue from the population includes user fees paid by uninsured patients for services and drugs received; and monthly MHI capitation payment depending on the number of MHI members in the partner MHI pool, and insured patients' co-payments. The financial dependency on revenue from patients sets HC an incentive to behave like private sector providers. The incentive to oversupply care to user fee paying patients is limited by patients' ability to pay. Capitation payment by MHI sets the incentive to HC to produce efficiently, as well as to avoid high cost patients and to under-service poorly informed patients (Newhouse 1996).

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[43] In this chapter, consultation is used as a synonym for visit to health centre.
[44] On average, 2 nurses are paid by government sources leaving the remaining staff costs to be financed by population revenue. Donors do not pay salaries but tend to pay mark-ups in the amount of 20% of net salary.

HC retain and manage all their revenue sources, and no financial auditing exists. They reinvest part of their surplus in covering recurrent costs, infrastructure costs, and hiring of personnel. All 52 HC have accumulated bank savings, which they keep in anticipation of "worse times", that is when the government and donors stop paying salary and salary bonuses. The attitude prevails that these subsidies are not to be taken as a guaranteed revenue sources. It leads HC to select input factors, such as staff and drugs, based on anticipated population revenue and in order to minimize eventual losses.

6.4 Model specification, methods and data

6.4.1 Specification of cost function

The health centre is the unit of analysis. The analytical framework employs an econometric cost function allowing identification of payer-specific outputs. In a payer-specific analysis, total costs rise with total volume of services provided on a payer-specific basis (Dor and Farley 1996), which is:

$$(1) \qquad TC = c(X_1\, M_1\, Q_1,\; X_2\, M_2\, Q_2, \ldots),$$

where TC reflects total costs, X_1 is the number of services provided to patients by payment source, M_1 represents the case-mix adjustment index for patients severity of illness, and Q_1 is a quality index, reflecting the payer-specific treatment intensity of patients. Factor prices are excluded from the cost function. They are fixed by the Ministry of Health for staff and drugs, and do not vary across health facilities[45].

Patients' demand for medical care X (P, Q) is a function of prices P charged by providers, the quality of care Q provided and other variables.

[45] Donors follow the MOH salary scale when paying bonuses to health centre employees. However, it is unknown to what extent salary levels vary in reality due to eventual 'under-the-table' payments made to staff by user fee-paying patients.

Quality is defined by the term 'service intensity' which is provided within a range of treatment options that are consistent with 'appropriate' medical practice. The underlying rationale is that clinical criteria about medical appropriateness vary (Dor and Farley 1996).

In equation (2), quality of care Q directly affects MC of care provided. Assuming that output X has been risk-adjusted by M, then the first order condition for expected cost minimization with respect to output X implies providers to select a quality of care level Q, where MC of producing quality equals the marginal revenue (MR) from additional quality by payer-source. Payer-specific marginal costs MC_i at a given quality level are defined as the derivative of TC with respect to X_i adjusted by case-mix M_i, which formally is (Dor and Farley 1996):

$$(2) \qquad MC_i = \delta TC / \delta(M_i X_i) = c'(.)\ Q_i.$$

Payer-specific quality Q_i suggests that quality differences exist on the basis of different resource intensities. If providers do not discriminate on this basis, then $Q_{MHI} = Q_{user\ fees}$, and differences in treatment costs would reflect differences in case mix.

If HC are able to differentiate treatment across payment source, then they will select payer-specific levels of resource intensity that equate MC and MR in each payer segment (Dor and Farley 1996). As a result, richer and generously user-fee paying patients might receive more quality, and resource intensive treatment resulting in higher MC.

Capitation payment without case-mix adjustment could lead to less intensive care, lower quality and MC. If this less intensive treatment of insured patients is within medical quality standards, then related cost reduction is expected to cause productivity gains, triggered by the financial incentives set by the prospective payment system (Dor and Farley 1996). It could also be that providers' quality discrimination in response to capitation causes dumping and skimping of insured patients, resulting in lower MC and medically inappropriate treatment (Ellis and McGuire 1996).

The data set available does not provide any criteria to judge whether eventual lower MC for insured patients are a result of providers' less intense treatment within or beyond the range of quality standards in health centres. Therefore, findings from additional data sources will be used to interpret results. Assumptions made on quality of care are presented below.

6.4.2 Model assumptions

The analysis is based on five assumptions: cost minimization, similar patient case-mix among HC, exogenous demand for care, similar structural quality, and HC are informed about their cost and revenue.

First, cost-minimizing behaviour implies that HC can choose all input factors at their cost-minimizing levels to produce a certain output level at the minimum possible cost (Begg et al. 2000). The analysis assumes that providers have an incentive to minimize cost when reimbursed under capitation payment (Kass 1987), and deviations from cost-minimizing behaviour may not influence total cost in a significant way (Wouters 1993).

Second, it is assumed that HC face the same overall health and socio-economic factors, resulting in similar case-mix with patients reporting similar severities of illness across HC and independent of their insurance status. No adverse selection among the insured is assumed. This assumption is based on the 1998 annual report of the MOH, which identified that the majority (88 percent) of health encounters in HC suffered of one of the five most frequent diagnoses.

Household survey findings suggest that a significantly larger proportion among the uninsured reported illness during the two weeks preceding the interview (27%) than among the insured (21%). But, the uninsured are five times less likely to visit a HC when sick, and they wait significantly longer than the insured until they seek care. Hence, uninsured patients might be more severely ill than the insured who receive treatment more regularly and at the onset of illness. Thus, caution should be applied when assuming similar severity of illness among the insured and uninsured. The analysis could control for patients' severity if payer-specific case-mix data were available on a HC level.

Third, based on the production theory model, it is assumed that the level of care provided is determined exogenously by patients' demand for care, and providers behave as perfect agents for patients (Scott and Parkin 1995). Two arguments justify this assumption: first, uninsured patients' limited financial ability reduces the incentive set by user fees to oversupply care; and second, capitation payment sets an incentive for providers to be efficient.

Fourth, structural quality including equipment and supplies in HC and qualification of medical staff is assumed to be similar across HC, independent of payer-status. This assumption is based on findings from the household survey where the same proportion (68%) among insured and uninsured patients said that the HC always had drugs available. Outcome quality describes the effect from treatment on health status; it is a multi-dimensional concept (Wouters 1991) and is excluded from this analysis.

Fifth, a major assumption is that providers are aware of the cost implications of different treatment styles, know their revenue situation, and that differentiated treatment is technically feasible, allowing providers to allocate resources in response to the financial incentives set by expected payment sources. This assumption is based on observations made during field visits and workshops with HC nurses. Due to providers' dependence on revenue from insured and uninsured patients, HC keep detailed treatment notes to estimate the amount they would have received if the insured patient were uninsured. Though, payer-specific patient treatment behaviour may be too costly to apply, and nurses might instead follow standard treatment protocols, for all patients.

6.4.3 Data and variables

The analysis uses data on service use, costs and finances collected monthly from 52 HC during the first year in which MHI has been in effect (8/99 – 7/00). For each HC, data were collected on the number of services (curative consultations, prenatal care visits, vaccinations, deliveries, inpatient admissions, lab tests) provided to insured and uninsured patients and the total amount of drugs sold to insured and to uninsured patients; the monthly total amount of HC expenses for drugs bought at the district pharmacy; the total amount of HC expenses for fixed costs, such as personnel and other recurrent costs (electricity, water, fuel, etc); and the total amount of monthly HC revenue from each payment source: government, donors, user fees payments, MHI capitation revenue and co-payments from insured patients.

Based on detailed HC data, an accounting-based step-down approach was used to conduct a disaggregated data analysis by insured and uninsured line of business in each HC. First, the total number of detailed service use, including preventive and curative care, lab tests, inpatient admissions and deliveries, was identified for each line of business. Second, insured and uninsured patients' drug consumption was registered and summarized based on detailed patient drug prescription records. Accordingly, the total value of drugs sold to insured and to uninsured patients, was summarized for each line of business. Third, overhead, including personnel and other recurrent costs were allocated to each line of business in proportion to their respective total number of services used. It results in payer-specific total costs by insured and uninsured patients.

Table 6.1 contains definitions and descriptive statistics for the variables used.

Table 6.1: Variable definition and descriptives (N = 52), (8/1999 – 7/2000)

Variable Definition	Variable	Mean	Std. Dev.	Min	Max
Total HC recurrent costs (RWF)	TC	5,170,393	3,047,893	1,846,899	14,100,000
Total number insured curative consultations	CM	1294.25	1272.09	126	6434
Total number uninsured curative consultation	CNM	4652.42	3068.96	1067	14107
Total number preventive care visits (vaccination and prenatal)	PREV	6559.73	3590.85	1942	18570
Total number inpatient services (deliveries and admissions)	INPAT	677.81	675.05	1	3739
Total number MHI members end of 1st MHI year (30/06/00)	MHI	1668.12	1619.8	204	8711
MHI curative visits per member per year (MHI visit rate)	CMpcap	1.531	0.582	0.626	3.095
Uninsured curative visits per uninsured per year (Uninsured visit rate)	CNMpcap	0.285	0.262	0.056	1.189
% of total revenue from MHI	PrMrev	0.120	0.080	0.019	0.332
% of total revenue from user fees	PrNMrev	0.533	0.121	0.253	0.773
Owner dummy (1=public, 0=church)	O	0.577	0.499	0	1
Log of TC	lnTC	15.310	0.541	14.429	16.463
Log of CM	lnCM	6.847	0.792	4.836	8.769
Log of CNM	lnCNM	8.256	0.620	6.973	9.554
Log of PREV	lnPREV	8.662	0.502	7.571	9.829
Log of INPAT	lnINPAT	5.727	1.984	0.000	8.227
Log of MHI	lnMHI	7.079	0.836	5.318	9.072

Note: Exchange Rate: USD 1=RWF390 in June 2000

Total recurrent cost (TC) in HC is the dependent variable, calculated as the sum of the two payer-specific total costs. The logarithmic transformation of variables reduces problems related to heteroskedasticity in error terms and multicollinear variables, which yields inefficient least square estimators when OLS is applied (Breyer 1987). Therefore, TC enters the equation in its logarithmic form.

Output is measured by the number of curative and preventive care consultations in their logarithmic form: insured consultations (lnCM), uninsured consultations (lnCNM), and preventive care visits (lnPREV), which includes total child vaccination and prenatal care consultations. The inpatient variable (INPAT) is computed by aggregating HC admissions and deliveries into one inpatient variable. Four HC report zero-output values for (INPAT). One version replaces these zero-output values by 1's before logarithmic transformation. In another version, these 4 health centres are excluded.

The MHI pool size is a proxy to identify whether smaller MHI pools suffer from adverse selection leading to higher HC costs. A larger MHI pool could also reflect a better performing HC: people may choose to enrol in MHI or not, based on the reputation of the partnering HC.

Under capitation payment, the size of the MHI revenue proportion in HC corresponds to the MHI pool size. Therefore, and following Dranove (1998), Model 3 includes measures of the percentage of total HC revenue from insured (PrMrev) and uninsured patients (PrNMrev). PrMrev includes monthly capitation payments and insured patients' co-payments of RWF 100 per new visit[46]. PrNMrev contains user-fee revenue. The sum of PrMrev and PrNMres is <1 as total HC revenue also includes donor and government funding. The different payment sources as a proportion of total revenue are expected to reveal the cost impact of large or small MHI pools as well as large or small numbers of user-fee paying patients. It is expected that the financial risk caused by adverse selection becomes less of an issue with growing MHI pool size. Hence, the association between TC and MHI revenue proportion (PrMrev) is expected to be negative. The variable on the user fee revenue proportion (PrNMrev) tests the hypothesis that with increasing user fee revenue, HC have fewer incentives to minimize costs, and a positive coefficient would be anticipated (Kass 1987).

The ownership dummy (O) (church-owned or public HC) helps to inform why observed costs eventually deviate from the theoretical minimum. The economic interpretation is that the dummy represents the overhead costs in multiplicative form of a public HC. The null hypothesis is that there is no difference in the overhead costs between church and public HC. In the sensitivity test, the ownership dummy is interacted with payer-specific output variables to examine whether church and public facilities have different slopes expressed by different

[46] RWF 100 = USD 0.30 in 1999.

payer-specific MC of consultations in church and in public HC. MC in HC are expected to be equal because of similar consultation-staff ratios.

Too many explanatory variables will decrease the degrees of freedom, which is problematic in this analysis given the already small sample size of 52 facilities. Therefore, the number of explanatory variables is limited. Annex Table A6.6 presents variables for the restricted model based on 47 HC.

6.4.4 Model definition

The analytical strategy employed is based on equations (1) and (2). First, on a HC level, the factors that affect HC total recurrent cost are evaluated. Second, it examines the extent to which payer-specific utilisation of services will affect HC cost structures.

A general-to-specific modelling approach is used, beginning with a translog model and testing linear restrictions to arrive at a log-linear functional form and the most parsimonious model. While the translog functional form permits flexibility to represent any relationship between costs and outputs, other functional forms, such as the Cobb-Douglas, restrict the shape of the cost curves and may distort estimates of marginal costs. However, the increased flexibility through a translog given by the higher order terms is gained at the cost of the number of parameters to be estimated, which is one of the main limitations of the translog and particularly important with small sample sizes. In order for the model to retain sufficient degrees of freedom, output variables tend to be aggregated; though this has been debated (Scott and Parkin 1995). Usually, a translog model is estimated by imposing the restriction of homogeneity in factor prices, since labour input prices tend to be similar in the public sector. The equation can then be estimated by OLS; but multicollinearity remains an issue. However, excluding the input price variable as well as aggregating variables improves the degrees of freedom (Scott and Parkin 1995). In this analysis, due to the small number of observations of 52 health centres, adding too many independent variables was problematic. .

The analysis regresses in a multi-product cost function total recurrent health centre cost on curative consultations defined by payment source and a series of other independent variables that may relate with cost. Considering the relative small sample size, the function is simplified by evaluating the relevance of individual variables through statistical tests on restrictions (Pindyck and Rubinfeld 1991). This is shown in the following model-building approach.

Model 1 estimates equation (3) in a translog functional form:

(3) $\mathrm{Ln(TC)} = \alpha + \beta_1\ln(\mathrm{CM}) + \beta_2\ln(\mathrm{CNM}) + \beta_3\ln(\mathrm{MHI}) + \beta_4\ln(\mathrm{CM})\ln(\mathrm{CNM}) + \beta_5\ln(\mathrm{CM})\ln(\mathrm{MHI}) + \beta_6\ln(\mathrm{CNM})\ln(\mathrm{MHI}) + \beta_7(\ln\mathrm{CM})^2 + \beta_8(\ln\mathrm{CNM})^2 + \beta_9(\ln\mathrm{MHI})^2 + \beta_{10}\mathrm{O} + \varepsilon$

Due to the small sample size of 52 HC, only most relevant output variables are included. The logarithm of total HC costs (TC) is regressed on the logarithm of curative consultation by payment source (CM) and (CNM), on the logarithm of MHI size (MHI), on their interactive and square terms and on the HC ownership dummy (O). ε is a random disturbance term.

Interaction terms reveal the effect on TC, conditioned on the relationship between the two outputs. The squared output terms show whether TC is an increasing function of outputs (Pindyck and Rubinfeld 1991). MC are estimated as linear combinations of the parameter values and the related mean values of explanatory variables (Scott and Parkin 1995).

To avoid losing too many degrees of freedom and due to zero value observations, preventive care visits (PREV) and inpatient services (INPAT) were excluded from the translog model. If they affect TC, then their omission can produce a bias as well as larger standard errors (Mukherjee et al. 1998). Results show that based on this data set, the translog model yields unsatisfactory explanatory power, and the model was abandoned.

Model 2 employs a log-linear cost function, which allows using an unlimited variety of functions (Greene 2000). This function does not require higher order terms, which gives place to include other parameters that can be estimated. Therefore, in addition to the explanatory variables used in Model 1, preventive care (PREV) is included. In analogy with Model 1, the logarithm of TC is regressed on the logarithmic form of insured (CM) and uninsured curative consultations (CNM), preventive care (PREV), the number of MHI members (MHI), and on the ownership dummy (O). Strong correlation between MHI and CM leads to the formulation of Model 3.

Model 3 contains a log-linear cost function. Following Dranove (1998), the MHI variable is replaced by measures of the percentage of total provider charges accounted for by user fees (PrNMrev) and by insured patients (PrMrev). The logarithm of total HC costs (TC) is regressed on the logarithm of insured curative consultations (CM), of uninsured curative consultations (CNM), of preventive care services (PREV), on the proportion of MHI revenue (PrMrev) and on the proportion of user fee revenue (PrNMrev), and on the HC ownership dummy (O). ε is a random disturbance term. The functional form can be written as:

(4) $\mathrm{Ln(TC)} = \alpha + \beta_1 \ln(\mathrm{CM}) + \beta_2 \ln(\mathrm{CNM}) + \beta_3 \ln(\mathrm{PREV}) + \beta_4(\mathrm{PrMrev}) + \beta_5(\mathrm{PrNMrev}) + \beta_6 \mathrm{O} + \varepsilon$

Modifications of Model 3 are estimated.

6.4.5 Estimation procedures

The analysis is performed in STATA7. All variables have been visually examined in histograms to identify skewness before logarithmic transformation. Parameter estimates are obtained using ordinary least square (OLS) regression.

Heteroskedasticity in an OLS regression results in inefficient least square estimators and inappropriate covariance matrix, although the estimator will remain unbiased and consistent.

