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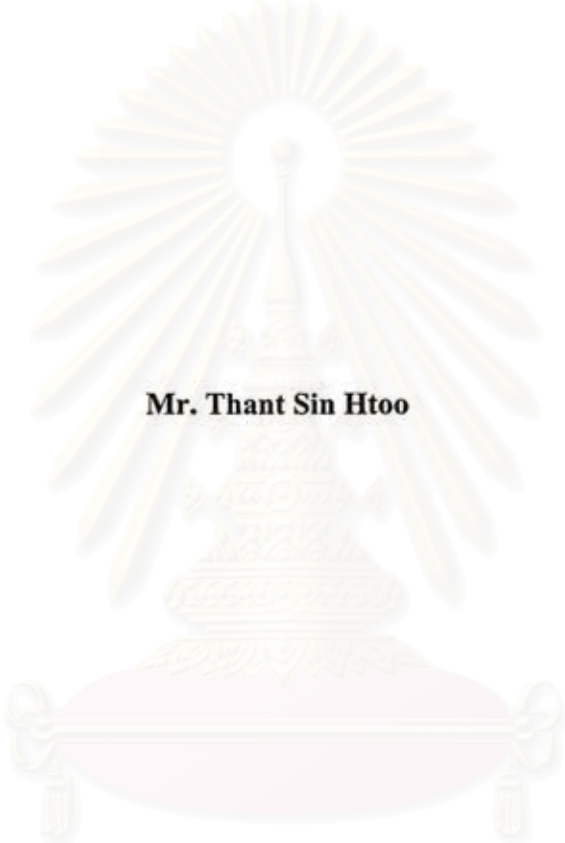
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**CATASTROPHIC HEALTH CARE PAYMENT IN MYANMAR:
A CASE STUDY IN UPPER MYANMAR**



Mr. Thant Sin Htoo

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for the Degree of Master of Science Program in Health Economics**

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การจ่ายเงินด้วยตัวผู้ป่วยเองเป็นวิธีการหลักของการใช้จ่ายเพื่อสุขภาพที่ใช้กันอย่างแพร่หลายในทวีปเอเชีย ซึ่งวิธีการนี้จะส่งผลให้ครัวเรือนต้องประสบกับความเสียหายต่อการเกิดค่าใช้จ่ายที่ไม่ได้คาดการณ์ไว้ล่วงหน้า ซึ่งคิดเป็นค่าใช้จ่ายที่มีสัดส่วนที่มากเมื่อเทียบกับงบประมาณของครัวเรือน การจ่ายเงินด้วยตัวผู้ป่วยเองนี้อาจถูกมองว่าเป็นภาวะหายหน้า เนื่องจากต้องสูญเสียทรัพยากรของครัวเรือนเป็นจำนวนมาก

ผลกระทบของภาวะหายหน้าต่อครัวเรือนทางตอนบนของประเทศพม่า วัดจากอุบัติการณ์และสัดส่วนเงินที่จ่ายด้วยตนเองต่อรายได้ที่เป็นตัวเงินทั้งหมดของครัวเรือน ดัชนีวัดการกระจุกตัวคำนวณจากการวัดความแปรปรวนร่วมระหว่างตัวแปร 2 ตัว เพื่อจะศึกษาผลกระทบของภาวะหายหน้าที่เกิดขึ้นว่าเกิดกับครัวเรือนที่มีรายได้น้อยหรือรายได้สูง

ผลการศึกษาพบว่า ในตอนบนของประเทศพม่าพบว่ามีผลกระทบของภาวะหายหน้าต่อครัวเรือนสูง อุตการณ์ของค่าใช้จ่ายหายหน้าสำหรับการดูแลสุขภาพมีอัตราร้อยละ 8.11, 6.59, 4.38 และ 3.82 โดยระดับหายหน้ากำหนดค่าเป็นอัตราร้อยละ 10, 15, 25 และ 30 ของรายได้ครัวเรือน ตามลำดับ และสัดส่วนเงินที่จ่ายด้วยตนเองต่อรายได้ที่เป็นตัวเงินทั้งหมดของครัวเรือนมีอัตราร้อยละ 4.76, 4.39, 3.84 และ 3.63 โดยใช้ระดับหายหน้าตามที่กล่าวไว้ข้างต้น ค่าเฉลี่ยของผลต่างมีค่าเป็นบวก คิดเป็นอัตราร้อยละ 58.7, 66.6, 87.7 และ 95 สำหรับระดับหายหน้าที่กำหนดไว้ ครัวเรือนที่มีรายได้น้อยมีแนวโน้มที่จะใช้จ่ายทรัพยากรของครัวเรือนเป็นจำนวนมากเพื่อการดูแลสุขภาพ เนื่องจากดัชนีวัดการกระจุกตัวทุกชนิดมีค่าเป็นลบ และเนื่องจากการจ่ายเงินด้วยตัวผู้ป่วยเองเป็นจำนวนมากเพื่อการดูแลสุขภาพนี้ ส่งผลให้รายได้ส่วนใหญ่ของครัวเรือนสูญเสียไปกับการกู้ยืมเงิน และนำไปสู่ภาวะความยากจนของครัวเรือนในท้ายที่สุด

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ลายมือชื่อนิสิต

ลายมือชื่ออาจารย์ที่ปรึกษา

4885892329 : MAJOR HEALTH ECONOMICS

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Out-of-Pocket (OOP) payments are the principal means of financing health care throughout much of Asia. It leaves households exposed to the risk of unforeseen expenditures that absorb a large share of the household budget. The OOP expenditures may be considered as catastrophic in the sense that they absorb a large fraction of household resources.

Catastrophic impact among households in Upper Myanmar is measured by the incidence and intensity of high shares of OOP in total household money income. Concentration indices are calculated by convenient covariance method in order to find catastrophic impact matters more for poor or rich households.

Households' catastrophic impacts are considerably high in Upper Myanmar. The incidence of catastrophic health care payment is 8.11, 6.59, 4.38 and 3.82 per cent for the defined catastrophic thresholds of 10, 15, 25 and 30 percent of households' income, respectively. The intensities are 4.76, 4.39, 3.84 and 3.63 per cents for the same thresholds. Mean Positive Gaps are 58.7, 66.6, 87.7 and 95 percents for the four defined threshold levels. The poor households are more likely to spend a large fraction of total household resources on health care since all concentration indices indicate negative values. Because of heavy out-of-pocket health care expenditure, most of the households' income absorbed with repeated borrowing and lending mechanisms can push these households into impoverishment.

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ABBREVIATIONS

CSO	Central Statistical Organization
C_E	Concentration Index for Headcount
C_O	Concentration Index for Overshoot
G_{cat}	Average excess of catastrophic payment
H_{cat}	Catastrophic payment headcount
IMF	International Monetary Funds
LSMS	Living Standards Measurement Study
MOH	Ministry of Health
MPG	Mean Positive Gap
MPO	Mean Positive Overshoot
OOP	Out-of-Pocket Payment
PAHO	Pan American Health Organization
PHC	Primary Health Care
SEARO	South-East Asian Regional Office
WHO	World Health Organization
WHR	World Health Report

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CHAPTER I

INTRODUCTION

1.1 Rationale

Today and every day, the lives of vast number of people lie in the hands of health systems. From the safe delivery of a healthy baby to the care with dignity of the frail elderly, health systems have a vital and continuing responsibility to people throughout the lifespan. They are crucial to the healthy development of individuals, families and societies everywhere. Although improving health is clearly the main objective of a health system, it is not the only one. Goals of a good health system are

- 1) to improve a population's health status and promoting social well being,
- 2) to ensure equity and access to health care,
- 3) to ensure microeconomics and macroeconomics efficiency in the use of resources,
- 4) to enhance the clinical effectiveness,
- 5) to improve quality of care and consumer satisfaction and
- 6) to assure the system's long-run financial sustainability.

The objective of good health system is twofold: the best attainable average level- *goodness*- and the smallest feasible differences among individuals and groups- *fairness*-. Goodness means a health system responding well to what people expect of it; fairness means it responds equally well to everyone, without discrimination (World Health Organization [WHO], World Health Report, 2000).