Therefore, Goldfeld-Quandt tests[47] are performed on each explanatory variable to identify eventual heteroskedasticity in the disturbance term and to test whether OLS is valid (Pindyck and Rubinfeld 1991). The null hypothesis of homoskedasticity cannot be rejected for the included variables. Each model is further tested by the Breusch-Pagan or Cook and Weisberg test for heteroskedasticity[48]. The Ramsay RESET test identifies model misspecification and non-linearity (Kennedy 1997), which would cause biased least square estimates.

For the cost structure analysis, the 52 HC are ranked according to their total consultations and divided into three groups with low, medium and high output levels. For each group, the following variables are calculated at their respective mean value: insured consultations, uninsured consultations, MHI pool size, payer-specific marginal and unit costs, as well as total number of curative consultations per staff per year. Results describe the "average HC" within its respective group and do not characterize providers that deviate unusually from the average (Dor and Farley 1996).

Based on the log-linear model, payer-specific MC are estimated to examine payer-specific treatment intensity[49]. Following Dor and Farley (1996), payer-specific marginal costs MC(i) for consultations are estimated as a linear combination of payer-specific elasticity estimates from the log-linear regression and their respective AC for consultations. Formally, this is:

(5) $MC(i) = \beta(i)\,(C(i)/y(i));$

where (i) = insured or uninsured patients; $\beta(i)$ = elasticities of cost with respect to insured or uninsured consultations; C(i) = payer-specific costs calculated based on a step-down

[47] The sample is divided into three ranges containing the 3/8 of the observations with the smallest values of the X variable (lower part of the regression), the 3/8 of the observations of the largest values (upper part), and ¼ in the middle. After fitting regression lines to the lower and upper part, the Goldfeld-Quandt test compares their respective residual sum of square (RSS) and degrees of freedom (n) in an F-test. $F(n_1, n_2) = (RSS_2 / n_2) / (RSS_1 / n_1)$, where subscript 1 = values from lower regression part, and subscript 2 = upper part RSS and n. The null hypothesis cannot be rejected if the residual variances associated with the lower and upper part of the regression are equal.

[48] The STATA command 'hettest' was originally written following a 1983 article in Biometrika by Cook and Weisberg. The same test was derived by Breusch and Pagan in Econometrica (1979). In econometrics, the test performed by the 'hettest' command is known as the Breusch-Pagan test for heteroskedasticity.

[49] In the translog model, payer-specific marginal costs would need to account for the interaction term.

accounting approach; and y(i) = number of payer-specific curative consultations in HC. F-tests are performed to test the null hypotheses of no significant difference between payer-specific MC of consultations, and of no significant difference in respective MC across HC output levels.

When calculating AIC using parameters and respective mean values of explanatory variables, implausible results are encountered. This is due to the "small number problem": insured consultations represent only about 20% of total consultations, but the AIC methodology allocates 100% of total overhead costs to insured consultations even though they use considerably less overhead costs. This problem does not occur when calculating AC following the step-down approach, where overhead costs are allocated to insured and uninsured patients, based on their utilisation of services.

This analysis examines payer-specific AC_i per curative visit following the approaches selected by Kass[50] (1987), Dor and Farley[51] (1996), and Dranove (1998), by dividing payer-specific recurrent costs C_i by the total number of payer-specific curative consultations y_i.

(6) $AC_i = C_i / y_i$

F-tests are performed to test the null hypotheses of no significant difference between AC between the insured and uninsured curative consultations, and of no significant difference in AC across the three HC output level groups.

Levels of short run product-specific returns to the variable factor (SPRVF) are analysed to examine HC capacity levels, following the approaches used by Dor and Farley (1996) and Dranove (1998). The percentage changes in payer-specific MC of consultations across HC output levels are compared. F-test results are interpreted by comparing MC as well as unit costs across output levels.

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[50] Kass calculated providers' total costs as the sum of the reported cost per visit multiplied by number of visit per category, $TC = \Sigma (C_i / y_i) * y_i$

[51] Dor and Farley did not report average incremental cost (AIC) as they encountered implausible results.

Additional insight is sought on HC technical efficiency by comparing the total number of curative consultation per staff per year across the three output groups and at their mean values. The total number of staff is estimated by dividing on a HC level the total personnel cost per month (including gross salary, bonuses, and primes) by RWF 30,000, an amount that corresponds to the average monthly gross personnel cost of a nurse or midwife in a HC.

Studies estimate economies of scope[52] to compare efficiency gains of joint or separated production, for example, of outpatient and inpatient care services (Somanathan et al. 2000). In Rwanda, providing care to either insured or uninsured patients is not an option, so this measure is not investigated.

6.5 Results

6.5.1 Findings from econometric models

Findings are reported on the two cost functions as well as on the cost structure analysis. Sensitivity results of the second model are presented in the section thereafter.

Model 1: Transcendental Logarithmic Functional Form

Table 6.2 presents the parameter estimates resulting from the transcendental logarithmic functional form estimated with OLS regression.

[52] If calculated, the equation would be: Scope = $\{\exp(\ln TC_{CNM}\hat{}) + \exp(\ln TC_{CM}\hat{}) - \exp(\ln TC\hat{})\} / \exp(\ln TC\hat{})$

Table 6.2: Results: translog cost function model 1 (8/1999 – 7/2000)

lnTC	Coef.	Std. Err.	t	P>|t|
lnCM	-2.568	2.430	-1.060	0.297
lnCNM	-0.747	1.980	-0.380	0.708
lnMHI	3.435	2.247	1.530	0.134
O	-0.091	0.103	-0.880	0.381
lnCM * lnCM	-0.057	0.323	-0.180	0.861
lnCNM * lnCNM	0.141	0.125	1.130	0.263
lnMHI * lnMHI	-0.380	0.290	-1.310	0.198
lnCM * lnCNM	0.031	0.281	0.110	0.914
lnCM * lnMHI	0.472	0.580	0.810	0.420
lnCNM* lnMHI	-0.167	0.238	-0.700	0.487
_cons	11.996	9.494	1.260	0.214
N = 52, R-sq = 0.765, adj.R-sq = 0.708, F(10,41) = 13.35 Breusch-Pagan test for heteroskedasticity: chi2(1) = 0.03; p>chi2 = 0.857 Ramsey RESET test: F(3, 38) = 2.22; p>F = 0.102				

Due to the interaction and squared functional form, these parameters do not lend themselves to direct interpretation. None of the output terms is significantly related to TC, which hampers a meaningful interpretation of this model. The Breusch-Pagan test for heteroskedasticity returns a low and insignificant Chi^2 value, which is consistent with the null hypothesis result of homoskedasticity found in the Goldfeld-Quandt test. Although the RESET test result is not significant and the null hypothesis of no model misspecification cannot be rejected, this value is higher than the RESET test result in the following log-linear model, suggesting that the translog functional form is more likely to be exposed to a non-linearity or a model misspecification problem. The model R^2 of 0.765 is high for a cross sectional study. However, the insignificant t-ratios for all explanatory variables in combination with high standard errors suggest that there is model misspecification or multicollinearity, which is not captured by the test statistics. The Pearson Correlation Matrix in Table A6.1 shows high correlation between MHI and insured consultations (CM). The small sample size of 52 HC and the large number of regressors raise concerns about the remaining degrees of freedom and in combination with multicollinearity may account for the large variances. Other studies have found that a log-linear model performs almost as well as a translog flexible functional form and is easier to interpret (Wouters 1993; Somanathan et al. 2000).

Model 2: Log-linear Functional Form I

Model 2 presents a log-linear functional form to estimate total recurrent costs with OLS regression and by using the same data and variables. Table 6.3 presents results. All explanatory variables have a significant impact on total HC costs, except ownership.

Table 6.3: Results: log-linear cost function model 2 (8/1999 – 7/2000)

lnTC	Coef.	Std. Err.	t	P>|t|
lnCM	0.399	0.133	3.000	0.004
lnCNM	0.519	0.080	6.480	0.001
lnPREV	0.212	0.104	2.040	0.047
lnMHI	-0.264	0.129	-2.050	0.046
public	-0.071	0.096	-0.730	0.468
_cons	8.372	0.891	9.400	0.001
N = 52 R-sq = 0.74 adj R-sq = 0.71 F(5, 46) = 25.95 Breusch-Pagan test for heteroskedasticity: chi2(1) = 1.04 p>chi2 = 0.31 RESET: F(3, 43) = 1.27 p>F = 0.296				

The model behaves well with a R^2 of 0.74. The parameter elasticity results show that a one-percent increase in uninsured consultations (lnCNM) increases total costs by 0.52%, whereas a one percent increase in insured consultation (lnCM) leads to 0.4% cost increase. The insignificant Wald test result[53] indicates that the null hypothesis of no significant difference between the cost impact of insured and uninsured consultation cannot be rejected. Preventive care visits affect costs significantly but to a lesser extent. HC total cost is a negative function of MHI pool size (lnMHI), suggesting that a one percent increase in MHI membership will cause total HC costs to decrease by 0.26%. This could mean that a larger MHI pool suffers from less adverse selection. The insignificant ownership dummy suggests similar overhead costs in public and church-owned HC.

[53] Wald Test after regression: Ho: lnCM=lnCNM: F(1,46) = 0.47, P < 0.497

Although the Breusch-Pagan and the RESET test are both insignificant, implying that the model does not suffer of heteroskedasticity or misspecification, there appears to be high correlation between MHI size and the number of insured consultations (see Table A6.2). Kennedy (1997) suggests not to worry about multicollinearity if the variances are not exceedingly high and if the t-statistics are all greater than 2, which is the case as shown in Table 6.3.

Model 3: Log-linear Functional Form II

Model 3 in Table 6.4 is a slight modification of Model 2 (see equation 4). Following the methodology applied by Kass (1987), and on the grounds of high correlation between insured consultations (CM) and MHI pool size, the MHI pool size variable is replaced by two proxy variables expressing the proportional revenue contributions in HC from MHI (PrMrev) and from user fees (PrNMrev). Table A6.3 shows that the correlation between (PrMrev) and insured consultations is considerably less (0.55).

The logarithm of total HC recurrent costs (lnTC) is regressed on the logarithm of insured consultations (lnCM), of uninsured consultations (lnCNM), of preventive care services (lnPREV), the proportion of capitation MHI revenue (PrMrev), the proportion of fee-for-service revenue from uninsured patients (PrNMrev), and on a facility ownership dummy (O). Table 6.4 presents results.

The model behaves well with a R^2 of 0.79. The elasticities of costs with respect to insured (lnCM) and uninsured consultations (lnCNM) are likewise positive and significant. The insignificant Wald test result[54] indicates no significant difference between the cost-impact of these consultations. Analysis of the cost structure is needed to examine whether patients receive treatment of the same resource intensity, and where along the respective cost curves consultations are provided.

[54] Ho: $\beta(\ln CM) = \beta(\ln CNM)$; $F(1, 45) = 0.18$; $P < 0.673$.

Table 6.4: Results: log-linear cost function model 3 (8/1999 – 7/2000)

lnTC	Coef.	Std. Err.	t	P>|t|
lnCM	0.395	0.080	4.930	0.001
lnCNM	0.327	0.101	3.260	0.002
lnPREV	0.148	0.083	1.800	0.079
PrMrev	-3.115	0.777	-4.010	0.001
PrNMrev	0.049	0.416	0.120	0.907
O	-0.058	0.087	-0.660	0.510
_cons	8.994	0.791	11.370	0.001
N = 52 R-sq=0.79 adj R-sq=0.763 F(6, 45) = 28.33 Breusch-Pagan for heteroskedasticity: chi2(1) = 1.24; p>chi2 = 0.266 RESET: F(3, 42) = 1.81; p>F = 0.161				

Provider costs seem to be significantly lower as their proportion of MHI revenue increases with a larger MHI membership pool. Under capitation payment, this may be a direct result of providers mitigating their financial risk related to MHI patients (e.g. adverse selection) over a larger MHI membership pool. Other explanatory variables, namely preventive care visits (lnPREV), the share of user fee revenues (PrNMrev) and HC ownership (O) are not significantly related to costs, suggesting that user fees do not appear to set any incentives to providers that would affect costs; and, there seems no relation between total costs and facility ownership (public or church-owned) or the total number of preventive care services provided.

The test statistics show similar findings as in Model 2. The Breusch-Pagan and the RESET test are insignificant, suggesting that the two hypotheses of homoskedasticity and of correct model specification cannot be rejected. The higher F-statistics and R^2 combined with three significant parameter results, lower standard errors and lower correlation factors, indicate that Model 3 provides more efficient estimates than the two previous models.

The robustness of Model 3 is checked. Table 6.5 presents parameter results for three variations of Model 3.

Table 6.5: **Results of variations of model 3 (8/1999 – 7/2000)**

	Version 1		Version 2		Version 3	
lnTC	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
lnCM	0.363***	(0.08)	0.329***	(0.08)	0.405***	(0.100)
lnCNM	0.357***	(0.099)	0.368***	(0.102)	0.404***	(0.128)
lnPREV	0.102	(0.084)	0.162	(0.103)	0.140	(0.084)
lnINPAT	0.037	(0.02)	0.014	(0.043)	-	
lnMHI	-	-	-		-	
PrMrev	-2.906***	(0.763)	-2.767***	(0.743)	-3.471***	(0.848)
PrNMrev	-0.095	(0.411)	-0.226	(0.417)	-0.023	
O	-0.073	(0.085)	-0.105	(0.088)	1.304	(1.321)
lnCM_O	-		-		0.005	(0.106)
lnCNM_O	-		-		-0.168	(0.153)
_cons	9.221***	(0.778)	8.967***	(0.868)	8.418***	(0.961)
R-squared	0.8		0.8		0.8	
Nbr HC	52		47		52	
RESET (F)	1.4		1.09		1.59	
P > F	0.257		0.366		0.207	
Breusch-Pagan	1.14		0.32		1.53	
P > chi2	0.286		0.574		0.216	

Note: HC=HC, C = total curative consultations, MHI=Micro-Health Insurance, MC=marginal costs, CM=insured curative consultation, CNM=uninsured curative consultation, O=Ownership. Significance test: *** Sig P < 0.01; **Sig P <0.05;

Variables that are not significant in Model 3 are included or excluded, to check for possible over-fitting of the model. Compared to Model 3, the first and second versions add the inpatient variable. Version 2 excludes HC with zero-values for inpatient care. Version 3 excludes the inpatient variable and adds two interaction terms between the ownership dummy and insured or uninsured consultations. The three versions have similar parameter results that look in the same direction, and comparable standard errors and significance levels.

Generally, the three versions behave well with R^2 of 0.8. Test results for the Ramsey RESET and the Breusch-Pagan test are insignificant, implying the hypotheses of no model misspecification and homoskedasticity cannot be rejected. Wald test results suggest that the hypothesis, that insured and uninsured consultations are likewise related to total cost cannot be refuted.

Version 1 shows that the elasticity of TC with respect to inpatient services is insignificant. This may be because HC report few inpatient admissions and care provided by nurses during an inpatient stay in HC is limited, and mainly consists of patient observation.

Version 2 includes the same variables as Version 1, but it excludes the five HC with zero-output inpatient services, which results in a smaller sample size of 47 HC. The parameters and test results are similar to those in Version 1. However, as expected, with smaller sample size and fewer degrees of freedom, standard errors increase slightly.

Version 3 includes two variables that interact the ownership dummy with payer-specific consultations to examine whether church and public HC have different slopes expressed by different payer-specific MC of curative consultations. There is no significant difference between MC for payer-specific consultations between public and church owned HC. This could be a result of similar consultation-staff ratio[55] in HCs, or similar production technologies (e.g. same salary levels, treatment protocols, drugs from same drug supplier (CAMERWA), etc.).

This comparison of parameter results of the three variations suggests that Model 3 presented in Table 6.4 behaves as well if not better than its three variations in Table 6.5, the translog Model 1, and the log-linear Model 2 in Table 6.3. Hence, Model 3 is used in this analysis. It appears to be the most parsimonious model that best describes the data generation process. Future research may try to include case mix adjusted utilisation of services, which might better describe the data generation process, and may strengthen the model's robustness if results are unchanged.

[55] This ratio equals: total curative consultation per year divided by total number of staff persons per year: In public HCs = 834; in church HCs = 857 consultations per staff person per year.

6.5.2 Cost structure measures

Cost measures are computed based on parameters estimates from Model 3 (Table 6.4) and mean values of respective outputs, following the methodology applied by Kass (1987), Dranove (1998), and Dor and Farley (1996). Table 6.6 presents results. HC are ranked on the basis of total consultations and divided into three consultation volume groups. The 'low consultation output' HC group includes 17 HC with an average of 2,788 consultations per year and an average MHI pool size of 1,191 insured. The 'medium consultation output' HC group includes 17 HC with an annual average of 4,875 consultations, and an average MHI pool size of 1,141 insured, slightly smaller than for low-output HC. The 'high consultation output' group includes 18 HC with an average of 9,942 consultations per year and a considerably larger average MHI pool of 2,617 insured.

Table 6.6 shows MC and AC at the sample means for insured (CM) and uninsured curative consultations (CNM). Pairwise t-tests are performed to test whether there are significant differences (1) between the insured and uninsured in relation to their MC, as well as to their AC, and (2) between the three output groups (e.g. low vs. medium CM). Indicators on consultation-staff ratio reflect HC productivity.

Table 6.6: Cost measures in health centres, by visit output level

Indicators	Low C output	Medium C output	High C output
N (health centres)	17	17	18
Total consultations per HC per year (C)	2,788	4,875	9,942
% of medium consultations	57%	100%	204%
Range of consultations	1,806 - 3,604	3,654 - 6,052	6,170 - 15,737
CM: total MHI consultations per HC per year (mean)	690	1,001	2,142
CNM: total uninsured consultations per HC per year (mean)	2,098	3,874	7,800
MHI pool size (mean) per MHI	1,191	1,141	2,617
% of MHI at medium MHI pool	104%	100%	229%
MC MHI consultation, RWF	244	249	240
MC uninsured consultations, RWF	402**	322**	311*
AC per MHI consultation, RWF	617	628	607
AC per uninsured consultation, RWF	1,230***	983***	950**
Number of total consultations per staff per year	719	816	987
Number of total consultations per staff per day	2.70	3.07	3.71

Note: HC data (8/99-7/00). C = total curative consultations, MC=marginal costs, CM=insured curative consultation, CNM=uninsured curative consultation, N=number of HC included. Costs are reported in RWF, Exchange Rate: USD 1=RWF 390 in June 2000. Difference between insured and uninsured consultations with respect to (a) MC and (b) unit costs, and within output level group, two-tailed test: *** Sig $P < 0.01$; **Sig $P < 0.05$; * Sig $P < 0.10$.

MC for uninsured consultations (CNM) are significantly higher than for insured consultations (CM), and in all three HC output categories[56]. The difference between MC for insured and uninsured consultations becomes smaller and less significant in HC with the highest output levels. It could be that providers with fewer patients are more likely to modify treatment intensity by payer-status, causing the uninsured to receive more resource-intensive and costly treatment than the insured under capitation. It could also be that HC with many patients spread their fixed cost over a larger number, causing MC as a linear function of AC per consultation to decrease.

[56] The null hypothesis Ho, that marginal costs for insured and uninsured consultations are the same, is rejected. Ho: mean (MC_CM - MC_CNM) = 0; $t = -5.5407$; $P < 0.001$ for all HC. Low output HC: $t = -3.2$; $P < 0.01$; Medium output: $t = -2.14$; $P < 0.05$; High output: $t = -1.96$; $P < 0.058$

Average incremental costs (AIC) have been estimated as well as AC per curative consultation. The two methods provide incompatible results. The econometric result for insured AIC is about four times the value estimated in the AC calculation. It reflects the problems arising when attributing total costs of a multi-product firm to a single output keeping all other outputs constant (Kass 1987; Dor and Farley 1996; Dranove 1998).

The uninsured have significantly higher AC per consultation compared to MHI patients. Insured AC remain similar over all three levels of output, while they decrease for the uninsured with increasing HC output levels, suggesting returns to the variable factor (RVF). For both, AC are considerably above MC pointing to significant payer-specific returns to scale. Thus, all of the results seem to be consistent with the hypothesis that less generous capitation payment through MHI is associated with lower intensity health centre services.

Because of the log-linear based calculation of MC, RVF are constant across the three output levels, and correspond to the regression parameters (elasticities) for insured and uninsured consultations. Therefore, payer-specific MC are compared across different output levels. F-tests are performed on the null hypothesis that MC are equal across HC. The insignificant test result combined with the very low consultation-staff per day ratio, indicate that RVF are equally positive in the three groups, and independent of output level. HC are providing care to insured and uninsured patients at less than full capacity. They could improve their financial sustainability by using idle resources.

There appears to be a contradiction between the econometric result of no difference in cost elasticity between insured and uninsured consultations and the cost structure results of significant differences between insured and uninsured marginal costs. This contradiction is related to the overhead cost allocation problem in the step-down accounting approach used when calculating AC and MC, and the insufficient flexible log-linear cost function that does not identify whether cost elasticities differ at different output levels.

A comparison of HC payer-specific average revenue (AR) per consultation reveals that revenue from user fees is higher (RWF 661 per visit) than revenue from MHI including capitation and insured patients' co-payment per visit (RWF 496 per visit). These AR are considerably above their payer-specific MC, pointing to short-term profits in HC. AR from these private sources covers about 63% of the reported average cost for uninsured visits (RWF 1,052) and slightly more (80%) of MHI visits (RWF 617). The differences are paid by subsidies, implying that HC are not covering their fixed costs from patient revenues. This reflects the pricing policies in the public sector, which are designed to subsidise the provision of care with donor and government sources. However, because of higher AC per uninsured visit, uninsured visits consume more subsidies (RWF 391 per uninsured visit) than insured visits (RWF 121 per insured visit). This indicates that in a mixed payment system HC shift a larger proportion of costs per uninsured visit to donors and government sources because of the higher price/cost margins charged to MHI with capitation payment (Ellis and McGuire 1993).

This situation may create losers and winners and have sustainability implications that should be considered. For example, MHI may lose members, resulting in more risky membership pools with higher AC per visit or/and increased frequency of insured visits, causing cost recovery rates from insured visits to drop in health centres and more costs to be shifted to public funds. Also, due to their higher visit rates, the total cost of a member may be higher during the course of a year which will affect the overall costs of health facilities and place pressure on services. However, with increasing membership, the insured visit rate may decrease over time, and – ceteris paribus – average cost per insured visit and per MHI member in health facilities. To protect themselves against these financial risks, public health centres and the government might react against MHI, for example by negotiating higher capitation amounts per insured member. As a result, the poor may be excluded from MHI as premiums become unaffordable for them. Though, in a heavily donor-funded health sector like Rwanda, additional costs created in public facilities and shifted to the government may most likely be picked up by donors, allowing the other partners – MHI, providers, the government and households – to be winners.

The general pattern of payer-specific MC is consistent with the hypothesis that more generously paying uninsured patients have higher MC. It suggests that public and church-owned health centres have flexibility in responding to financial incentives. Hence, instead of cost-shifting to public and donor sources, HC could adopt a treatment strategy that brings payer-specific MC closer to the average level of reimbursement. But, as insured visits reflect only about one-fourth of total HC visits, the significant difference in payer-specific MC cannot only be explained with different efficiency levels driven by payer-specific treatment intensity. Other factors not addressed in the model may be related to MC, including under-supplying care to insured patients; differences in case-mix across payer groups resulting in less severely ill insured patients; and economies of scale in HC. The following discussion elaborates on these reasons and their possible association with payer-specific MC differences between insured and uninsured groups, considering the evidence that supports or refutes them.

6.6 Discussion and conclusion

Based on monthly routine data collected in 52 Rwandan health centres, the purpose of this analysis was to examine providers' cost structure; to identify the cost and efficiency impact in health centres of user fee payment and of MHI with capitation provider payment; and to discuss the implications of cost results in view of selecting a provider payment system when scaling up MHI.

The theory about the responsiveness of public providers to financial incentives is weak. In developing countries, little evidence exists about the impact of health insurance and different provider reimbursement systems on behaviour, costs and efficiency of public providers

(Barnum and Kutzin 1993). Based on economic theories of insurance, this analysis expected two results. First, as the financial risk of insurance caused by members' adverse selection decreases with growing MHI pool size, a negative relationship was hypothesised between total cost in health centres and MHI pool size expressed by the proportion of MHI revenue in health centres.

The second hypothesis was derived from studies conducted with payer-specific provider data in the USA. It was that providers behave as economic agents and adjust treatment intensity according to the expected payer-specific revenue sources (Dor and Farley 1996). Applied to the Rwandan context, the analysis hypothesised that HC behave in response to incentives set by capitation payment paid by MHI. Providers' behavioural response will lead to less resource-intense treatment for MHI patients, which – ceteris paribus – results in lower marginal costs when treating insured patients and contribute to economic efficiency in the production of care. If this less-intense treatment is within a given range of quality of care then this would suggest room for cost savings in the provision of care in health centres.

The analysis employed an econometric cost function allowing identification of payer-specific outputs. In the absence of provider data on quality of care and treatment intensity by patient groups, findings from surveys conducted with focus groups and with patients following treatment were used to interpret results.

There are five main findings. First, the analysis found a negative relationship between the proportion of MHI revenue and total cost in health centres. Under MHI with capitation payment, this may be a direct result of providers mitigating their financial risk related to insurance over a larger MHI membership pool size.

Second, results from the payer-specific cost analysis in health centres suggest no significant difference between the cost-elasticities of insured and uninsured consultations.

Third, marginal costs for insured patients are markedly lower than for uninsured patients who pay user fees. This evidence is consistent with the theory that providers behave as economic agents and adjust treatment intensity according to the expected payer-specific revenue.

Fourth, uninsured patients report significantly higher AC per consultation than MHI patients. For both groups, average costs are considerably above marginal costs, pointing to significant payer-specific short-run returns to scale in public and church-owned health centres.

Fifth, average revenue per consultation from MHI and from user fees are above the relative marginal cost, implying important short-term profits in health centres. However, the lower average cost recovery by user fee compared to MHI suggests that providers shift a larger proportion of treatment cost for uninsured patients to government and donor sources, who subsidize the supply of medical care.

The result of significantly higher marginal cost for treating uninsured compared to insured patients may be explained by phenomena other than provider response to different payment mechanisms: severity of illness; adjustment of treatment intensity; and returns to the variable factor.

Economic theory on insurance suggests that adverse selection by more severely ill patients into the insurance pool would lead to case-mix differences between insured and uninsured patients. Adverse selection would result in higher treatment intensity and therefore higher marginal cost for the insured. However, the contrary was found in this analysis; suggesting that the insured may be less severely ill than uninsured patients.

This result is supported by household and focus group survey findings. Insured individuals report about a five times higher probability of visiting a provider than the uninsured[57]. In

[57] During the first MHI operational year (8/1999-7/2000), the following curative consultation rates were reported by capita per year in HCs in the three districts: Byumba: 1.16 curative consultations per MHI member per year, and 0.15 per non-member per year. Kabgayi: 1.52 visit per members, 0.27 visits per non-members. Kabutare: 1.56 visits per member, 0.3 curative consultations per non-member per year.

addition, there seems to be a time-shift in seeking care. Uninsured patients interviewed in the patient exit survey spend significantly more time in bed before seeking care (5.5 days) than insured patients (4 days)[58] (Schneider et al. 2001a). According to HC nurses, insured patients are less severely ill because they seek care at the onset of illness and consequently need less intensive treatment (ONAPO 2000:p. 58).

These observations imply that the severity of illness is influenced by the way patients pay for health care. However, testing for the effect of patients' severity of illness on costs requires additional payer-specific information collected from health centres on the occurrence of diagnoses, patient health status, and the duration of illness before they seek care.

Alternatively, the incentives set by user fees and MHI with capitation payment could be driving different treatment intensities, leading to lower marginal cost for the insured and increased economic efficiency. This explanation leads to two possibilities. Either treatment is provided *within or below* a medically acceptable quality range. The latter case implies that under capitation payment, MHI patients receive sub-standard care. Providers deter patients from treatment or under-provide care to insured patients if they are expected to generate losses. Under-supplying treatment to insured patients will decrease marginal cost and lead to worse quality care. Under-supplying care also includes the situation where health centres refuse treatment to patients and refer them to the district hospital, which is reimbursed per episode of illness in Kabgayi, and per episode of illness as well as per service in the other two districts (see Table 3.2). The analysis did not dispose of the necessary hospital data to assess to what extent this situation has occurred. However, since increasing hospital costs reduces the revenue from capitation payment for health centres, the latter do have a financial incentive to keep hospital referrals on a reasonable level.

On the other hand, providers may adjust their treatment intensity within the acceptable quality range, and provide less intense care, in anticipation of the capitation revenue from

[58] Ho: mean(NM) - mean(M) = diff = 0; $t = 2.27$; $P < 0.024$.

MHI. Insured patients' marginal cost will decrease without having a negative effect on quality. It suggests that MHI with capitation enhances efficiency in the provision of care. The health centre data set does not allow distinguishing between these two alternatives. Therefore, information from additional data sources will serve to interpret lower marginal costs in the context of quality of care.

Sick individuals interviewed in the household survey judged the availability of drugs in health facilities as high, independent of their insurance status (Schneider and Diop 2001). Both insured and uninsured patients waited on average 20 minutes before seeing a nurse, and all patients reported equal compliance rates on variables such as "received lab test", "provider prescribed drugs", "staff informed about illness and how to take drugs", and about "patient satisfaction with treatment". However, patient exit interview findings suggest that insured patients have received all the prescribed drugs, whereas 10 percent of uninsured patients did not receive the prescribed drugs, which was due to uninsured patients not having the money to pay drug fees (Schneider et al. 2001a). Focus group survey participants reported that when sick the uninsured only report to the provider the ailments for which they have the money to pay for, whereas insured patients report all symptoms as their treatment is covered by MHI (ONAPO 1999:p. 13). Patients' self-perception on having received "equally good" treatment, independent of payer-status, suggests that they might have been treated within the medical acceptable quality range, and providers might have followed standard treatment protocols; in contrast, poor uninsured patients are more likely to be skimped or dumped because of financial barriers caused by user fees. They reflect the majority of sick individuals.

Still, differences in technical quality may exist that patients are not able to notice. There are no data available on the treatment intensity by patient to identify whether the lower marginal costs are caused by treatment intensity below or within the technical quality standard. Patients' self-perception about the quality of care level is not sufficient to conclude whether providers are under-providing care to uninsured patients. Other studies found that in a mixed financing system, under-provision of care is rather limited and providers may try shifting costs to other sources (Ellis and McGuire 1993). As Rwandan health centres are financed in a mixed financing system, this implies that instead of dumping and skimping insured patients, HC shift cost to other financing sources, such as donors and the government.

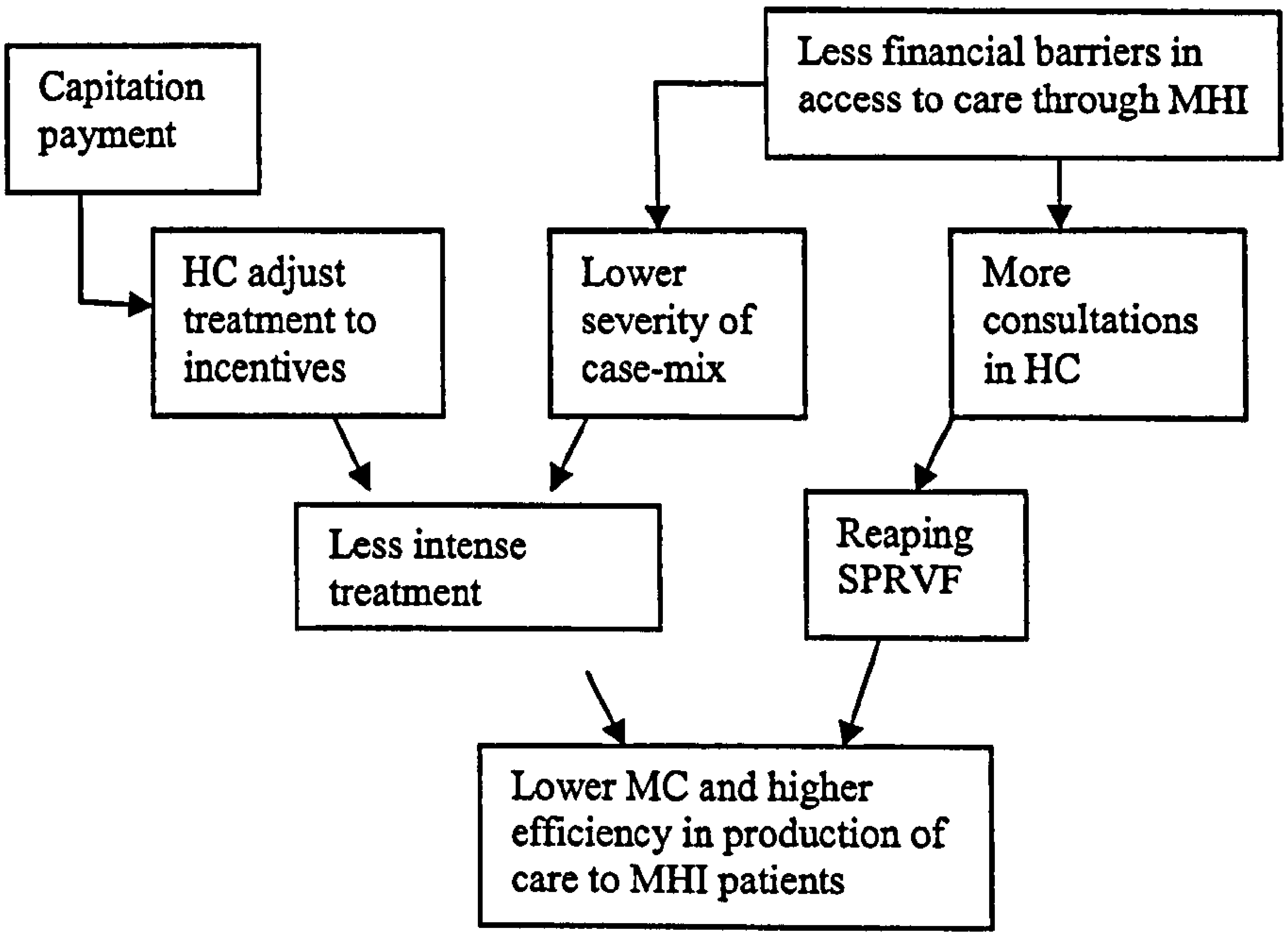
A third explanation for lower MC of insured patients is that reduced financial barriers through insurance leads to greater utilisation by the insured and exploitation of *short-run returns to the variable factor (SRRVF)* in HC with spare capacity. This argument is supported by the fact that the difference between MC for insured and uninsured consultations becomes smaller in HC with higher output levels; and the consultation-staff ratio improves with increasing output level category, causing idle resources to be used. However, exploiting SRRVF will affect the marginal cost of insured and uninsured consultations equally.