As described above, equity is an important goal of a good health system and it is also one of the most important criteria for judging the success of policies in the health sector. At its most basic equity implies some notion of fairness. Fairness is integral to our perspective on the world, as human beings are sociable animals and judge things in relative terms: we only know what we have by looking at what our neighbor has. This influences our judgment of our position in the social hierarchy, our expectations and ultimately, our happiness. Therefore fairness is fundamental and is particularly so when applied to health, which is itself basic to our well being (Witter et al., 2000).

However there are many possible interpretations of equity. Equity can be explained in terms of equal resources/equal use of services, equal health, fair innng, equal access/utilization according to need or equal treatment according to capacity to benefit. In 1986, Musgrove mentioned that measurement of equity in Health or in otherwise Health Equity Analysis can be either

- 1) Equality of health care access or
- 2) Financial measures of equity

Fair financing in health systems means that the risks each household faces due to the costs of the health system are distributed according to ability to pay rather than to the risk of illness. A fairly financed health system ensures financial protection for everyone. A health system, in which individuals or households are sometimes forced into poverty through their purchase of needed care, or forced to do without it because of the cost, is unfair. However, this situation characterizes most poorer countries and some middle and high income ones, in which at least part of the population is inadequately protected from financial risks.

Paying for health care can be unfair in two different ways. It can expose families to large unexpected expenses, that is, costs that could not be foreseen and have to be paid out of pocket at the moment of utilization of services rather than being covered by some kind of prepayment. Or it can impose regressive payments, in which those least able to contribute pay proportionately more than the better-off (WHO, 2000).

Health care financing is one of the most important options on equitable distribution of health care. Developing countries rely heavily on out-of-pocket (OOP) financing of health care. As a result, households exposed to the risk of unforeseen medical expenditures. Illness can bring a difficult choice between diverting resources towards medical care or foregoing treatment with the risk of long term deterioration in health and earnings capacity (O'Donnell, 2005).

Every year, more than 150 million individuals in 44 million households throughout the world face financial catastrophe as a direct result of having to pay for health care and about 25 million households or more than 100 million individuals are pushed into poverty by the need to pay for health services. When people have to pay fees or co-payments for health care, the amount can

be so high in relation to income that it results in "*Financial Catastrophe*" for the individual or the household. Because of such high expenditure, people have to cut down on necessities such as food and clothing, or are unable to pay for their children's education (WHO, Technical Briefs, 2005).

The impact of these out of pocket payments for health care goes beyond catastrophic spending alone. Many people may decide not to use services, simply because they cannot afford either direct cost, such as for consultations, medicines and laboratory test, or the indirect costs, such as for transport and special food. Poor households are likely to sink even further into poverty because of the adverse effects of illness on their earnings and general welfare (WHO, 2005).

One of the conception of fairness in payments for health care is that households ought not be required to spend more than a given fraction of their income on health care in any given period and that spending in excess of this threshold can be labeled "*Catastrophic*". The catastrophic label main refers to the fact that falling ill can induce often sizeable and unpredictable shocks a household's living standards. Clearly, the extent to which illness shocks really result in catastrophic economic consequences for households depends not only on medical care costs, but obviously also on any effects from reduced labor supply and productivity and on the extent to which households are able to smooth their consumption over several periods by borrowing and lending mechanisms (World Bank, Technical Notes 18, 2002).

There are a few articles and researches on catastrophic health care payment in developing countries although there are rich literatures on health care financing since the analysis of financing of health care has assumed greater significance in recent times. Majority of these studies varies from multi-country analysis (Xu et al., 2002) to country level analysis (Wagstaff & van Doorslaer, 2001; Tangcharoensathien, V et al., 2005).

Like many developing countries, the health care system in Myanmar is a public- private mix in both financing and delivery. The public health system has gradually developed and expanded in all the states and divisions of the country. In contrary, the rapid growth of private sector medical care concentrates in the large cities but notable absence in most townships and rural areas of the country. The major sources of finance for health care services are the government,

private households, social security system, community contributions and external aids where private household out-of-pocket expenditure is the vast majority (81.5% of total health care expenditure) since there is no public or private health insurance systems (Ministry of Health [MOH], 2004). Thus, the study of “catastrophic health care payment” can reflect the household financial contribution for health and its burdens in Myanmar community.

In Myanmar, where per se the need for spending on health is high, high levels of private health expenditures pose serious challenge to policy makers. The sheer size of these expenditures once it has risen to high levels can impede control of health expenditures itself. The high private health expenditures are also a cause of concern because most of these expenditures are out-of-pocket. Insurance mechanisms cover extremely small segment of population. Provider payment systems are primarily based on fee-for-services. The professional regulation and accountability systems are weak and non-functioning in many ways. It is not clear whether these expenditures are sustainable as it can have a number of undesirable consequences making the health system costly, unaffordable, and vulnerable to provider payment system.

1.2 Research question

What is the extent of household catastrophic health care payments in Upper Myanmar and does it affect more for the poor or rich households?

1.3 Objectives

General objectives

To measure the extent of household catastrophic health care payments in Upper Myanmar

Specific objectives

- 1) To identify the incidence and intensity of household catastrophic health care payments in Upper Myanmar
- 2) To determine the household catastrophic impact matter more for worse-off or better-off in Upper Myanmar

1.4 Scope of the study

Household survey is the integral part of analysis of catastrophic health care payments where the household living standard data and user payments for health care are the essential ones. The data are obtained from “household living standard and life style survey in Upper Myanmar” conducted by Department of Preventive and Social Medicine, University of Medicine, Mandalay, Union of Myanmar in 2005.

1.5. Operational Definitions

Catastrophic health care payments

Households can not afford to pay more than some prespecified fraction (threshold z) of their annual income on health care of whatever type (either curative or preventive) and spending in excess of this threshold is labeled catastrophic. In this study, the threshold levels will be 10%, 15%, 25% and 30% of household annual income.

Incidence of catastrophic health care payments

The number of household as a percentage of the sample where their Out-of-Pocket (OOP) health care costs exceeds the threshold level of income (10%, 15%, 25% and 30%) respectively.

Intensity of catastrophic health care payments

The average percentage of catastrophic health care payments of households in each category will be calculated and identifies how much this average percentage exceeds the threshold levels. In this study, the threshold levels are 10%, 15%, 25% and 30% of household average annual income.

Catastrophic impact sensitive to income rank

Household catastrophic health care payment matters more for the poor or rich households according to income rank is determined by concentration indices.

Out-of-pocket payments (OOP)

OOP of households is defined as the share of total income being spent on purchase of health care services. In this study, 'T' is defined as OOP health payments and 'X' as total household annual income, 'T/X' is defined as the share of OOP payments (OOP) to total household annual income. Household annual income includes only monetary part of total income.

1.6. Expected Benefits

This study will provide information for policy-makers about the extent of catastrophic health care payments of Myanmar community in terms of health financing aspect of health equity analysis. This information can be used for re-designing of national health financing system not only to allow people to access services when they are needed, but also to protect households from financial catastrophe by reducing out-of-pocket spending.



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CHAPTER II

LITERATURE REVIEW

2.1. Fair financial contribution in health

Fair financing in health systems means that the risks each household faces due to the costs of the health system are distributed according to ability to pay rather than to the risk of illness: a fairly financed system ensures financial protection for everyone. A health system, in which individuals or households are sometimes forced into poverty through their purchase of needed care, or forced to do without it because of the cost, is unfair. This situation characterizes poorer countries and some middle and high income ones, in which at least part of the population is inadequately protected from financial risks (Fabricant 1999 cited by WHO, 2000).

Paying for health care can be unfair in two different ways. It can expose families to large unexpected expenses, that is, costs that could not be foreseen and have to be paid out of pocket at the moment of utilization of services rather than being covered by some kind of prepayment. Or it can impose regressive payments, in which those least able to contribute pay proportionately more than the better-off. The first problem can be solved by minimizing the share of out-of-pocket financing of the system, so as to rely as fully as possible on more predictable prepayment that is unrelated to illness or utilization. The second is solved by assuring that each form of prepayment through taxes of all kind, social insurance, or voluntary insurance is progressive or at least neutral with respect to income, being related to capacity to pay rather than to health risk (WHO, 2000).