Figure 6.7 visualizes the three main arguments made above. MC per insured consultation are affected when providers adjust treatment intensity in response to first, the financial incentives set by capitation payment; and second, to a less severe case-mix among the insured related to the elimination of financial barriers in accessing care. Third, lower financial barriers lead to more patients and higher output levels in HC. Short-run returns to the variable factor can be reaped where idle resources exist.

These explanations are competing for their relevance. The negative relation between the share of MHI in total revenue and total HC costs suggests that a higher capitation amount as a function of a larger MHI pool mitigates the financial risk of a more severely ill patient case-mix through adverse selection. In addition, markedly higher average than marginal cost suggest that significant SRRVF exist in treating both insured and uninsured patients.

Thus, the main factor that contributes to insured patients lower MC is less intense treatment in response to the incentives set by capitation payment, which may have been reinforced by insured patients' less severe case-mix, due to better access to care. The available data does not allow identifying whether less intense treatment has caused worse quality of care for insured patients. However, the income-dependent consultation rates for the uninsured suggest that this is the case for poor uninsured patients who have been deterred from treatment.

Figure 6.7: Factors affecting marginal cost of insured patients



The weakness of this result is that there is no clear definition of the medically acceptable quality range. To assume a quality of care range based on findings from surveys of patient perceptions may not be enough to substantiate that insured and uninsured patients are treated within a medically acceptable range. Poor quality may not have been detected by the individuals interviewed in the surveys, which is supported by asymmetric information problems between patients and providers.

These findings have equity implications, and give insights into the presumption of providers' cost-shifting behaviour when they benefit from multiple revenue sources.

The health financing system described in this Chapter has divided the population into three groups. The generously-paying user fee patients, who can afford paying higher fees, tend to have significantly higher marginal costs than the second group, composed of the less generously-paying MHI members with capitation payment, and than the third group. They are the majority representing about 70 percent of the district population, and are excluded from care as they cannot afford paying the price that covers their marginal costs of treatment. This exclusion due to financial barriers goes below the medically acceptable quality of care range and hampers equity objectives.

This result gives insight to the development of the design of community-based health insurance. Under MHI with capitation payment, providers do not primarily shift cost across payment sources, as is alleged when FFS is selected. Rather, they adjust costs by adapting the resource-intensity of treatment to the expected payment source. This is a relevant result in the context of scaling-up MHI in Rwanda, which requires selecting a payment mechanism for health centres and district hospitals. Based on these arguments, and on the grounds of practical feasibility of administering capitation payment for providers and insurers, capitation payment is recommended under a MHI scale up.

When scaling up MHI with capitation payment, health centres will most likely receive the same capitation amount for each MHI member. But, over time, if capitation payment does not cover providers' medical expenditures for the insured and if health centres receive revenues from several payment systems, then they have less incentive to be productive, and may try to shift costs across different payment systems (Newhouse 1996); and providers might skimp on treatment of insured patients. Therefore, provider performance in health centres must be monitored and evaluated to ensure quality of care.

This analysis and its findings contribute to current research on health financing in developing countries in three ways. First, it adds to the development of a methodology to identify factors that affect health facility costs and to assess the payer-specific efficiency impact of provider behaviour in response to incentives set by the provider payment in low-income contexts. Thereby, it supports the increasing demand for disaggregated data collected on service use, quality, finances and morbidity in the health sector.

Second, it provides the first payer-specific efficiency measures, such as estimates of marginal and average costs, and RVF in a low-income country by distinguishing between two provider payment systems: user fees paid by uninsured patients and capitation payment by MHI.

Third, it demonstrates that differences in costs of treating insured and uninsured patients in Rwanda vary widely and are related to the expected payment source and tremendous RVF in underused health facilities.

This study has weaknesses related to the data and methods used. The model used is not fully specified, nor is it tested rigorously. The data set consists of health centres observed over a fairly short and perhaps idiosyncratic time period. Panel data about quality of care and severity of illness, broken down by patients' insurance status would have enhanced the understanding of the relationship between provider payments and the resource-intensity of health centre care. Also, additional data is needed to define a model with case-mix adjusted service use. It would allow identifying whether there is a significant difference in the payer-specific patient case-mix and its cost relevance. Generally, future data collection in health facilities should include data on the technical quality of care to identify eventual underprovision of care.

6.7 Annex: Correlation matrices and summary tables

Table A6.1: Pearson correlation for translog cost function

	lnTC	lnCM	lnCNM	lnMHI	public	lnCM2	lnCNM2	MHI2	lnCM_CNM	lnCM_MHI	lnCNM_HI
lnTC	1										
lnCM	0.516	1.000									
lnCNM	0.797	0.351	1.000								
lnMHI	0.334	0.878	0.207	1.000							
public	-0.479	-0.336	-0.437	-0.159	1.000						
lnCM2	0.528	0.996	0.359	0.873	-0.351	1.000					
lnCNM2	0.802	0.355	0.999	0.217	-0.440	0.363	1.000				
MHI2	0.347	0.875	0.226	0.996	-0.174	0.877	0.235	1.000			
lnCM_CNM	0.754	0.895	0.730	0.744	-0.460	0.897	0.733	0.752	1.000		
lnCM_MHI	0.453	0.965	0.302	0.965	-0.271	0.969	0.309	0.969	0.851	1.000	
lnCNM_HI	0.649	0.848	0.654	0.874	-0.348	0.850	0.662	0.882	0.935	0.894	1

Table A6.2: Pearson correlation for log-linear cost model 2

	lnCM	lnCNM	lnPREV	lnMHI	public
lnCM	1.000				
lnCNM	0.351	1.000			
lnPREV	0.307	0.277	1.000		
lnMHI	0.878	0.207	0.488	1.000	
public	-0.336	-0.437	-0.115	-0.159	1.000

Table A6.3: Pearson correlation for log-linear cost model 3

	lnCM	lnCNM	lnPREV	PrMrev	PrNMrev	public
lnCM	1					
lnCNM	0.3508	1				
lnPREV	0.3074	0.2767	1			
PrMrev	0.5526	-0.3305	0.1633	1		
PrNMrev	-0.0906	0.5424	-0.1247	-0.4833	1	
public	-0.3363	-0.4369	-0.1151	0.1032	-0.3246	1

Table A6.4: Pearson correlation for model 3, version 1

	lnCM	lnCNM	lnPREV	lnINPAT	PrMrev	PrNMrev	public
lnCM	1						
lnCNM	0.351	1.000					
lnPREV	0.307	0.277	1.000				
lnINPAT	0.179	0.120	0.276	1.000			
PrMrev	0.553	-0.331	0.163	-0.003	1.000		
PrNMrev	-0.091	0.542	-0.125	0.107	-0.483	1.000	
public	-0.336	-0.437	-0.115	-0.043	0.103	-0.325	1

Table A6.5: Pearson correlation for model 3, version 2

	lnCM	lnCNM	lnPREV	lnINPAT	PrMrev	PrNMrev	public
lnTC							
lnCM	1						
lnCNM	0.346	1					
lnPREV	0.352	0.226	1				
lnINPAT	0.371	0.485	0.515	1			
PrMrev	0.575	-0.309	0.214	-0.009	1		
PrNMrev	-0.104	0.530	-0.192	0.147	-0.467	1	
public	-0.332	-0.422	-0.131	-0.182	0.084	-0.355	1

Table A6.6: Pearson correlation for model 3, version 3

	lnCM	lnCNM	lnPREV	PrMrev	PrNMrev	public	lnCM_p	lnCNM_p
lnCM	1							
lnCNM	0.3508	1						
lnPREV	0.3074	0.2767	1					
PrMrev	0.5526	-0.3305	0.1633	1				
PrNMrev	-0.0906	0.5424	-0.1247	-0.4833	1			
public	-0.3363	-0.4369	-0.1151	0.1032	-0.3246	1		
lnCM_p	-0.2405	-0.4275	-0.0905	0.1618	-0.3435	0.989	1	
lnCNM_p	-0.3316	-0.3698	-0.1061	0.0539	-0.2892	0.995	0.9848	1

Table A6.7: Variables definition model 3, version 2 (N = 47), (8/1999 – 7/2000)

Variable Definition	Variable	Mean	Std. Dev.	Min	Max
Total HC costs (RWF)	TC	5,070,583	2,899,513	1,912,886	14,100,000
Total number insured curative consultations	CM	1295	1322	126	6434
Total number uninsured curative consultation	CNM	4391	2759	1067	14107
Total number preventive care visits	PREV	6310	2971	1942	18570
Total number of inpatient services (deliveries and admissions)	INPAT	746	675	2	3739
% of total revenue from MHI	PrMrev	0.120	0.083	0.019	0.332
% of total revenue from user fees	PrNMrev	0.534	0.122	0.253	0.773
Owner (1=public, 0=church)	O	0.596	0.496	0.000	1.000
Log of TC	lnTC	15.302	0.518	14.464	16.463
Log of CM	lnCM	6.826	0.816	4.836	8.769
Log of CNM	lnCNM	8.212	0.600	6.973	9.554
Log of PREV	lnPREV	8.651	0.452	7.571	9.829
Log of INPAT	lnINPAT	6.225	1.119	0.693	8.227

Part IV: Balancing Equity and Sustainability

Chapter 7: Discussion and Conclusion

7.1 Overview of findings

This thesis contributes new knowledge to the research on equity and sustainability of health financing in low-income settings by conducting quantitative analysis based on cross-sectional micro-data that have been collected from insured and uninsured groups during the Rwandan prepayment pilot phase.

The analysis comprises three main components. It has examined the demand for health insurance; the impact on households of utilisation and financing of health care; and the cost and efficiency implications of different provider payment methods in health facilities. This last Chapter synthesizes findings from the analytical chapters and embeds them within the theoretical context presented in the literature review. Policy implications include deriving a MHI design to scale up MHI and improve equity and sustainability in the district health system. The limitations of this study are discussed, and recommendations are suggested for future research, before the conclusion.

Ideally, a scale up process starts by judging different scale up options against the extent to which goals are met, given a country's institutional and socio-economic situation, and financial, organisational and political constraints in the overall system (Normand 1999). Scale up options of health insurance should be costed out in a financial model to estimate their financial implications (Solon and Capuno 1996; Cichon et al. 1999). This is not done in this thesis. Due to incomplete hospital data and health centre data from 1999/2000, results would not be valid to become the basis for costing out the expansion of prepayment schemes in Rwanda. Future research might focus on improving the data collection in the health sector to investigate the additional amount of public resources needed, on top of member contributions, to keep MHI financially viable.

7.1.1 Demand for health insurance

Few attempts exist to understand demand for voluntary health insurance schemes in low-income countries. Others have argued that MHI is mainly offered in the formal sector, and that MHI premiums tend to be too high, which dissuades the poor from enrolling (Bennett et al. 1998).

Reflecting the importance of equity in MHI enrolment, the first analytical Chapter reviewed economic and social theories on decision-making to derive an analytical framework based on which the determinants of the MHI enrolment probability were analysed. A binary choice model was developed remaining consistent with expected utility maximization. It was hypothesised that the demand for MHI reflects individuals' risk aversion and demand for income certainty (Rothschild and Stiglitz 1976; Schoemaker 1982). Following the poverty literature, it was expected that poor households would be less likely to insure, because they have to respond to more pressing current needs like food, than worrying about securing eventual future medical care (World Bank 1999).

Results indicate no relationship between MHI enrolment and household income proxied by monetary expenditures; and that about 90 percent of the target population of 1 million chose to remain uninsured during the first operational year of MHI. The enrolment probability was determined by geographic variables, such as district of residence and distance to the health facility and to a lesser extent by demographic and asset variables. While poverty was the main reason for non-enrolment, precaution was the main reason members gave for enrolling in MHI, independent of their monetary expenditure classification. These findings indicate that households express similar risk aversion across socio-economic groups; and, that other reasons than risk aversion, may better describe poor households' insurance demand. They include poor households' increasing risk aversion when moving closer to poverty, their credit constraints, lumpiness of assets, lack of social capital among family members and friends and trust in the health insurance system.

As these results are not unambiguous in relation to the theories and findings reported by the development literature (Morduch 1995; Townsend 1995), the discussion focused on reasons related to statistical methods, the data, and omitted variables that may have contributed to the attenuation of the monetary expenditure effect. It concluded that the above result is related to the low level of income inequality in rural Rwanda, several omitted variables, and the choice of the underlying theory. Theories of decision-making under uncertainty are not based on real market decisions of the type examined in this Chapter. As suggested by state-dependent expected utility theory, the richer may have remained uninsured because the magnitude of the expected pay-off from MHI is not 'good enough' for them (Phelps 1973). They might prefer paying user fees for hospital care provided by physicians instead of enrolling in MHI to benefit from basic care provided by nurses in health centres.

The endowment effect and status quo bias, as well as the poverty-related depletion of social capital may have played a role in the enrolment decision. Focus group participants explained that they would rather "wait and see" whether MHI works before paying the annual enrolment fee (ONAPO 2000). It suggests that households do not know whether the benefits of being an MHI member exceed the costs of paying annual premium (Kahnemann et al. 1991). The observation that poverty has decreased the number of acts of solidarity among family members and friends may have affected poor households' insurance demand (Colletta and Cullen 2000). However, additional data is needed to substantiate this hypothesis.

Based on these findings, the Chapter concluded first, that combining empirical evidence with decision-making theories may help in designing health insurance that responds to the needs of low-income groups. However, theories developed and tested in Western contexts may not necessarily be appropriate in low-income areas, and need to be interpreted accordingly.

Second, the income-independent demand for MHI does not mean that insurance is easily affordable for the poor. Rather, the poor may have endured additional economic hardship to insure and gain income certainty. Third, as suggested by the endowment effect and status quo bias, the decision to insure may be complicated for individuals, particularly in areas where insurance is a new concept and illiteracy rates are high. Hence, information on insurance and transparency in financial management plays a major role in building trust, and will help assuring the poor that paying premium is not a risky investment.

7.1.2 Utilisation and financing of health care

Due to the lack of cross-sectional household survey data in low-income areas, research on the equity impact under user fees and under health insurance has been limited. A study from Vietnam quantifies and compares over time the equity impact of out-of-pocket payments on insured households, broken down by provider level (Wagstaff and Van Doorslaer 2001). Empirically, equity in health care has been quantified in OECD countries, where a great emphasis was found on equity in delivery and financing of health care, and backed by governments through public financing and delivery of care (Van Doorslaer et al. 1993).

In the second analytical Chapter, the egalitarian equity principle and the minimum standard approach served as a framework to examine and compare for insured and uninsured households (1) horizontal equity in utilisation; (2) vertical equity in financing; and (3) following the minimum standard approach, the extent to which health spending endangers households ability to purchase other goods (Culyer and Wagstaff 1993). In areas with high levels of poverty, the minimum standard definition may be more relevant than egalitarian equity principles (Wagstaff and Van Doorslaer 2001).

Combining multivariate analysis with equality measures and the corresponding concentration indices (Van Doorslaer et al. 1999; Wagstaff and Van Doorslaer 2001), the analysis focused on actual and need-adjusted utilisation based on indirect standardization methods for insured and uninsured individuals. The focus of the health financing analysis was on the degree of progressivity and on the redistributive effect of health care payments among insured and uninsured households (Kakwani 1977; Aronson et al. 1994). The minimum standard approach served to compare in a short-run context the extent to which payments made for an episode of illness force insured and uninsured household income to drop below and further below the consumption poverty line. This approach has previously not been used to compare the impact of health spending on income of insured and uninsured households.

There are three main findings.

First, results indicate that MHI with utilisation levels at a significantly increased level achieves horizontal equity in utilisation. User fees cause utilisation to strongly correlate with the socio-economic background of uninsured individuals.

Second, results on equity in health financing support findings from the previous Chapter on the demand for health insurance: the MHI premium level is too high for poor households. According to the Kakwani and the Aronson/Johnson/Lambert indices, the current MHI premium level causes regressivity in health financing and some re-ranking among insured households. Similarly, the Reynolds-Smolensky index is negative for total MHI including premium, suggesting a pro-rich income redistribution among MHI members. However, once the premium has been paid, MHI and user fees seem to contribute to proportionality in patients' out-of-pocket spending for an episode of illness. Under user fees, this proportionality result is reached at the expense of the poor being excluded from basic care.

Third, results from the minimum standard analysis suggest that out-of-pocket spending per episode of illness has a similar small impact on the headcount and the normalized poverty gap for insured and uninsured households. Considering the significantly lower utilisation rate of uninsured individuals, this result implies that the poor uninsured do not seek care because they fear that paying user fees could leave them with insufficient cash to purchase other goods and services. Some insured households' pre-payment income still drops below and further below the poverty line due to payments made for services and drugs received at the district hospital, which is not covered by MHI. Thus, the current MHI benefit package with mainly health centre coverage is too small to protect the socio-economic situation of the poor.