Out-of-pocket payments are generally regressive but they can, in principle, be neutral or progressive. When this happens, and out-of-pocket expenses are not too large, they need not impoverish anyone or deter the poor from obtaining care. However, of all the forms of financing they are the most difficult to make progressive. Arrangement that exempt to destitute from user fees at public facilities, or impose a sliding scale based on socioeconomic characteristics are attempts to reduce the risk associated with out-of-pocket payments (Nolan, 1995 & Bennett, 1998 cited by WHO, 2000). Except when private practitioners know their clientele well enough to discriminate among them in fees – and the better-off accept that their

charges will subsidize the worse-off – such arrangements are limited to public facilities, which often account for only a small share of utilization in poor countries. And even then, such schemes require relatively high administrative costs to distinguish among users, and typically affect only a small amount of total risk-related payments.

Financial fairness is best served by progressive prepayment in place of out-of-pocket expenditure. Out-of-pocket expenditure should be small not only in the aggregate, but relative to household's ability to pay. The ideal is largely to disconnect a household's financial contribution to the health system from its health risks, and separate it almost entirely from the use of needed services.

The burden of health financing on a particular household is the share that its actual health expenses are of its capacity to pay. The numerator includes all costs attributable to the household, including those it is not even aware of paying, such as the share of sales or value-added taxes it pays on consumption, which governments then devote to health, and the contribution via insurance provided, and partly financed, by employers.

The denominator is a measure of the household's capacity to pay. In poor households, a large share goes for basic necessities, particularly food, whereas richer households have more margins for other spending, including spending on health care. Food spending is treated as an approximation to expenditure on basic needs. Total non-food spending is taken as an approximation of the household's discretionary and relatively permanent income, which is less volatile than recorded income (Friedman 1957 cited by WHO, 2000) and a better measure of what a household can afford to spend on health and other non-food needs.

The way health care is financed is perfectly fair if the ratio of total health contribution to total non-food spending is identical for all households, independently of their income, their health status or their use of the health system (Bevan 1952 cited by WHO, 2000).

2.2. Equity and Health Equity Analysis

2.2.1. Equity

Equity is the most important goal as well as one of the most important criteria for judging the success of policies in the health sector. Different societies have different perceptions of what is equitable & their social and cultural norms shape the policies they will adopt to promote equity. During the periods of economic expansion, people see their income rise and living standards improve. Even in good times, however, an unfortunate few may be left behind. When and how should governments intervene to ensure not only that the size of the pie increases, but that everybody gets a fair share? Although there is a consensus that extreme inequality is unfair and those efforts should be made to raise the incomes of the poorest member of society, there is little agreement on the desirability of income and health equality for its own sake or on what constitutes a fair distribution of health. In fact equity issues are especially complex because they are inextricably intertwined with social values, but policymakers need to devote greater attention to them (International Monetary Funds IMF, 1998). At its most basic, equity implies some notion of fairness however there are many possible interpretations of equity. Witter et al. (2000) described the various definitions of equity as follows:

- (a) *Equal resources/ uses of serves*: Some literature stated that everyone should receive the same services or have the same resources spent on them. However, this would make little sense from an efficiency point of view as health needs differ widely
- (b) *Equal health*: It is stated that everyone have a right to equal health. But this concept is ambitious and possibly misguided. People have very different health endowments and some look after themselves less well than others. If someone wants to drink himself to an early death, is it the duty of the state to pour resources into preserving him?
- (c) *Fair innings*: Another interpretation of equity is the fair innings argument. Health authorities might set a target age which people are in some way entitled to reach. Then health activities would be focused on enabling as many as possible to reach that age. The implication of this, however, is that people whose genetic inheritance and/or behavior predisposes them to early death or disability would receive a disproportionate share of health resources, while people beyond the target age would be neglected, however cost-effective a treatment for them. If so, this is neither fair nor efficient.

- (d) *Equal access/utilization according to need*: this can be interpreted narrowly, as in equal geographic proximity to health facilities, or more broadly to include quality of services and their affordability. If broader approach is taken, differential fees or some income redistribution would be needed to ensure that the real cost of using services is evened out between income groups. If equal utilization is the goal, then that would also imply dismantling cultural barriers which prevent certain groups from making full use of available services. Equal treatment for equal needs is the ethical basis for doctors' clinical work. It follows the principle of horizontal equity that people with the same problems be treated in the same way. This is important but it does not illuminate decisions about vertical equity or how to treat unlikes. The most difficult issue is how to prioritize between groups with different health problems. (Reducing maternal mortality or a mental health problem, which is more important?)
- (e) *Treatment according to capacity to benefit*: this goes beyond needs to the question of whether someone is likely to benefit from treatment. It will depend both on the availability of effective technologies and the characteristics of the patient which make successful treatment likely or unlikely. But it is the definition favoured by economists as it links fairness with effectiveness and maximizes health gain. The assumption is that money would be spent on those with the greatest marginal capacity to benefit, moving down the scale until all health gains are exhausted or funds run out. However, in practice it is unlikely to be able to measure marginal capacity to benefit, and will have to exercise judgement in operating this rule. And this approach could appear harsh, if people who have less capacity to benefit are excluded from treatment. If someone is a smoker and less likely to benefit from an operation, should they be denied it? Or should invest in stopping them smoking thus increasing their capacity to benefit?

Among these proposed definitions of equity, the first three are arguably too egalitarian, not taking account of the differing needs and behavior of different people. Equal access according to need probably accords most closely with the common interpretation of equity. However, it provides little guidance on how to set priorities between groups with different needs. The last definition, is appealing in a theoretical sense, but may be hard to use in practice. In practice, equity concerns with available resources, infrastructure and health status.

2.2.2. Health Equity Analyses

Equity is one of three essential qualities of a system of health services, efficiency and effectiveness being the other two (Pan American Health Organization [PAHO] 1982). None of these concepts is simple to define or measure. However a number of simple indicators can be used to tell something about equity, even if there is no single measure of it. The two outstanding areas of measurements are equity as equality of treatment and financial measures of equity (Musgrove, 1986).

Health outcomes measurement is a basic building block for health equity analysis. But how can health be measured? Murray and Chen (1992) have proposed a classification of morbidity measures that distinguishes between self-perceived and observed measured.

Table 2.1 A classification of morbidity measures

Self perceived	
Symptoms and impairment	Occurrence of illness or specific symptoms over a defined time period
Functional disability	Assessment of ability to carry out specific functions and tasks or restrictions of normal activities (<i>Activities of Daily Living</i> -dressing, meal preparation or physical movements)
Handicap	Self perceived functional disability within a specifically defined context
Observed	
Physical and vital signs	Aspects of disease or pathology that can be detected by physical examination
Physiological & Pathophysiological indicators	Measures based on laboratory examinations (Blood, urine, feces, body fluids), body measurements (anthropometry)
Physical tests	Demonstrated ability to perform specific functions, both physical and mental (Running, squatting, blowing up a balloon or perform an intellectual task)
Clinical diagnosis	Assessment of health status by a trained health professional, based on an examination and possibly specific tests

Source: World Bank, Technical Notes for health equity analysis

Health equity analysis can also be concerned with health related behavior. That is the utilization of health services and payment for health services (World Bank, Technical Notes 20, 2002). Questions on these issues have been included in many surveys, although the level of details has varied considerably. But health related behavior extends beyond the merely utilization of health services. Other variables that merit attention in the analysis of health equities include behavior with an effect on health status (smoking, drinking, and diet), sexual practices and household level behaviors (cooking practices, waste disposal, sanitation, sources of water). In general, health equity analyses and relevant data can be summarized as follows:

Table 2.2 Health equity analyses and data needs

	a	b	c	d	e	f	g
Health outcome measurement	■		■				
Equity in utilization		■	■				
Multivariate analysis	■	■		■			■
Benefit incidence analysis		■	■		■		■
Health financing							
o Progressivity							
o Catastrophic payments				■		■	
o Poverty impact							

Source: World Bank, Technical Notes for health equity analysis 20

a: Health Variables

b: Utilization Variables

c: Living Standard Measures (Ordinal)

d: Living Standard Measures (Cardinal)

e: Unit Subsidies

f: User payments

g: Background Variables

2.3. Financial measurements of health equity

Equity or fairness in health financing comprises the financial protection function of health systems, catastrophic health care costs and the impoverishment associated with health care outlays. Two distinct strands of thinking are evident in this aspect. One is based on egalitarian

notions of equity and its concept is that payments for health care ought to be linked not to usage of health services but rather to ability to pay, and the concern is with the degree of inequality in one or other variable. The other focuses on minimum standards. Here, the concern is not with inequality in any variable but rather with a variable exceeding or falling short of a threshold. There are at least two minimum standard approaches. One approach sets the threshold in terms of proportionality of income and ensuring that households do not spend more than some prespecified fraction of their income (usually called z) on health care and spending in excess of this threshold is labeled "catastrophic". The logic behind that approach is to ensure that households have at least $(1-z)$ of their income to spend on things other than health care. The other minimum standard approach sets the minimum in terms of the absolute level of income. The concern here is to ensure that spending on health care does not push households into poverty or further into it if they already there. These catastrophic and impoverishment aspects of minimum standard approaches are fundamentally different neither is absolutely right the choice between them must be made on normative and ideological grounds (Wagstaff & van Doorslaer, 2001).

Wagstaff and van Doorslaer (2001) compared egalitarian concepts of fairness in health care payments (agnostic approach) and minimum standard approaches by using data on out-of-pocket health spending in Vietnam in 1993 and 1998. For both set of approaches, they develop indices and show how these can be quantified. They found that out-of-pocket payments had a smaller disequalizing effect on income distribution in 1998 than 1993, whether income is measured as prepayment income or as ability to pay. The authors find that the incidence and intensity of catastrophic payments- in terms of both prepayment income and ability to pay- declined between 1993 and 1998, and that both the incidence and the intensity of catastrophe became less concentrated among the poor. They used the catastrophic threshold of 2.5%, 5%, 10% and 15% of pre-payment income. In 1993, the incidence of catastrophic health care payments were 60.97%, 38.19%, 18.40% and 9.26% in threshold level of 2.5%, 5%, 10% and 15% respectively and in 1998, the incidence reduced up to 55.47%, 33.02%, 14.20% and 7.73% respectively for each threshold level. The incidence and intensity of poverty impact out-of-pocket payments diminished over the period and was due primarily to poor people becoming even poorer rather than non-poor becoming poor. However they did nothing on health service

utilization. Any assessment of the fairness of a health care system requires looking not just at what people pay for health services but also at how much they use services. In other words, health care payments and health service utilization are both key focal variables whose distributions have to be examined in any assessment of the fairness of a health care system. In their paper, their focus is exclusively on equity in health care payments, not equity in health care utilization and sheds light on only one of these two equity issues.

2.4. Catastrophic health care payments

Among agnostic approach and minimum standard approach of financial measurements for equity, minimum standard approach is easy to understand as well as quantified. World Bank adopted this approach in its technical notes on quantitative techniques of health equity analysis and developed a methodology for catastrophic health care payments focusing on the incidence & intensity of catastrophic health care payment and catastrophic impact with some statistical tools (World Bank, Technical Notes No.18).

Xu and Evans et al. (2002) conducted a study on catastrophic health care costs: "household catastrophic health care expenditure: a multi-country analysis". In this study, they used data of different surveys from 59 countries: Argentina to Zambia. They defined catastrophic health care payments as "Households reduce their basic expenditures over a certain period of time in order to cope with the medical bills of one or more of their members". And they agreed that there is still no consensus on catastrophic threshold. For their study, they developed catastrophic threshold that is equal or above 40% of household's capacity to pay and household's capacity to pay is defined as effective income net of subsistence spending. Subsistence spending here is defined as the average equivalized food expenditure of households whose food share of total household expenditure is within the 45th and 55th percentile (Food share based poverty line). They also developed two hypotheses in terms of system level and individual household level (Uganda, Indonesia and Lebanon) to estimate catastrophic health care payments. For system level, they used double logarithmic multivariate ordinary least squares (OLS) regression and for individual household level, logistic regression methods. Later their method is adopted by World Health Organization and became WHO methodology for catastrophic health care payments. In this paper, they focus only on catastrophic health care

costs and did not take into account either distribution of payments within household or impoverishment. They found that the proportion of households facing catastrophic payments from out-of-pocket health expenses varied widely between countries (less than 0.01% in Czech Republic and Slovakia to 10.5% in Vietnam). Catastrophic spending rates were highest in some countries in transition, and in certain Latin American Countries. And the authors identified three key preconditions for catastrophic payments as;

- 1) the availability of health services requiring payment,
- 2) low capacity to pay and
- 3) the lack of prepayment or health insurance.

Table 2.3 Household catastrophic health care expenditure: South Asian and South-East Asian Region

Country	Survey name & Year	Sample Size	Proportion of household with catastrophic health expenditure
Bangladesh	Household expenditure survey 1995/96	7420	1.21 %
Cambodia	Cambodia socioeconomic survey 1999	6000	5.02 %
Indonesia	National socioeconomic survey 1999	61328	1.26 %
Philippines	Family income & expenditure survey 1997	39520	0.78 %
Sri Lanka	Household income & expenditure survey 1995/96	19631	1.25 %
Thailand	Thailand socioeconomic survey 1998	24977	0.80 %
Vietnam	household budget survey 1998	13638	10.45 %

Note: Catastrophic threshold is equal or above 40% of household's capacity to pay

Source: Xu et al. (2002), Household catastrophic health expenditure: a multi-country analysis

Equitap organization also pays attention on health equity analysis. Working papers on catastrophic health care payments from Equitap has been found. Van Doorslaer et al. (2005) identified the catastrophic and poverty impact of paying out-of-pocket for health care in fourteen Asian countries accounting for 81% of the Asian population. They measured catastrophic impact by the incidence and intensity of high shares of out-of-pocket payments in both total spending and in non-food expenditure and poverty impact by comparing poverty headcounts and gaps before and after OOP health payments. The results show that in most low and middle-income countries, the better-off are more likely to spend a large fraction of total households' income on health care, but in some countries, there are no exemptions of the poor from charges, the poor are as likely to incur catastrophic payments. They also found that despite the concentration of catastrophic payments on the better-off in the majority of low-income countries, OOP payments still push many Asians further into poverty and 2.7% of total population is pushed below extreme poverty. In this paper, they used the minimum standard approaches for both catastrophic and poverty impact.

O' Donnell et al. (2005) identified sources of variation across households in the incidence of catastrophic expenditures on health care in six Asian countries (Bangladesh, Hong Kong, India, Sri Lanka, Thailand and Vietnam) that differ in income levels, degree of reliance on OOP financing and the incidence of catastrophic payments. They defined catastrophic payments as OOP expenditures on health care in excess of a given share of the total household budget and concentrate on 10% threshold. The percentage of households exceeding this threshold varies from 3% in Sri Lanka, 3.5% in Thailand, almost 6% in Hong Kong, almost 11% in India and more than 15% in Bangladesh and Vietnam. Probit analysis is used to examine how the probability of medical expenditures exceeding the 10% catastrophic threshold varies with household characteristics. They found that except in India and Sri Lanka, larger households are more likely to incur catastrophic payments. The incidence is higher in rural areas and lower among households with a sanitary toilet and safe drinking water. Household total consumption is positively correlated with the incidence of catastrophic payments and households finance health payments from savings, borrowing and assets sales resulting in a rise both in total household expenditure and its health care share.

Tangcharoensathien, Limwattananon and Prakongsai (2005) developed a paper on “equity in financing health care: impact of universal access to healthcare in Thailand”. They used five different data sets of the national household survey in pre-universal health care coverage (UC) periods (2000 & 2001) and post UC periods (2002 & 2004) to analyze trends and patterns of the distribution of utilization and OOP payments for public health care in relation to the distribution of household living standards. Not only catastrophic and poverty impact but also they performed benefit incidence analysis. For catastrophic and poverty impact, they used the standardized methodology for minimum standard approach of Wagstaff & Doorslaer. The findings shown that the incidence of catastrophic health expenditure (with 10% threshold level of total household consumption expenditure) reduced from 5.4% in 2000 to 2.8% in 2004, respectively for all households but the catastrophe tended to be regressive against the poor households after UC policy was implemented.