This analysis has weaknesses. The lack of longitudinal data inhibits examining the association between equitable utilisation of health care and equal distribution of health (Hurley 2000), as well as the association between health spending and consumption smoothing over time (Morduch 1995). Equity in health financing measures need to be interpreted with caution when they are estimated based on one month of monetary expenditure data only. Also, measurement errors in the data set and incomplete data have affected the precision with which inequality levels were estimated (Deaton 1998). The self-assessed health status variable used in this analysis is limited in time and scope, and household income is proxied by monetary expenditures only. Therefore, the findings from this analysis cannot be used for comparison with other studies. Despite these limitations, the comparative results for insured and uninsured households appear to be robust.

7.1.3 Cost and efficiency implications on health facilities

The theory about the responsiveness of public providers to financial incentives is weak. And, in low-income countries, little evidence exists about the impact of health insurance and different provider reimbursement systems on behaviour, costs and efficiency of public providers (Barnum and Kutzin 1993). Other studies have suggested that MHI with fee-for-service (FFS) induces cost escalation and cost shifting to other financing sources, such as user fee-paying patients (Bennett et al. 1998). However, this hypothesis has not been researched. Similarly, the impact of MHI with capitation payment and user fees on provider cost and efficiency has to date not been compared.

The third analytical Chapter focused on the financial incentives set by payment systems, providers' reaction to these incentives, and the cost and efficiency implications for health centres. The hypothesis was that Rwandan health centres behave as economic agents and adjust the treatment intensity to the expected payment mechanisms: user fee or MHI with capitation payment. As a result, generously paying user fee patients, who can afford it, would receive more resource intensive care, than patients insured in a capitated plan (Dor and Farley 1996). The analysis used routine data collected in 52 health centres during the first operational year of MHI (1999-2000).

A log-linear cost function was employed that allowed identification of payer-specific outputs to analyse and compare the cost and efficiency implications of provider payment in health centres. Thereafter, the provider cost structure was examined for insured and uninsured patients.

The main findings were: first, there appears to be no significant difference between the cost-elasticities of insured and uninsured consultations; and, second, cost structure analysis reveals that MHI with capitation provider payment leads to significantly lower marginal costs of treating insured patients, enhances efficiency in the production of care, and contributes to financial sustainability in the health system. These findings are related to the step-down approach of the accounting based cost analysis and the inflexible cost function that does not identify elasticities at different output levels.

The discussion focused on the contribution of other reasons to this result, such as tremendous returns to the variable factor in underused health facilities; and less severely ill insured patients as they face fewer financial barriers to access to care. By using information from additional sources from patients and focus groups, concerns were addressed about whether treatment is provided *within or below* a medically acceptable quality range.

The analysis concluded that in the first instance, the poor uninsured suffer from exclusion from care. The lack of data on technical quality of care and patients' severity of illness did not allow quantifying the extent to which the above results have been caused by worse quality of care delivered and patient case mix among insured and user-fee paying patients.

Thus, it is recommended that future research should try to account for these weaknesses and include measures on severity of illness and quality of care, broken down by insured and uninsured patients.

7.1.4 Policy implications

These findings have policy implications. First, to ensure horizontal equity in utilisation of health care in Rwanda and considering that user fees lead to utilisation that is strongly related to income, the policy response derived is scaling up MHI. Second, to improve equity in health financing, some form of means-testing should be applied to exempt socially disadvantaged groups from paying MHI premium, and support their enrolment with demand-side subsidies from government and donors and funds paid by the better-off. Also, to protect the socio-economic situation of low-income groups against financial shocks related to their need for care, it is recommended that the MHI benefit package be expanded to cover district hospital care. And finally, to respond to principles of financial sustainability, MHI should be designed with capitation provider payment to hospitals and health centres to encourage efficiency in the production of care. This requires monitoring and evaluating the quality performance of providers in an institutionalized process to prevent provision of care below medically accepted quality standards.

The current health insurance situation in Rwanda further motivates a MHI scale up. The social health insurance scheme for public employees and their dependents (RAMA) is financed by government contributions and levies of five percent on public employees' salary. Since 2000, RAMA covers all care in Rwanda, leaving a 25 percent co-payment to the patient. Rwandans working in the private and informal sectors are excluded from RAMA. The political will to use MHI as a means to improve access to care for the uninsured has been expressed in the health policy of the MOH, and in several strategic documents of the Rwandan government (CNLS 2002; Ministry of Health 2002).

In the health policy literature, scaling up has mainly been discussed in the context of introducing universal coverage insurance in middle- and high-income countries (Solon and Capuno 1996; Cichon et al. 1999; Glied et al. 2002; Remler et al. 2002), and of scaling up HIV/AIDS programs to a larger geographic area (Binswanger 2000; ACTafrica 2001). Few MHI have been expanded to national level health insurance, and these have been mainly in middle- and high-income countries (Germany, South-Korea, and Japan) (Bennett et al. 1998), while experience on scaling up MHI in low-income countries is nonexistent.

7.2 Paradigms of scaling up

The development literature describes scaling up organisations in terms of 'old' and 'new' paradigms, and has been developed to focus specifically on NGOs. The 'old' one is about scaling up through expansion, whereby non-governmental organisations (NGOs) become larger, more professionally managed and efficient organisations (Uvin et al. 2000). However, critics claim that NGOs lack a strategic link with governments and other organisations; and do not translate into sustainable national programs (Binswanger 2000). Therefore, the 'new' scale up paradigm sees NGOs as contributors to a diverse civil society, where the state and NGOs become interacting partners (Clark 1991). 'New' is that NGOs are well-managed organisations able to mobilize the participation of large numbers of people and to channel money to important activities. The state's role is ensuring the institutional framework and creating an enabling environment that fosters private initiative (Uvin and Miller 1999). Since many MHI are organized as NGOs, a MHI scale up may benefit from lessons learned in the development literature.

The 'new' paradigm involves organisational, quantitative, functional, and political scaling up. First, *organisational* scaling up aims to respond to six principles: (1) *diversify* funding sources to build a portfolio of stable and non-discretionary program funds from private and public sources; (2) increase the degree of *self-financing*, depending on the socio-economic context and the private or public good character of the product; (3) build *technical and managerial skills* to strengthen the organisation's capacity; (4) develop *organisational learning* by feeding-back lessons into actions; (5) foster *institutional* variety by building operational links with other actors on a horizontal and vertical level; and (6) support *participation and accountability* to prevent bureaucratization and distance between leaders and members (Uvin and Miller 1999). An organisational scale up of MHI could include diversifying funding sources as well as skill building allowing members to participate in management.

Second, *quantitative* scaling up includes organisations' structural growth by increasing membership, the geographic working area, and budget. Five different paths exist: (1) organisations *spread* as members adhere spontaneously; (2) they *replicate* when a successful program is initiated elsewhere; (3) *nurturing* is when well-funded outside agencies together with community participation promote scaling up; (4) organisations *aggregate* on a horizontal and vertical level and combine resources with other organisations; and (5) they *integrate* into existing systems (Uvin and Miller 1999). Quantitative scaling up of insurance includes spreading membership; replication in a different context; nurturing through technical and financial support; aggregation with other insurers; and integration of a small insurer into a larger system.

Third, *functional* scaling up refers to program expansion. The number and types of activities are expanded due to increased demand by clients (push factors), or because of the availability of new resources (pull factors). Organizations grow through *horizontal and vertical integration* of activities (Uvin and Miller 1999). Horizontal and vertical integration occurs when the insurance benefit package will be expanded horizontally to cover the same benefit package in similar facilities; and vertically, when the insurance benefit package is expanded from basic care to cover hospital care.

Fourth, *political* scaling up consists of organisations moving beyond service delivery towards political empowerment of their members to change the structural cause of their social environment. It includes four components: (1) *information and mobilization* of people to lobby for changes; (2) *networking* with other organisations on issues of joint interest; (3) *aggregating* to federative structures aiming to influence policy making; and (4) *direct entry* into politics for example when grassroots organisations create or join a political party, or when they put up candidates from their own ranks, to move their issues on the local political agenda (Uvin and Miller 1999). An insurer with a large membership pool may become an interest group and could try to influence politics.

7.3 Scaling up MHI in Rwanda

This section derives a MHI design. The insurance features introduced Chapter 2 are discussed in the context of the scale up types suggested by Uvin (1999), and egalitarian equity and sustainability principles.

Success factors that appear to contribute to a successful scale up of organisations include a focus on simple goals, central coordination, decentralized and participatory mechanisms of planning and execution, and accountability of service providers to the population (Binswanger 2000). Applying these factors to Rwanda suggests that an MHI scale up could start on a district level and be eventually replicated in other districts; a central steering committee could be created to coordinate the scale up and evaluate the process; district level planning and implementation committees become partners to the central steering committee and the existing MHI; and health care providers actively participate in the process. This could be accomplished by re-vitalizing the structures at the MOH and within the districts that have been set up during the prepayment pilot phase (see Chapter 3).

Given Rwanda's socio-economic and legal context, two options exist to scale up MHI: vertical integration of MHI into RAMA the public health insurance system; or scaling up MHI to a district or national level. Both options face constraints. Integrating MHI into RAMA would lead to a social health insurance which usually relies on a formal sector economy. However, about 95 percent of the population living in the three districts are subsistence farmers (Ministry of Economics and Finance 2002). Hence, integrating MHI into RAMA would require technical capacity, political consensus, legal and organisational changes, and additional resources to finance the enrolment of those who could otherwise not afford it. This could be a future strategy Rwanda may want to prepare for.

Meanwhile, Table 7.1 proposes a MHI design with universal district coverage, following the framework presented in Table 2.2 and Figure 2.3, and based on findings from this thesis. The first column lists the insurance features to be modified to address inequity and sustainability concerns in the current MHI. Then, the modified insurance features are presented for a MHI and the related components of scaling up are listed (second and third column). The last two columns show how a scale up of MHI might affect sustainability and equity in delivery and financing of health care.

Table 7.1: Scaling up health insurance features

Insurance Features	MHI Model	Scale up types	Impact of Scale up on Sustainability	Impact of Scale up on Equity
Fund collection	Progressive premium Mix of revenue sources	Organizational Quantitative	Diversify funding to build stable MHI revenue portfolio	Increases membership among poor
Fund management	Technical and managerial skill building	Organizational	Strengthen organisational capacity and learning	Provide access to information to change situation of poor
Fund pooling	Compulsory enrolment	Quantitative	Increase membership Prevents adverse selection by individuals	Prevents cream-skimming by MHI
Purchasing mechanism	Capitation payment Quality of care	Organizational	Accountability for costs to limit inefficiency	Accountability for costs to prevent unaffordable

	control			premium increases
Benefit package	MHI coverage of care provided in district Co-payment	Functional	Co-payment limits moral hazard	Vertical integration of hospital care to expand MHI benefits Exempt poor from co-payment to prevent their exclusion from care

This proposed MHI scale up model includes six components, which are further discussed: (1) progressive premium levels, and diversifying and increasing the MHI funding sources to subsidize MHI enrolment for population groups exempted from premium payment; (2) compulsory MHI enrolment to spread membership to 100 percent of the districts population; (3) capitation provider payment to hospitals and health centres; (4) "upstream vertical integration" by adding district hospital care to the MHI benefit package; (5) skill building and organisational strengthening of MHI executive bureau members; and (6) establishing the legal and organisational framework to implement the scale up of MHI.

7.3.1 Fund collection

The above MHI design proposes expanding fund collection on two levels to respond to principles of egalitarian equity and sustainability. First, quantitatively by spreading MHI membership within the district; and second, organizationally by diversifying the sources of funding to build a portfolio of stable funds from members, government and donors (Uvin and Miller 1999). Also, it is suggested that the current flat-rate MHI premium be changed to a progressive rate: higher income groups contribute a higher percentage of their income to premium than poorer groups (Le Grand 1991), and the demand for MHI be subsidised.

Demand-side subsidies can be allocated based on targeting subsidies to beneficiaries through ideal means testing; or a universal approach giving everybody a benefit regardless of socio-economic background. In between is targeting through key indicators that are less costly to identify than income, but correlate with income (Besley and Kanbur 1990). Key indicators include: (1) population groups with high poverty incidence; (2) geographic areas with mainly poor inhabitants; and (3) poverty-relevant goods, such as treatment of communicable diseases on a district level (Nicholas and Zeckhauser 1982).

In Rwanda, key indicators are suggested for targeting. MHI is a good that is mainly attractive to low-income groups who live in areas where the majority of the population is poor; and the MHI benefit package covers access to care in basic health centres and district hospitals, where the poor seek care. Characteristics of poor households identified in the HLCS and in Chapter 4 may serve as key indicators. These include: orphans, child-headed households, female-headed households, households headed by an illiterate person, large households, and household-heads who work as farm labourers. Alternatively, a universalistic approach could be employed, which provides subsidised MHI to all district inhabitants with the exception of the better-off with employment in the public or private sector, and business owners.

Results have been rather mixed when it comes to evaluating the performance of the administrative capacity in charge of identifying the poor. Generally, these are political or administrative authorities from the community, or local committees appointed by the authorities (Gilson et al. 1995; Willis and Leighton 1995). On the other hand, the higher degree of transparency achieved through participatory poverty assessment (PPA) with community members may have its price, such as the social stigma attached to being identified as poor by community members and the eventual resulting psychic costs for households (Besley and Kanbur 1990). In Rwanda, key indicators could be communicated to all households in a transparent way for example by radio broadcasting, political and administrative authorities, church services, market places, community gatherings, the health centre, and the MHI office.

MHI can take the role of an intermediary, who channels subsidised membership cards to eligible groups. The government and donors could deposit funds into local bank accounts over which the MHI managers have full control (Binswanger 2000). It would allow MHI managers to access incremental resources to ensure and finance enrolment. Upon enrolment of targeted beneficiaries, the MHI management team should be able to transfer funds to the MHI account, to pay providers.

7.3.2 Fund management

The objective of scaling up the MHI fund management function is to enhance the quality and effectiveness of the MHI management performance and sustain MHI activities on an expanding scale. With 7 percent of total revenue going to MHI administration per year, economies of scale in MHI administration seem not to be an issue that would indicate centralized MHI management. Also, insurance features can be designed to keep MHI administrative costs low. For example, capitation payment as the purchasing mechanism is less costly to administer than fee-for-service reimbursement, which involves detailed billing (Barnum and Kutzin 1993).

The challenge of a democratically managed MHI is that elected leaders are not necessarily trained as managers, which may affect the insurance effectiveness. Hence, continuous capacity building is needed and the work of voluntary MHI may need to be formalized. This would involve recruiting the elected MHI committee members (president, vice-president, treasurer, and secretary) and technical staff either in part-time or fulltime positions, and paying them a salary[59].

MHI with high enrolment rates might find it organisationally easier to scale up. But in areas where enrolment rates are still low, it should be investigated to what extent this is due to reasons related to the management and administrative capacity of the MHI executive team.

[59] During the first operational year, the prepayment scheme of Bungwe hired its elected secretary in a part-time position due to the high workload of managing an MHI with more than 10,000 members.

7.3.3 Fund pooling

Under a scale up with progressively set premiums, the rich who are low-risk individuals may have reservation prices below the progressively defined premium level. Under voluntary insurance, they may not enrol. Lower take-up rates among higher-income groups endanger redistributive objectives based on egalitarian equity principles and the financial sustainability in the insurance pool. Therefore, compulsory MHI enrolment is proposed in a scaled up MHI. Compulsory enrolment requires legal changes that need to be initiated by the government.

Compulsory enrolment prevents adverse selection by members and cream skimming by the insurer; limits inadequate coverage that excludes individuals from health care and worsens their health status, which could lead to the spread of infectious diseases (Barr 1992); and ends 'free-rider' problems by the uninsured who speculate that if they become sick, eventually they may be cared for at little or no cost to themselves (Cutler 2000).

Introducing compulsory enrolment may create responses among individuals who do not want to enrol in MHI. Depending on how well these groups are politically organized, they will take actions to be exempted from MHI enrolment.

7.3.4 Purchasing function

The Rwandan MHI pay a monthly capitation amount to health centres and 10 percent of their total revenue to the MHI district federation who reimburses the district hospital on a fee-for-service and per case level for care provided to the insured (see Table 3.2). Findings from the payer-specific cost analysis in health centres presented in Chapter 6 suggest that MHI with capitation payment result in lower marginal costs of treating insured patients, enhance efficiency in the production of care and contribute to financial sustainability in the health system. During the pilot phase, hospital reimbursement by MHI was often delayed due to the limited administrative capacity in hospitals, which led to late billing. Capitation payment to hospitals would be easier to administer for hospitals and for MHI.

Thus, capitation payment to health centres and hospitals is proposed under a MHI scale up. However, to prevent perverse responses by providers to capitation payment such as avoiding high cost patients (Ellis 1998) and under-servicing less-informed patients, capitation payment should be combined with on-going monitoring and evaluation of quality of care in all health facilities.

Financial analysis in health centres and hospitals is needed to prevent double-funding of public services from the supply and the demand-side. Some providers may have to consider restructuring their production of care to ensure an efficient response to an increased demand for care by more MHI members. Some health centres with MHI enrolment rates of more than 50 percent already reported important increases in revenues from MHI, allowing them to invest in better quality care[60]. Whether cost increases are caused by improved quality or provider rent-seeking behaviour needs to be monitored and evaluated continuously.

7.3.5 Benefit package

A functional scale up of the MHI benefit package through vertical integration of care involves expanding insurance coverage to include all care provided in district hospitals and health centres. The objective is to improve equity in delivery and financing of health care in district hospitals and health centres and to prevent that insured households' pre-payment income drops below and further below the poverty line due to their expenditures for services and drugs not covered by MHI.