Ranson (2002) stated that community-based health insurance schemes in India could protect poor households against the uncertain risk of medical expenses including people and households below the poverty line. Moreover, there is a trade off exists between maintaining the scheme’s financial viability and protecting members against catastrophic expenditures.



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CHAPTER III

BACKGROUND INFORMATIONS

3.1. General background of Myanmar

3.1.1. Location

Union of Myanmar is located in mainland South-East Asia with a total land area of 676,578 square kilometers (261,228 square miles). It stretches 2200 kilometers from north to south and 925 kilometers from east-west at its widest point. It is bounded on the north and north-east by the People's Republic of China, on the east and south-east by the Lao People's Democratic Republic, and the Kingdom of Thailand, on the west and south by the Bay of Bengal and Andaman Sea, on the west by the People's Republic of Bangladesh and the Republic of India. It lies between 09° 32' N and 28° 31' N latitudes and 92° 10' E and 101° 11' E longitudes.

3.1.2. Geography

Myanmar is divided administratively into 14 States and Divisions. It consists of 63 districts, 324 townships, 2689 wards, 13730 village tracts and 65003 villages. Myanmar falls into three well-marked natural divisions, the western hills, the central belt and the Shan plateau on the east, with a continuation of this high land in the Tanintharyi. Three parallel chains of mountain ranges from north to south divide the country into three river systems, the Ayeyarwaddy, Sittaung and Thanlwin. Myanmar is famous for her abundant natural resources but great diversity exists between the regions due to the rugged terrain in the hilly north which makes communication extremely difficult. In the southern plains and swampy marshlands there are numerous rivers and tributaries of these rivers criss-cross the land in many places.

3.1.3. Climate

Myanmar enjoys a tropical climate with three distinct seasons, the rainy, the cold and the hot season. The rainy season comes with the southwest monsoon, which lasts from mid-May to mid-October. Then the cold season follows from mid-October to mid-February. The hot season precedes rainy season and lasts from mid-February to mid-May.

3.1.4. Demography

The population of Myanmar in 2002 is officially estimated at 52.17 millions with growth rate of 2.02%. About 70% of the population resides in the rural areas, whereas the remaining are urban dwellers. The population density ranges from 390 per square kilometers in Yangon Division, where in lies the capital city, Yangon, to 10 per square kilometers in Chin State, the Western part of the country.

Table 3.1 Estimates of population and its structure (1980-2003)

Population/structure (in millions)	1980-81		1990-91		2000-01		2000-02		2002-03	
	Est.	%	Est.	%	Est.	%	Est.	%	Est.	%
0-14 years	13.03	38.77	14.70	36.05	16.43	32.77	16.73	32.71	17.05	32.68
15-59 years	18.44	54.86	23.47	57.55	29.72	59.29	30.33	59.31	30.92	59.27
≥ 60 years	2.14	6.37	2.61	6.40	3.98	7.94	4.08	7.98	4.20	8.05
Total	33.61	100	40.78	100	50.13	100	51.14	100	52.17	100
Female	16.93	50.37	20.57	50.44	25.22	50.31	25.72	50.29	26.23	50.28
Male	16.68	49.63	20.21	49.56	24.91	49.69	25.42	49.71	25.94	49.72
Sex ratio (M/100 F)	98.52		98.25		98.77		98.83		98.89	

Source: *Statistical Year Book 2002, Central Statistical Organization: CSO*

3.1.5. People and Religion

Myanmar is made up of 135 national groups speaking over 100 languages and dialects. The major ethnic groups are Kachin, Kayah, Kayin, Chin, Bamar, Mon, Rakhine and Shan. 89.4% of the population is Buddhists and the rest are Christians, Muslims, Hindus and Animists.

3.1.6. Economy

Since it has a large land area rich in natural resources, agricultural sector can contribute to overall economic growth of the country. The government has accorded top priority to agricultural development as the base for all round development of the economy as well. Since the adoption of the market oriented economic policy, the government has carried out liberal economic reforms so that private sector will be able to participate extensively in economic activities.

Table 3.2 Gross Domestic Product (Kyats in millions)

GDP	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
Current	604729	791980	1119509	1609776	2190320	2552733
Real at 85-86 prices	66742	71042	75123	79460	88157	100275
Growth %	6.9	6.4	5.7	5.8	10.9	13.7
Per capita	1492	1559	1619	1650	1794	2000

Source: Statistical Year Book, 2002

3.1.7. Social Development

Development of social sector has kept pace with economic development. Expansion of schools and institutes of higher education has been considerable especially in the States and Divisions. Adult literacy rate for the year 1999-2000 was 91% with 91.4% for male and 90.6% for female.

3.2. Health Care System in Myanmar

Myanmar health care system evolves with changing political and administrative system and relative roles played by the key providers are also changing although the Ministry of Health remains the major provider of health care. It has a pluralistic mix of public and private system both in financing and provision. Health care is organized and provided by public and private providers. Ministry of Health is the main organization of health care provision. Some ministries are also providing health care, mainly curative, for their employees and their families. They include Ministries of Defense, Railways, Mines, Industry I & II, Energy, Home and Transport and Labor.

The private, for profit sector is mainly providing ambulatory care though some providing institutional care has been developed in major cities. Funding and provision of care is fragmented. They are regulated in conformity with the provisions of the Myanmar Medical Council Law.

Table 3.3 Selected Indicators of Myanmar (2003)

Population estimates	
Indicator	Value
Total population (000)	49,485
Annual population growth rate (%), 1993 to 2003	1.5
Dependency ratio (per 100)	58
Percentage of population aged 60+ years	7.0
Total fertility rate	2.8
Health indicators	
Indicator	Value
Life expectancy at birth (years)	
Total population	59.0
Males	56.0
Females	63.0
Child mortality (probability of dying under age 5 years) (per 1000)	
Males	117
Females	93
Adult mortality (probability of dying between 15 and 59) (per 1000)	
Males	337
Females	222
Healthy life expectancy at birth (years)	
Total population	51.7
Males	49.9
Females	53.5
Healthy life expectancy at age 60 (years)	
Males at age 60	10.1
Females at age 60	11.3
Expectation of lost healthy years at birth due to poor health (years)	
Males	6.3
Females	8.4
Percentage of total life expectancy lost due to poor health (%)	
Males	11.2
Females	13.5

Source: WHO/ Country profiles/Myanmar

3.3. Health Care expenditures in Myanmar

Health care in Myanmar has developed into two tier systems, a sophisticated and expensive hospital care system in urban areas, and a network of primary health care (PHC) centers that complement the hospital system and offer basic, preventive services to low income families in both urban and rural areas. Public, not for profit, health care sector and private, for profit, sectors are the two main health care delivery sectors in Myanmar (Ministry of Health: MOH 2004). Health Care Financing System in Myanmar is public-private mix system. Official Data stated that public health care expenditure has increased on both current and capital yearly. Total public health expenditure increased from kyat 464.1 million in 1988-89 to kyat 18741.7 million in 2002-03. The total national health expenditure is equivalent to 2.5% of GDP for the year 2001-2002.

Table 3.4 Estimation of National Health Expenditure (2001-2002) of Myanmar

No	Source	Amount (Millions Kyats)	Percent
1	Government	11957.5	13.6
2	Social security	313.5	0.36
3	Community contribution	475.0	0.54
4	Private households	64483.4	73.4
5	International aids	10624.5	12.1

Source: MOH, 2004

It is obvious that major source of health expenditure is private expenditure. Private health expenditure comprises the outlays of insurers and third-party payers other than social security, mandated employer health services and other enterprise provided health services, non-profit institutions and non-governmental organizations financed health care, private investments in medical care facilities and household out-of-pocket spending. 99% of private expenditure is out of pocket expenditure in Myanmar (WHO, 2005). Since majority of health expenditure is out of pocket, it may assume that households will face potential financial distress and economic burden of low-income families suffering from catastrophic illnesses.