[60] Bungwe health centre with a MHI pool of about 15,000 individuals used the extra revenue to construct latrines in houses of indigents, hire 2 more health centre staff and finance MHI awareness campaigns.

Greater insurance coverage less risk-bearing by the insured, and encourages moral hazard and supply-side induced demand by providers. Capitation provider payment limits supply-side induced demand. Co-payments charged to the insured, as well as health centres' gatekeeper function for hospital care, help balancing the marginal gains from increased risk pooling and the marginal losses from increased moral hazard (Zeckhauser 1970). In Rwanda, some population groups, such as poor patients who live further away from the health facility and pay higher transport costs, may need to be exempted from co-payments to ensure equity in utilisation and financing of care.

7.3.6 Institutional sustainability

An insurance scale up is affected by a country's institutional context, including area- and trade-specific living and working conditions of the population (Uvin and Miller 1999). In a low-income country, this may hamper the scale up process. Context inherent constraints include the lack of political consensus between partners; a health sector unable to respond to the increased demand of an insured population; inefficient management of health and financial information; and political instability.

Rwanda's institutional and socio-economic context may hamper scaling up MHI. Constraints include the lack of a legal framework to make enrolment compulsory; the lack of a long-term health financing strategy for the health sector; the risk of political instability; low per capita income; high donor dependency; high illiteracy levels and low secondary school enrolment resulting in a lack of technical and organisational capacity mainly in rural areas. The strengths include a strong political commitment among all stakeholders in the public and private sector and among the population to scale up MHI.

In April 2003, participants who attended a three-day workshop to discuss the objectives and approaches of scaling up MHI in Rwanda[61] concluded that a scale up needs the collaboration between the Ministry of Health (MOH), the Ministry of Local Administration, and the Ministry of Justice; and is based on four principles: risk-sharing, solidarity, equity, and member-managed organisations. Several recommendations emerged from the workshop. First, a replication of MHI in other districts requires technical and financial support and information of the population. Second, a national strategy needs to be prepared to support the scale up. Third, a national committee supports the dialogue on the sale up. Fourth, the development of networks between MHIs with banks, providers, organisations, local administration, and other health financing sources needs to be fostered. Fifth, a government unit responsible for the oversight of health insurance should be created. Sixth, institutional support includes the creation of an evaluation committee, technical and human capacities, and defining a national health financing strategy.

Finally, resources are fungible. The scaled-up MHI might appear to be sustainable within the district but in fact, could be drawing resources from other sources, or cause patients to seek care not covered within the district. Thus, the financial implications of MHI with district coverage need to be monitored and evaluated within the national health system. It implies setting up a central data collection system in the health sector that distinguishes between care delivered and financed by insured and uninsured patients.

7.4 Limitations

Several limitations have to be accounted for in this thesis.

Limitation 1: A long-term hypothesis would state that due to insurance coverage and subsequently better access to care, insured individuals will report better health, improved

[61] Atelier sur l'élaboration du cadre stratégique d'appui aux mutuelles de santé. Synthèse des travaux du 15 au 17 avril 2003. Kigali, Rwanda.

productivity, and comparatively less danger to be drawn into chronic poverty compared to those without insurance. Although of interest, this thesis did not evaluate the impact of equity in utilisation of care on the health outcome of the insured population group or whether MHI membership has reduced differential in health status among the insured. The necessary longitudinal data are not available to analyse this question.

Limitation 2: Household data were collected at the end of first MHI operational year. At this time, the insured had been, on average, enrolled for about six months, which ruled out conclusions on adverse selection based on members' health status.

Limitation 3: Data collected in the household and patient exit interview survey on self-reported perception of health status may not reflect the truth of ill-health. Self-reported health status is influenced by interviewees' self-perception, reference system, risk attitude and other factors. While this self-assessed health status variable served to compare the insured and uninsured, it should not be used for comparison with other surveys.

Limitation 4: The lack of provider data on quality of care and patients severity of illness limited the interpretation of findings in the cost analysis presented in Chapter 6. Future research should focus on providers' response to the anticipated payment system to detect eventual problems related to the quality of care.

Limitation 5: The analysis did not dispose of the necessary data to examine issues related to organisational and human capacity building in the health sector and its implications for the organisational sustainability of MHI and health facilities. However, the impact of providers' and MHI performance on consumer trust and as a consequence, their enrolment decision has been discussed in a paper submitted to Social Science and Medicine (Annex C).

Limitation 6: The focus was on the population living in three rural districts. They share similar socio-economic conditions and medical access problems. Thus, subjects related to insurance coverage disparities within a country as a whole, leading to questions on inequalities in health insurance coverage and in health outcomes in low- and middle-income countries go beyond the scope of this study.

Limitation 7: In the absence of longitudinal household survey data, the analysis using the minimum standard approach did not allow any conclusion on the poverty impact of health spending through MHI and user fees. The poverty line just served as a theoretical measure to compare households' monetary expenditure levels before and after health spending.

Limitation 8: The lack of data on utilisation, cost and financing of care in hospitals did not allow simulating the financial implications of a MHI scale up in a financial model. In addition, more recent health centre data would be needed for these simulations.

Limitation 9: A conceptual approach served to address the tension between equity and sustainability in designing MHI. As there is only one data set available on one specific MHI design, it was not possible to quantify eventual tradeoffs between equity and sustainability by comparing different health insurance designs.

7.5 Recommendations for further research

Findings from this thesis have implications for future research in the context of community-based health insurance.

First, in areas of high degrees of poverty, research on the demand for health insurance could focus on testing economic and social theories in the relevant real market situation. For example, examining the relevance of trust in poor households' enrolment decision based on quantitative data may yield new insight about decision-making under uncertainty among the poor and help developing policy measures that strengthen the trustworthiness of the health care system.

Second, the availability of household survey panel data spanning over several years would allow assessing the long-run impact of insurance on individuals' health and well-being. Detailed consumption measures could enhance future research that compares the socio-economic implications of insurance and user fee payments in the context of consumption smoothing. Research could focus on examining the association between consumption smoothing and fairness of health financing and utilisation for insured and uninsured groups. Findings may help to support policy arguments and develop health financing reforms to protect poor households against the impoverishing effect of health spending. This is of particular interest for donors and governments in poor countries where debt-relief money is used to subsidize insurance enrolment of low-income groups.

Third, comparative research could evaluate the cost and efficiency implications of MHI with FFS provider payment versus MHI with capitation payment. It would allow examining to what extent alleged cost escalations and cost shifting are caused by the provider payment system rather than by the insurance mechanism. Data collection should include measures of quality of care and patient case-mix in health facilities. If MHI with FFS contributes to cost increases and shifting, as has been suggested by other researchers, then capitation payment combined with monitoring and evaluation of provider performance may be the preferred provider payment mechanism when designing community-based health insurance in low-income countries.

7.6 Conclusion

This thesis has contributed new knowledge to the broader literature of community-based health insurance, which has so far mainly been descriptive. Reflecting the importance of equity and sustainability through risk sharing arrangements in Rwanda, the thesis extended previous analysis through the incorporation of econometric methods that have been used in high- and middle-income countries.

The analysis provided results on the demand for MHI, equity in utilisation and financing of health care, the financial implications of health spending on household income in terms of poverty measures, and the cost and efficiency implications of MHI and user fees in health facilities. Based on findings, a MHI design was derived to scale up MHI on a district level. This is new. Generally, health sector reform is suggested without the experience of a pilot-test and the results of detailed analysis from various data sources.

Governments make frequent policy statements committing themselves to promoting equity and sustainability in health care and are increasingly turning to health insurance as a means to achieve this goal. The findings from this thesis may serve policy makers in Rwanda when scaling up prepayment schemes; and have policy implications for designing community-based insurance schemes elsewhere. Therefore, this conclusion presents three relevant MHI components that emerge from this analysis and are applicable to other low-income settings.

First, to respond to egalitarian equity principles, health insurance that caters to low-income groups requires additional funds to finance enrolment of the poor, simply because they cannot afford to pay for their own health needs.

Second, achieving financial sustainability through health insurance relies on a large enough participating population that lives in stable political and socio-economic conditions; and on an insurance design that enhances efficiency in insurance management and in the production and consumption of care. Donors and governments will be more willing to provide durable funds to well-managed MHI to ensure equity in financing and covering of full operational cost on a sustainable basis.

Third, it is important to monitor and evaluate the performance of the health system to detect eventual deviations from reaching health policy objectives, and to prevent that the MHI system appears to be financially sustainable, but in fact is drawing resources from other sources within the broader system (McPake and Kutzin 1997).

Finally, the government provides the policy and institutional framework for health insurance. This may require developing a long-term health financing strategy that describes the role and responsibilities of the different actors: MHI, providers, the population, the government and donors.

Equitable health financing is likely to be sustainable only if resources are pooled for those members of the society who are healthy and those less healthy, and for the affluent and the poor. Therefore, from the Rwandan government's perspective, the feasibility of other scale up options should be examined to create an insurance pool that shares the risk of all socio-economic groups in Rwanda. This could include building a pool between MHI, RAMA and private health insurance, into which RAMA and private insurance contribute a higher proportion per member than MHI, and that will be redistributed to low-income risk-sharing pools to finance health care of the poor[62].

Such health financing options require legal and organisational changes and the political and economic support of richer society members who express solidarity with the poor in Rwanda. It requires building public consensus on commitments to equity in utilisation and financing of health care and to a minimum standard health insurance that reflects a basic 'safety net' for those who cannot support themselves.

[62] Similar to the health insurance system in Switzerland, where funds are re-distributed among private insurers based on age and gender criteria of enrollees.

Annex A: Tables

Annex Table 1: Rwanda development indicators, 1998 - 2002

Foreign exchange	**1998**	**1999**	**2000**	**2001**	**2002**
annual average: USD 1=RWF	312.3	334	390	440	460
Annual % change		***6.9%***	***16.7%***	***13.0%***	***4.5%***
end of year: USD 1=	320.3	349.5	429.8		

CPI (Base 1989=100)	**1998**	**1999**	**2000**	**2001 (est.)**
General CPI	380.8	341.2	348.44	
Annual % change		***-10.4%***	***2.1%***	
Health and Education CPI	299	315.96	342.82	
Annual % change		***5.7%***	***8.5%***	

Population	**1998**	**1999**	**2000**	**2001 (est.)**
Population in million	7.883	8.109	8.434	8.679
Growth rate %, annual	2.8	2.9	2.9	2.9
Female in % of total pop	53.5	53.4	53.2	

				GDP Growth Projections			
GDP	**1998**	**1999**	**2000**	**2001-05**	**2006-10**	**2011-15**	**2016-20**
Nominal in Mio current RWF	627,307	632,765	682,523				
Real GDP growth rate %	9.2	6.1	6	**6.2**	**8.8**	**9.1**	**10.5**
Per capita GDP USD		250					

Annex Table 2: List of all 52 MHI and HC: 1st year (7/1999 – 6/2000)

Rank	Name of MHI and HC	Health District	Owner	Population in HC catchment's area	Total MHI Members on 6/2000	First Year MHI Enrolment Rate
1	Muyanza	Byumba	Church	7,088	3,911	55.18
2	Karama	Kabutare	Church	10,621	4,389	41.32
3	Bungwe	Byumba	Church	36,167	8,711	24.09
4	Gisiza	Byumba	Church	13,024	3,067	23.55
5	Rushaki	Byumba	Church	31,549	7,249	22.98
6	Mulindi	Byumba	Public	21,686	3,795	17.50
7	CS Kabgayi	Kabgayi	Church	23,143	3,835	16.57
8	Kabilizi	Kabutare	Public	10,891	1,727	15.86
9	Buramba	Kabgayi	Public	10,899	1,512	13.87
10	Mbazi	Kabutare	Public	13,054	1,579	12.10
11	Kivumu	Kabgayi	Church	14,215	1,693	11.91
12	Ruhango	Kabgayi	Church	21,544	2,465	11.44
13	Mukono	Byumba	Public	24,741	2,643	10.68
14	Manyagiro	Byumba	Church	22,921	2,358	10.29
15	Kivuye	Byumba	Public	13,107	1,155	8.81
16	Tumba	Byumba	Public	19,815	1,640	8.28
17	Shyogwe	Kabgayi	Church	10,509	828	7.88
18	Rutare	Byumba	Church	27,964	2,086	7.46
19	Mukoma	Kabgayi	Church	9,519	703	7.39
20	Gishweru	Kabgayi	Public	14,823	1,028	6.94
21	Rwesero	Byumba	Church	19,906	1,379	6.93
22	Musambira	Kabgayi	Public	34,020	2,228	6.55
23	Biwisige	Byumba	Public	11,021	690	6.26
24	Nyarusange	Kabgayi	Church	23,738	1,483	6.25
25	Kigogo	Byumba	Public	20,845	1,290	6.19
26	CS Byumba	Byumba	Public	31,550	1,900	6.02
27	Save	Kabutare	Church	33,108	1,949	5.89
28	Buyoga	Byumba	Public	18,677	1,068	5.72
29	Matyazo	Kabutare	Church	17,098	925	5.41
30	Cyahinda	Kabutare	Church	23,954	1,234	5.15
31	Ruhashy	Kabutare	Public	11,943	594	4.97
32	Miyove	Byumba	Public	25,239	1,254	4.97
33	Byimana	Kabgayi	Public	23,207	1,135	4.89
34	Giti	Byumba	Public	23,862	1,127	4.72
35	Gisagara	Kabutare	Church	25,331	1,086	4.29
36	Sovu	Kabutare	Church	16,193	679	4.19
37	Kinazi	Kabgayi	Public	21,583	855	3.96
38	Rukozo	Byumba	Church	34,705	1,371	3.95
39	Mushishiro	Kabgayi	Church	32,510	1,273	3.92
40	Munyinya	Byumba	Public	29,151	1,117	3.83
41	Rubona	Kabutare	Public	14,071	490	3.48
42	Mbuye	Kabgayi	Church	20,757	708	3.41
43	Rango	Kabutare	Public	7,323	218	2.98

44	Gitarama	Kabgayi	Public	33,256	897	2.70
45	Rutobwe	Kabgayi	Public	28,908	761	2.63
46	Musenyi	Byumba	Public	26,311	687	2.61
47	Nyantang	Kabutare	Public	9,007	204	2.26
48	Simbi	Kabutare	Church	27,838	575	2.07
49	Gishamv	Kabutare	Public	22,591	447	1.98
50	Maraba	Kabutare	Public	15,137	245	1.62
51	Kizibere	Kabgayi	Church	18,901	260	1.38
52	Nyabikenke	Kabgayi	Public	26,488	239	0.90
Total Prepayment Schemes / Health Centres in Pilot District Sample Size				1,085,509	86,742	7.99

Note: Two health centres and partnering MHI are excluded from this sample because they only became operational towards the end of the pilot year.

Annex Table 3: Overview: Data collection during PHR pilot phase (8/1998 – 11/2000)

Sources of data	Study area	Scope of study	Data Collection Method	Time Period / Periodicity
Micro health insurance schemes (MHI)	52 MHI and 3 federations of MHI in 3 districts	Membership - new members - premium contributions Medical care expenses: - health centre capitation payment, - federation transfer for district hospital bill - hospital payments by federation MHI administrative expenses	MHI survey: Structured questionnaire Unit of observation: - MHI associated with HC - MHI federation of district	Time period: Jul 1999-Jul 2000 Periodicity of collection: Monthly routine data
Health centres and District hospitals	52 health centres and 3 district hospitals in 3 pilot districts 24 health centres and 2 district hospitals in 2 control districts	Availability of resources: - medical equipment - personnel - drugs - logistics - management tools use of services for MHI members and uninsured: - curative consultation - vaccination - prenatal consultation - delivery - laboratory exam - surgery - hospitalization costs of care: - personnel costs - costs of drugs - other functioning costs funding sources: - internal public sources - internal private sources - payment by users - micro health insurance system - external sources	Provider survey: Structured questionnaire Unit of observation: - health facility	Time period: Aug 1998-Jul 1999 (Before) Aug 1999-Jul 2000 (Since MHI) Periodicity of collection: Monthly routine data

Sources of data	Study area	Scope of study	Data Collection Method	Time Period / Periodicity
Patient survey	3 pilot districts 2 control districts	- socio-demographic characteristics - quality of micro health insurance system members - purpose of visit - perception of the quality of care and services - expenses related to illness	Exit interview at health centres Sample: 800 patients Structured questionnaire Unit of observation : Patients	Time period: July/August 2000 Periodicity: Once
Household survey	3 pilot districts 2 control districts	- socio-demographic characteristics of individuals - socio-economic characteristics of households - sources of income - micro health insurance enrolment pattern - demand of care: - curative care - vaccination - prenatal consultation - obstetrical care	Structured questionnaires: - household - curative care - preventive care Sample: 3,772 households counting 17,198 individuals Unit of observation: - individual / household	Time period: October/November 2000 Periodicity: Once 40 days of collection

Annex Table 4: List of PHR technical reports written on Rwanda

PHR Reports	Methodology	Data source
Schneider, P., F. Diop, and S. Bucyana (2000). Developing and Implementing Prepayment Schemes in Rwanda. Technical Report No. 45.	Descriptive analysis on design process and preliminary results	First six months insurance and provider routine data
Schneider, P., F. Diop, D. Maceira, and D. Butera (2001). Utilization, Cost and Financing of District Health Services in Rwanda. Technical Report No. 61.	Descriptive analysis based on health centre and hospital data, conducted in Excel	2 years provider data, one-year insurance data
ONAPO (1999). Etude sur les connaissances et attitudes sur le système de prépaiement et l'assurance de maladie pour la santé au Rwanda. Kigali, Rwanda, Office National de la Population (ONAPO) in collaboration with Partnerships for Health Reform (PHR)	Interview report (French translation of Kinyrwanda)	First focus group interviews
ONAPO (2000). Qualitative Survey on Beneficiaries and Local Stakeholders of Prepayment Schemes in Rwanda. Kigali, Rwanda, Office National de la Population (ONAPO) in collaboration with Partnerships for Health Reform	Interview report (French translation of Kinyrwanda)	Second focus group interviews
Schneider, P., F. Diop, and C. Leighton (2001). Pilot testing Prepayment for Health Services in Rwanda: Results and Recommendations for Policy Directions and Implementations. Technical Report No. 66.	Summary of key findings and policy recommendations	All data sources (see previous Table 3)
Schneider, P., and Francois Diop (2001). Impact of Prepayment Pilot on Health Care Utilization and Financing in Rwanda: Findings from Final Household Survey. TE002	Descriptive and statistical methods report insurance implications based on household survey data, conducted in SPSS	Household survey

Note: all these reports are downloadable from the PHR webpage: www.phrproject.com

Annex B: Household Survey Questionnaire

Module 1: Questionnaire on household socio-demographic and economic condition

Module 2: Questionnaire on curative care seeking behaviour addressed to individuals who were sick during the 2 weeks prior to the interview.

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HOUSEHOLD QUESTIONNAIRE

AA1 TYPE OF SURVEY

1

AA2 TYPE OF QUESTIONNAIRE **SHEET ______ OF ____**

1

	IDENTIFICATION AND DOCUMENTATION OF INTERVIEW	
IDN01	HEALTH REGION:______________________	
IDN02	HEALTH DISTRICT:______________________	
IDN03	COMMUNITY:____________________	
IDN04	SECTOR:______________________________	
IDN05	NEIGHBORHOOD:_______________________	
IDN06	HOUSEHOLD ID NUMBER	
IDN07	NAME OF THE HEAD OF HOUSEHOLD:______________________________	
DOC1	DATE OF INTERVIEW : DAY:__/__ MONTH:__/__ YEAR:_2000_	DAY MONTH YEAR 0 0
DOC2	NAME OF INTERVIEWER:____________________	
DOC3	LEADER OF OBSERVATION TEAM: ______________________________ ______________________________	
SAI1	DATE OF DATA ENTRY DAY:__/__ MONTH:__/__ YEAR:_2000__	DAY MONTH YEAR 0 0
SAI2	NAME OF DATA ENTRY SPECIALIST ______________________________	

100 INDIVIDUAL CHARACTERISTICS

No ORDER	FULL NAME	Has (NAME) lived in this neighbourhood in the last six months or is he on transit? Is (NAME) currently in the neighbourhood?	What is the relationship of (NAME) with the head of household?	Is (NAME) a man or a woman?	How old is (NAME)?	10 YEARS OR OLDER	INDIVIDUALS SIX YEARS OR OLDER		
						What is the family status of (NAME)?	Has (NAME) ever attended school?	At what level did (NAME) stop school?	What is the last class or grade completed by (NAME)?
IDN08	M101	M102	M103	M104	M105	M106	M107	M108	M109
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									

M102. RESIDENCE STATUS 1. PRESENT 2. ABSENT 3. VISITOR 9. UNKNOWN	M103. RELATIONSHIP WITH HEAD OF HOUSEHOLD (HOH) 01. HEAD OF HOUSEHOLD 02. SPOUSE OF HOH 03. SON/DAUGHTER OF HOH 04. M'THER/F'THER OF HOH 05. BR'THER/SISTER OF HOH 06. OTHER 07. HOUSEKEEPER 08. NO RELATIONSHIP 99. UNKNOWN	M104. SEX 1. MAN 2. WOMAN	M106. FAMILY STATUS 1. SINGLE 2. MARRIED 3. WIDOW(ER) 4. DIVORCED 5. SEPARATED 6. OPEN RELATIONSHIP 9. UNKNOWN	M107. ATTENDED SCHOOL 1. YES 2. NO IF NO, GO TO M110	M108. SCHOOL LEVEL 1. ELEMENTARY 2. MIDDLE 3. SECONDARY 4. SUPERIOR IF SUPERIOR, GO TO M110	M109. GRADE /CLASS COMPLETED 1. 1^{ST} 2. 2^{ND} 3. 3^{RD} 4. 4^{TH} 5. 5^{TH} 6. 6^{TH} 7. 7^{TH} 8. 8^{TH} 9. UNKNOWN

No ORDER	Is (NAME) a member of the prepayment scheme? VERIFY NAME IN THE MEMBERS ROSTER 1. YES 2. NO	Since what month is (NAME) a member of the prepayment scheme? VERIFY IN THE MEMBERS ROSTER	Since what year is (NAME) a member of the prepayment scheme? VERIFY IN THE MEMBERS ROSTER 1. 1999 2. 2000	ELIGIBILITY: CURATIVE CARE (EVERY INDIVIDUAL)			ELIGIBILITY: PREVENTIVE CARE (WOMEN AGES *12* TO 49 YEARS)			STATUS OF VISITE	
				Were you sick, did you have an accident /injury in the last two weeks? 1. YES 2. NO	Did you have headache, diarrhoea or fever, caught in the last two weeks? 1. YES 2. NO	INTERVIEWER: IF YES, FOR M201A OR M201B, CIRCLE "1", ELSE CIRLCE "2" 1. ELIGIBLE 2. INELIGI-BLE	Do you have children under five year old living with you? 1. YES 2. NO	Were pregnant in the last 12 months? 1. YES 2. NO	INTERVIEWER: IF YES, FOR M202A OR M202B, CIRCLE "1", ELSE CIRLCE "2" 1. ELIGIBLE 2. PAS ELIGIBLE		
IDN08	M110	M111	M112	M201A	M201B	M201C	M202A	M202B	M202C	VIS1	VIS2
01											
02											
03											
04											
05											
06											
07											

08																							
09																							
10																							
IF NO, GO TO M201A								CIRCLE CODE "1" OF THE M201C COLUMN AND THE CORRESPONDING NUMBER. YOU MUST COMPLETE ONE QUESTIONNAIRE CURATIVE CARE FOR INDIVIDUALS WITH CODE "1" ENCIRCLED						CIRCLE CODE "1" OF THE M202C COLUMN AND THE CORRESPONDING NUMBER. YOU MUST COMPLETE ONE QUESTIONNAIRE CURATIVE CARE FOR INDIVIDUALS WITH CODE "1" ENCIRCLED						STATUS OF VISITE 1. COMPLETE 2. NOT AT HOME 3. DELAYED 4. REJECTED 5. OTHER			

300

301 HOUSEHOLD EXPENSES

INTERVIEWER:

THE HEAD OF HOUSEHOLD OR HIS SPOUSE MUST BE PRESENT TO RESPOND TO THIS SECTION. MAKE SURE THAT THE PERSON WHO PRIMARILY TAKES CARE OF DAILY EXPENSES FOR THE HOUSEHOLD IS PRESENT DURING THE INTERVIEW.

No QUESTION	QUESTIONS \ INSTRUCTIONS	RESPONSES	GO TO	CODES
M 301	INTERVIEWER: WRITE THE NAME OF THE RESPONDENT: …………………………………………………………			
M 302	WHAT IS THE NUMBER OF THE RESPONDENT? INTERVIEWER: VERIFY THE NAME AND NUMBER OF THE RESPONDENT IN COLUMNS IDENT8 AND 101 OF THE HOUSEHOLD QUESTIONNAIRE.			
M 303	How often do you go the market in your household: once a day, twice a day, once a week, …? INTERVIEWER: READ THE POSSIBILITIES IN THE OPPOSITE BOX BEFORE RECORDING THE RESPONSE OF THE INTERVIEWEE INTERVIEWER: IN THE TABLE BELOW, CIRCLE THE COLUMN CORRESPONDING TO THE FREQUENCY OF THE SURVEY	1 TIME A DAY 2 TIMES A DAY 1 TIME A WEEK 2 TIMES A WEEK 3 TIMES A WEEK 1 TIME A MONTH 2 TIMES A MONTH OTHER (SPECIFY) ____________		
M 304	On the average, how much do you spend each time in the market excluding goods sold or intended for sale?	____________ RWF		RWF
	INTERVIEWER: IN THE TABLE BELOW, CIRCLE THE LINE CORRESPONDING TO THE AMOUNT DECLARED.			

AMOUNT DECLARED IN RESPONSE TO QUESTION M304	FREQUENCY OF VISIT TO MARKET IN RESPONSE TO QUESTION M303						
	1 TIME PER DAY	2 TIMES PER DAY	1 TIME PER WEEK	2 TIMES PER WEEK	3 TIMES PER WEEK	1 TIME PER MONTH	2 TIMES PER MONTH
100	3000	6000	400	800	1.200	100	200
150	4500	9000	600	1.200	1.800	150	300
200	6000	12.000	800	1.600	2.400	200	400
300	9000	18.000	1.200	2.400	3.600	300	600
400	12.000	24.000	1.600	3.200	4.800	400	800
500	15.000	30.000	2.000	4.000	6.000	500	1.000
600	18.000	36.000	2.400	4.800	7.200	600	1.200
700	21.000	42.000	2.800	5.600	8.400	700	1.400
800	24.000	48.000	3.200	6.400	9.600	800	1.600
900	27.000		3.600	7.200	10.800	900	1.800
1.000	30.000		4.000	8.000	12.000	1.000	2.000
1.500	45.000		6.000	12.000	18.000	1500	3.000
2.000			8.000	16.000	24.000	2.000	4.000
2.500			10.000	20.000	30.000	2.500	5.000
3.000			12.000	24.000	36.000	3.000	6.000
4.000			16.000	32.000	48.000	4.000	8.000
5.000			20.000	40.000		5.000	10.000
7.500			30.000			7.500	15.000
10.000			40.000			10.000	20.000
20.000						20.000	40.000
40.000						40.000	

INTERVIEWER: CIRCLE THE CORRESPONDING BOX IN THE TABLE BELOW RELATED TO MONTHLY MARKET EXPENSES OF HOUSEHOLD AND WRITE THE AMOUNT IN RESPONSE TO QUESTION M305. THEN ASK QUESTION M 305

No	QUESTIONS \ INSTRUCTIONS	RESPONSES	GO TO	CODES
M 305	Does your household spend... READ THE AMOUNT....on market expenses per month? IF YES, ENTER THE AMOUNT IN THE CODE COLUMN AND CONTINUE THE INTERVIEW; IF NO, ASK IF IT IS MORE OR LESS, CORRECT THE AMOUNT, AND REPEAT THE QUESTION.			RWF TOTAL 2
M 306	In the last month, outside of market expenses, how much did you spend on transportation, tissues, cigarettes, etc... INTERVIEWER: READ THE LIST OF GOODS AND SERVICES BELOW, ASK IF THE GOOD OR SERVICE WAS BOUGHT IN THE LAST MONTH. OMIT HEALTH AND EDUCATON EXPENSES. CALCULATE TOTAL EXPENSES. RENT .... DRINKS .... HOME ENERGY .... CIGARETTES\ TOBACCO .... TRANSPORTATION .... TISSUE\CLOTHES\TAYLOR............ GIFTS... OTHER PURCHASES / EXPENSES... INTERVIEWER: CALCULATE TOTAL INTERVIEWER: ENTER AMOUNT TOTAL 4 INTERVIEWER: RECOPY AMOUNTS FROM TOTAL 2 AND TOTAL 4 IN THE FOLLOWING BOXES AND CALCULATE THE TOTALS. TOTAL 2 TOTAL 4 HOUSEHOLD MONTHLY EXPENSES			RWF TOTAL 4

M 307	According to the information you provided, your household spend ...READ TOTAL AMOUNT... per month Do you think this amount is correct? INTERVIEWER: IF THE ANSWER IS NO, GO BACK TO QUESTION M306 AND TRY TO FIND OUT WHAT EXPENSES THE RESPONDANT FORGOT TO INCLUDE. THEN RECALCULATE THE AMOUNT IN QUESTION M307 AND REPEAT QUESTION M307 UNTIL THE RESPONDANT'S ANSWER IS YES. IF YES, ENTER THE AMOUNT IN THE CODES COLUMN.			RWF MONTHLY HOUSEHOLD EXPENSES

Nº	QUESTIONS	RESPONSES	GO TO	CODE
M308	Do you pay education expenses for any member of your household: tuition, textbooks, copy books, boarding?	1. YES 2. NO		
M309	For how many members of your household do you pay education expenses?	______ 99. UNKNOWN		
M310	Do you pay education expenses monthly, quarterly, or annually?	1. MONTHLY 2. QUARTERLY 3. ANNUALLY 4. OTHER (SPECIFY)		
M311	How much did you pay last for education expenses in your household?	______ 99999. UNKNOWN		
M312	Did you spend money to prevent or cure a sickness, or for delivery in the last month in your household?	1. YES 2. NO------------→	M319	
M313	How much did you pay for consultations and treatments to traditional healers in the last month in your household?	______ 99999. UNKNOWN		
M314	How much did you pay for consultations to health centres or hospitals in the last month in your household?	______ 99999. UNKOWN		
M315	How much did you pay for drugs to health centres or hospitals in the last month in your household?	______ 99999. UNKNOWN		
M316	How much did you pay for drugs to pharmacies in the last month in your household?	______ 99999. UNKNOWN		

Nº	QUESTIONS	RESPONSES	GO TO	CODE
M317	How much did you pay for hospitalization to health centres or hospital in the last month in your household?	______ 99999. UNKNOWN		
M318	How much did you pay for other treatments or health (other than consultations, drugs and hospitalization) to health centres or hospital in your last month in your household?	______ 99999. UNKNOWN		
M319	Does a member of the household have a small livestock?	1. YES 2. NO——→	M322	
M320	How many goats does the household have?	______ 10. 10+		
M321	How many sheep does the household have?	______ 10. 10+		
M322	Does a member of the household have a big livestock?	1. YES 2. NO——→	M324	
M323	How many cows does the household have?	______ 10. 10 et plus		
M324	Is there a radio in the household?	1. YES 2. NO		
M325	Is there a bicycle in the household?	1. YES 2. NO		
M326	How many rooms are there in the patient's residence?	______		
M327	What material was used to build the main rooms in the house where the patient resides?	1. HARD 2. SEMI-HARD 3. CLAY 4. STRAW 5. OTHERS (SPECIFY)		
M328	What is the main material used for the roof of the house where the patient resides?	1. CONCRETE 2. METAL SHEET 3. CLAY 4. STRAW 5. OTHERS (SPECIFY)		

Now, I will ask you questions about prepayment scheme membership.

Nº	QUESTIONS	RESPONSES	GO TO	CODE
M329	INTERVIEWER: VERIFY AT QUESTION M110 IF THE HEAD OF HOUSEHOLD IS A MEMBER OF THE PREPAYMENT SCHEME	1. YES 2. NO		
M330	INTERVIEWER: VERIFY AT QUESTION M110 IF ALL MEMBERS OF THE HOUSEHOLD ARE MEMBERS OF THE PREPAYMENT SCHEME	1. YES, ALL—→ 2. YES, SOME 3. NO, NONE–→	M332 M340	
M331	Why are some members of the household not enrolled in the prepayment scheme?	______________________		
M332	What is the main reason your household is participating in the prepayment scheme?	______________________		
M333	How much did you pay to enrol members of the household in the prepayment scheme?	__________		
M334	What do you think of the amount you contributed to the prepayment scheme? Is it easily affordable, somewhat affordable, or unaffordable?	1. EASY 2. SOMEWHAT 3. UNAFFORDABLE		
M335	How did you gain the money you contributed to the prepayment scheme?	1. OWN MONEY 2. GIFT FROM RELATIVE 3. BORROW 4. TONTINER 5. SALE OF AGRICULURAL GOODS 6. SALE OF POULTRY 7. OTHER (SPECIFY)		

Nº	QUESTIONS	RESPONSES	GO TO	CODE
M336	Are sick members of the household covered in the prepayment plan?	1. YES, RARELY 2. YES, FREQUENTLY 3. NO		
M337	When your current membership expires, would you renew it for the following year?	1. YES 2. NO ——→	M339	
M338	What is the highest amount you are able to pay to renew your membership for the following year?	______ 9999. UNKNOWN	END OF INTERVIEW	
M339	What is the main reason you are choosing not to renew your membership for the following year?	______ END OF INTERVIEW		
M340	What is your main reason for choosing not to enrol in the prepayment scheme?	______ END OF INTERVIEW		
M341	Would you enrol in the prepayment scheme next year?	1. YES 2. NO ——→	M343	
M342	What is the highest amount you are able to pay to enrol in the prepayment scheme next year?	______ 9999. UNKNOWN	END OF INTERVIEW	
M343	What is your main reason for choosing not to enrol in the prepayment scheme?	______ END OF INTERVIEW		

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CURATIVE CARE QUESTIONNAIRE

AA1 TYPE OF SURVEY

| 1 |

AA2 TYPE OF QUESTIONNAIRE

| 2 |

	IDENTIFICATION AND DOCUMENTATION OF INTERVIEW	
IDN01	HEALTH REGION:________________	
IDN02	HEALTH DISTRICT:________________	
IDN03	COMMUNITY:________________	
IDN04	SECTOR:________________	
IDN05	NEIGHBOURHOOD:________________	
IDN06	HOUSEHOLD NUMBER	
IDN07	NAME OF HEAD OF HOUSEHOLD: ________________	
NMAL	NAME OF PATIENT: ________________	
IDN08	PATIENT IDENTIFICATION NUMBER IN THE HOUSEHOLD QUESTIONNIARE	
DOC1	DATE OF INTERVIEW: DAY: __/__ MONTH: __/__ YEAR: __/__	DAY MONTH YEAR
DOC2	NAME OF INTERVIEWER: ________________	
DOC3	OBSERVATION TEAM LEADER:	
SAI1	DATE OF DATA ENTRY DAY: __/__ MONTH: __/__ YEAR: __/__	DAY MONTH YEAR
SAI2	NAME OF DATE ENTRY SPECIALIST: ________________	

IDN01	IDN03	IDN05	IDN06	IDN08

INTERVIEWER:

REMINDER: FOR PATIENTS LESS THAN 15 YEARS OLD, ADDRESS THE QUESTIONS TO THEIR MOTHER OR GUARDIAN. THE QUESTIONS ARE ASKED AS IF ADDRESSED DIRECTLY TO THE PATIENT. IF THE RESPONDANT IS NOT THE SAME AS THE PATIENT, THE QUESTIONS WILL BE ASKED BY MAKING REFRENCE TO THE PATIENT AS INDICATED THE INTERVIEWER MANUAL.