Table 3.5 Selected National Health Accounts in Myanmar

	1998	1999	2000	2001	2002
Total expenditure (% of GDP)	1.8	1.8	2.2	2.1	2.2
% Total expenditure on health (Public Expenditure)	10.6	11	13.7	12.5	18.5
Private expenditure (% GDP)	89.4	89	86.3	87.5	81.5
% of total government expenditure	0.7	0.8	1.2	1.3	2.3
External source	1.2	3.9	1.9	1.9	1
Social security expenditure	1.6	2.1	2	3.4	1.2
Out of pocket expenditure (% of private expenditure)	99.7	99.8	99.7	99.7	99.0
Private prepaid plans (% of private expenditure)	0	0	0	0	0

Source: World Health Organization. *World Health Report, 2005*

Table 3.6 Selected national health accounts indicators in Myanmar 2002

Selected national health accounts indicators	
Indicator	Value
Per capita GDP in international dollars	1,384
Total health expenditure	
Total expenditure on health as % of GDP	2.2
Per capita total expenditure on health at average exchange rate (US\$)	315
Per capita total expenditure on health in international dollars	30
Public health expenditure	
General Government expenditure on health as % of total expenditure on health	18.5
General Government expenditure on health as % of total general government expenditure	2.3
Per capita government expenditure on health at average exchange rate (US\$)	58
Per capita government expenditure on health in international dollars	6
Sources of public health expenditure	
Social security expenditure on health as % of general government expenditure on health	1.2
External resources for health as % of total expenditure on health	1.0
Private health expenditure	
Private expenditure on health as % of total expenditure on health	81.5
Sources of private health expenditure	
Prepaid plans as % of private expenditure on health	.0
Out-of-pocket expenditure on health as % of private expenditure on health	99.7

Source: WHO/Country Profiles/Myanmar

Figure 3.1 Private expenditure on health as percentage of total expenditure on health, 1998-2002 in Myanmar (Source: WHO, Countries profiles, Myanmar)

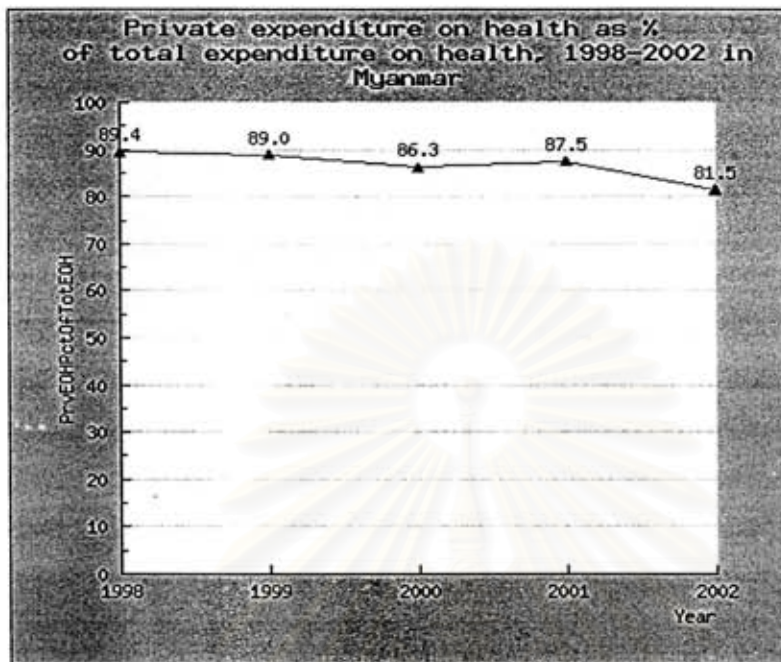
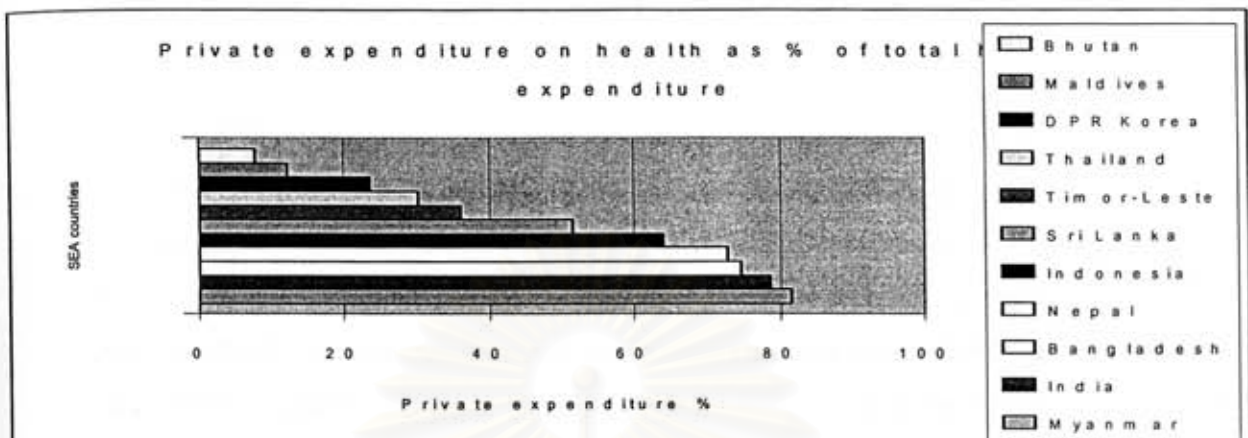


Figure 3.2 Out-of-pocket expenditure on health as percentage of private expenditure on health, 1998-2002 in Myanmar (WHO, Countries profiles, Myanmar)



Figure 3.3 Private health expenditure (Myanmar Vs Other SEA RO countries)

Source: WHO/Country profiles/Myanmar

Table 3.7 Private expenditure on health as percentage of total health expenditure

Country	Ordered by private expenditure (% of total expenditure)
Myanmar	81.5
India	78.7
Bangladesh	74.8
Nepal	72.8
Indonesia	64
Sri Lanka	51.3
Timor-Leste	36.1
Thailand	30.3
DPR Korea	23.4
Maldives	12.3
Bhutan	7.8

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CHAPTER IV

RESEARCH METHODOLOGY

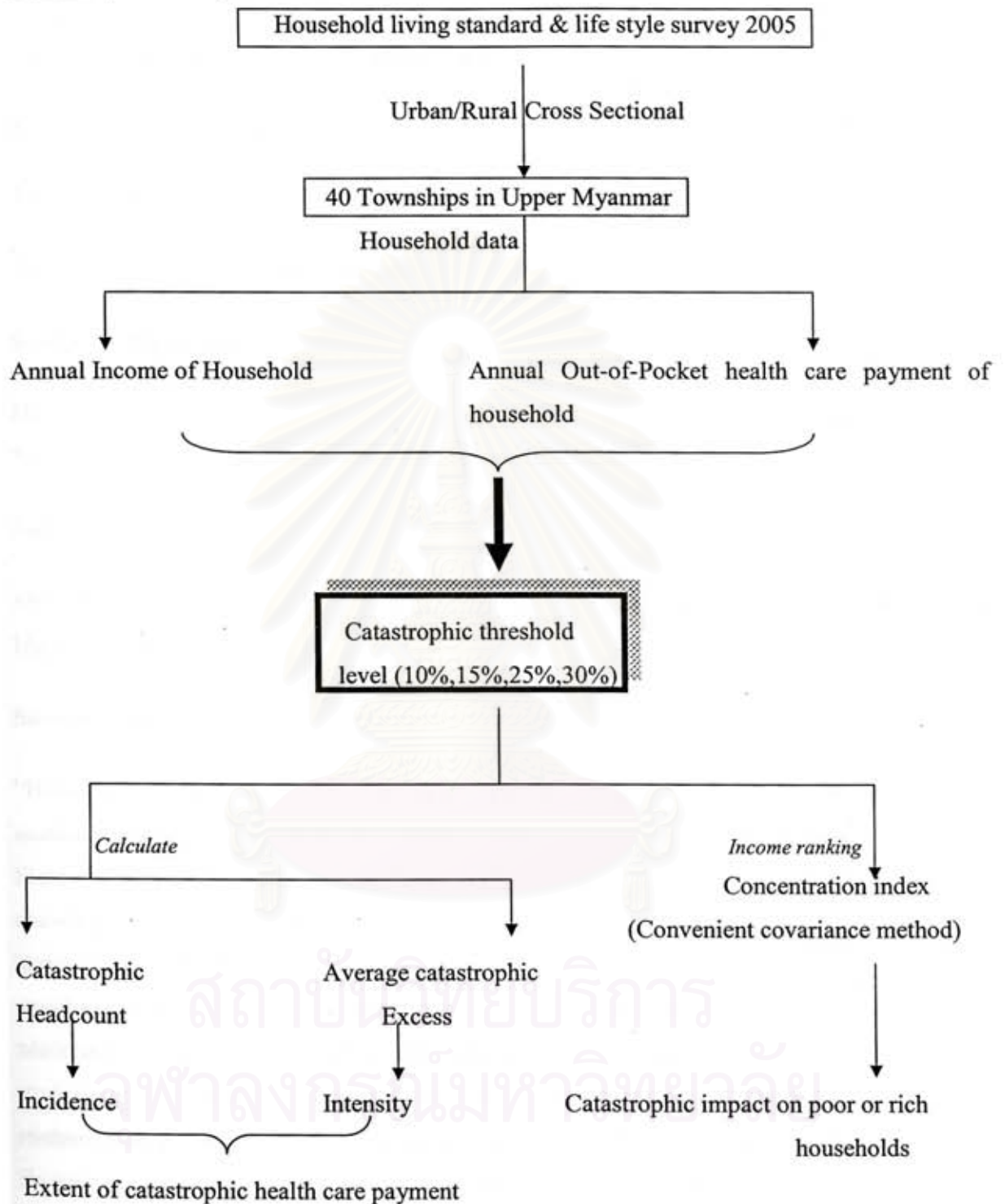
4.1 Conceptual framework

Household living standard and life style survey conducted by department of preventive and social medicine, University of Medicine, Mandalay during 2005 will be used in this study. This data set includes household data from 8800 households residing in both urban and rural areas of 40 townships in Upper Myanmar. Among those data, households' annual average income data and households' annual out-of-pocket health care payment data will be selected. Four defined catastrophic threshold levels of 10, 15, 25 and 30 per cent of households' annual average income will be set up. To measure the extent of catastrophic health care payment, incidence and intensity of catastrophic health care payment will be calculated. To justify the catastrophic impact matters more for poor or rich households, concentration index by convenient covariance method will be used.



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Figure 4.1 conceptual framework



4.2. Study design

This study is a cross-sectional descriptive study.

4.3. Population and sample

Target population

All households reside in Upper Myanmar.

Sampling Population

Households reside in both urban and rural areas of 40 townships in Mandalay, Sagaing, Magway divisions and Shan state in Upper Myanmar.

Sample

8800 households live in urban and rural settings of 40 townships in 3 divisions and 1 state in Upper Myanmar

Sampling Design

“Household Living Standard & Life Style Survey” is the survey conducted by final year medical students of University of Medicine, Mandalay, during their three weeks Residential Field Training program. This survey included 11 sections: Socio-economic, tobacco use, betel chewing, alcohol drinking, diet, physical activity, health care access and health care expenditure, reproduction, family planning, personal hygiene and roles of women. Pre-structured questionnaire was prepared and pre-tested by Department of Preventive and Social Medicine, University of Medicine, Mandalay. It is compulsory for all final year medical students to participate. Students were divided into 40 groups and each group contained 12-15 students with a group leader and a supervisor (teaching staff from University of Medicine).

To achieve maximum precision in the estimates within a given sample size and to avoid bias in the selection of the sample, this survey based on huge sample size. Sampling design is primarily based on random/probability sampling technique with three stages.

Stage 1: Selection of states and divisions: there are 4 states and 3 divisions in Upper Myanmar. Among them 1 state and 3 divisions were selected by the fishbowl draw method. The fishbowl draw method is one of the most common methods of drawing a random sample. If the total population is small, it is an easy procedure to number each element using separate slips of paper for each element, put all the slips into a box, and then picks them out one by one without looking, until the number of slips selected equals the sample size decided upon (Kumar, 1996).

Stage 2: Selection of townships: out of 79 townships in selected state and divisions, 40 townships are picked up by students' group leaders by the fishbowl draw method.

Stage 3: Selection of households: each student group was assigned to interview 100 households in urban area and 100 in rural area of their townships. Teaching staffs from Department of Preventive and Social Medicine trained the student groups and supervisors about the sampling techniques emphasizing on simple random sampling by using random number table. The procedure for selecting a sample using a table of random numbers is as follows:

- 1) Identify the total number of elements in the study population.
- 2) Number each elements starting from 1.
- 3) If the table for random number is on more than one page, choose the starting page by a random procedure. Again, select a column or row that will be the starting point with a random procedure and proceed from there in a predetermined direction.
- 4) Corresponding to the number of digits to which the total population runs, select the same number, randomly, of columns or rows of digits from the table.
- 5) Decide on the sample size.
- 6) Select the required number of elements for the sample from the table. If the same number is selected twice, discard it and go to the next. This can happen as the table for random numbers is generated by sampling with replacement.

However, in this survey, sample size is predetermined (200 households for each township). And there is no way to know whether the interviewers strictly followed the rules of simple random sampling procedure of data collection in 40 townships. This may become a problem in processing and analysis of data.

Types of information

Section I: socio-economic data and section VII: health care access and health care expenditure data of “Household Socio-economic and Life Style Survey” contained the relevant data for this study and will be used.

4.4. Data Collection

- Household survey conducted by final year medical students during their 3 weeks residential field training practice in April 2005
- Personal interview by using pre-structured interview questionnaires constructed by departmental staffs and pre-tested during community medicine training of interns at superb Mandalay

4.5. Hypothesis

The extent of household catastrophic health care payment in Upper Myanmar is higher than other countries in the South East Asia Region and catastrophic impact matters more for the poor households.



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4.6. Methods of Data Analysis

Data

Income (X)

The heads (In-charge/ responsible person) of each household were target persons to be interviewed. He/ she was asked about

- Occupation (In specific words)
- Work status of other household members
- Wages and salaries if members are employees for wages
- Firm and business profits if members are self-employed. In Rural setting, farm profits and income are included in this section.
- Informal income if present. In Myanmar, many households have informal income especially in government and private employees. In the interview questionnaire, informal income was income from lottery, gambling, tips and presents in money terms.

Then, average household income earned for the whole year was asked and calculated. However, all categories of income generating resources were expressed in monetary term. Non-monetary part of income was excluded in this survey. Since household income is the denominator for calculating the incidence of catastrophic health care payment, and without non-monetary income, the incidence of catastrophic health care payment can be overestimated. To avoid this problem, the higher threshold level for catastrophic health care payment will be used in this study. Usually, in the literature, catastrophic threshold is 2.5%, 5%, 10% and 15% of household income and sometimes 5%, 10%, 15% and 25% (Wagstaff & Doorslaer, 2003 and O' Donnell, 2005). In this study, the catastrophic threshold will be 10%, 15%, 25% and 30% of household average income.

Out-of-pocket health care payments (T)

To get data for household out-of-pocket health care payments, each household representative person (head of the household) was asked about

- Any illness of the member in the household during last 12 months

- Treatment and its cost for that illness
- Number of hospitalization and its costs during last 12 months
- Number of consultation with general practitioner/basic health staffs and their costs
- Out-of-pocket payment for public health activities (immunization, chemoprophylaxis, environmental health etc.)

Then,

X = pre-payment income (household annual income)

T = Out-of-pocket health care payments within 1 year

Z_{cat} = Threshold level for catastrophic health care payment

a. Measuring the incidence and intensity of catastrophic health care payments

Incidence of catastrophic health care payment

Let $E_i = 1$ if $T_i/X_i > Z_{cat}$ and $E_i = 0$ if $T_i/X_i < Z_{cat}$

($Z_{cat} = 10\%$, 15% , 25% and 30% of household annual income)

It represents the fraction of the sample whose expenditures as a proportion of their income exceed the threshold Z_{cat} . This is the *catastrophic payment headcount* (H_{cat})

$$(1) \quad H_{cat} = \frac{1}{N} \sum_{i=1}^N E_i \times 100 = \mu_E$$

Where

N = Sample size

μ_E = the mean of E_i

It can be interpreted as how many percentage of household exceed the catastrophic payment threshold (Z_{cat}) of 10%, 15%, 25% and 30% levels.