SYMPTOMS AND GRAVITY OF SICKNESS

400 We are going to talk about how you felt when the sickness started

SYMPTOMS TABLE

No	SYMPTOM	Did you have (SYMPTOM) when the sickness started?	When was the last time you have (SYMPTOM)?		Did the (SYMPTOM) start in the last 15 days?	How many days did you have the (SYMPTOM)?
401		402	403		404	405
			MTH	DAY		
01	FEVER					
02	HEAD ACHE					
03	IRRITATION OF THE EYES					
04	STOMACH ACHE					
05	COUGH					
06	WATERY FAECES					
07	BLOOD-STAINED FAECES					
08	VOMITS					
09	WOUND					
10	OTHER:					
INTERVIEWER: ASK IF THE PATIENT HAD OTHER SYMPTOMS AND IDENTIFY THE MAIN ONES		1. YES 2. NO (GO TO NEXT SYMPTOM) 9. UNKNOWN (GO TO NEXT SYMPTOM)	1. AUGUST 2. SEPTEMBER 3. OCTOBER 4. BEFORE AUGUST 999. UNKNOWN		1. YES 2. NO 9. UNKNOWN	31 = 31 DAYS OR MORE 99 = UNKNOWN

INTERVIEWER:

USE THE CALENDAR BELOW TO DETERMINE DATES AND DURATIONS

AUG	SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		

SEP	SUN	MON	TUE	WED	THU	FRI	SAT
						1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30

OCT	SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28

No	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
406	When did the sickness start? INTERVIEWER: USE THE CALENDAR ABOVE TO SPECIFY THE DATE GIVEN BY THE RESPONDANT	1. AUGUST 2. SEPTEMBER 3. OCTOBER 4. BEFORE AUGUST 999. UNKNOWN		MONTHS DAY
407	Did you inquire about treatments for this sickness?	1. YES 2. NO 9. UNKNOWN	 ..410	
408	Will you continue to search for treatments for the sickness?	1. YES 2. NO 9. UNKNOWN	..410	
409	What day did you receive treatment for the first time? INTERVIEWER: USE THE CALENDAR ABOVE TO SPECIFY THE DATE GIVEN BY THE RESPONDANT	1. AUGUST 2. SEPTEMBER 3. OCTOBER 4. BEFORE AUGUST 999. UNKNOWN		MONTHS DAY

No QUESTION	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
410	Before receiving treatments, did you think the sickness was not serious, was serious, was very serious, or you did not know?	1. NOT SERIOUS 2. SERIOUS 3. VERY SERIOUS 4. DON'T REMEMBER 9. NO RESPONSE		
411	What was your main activity in the last month?	1. FARMER 2. GOVERNMENT WORKER 3. EMPLOYEE (COMPANY) 4. SHEPHERD 5. FISHERMAN 6. STUDENT.................. 7. MINOR .... 8. OTHER (SPECIFY) ________________ 9. UNKNOWN	 ..414 ..414	
412	In the last two weeks, did you have to interrupt or stop your main activity due to the sickness?	1. YES 2. NO 9. UNKNOWN	 ...414	
413	How many days was main activity interrupted due to the sickness?	________________ 99. UNKNOWN		
414	In the last two weeks, did you stay in bed due to the sickness?	1. YES 2. NO 9. UNKNOWN	 ..416	
415	How many days did you stay in bed due to the sickness?	________________ 99. UNKNOWN		

ATTENTION
INTERVIEWER: FROM QUESTION 415 TO 421, THE INFORMATION WILL RELATE ONLY TO TREATMENTS RECEIVED AT HOME BEFORE MAKING A VISIT TO THE HEALTH CENTER OR AN OUTSIDE TRADITIONAL HEALER

INTERVIEWER: (READ TO RESPONDANT) I AM NOW GOING TO ASK QUESTIONS ABOUT TREATMENTS RECEIVED AT HOME TO CURE YOUR ILLNESS BEFORE MAKING A VISIT TO THE HEALTH CENTER.

416	In the last two weeks, did you receive treatment at home by a heath worker (doctor, nurse ...), a traditional healer, or a friend?	1. YES 2. NO 9. UNKNOWN	 ..420 ..420	
417	Who came to your house to provide treatments?	1. DOCTOR 2. NURSE 3. TRADITIONAL MIDWIFE 4. HEALER 5. OTHER (SPECIFY) __________ 9. UNKNOWN		
418	Did you pay the person you came to the house to provide the treatment? With money or goods?	1. YES, WITH MONEY 2. YES, WITH GOODS 3. NO.............................. 999. UNKNOWN	 ..420 ..420	
419	How much money did you pay the person who treated you at home? INTERVIEWER: IF THE PAYMENT WAS MADE IN GOODS, ESTIMATE THE MONETARY VALUE OF THE PAYMENT.	__________ 9999. UNKNOWN		RWF
420	Did you take any drugs you have at home in the last two weeks?	1. YES 2. NO 9. UNKNOWN		
421A	Did you send someone to buy or did you yourself buy any drugs to treat your illness in the last two weeks?	1. YES 2. NO 9. UNKNOWN	 ..423	
421B	Where were the drugs purchased?	1. PHARMACY 2. MAGENDU 3. IN THE MARKET 4. HEALTH CENTER 5. HEALER 6. OTHER (SPECIFY) __________ 9. UNKNOWN		
422	How much money did you spend on the drugs in the last two weeks?	__________ 9999. UNKNOWN	...414	RWF

No QUESTION	QUESTIONS / INSTRUCTIONS	RSEPONSES	GO TO	CODES
ATTENTION INTERVIEWER: IN THIS SECTION, THE INFORMATION WILL RELATE TO TREATMENTS RECEIVED OUTSIDE OF THE HOUSE IN THE LAST TWO WEEKS.				
423	Did you visit a doctor, a nurse, a healer, etc outside of the house ? Did you go to a health centre … to treat your illness in the last two weeks?	1. YES 2. NO 9. UNKNOWN	 ..462	
424	Where did you go for treatment outside of the house?	01. PUBLIC HOPITAL 02. CERTIFIED HOPITAL 03. PUBLIC HEALTH CENTER 04. CERTIFIED HEATH CENTER 05. DISPENSARY 06. TRADITIONAL HEALER 07. PRIVATE CLINIC 08. HOME PRACTICE 09. OTHER (SPECIFY) ________ 99. UNKNOWN		
425	What is your primary reason for deciding to go to … HEALTH CENTER INDICATED IN QUESTION 424… ?	1. LESS EXPENSIVE 2. CLOSE BY 3. COMPETENT PERSONNEL 4. HABIT 5. WELL EQUIPED IN MATERIALS AND DRUGS 6. RELIGIOUS OR TRADITIONAL REASONS 7. PREFERRED PPS CENTER 8. OTHER (SPECIFY) ________ 99. UNKNOWN		

No QUESTION	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
426	What do you think of the availability of drugs at this location ... HEALTH CENTER INDICATED IN QUESTION 424... ? INTERVIEWER: READ THE POSSIBLE ANSWERS IN THE NEXT BOX BEFORE RECORDING THE CORRESPONDENT'S RESPONSE.	1. THEY RARELY HAVE DRUGS 2. THEY OCCASIONALLY HAVE DRUGS 3. THEY ALWAYS HAVE DRUGS 4. OTHER (SPECIFY) __________ 9. UNKNOWN		
427	Who was the main person that provided the treatments for you during your first visit to the ... HEALTH CENTER INDICATED IN QUESTION 424... ?	1. DOCTOR 2. NURSE 3. TRADITIONAL MIDWIFE 4. HEALER 5. OTHER (SPECIFY) __________ 9. UNKNOWN		
428	According to this person, what was your sickness?	01. MALARIA 02. DIARRHOEA 03. MEASLES 04. PNEUMONIA 05. FLU 06. COQUELUCHE 07. GHONORRHEA 08. CONJUNCTIVITY 09. ACCIDENT 10. COLD 11. OTHER (SPECIFY) __________ 99. UNKNOWN		
429	How far away from your house is the first health centre you visited? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	1. Less than 2 km 2. 2 – 4 km 3. 4 – 6 km 4. 6 – 8 km 5. 8 – 10 km 6. 10 km and more 9. UNKNOWN		
430	What form of transportation did you use to get to the first health centre you visited? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424 Indicate the two basic means of transportation. if he/she used only one, record that twice.	1. BY FOOT .... 2. CAR 3. BUS OR TAXI 4. CANOE 5. BICYCLE / MOTORCYCLE 6. OTHER (SPECIFY) __________ 9. UNKNOWN	..432 IF BY FOOT ONLY	
431	How much did you, you and those who accompanied you, pay for transportation (round-trip) to get to the first location where you received treatment?	__________ 9999. UNKNOWN		RWF
432	Did you and those who accompanied you spend money on food and lodging?	1. YES 2. NO.......................... 9. UNKNOWN	..434	
433	How much did you and those who accompanied you spend on food and lodging?	__________ 9999. UNKNOWN		RWF

No	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
434	How much time did it take to arrive at the first health centre you visited?	1. Less than 30' 2. 30 – 60' 3. 1h – 1h30 4. 1h30 – 2h 5. 2h00 – 2h30 6. 2h30 – 3h00 7. More than 3h00 9. UNKNOWN		
435	After arriving at the health centre, how long did you wait before consultation with a member of the health personnel? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	1. Less than 30' 2. 30 – 60' 3. 1h – 1h30 4. 1h30 – 2h 5. 2h00 – 2h30 6. 2h30 – 3h00 7. More than 3h00 9. UNKNOWN		
436	Were you hospitalized in this health centre? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	1. YES 2. NO.......................... 999. UNKNOWN	..438	
437	For how many days were you hospitalized in this health centre? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	__________ 99. UNKNOWN		
438	Were you advised to be hospitalized somewhere else?	1. YES 2. NO 9. UNKNOWN		
439	How many times did you go to this health centre for treatment in the last two weeks? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	__________ 99. UNKNOWN		
440A	Did you receive a prescription from this health centre in the last two weeks?	1. YES 2. NO 9. UNKNOWN		
440B	Did you pay or did someone else pay for the treatments you received at this health centre? INTERVIEWER: SPECIFY THE HEALTH CENTER INDICATED IN QUESTION 424	1. YES 2. NO........................... 3. NO, MEMBER OF PPS 9. UNKNOWN	..455	
441	Who paid for the treatments; yourself, someone in your household, a different relative, a friend, the company you work for, or somebody else?	1. PATIENT OR MEMBER OF HOUSEHOLD 2. AN OUTSIDE RELATIVE 3. A FRIEND 4. EMPLOYER OF PATIENT 5. PPS (MUTUELLE) 6. OTHER (SPECIFY) __________ 9. UNKNOWN		

No QUESTION	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
442	Did you pay for each consultation or just the first time you visited the health centre?	1. EACH CONSULTATION 2. 1ST CONSULTATION 3. OTHER (SPECIFY) __________ 9. UNKNOWN		
443	Was the price of drugs included or did you pay for them separately?	1. DRUGS INCLUDED 2. DRUGS SEPARATE 3. OTHER (SPECIFY) __________ 9. UNKNOWN		
444	Was the price of medical exam included or did you pay for it separately?	1. EXAM INCLUDED 2. EXAM SEPARATE 3. OTHER (SPECIFY) __________ 9. UNKNOWN		

INTERVIEWER: REPEAT THE ANSWER TO QUESTION 439: NUMBER OF CONSULTATIONS AT THE FIRST HEALTH CENTER VISITED

Now we would like to discuss payments made for drugs, exams, and other services during each consultation in the last two weeks.

TABLE: PAYMENTS AT THE FIRST HEALTH CENTER VISITED

CONSULTATION		How much did you pay for consultation?	Did you receive any drugs during the consultation?	How much did you pay for the drugs?	Did they perform any exams?	How much did you pay for the exams?	Did you receive other services?	How much did you pay for the other services?
445		446	447	448	449	450	451	452
1	1ST VISIT							
2	2ND VISIT							
3	3RD VISIT							
4	4TH VISIT							
5	5TH VISIT							
6	6TH VISIT							
		RWF	1. YES 2. NO (GO TO 449)	RWF	1. YES 2. NO (GO TO 451)	RWF	1. YES 2. NO (GO TO NEXT LINE)	RWF

No	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
453	Did you have to pay in goods for the treatments received?	1. YES 2. NO............ 9. UNKNOWN	..456	
454	What was the monetary value of the goods given in exchange for the treatments received?	__________ 9999. UNKNOWN		RWF

No	QUESTIONS / INSTRUCTIONS	RESPONSES	GO TO	CODES
455	Why didn't you pay for the treatments received? INTERVIEWER: RECORD THE FIRST ANSWER OF THE RESPONDANT	1. FREE CARE 2. I DON'T HAVE THE MEANS 3. I'M A FRIEND OR FAMILY MEMBER OF THE HEALTH WORKER 4. I'LL PAY WHEN I FIND THE MEANS 5. MEMBER OF PPS 6. OTHER (SPECIFY)__________ 9. UNKNOWN		
456	Did you visit other health centres, health worker, or traditional healer during the same illness in the last two weeks?	1. YES 2.NO.. 9. UNKNOWN	 END	

INTERVIEWER: INDICATE IN ORDER THE OTHER HEALTH CENTERS VISITED AFTER THE FIRST VISIT? HOW MUCH MONEY DID THE PATIENT PAY IN EACH CENTER FOR CONSULTATIONS? DRUGS? AND SERVICES?

TABLE: PAYMENTS MADE AT OTHER HEALTH CENTERS

OrdER OF visit TO OTHER HEALTH CENTERS (hc)	What type of health centre? (SEE code BELOW)	How much did you pay for consultations? 9999. UNKNOWN	How much did you pay for drugs? 8888. DIDN'T RECEIVE DRUGS 9999. UNKNOWN	How much did you pay for other services? 8888. NO OTHER SERVICE 9999. UNKNOWN	Did you visit any other health centre? 1. YES 2. NO
457	458	459	460	461	462
2 2ND HC					
3 3RD HC					
4 4TH HC					

TYPE OF HEALTH CENTER:	
PUBLIC HOSPITAL	06. HEALTH POST
CERTIFIED HOSPITAL	07. PRIVATE CLINIC
PUBLIC HEALTH CENTER	08. TRADITIONAL HEALER
CERTIFIED HEALTH CENTER	09. OTHER (SPECIFY)
DISPENSARY	99. UNKNOWN

END OF INTERVIEW

Annex C: Difficulties Faced During Data Collection

Problems encountered during the data collection for the household surveys included constraints related to logistics, communication and identification of target households. For example, cars with interview teams broke down and needed to be replaced; difficult roads to the households prolonged the overall interview process; there were no laptops available that would have allowed interviewers to enter the data directly into the software whilst in the field; households identified in the sample frame had left their dwellings and moved to other areas; and sometimes it took longer than anticipated to conduct an interview, for example when the household head was absent working in the field and had to be found (Schneider and Diop 2001).

Difficulties also occurred when collecting self-reported monthly information from health centre managers and MHI presidents on the performance of their respective organisations. These were mainly related to delays in filling in the monthly reports, incomplete questionnaires and errors in recording. However, this situation considerably improved over time. Regular meetings were held with providers and the MHI manager to discuss the validity of data and analysis results. Participants appreciated this regular feed-back of information they had contributed. These meetings helped them to understand how reliable data can be used to derive strategies to improve their situation (Schneider et al. 2001a; Schneider et al. 2001b).

Annex D: List of Papers Submitted

Trust in Micro Health Insurance. Submitted to Social Science and Medicine, June, 2003.

Why should the poor insure? A review of theories on decision-making in the context of health insurance. Submitted to Health Policy and Planning. August, 2003.

The contribution of MHI to horizontal equity in utilisation and fairness in health financing in Rwanda. Submitted to Health Economics. February, 2004.

Provider payment reform in Rwanda: The cost impact of payments made by insured and uninsured patients in health centres (Co-authored with Kara Hanson). Submitted to Health Economics. October, 2003.

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