Intensity of catastrophic health care payment

By analogy with the poverty literature, one could define not just a catastrophic payment headcount but also a measure analogous to the poverty gap, known as the *catastrophic payment gap or excess*. This captures the height by which payment as a proportion of income exceed the threshold Z_{cat} . If $E_i=1$, let O_i be the catastrophic overshoot, equal to $T_i/X_i - Z_{cat}$ in percentage.

$$\text{If } E_i = 1 \text{ then } O_i = 100 \left[\frac{T_i}{X_i} - Z_{cat} \right]$$

$$\text{If } E_i = 0 \text{ then } O_i = 0$$

Dividing this by the sample size, then average excess or G_{cat} will be obtained. This will capture the height by which payments as a proportion of income exceed the threshold Z_{cat} . Thus we can measure the intensity or severity of catastrophic payment by defining the average gap or excess of catastrophic payment as

$$(2) \quad G_{cat} = \frac{1}{N} \sum_{i=1}^N O_i = \mu_o$$

Where

μ_o = the mean of O_i

N = sample size

The mean positive gap (MPG)

The mean positive gap (MPG) is the ratio between catastrophic headcount measures (H_{cat}) and catastrophic gap measures (G_{cat}). It is defined as the average catastrophic gap or excess divided by average catastrophic headcount and is expressed by percentage. If MPG is decreasing with the level of thresholds, it may be due to increase in denominator (H_{cat}) or decrease in numerator (G_{cat}) and the reverse is true for increasing MPG.

$$(3) \quad MPG_{cat} = G_{cat}/H_{cat} = \mu_o / \mu_E$$

**b. Measures that reflect that catastrophic costs matter more for the poor or rich
(Measuring catastrophic impact sensitive to income rank)**

Incidence and intensity of household catastrophic health care payments can't indicate whether it is poor or better-off individuals who exceed the threshold. This can be done by catastrophic impact sensitive to income rank (how the proportions of those exceeding the threshold vary across the income distribution). To measure this, concentration index approach will be used. Concentration index for Headcount (C_E) and concentration index for Overshoot or gap (C_O) for each catastrophic threshold level will be calculated and interpreted.

Indices for measuring health inequalities

Equity in health is one of the basic values of a good health system. Equity can be measured by identification of inequities in health. However, inequities can not be identified directly and inequalities in health should be identified first. The fundamental difference between inequities and inequalities resides in the fact that inequities represent inequalities that are considered and qualified as unjust and avoidable. As a result, measuring health inequalities represents the first step towards the identification of inequities in health (PAHO, 2001).

There exists a wide variety of indicators for the magnitude of inequalities in health. Among them, the Gini Coefficient and the Concentration Index, has been taken from the field of economics and applied to the study of health inequalities.

The Gini coefficient is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable with the uniform distribution that represents equality. This equality distribution is represented by a diagonal line, and the greater the deviations of the Lorenz curve from this line, the greater the inequality. When applying this index to health variables, the cumulative proportion of the population is generally shown on the X axis, and the cumulative proportion of the health variable on the Y axis. The greater the distance from the diagonal line, the greater the inequality. There are different methods to calculate the Gini, which corresponds to twice the area between the Lorenz curve and the diagonal and the simple formula was provided by Brown (1994) (Appendix I).

The value of Gini Coefficient ranges from 0 (perfect equality) to 1 (total inequality). However, Gini coefficient and Lorenz Curve approach do not take into account the socioeconomic group. So it can not measure the direction and the strength of the association between socioeconomic level and health and is not a valid indicator (Thio' 1996).

Concentration index

There are generally two approaches to get concentration index.

1. Concentration curve and concentration index approach (grouped data)
2. Concentration Index by convenient covariance method (micro-data)

1. Concentration curve and concentration index

If the population or geographical units are ordered by socioeconomic status (e.g. income ranking), and not by a health variable, one can include the socioeconomic dimension in the analysis. The concentration curve and concentration index are calculated by the same logic as the Lorenz curve and the Gini coefficient, but incorporating the social dimension.

In order to provide a framework for inequality comparison, a set of properties which should be satisfied by an inequality measure is proposed in the form of axioms by Kakwani (1980). An inequality measure should satisfy axiom S (Scale Independence), axiom A (Addition), axiom P (Proportionate growth) and axiom T (Transfer) (Sarntisart, 1993). Concentration index does not satisfy all above axioms. However, concentration index meets the necessary requirements for the measurement of the inequalities in health. PAHO (2001) described that good indicators of inequality should

- 1) reflect the socioeconomic dimension of inequalities in the health field
- 2) use information on the entire population and
- 3) be sensitive to changes in the distribution and size of the population across socioeconomic groups.

For grouped data case, one must construct a concentration curve first. It is almost the same method as the construction of Lorenz curve but the population (sample) is ordered by socioeconomic status and not following a health variable. The concentration curve plots the

cumulative percentage of household catastrophic health care payments (y- axis) against the cumulative percentage of the sample, ranked by living standard (income ranking), beginning with the poorest, and ending with the richest (x-axis). So, the concentration curve can show the cumulative percentage of catastrophic health care payments accruing to the poorest p% of the sample. If, every household, irrespective of their income, has exactly the same value of catastrophic health care payment, the concentration curve will be a 45° line, running from the bottom left-hand corner to the top right-hand corner. This line is called the line of equality. If, household catastrophic health care payments take higher values amongst poor people, the concentration curve will lie above the line of equality and if household catastrophic health care payments take higher values amongst rich people, the concentration curve will lie below the line of equality. The further the curve is above the line of equality, the more concentrated the health variable is amongst the poor (World Bank, Technical Notes 6, 2002). Then the concentration index, which is defined as twice the area between a concentration curve and a line of perfect equality can be calculated by Brown's formula (Brown 1994) or Kakwani's formula (Kakwani 1997) (Appendix II).

Unfortunately in this study, the available data are micro-data (household data) and concentration curve is extremely difficult to construct because of the nature of health variable (Catastrophic Health Care Payment). Even if the cumulative percentage of sample ranked by socio-economic status (or income) is possible (x-axis), cumulative percentage of household catastrophic health care payment (Headcount or Gap) is difficult (y-axis) because not all the household are exposed to illness and there is no reason for out-of-pocket health care payment for every household in the sample. Therefore, neither of Brown's formula or Kakwani's formula can be used to calculate concentration index in this study.

2. Concentration Index by Convenient Covariance Method

Concentration index of a variable 'y' can be computed by using a simple convenient covariance formula as follows (Lerman and Yitzhaki, 1989).

Convenient covariance formula

$$C = \frac{2}{y} \sum_{i=1}^n (y_i - \bar{y}) (R_i - R^m)$$

$$= \frac{2 \text{cov} (y_i, R_i)}{\mu}$$

$$(4) \quad C = 2 \text{cov} (y_i, R_i) / \mu$$

Where-

C = Concentration Index

y_i = Health Variable whose inequality is being measured [In this study, y_i will be E_i and O_i respectively to calculate concentration index for headcount measures (C_E) and gap measures (C_O)]

\bar{y} = sample mean of y

R_i = i th individual's (household's) relative fractional rank in the income distribution (cumulative probability distribution)

$\text{Cov} (y_i, R_i)$ = covariance between y_i and R_i

In practice, to find R_i , household data must be sorted by ascending order of income and divided by sample size (n). So the household with least annual income (poorest) will be almost 0 and the richest household will be 1. Therefore, the value of R_i ranges between 0 and 1. SPSS command for calculating covariance is shown in appendix III.

Interpretations

The value of concentration index is between -1 and +1. If the value of concentration index is 0, there is no income-related inequality. The values close to 0 imply very little income related inequality. Negative values means that poorer units have more adverse health events than would be expected under conditions of equality and positive values means richer units have more adverse health events (PAHO, 2001). Concentration index for headcount measures (C_E) and gap measures (C_O) can be interpreted as above. If C_E and C_O is exactly zero, it can be said that there is no income-related inequality of catastrophic headcount and overshoot. Positive C_E and C_O values will indicate a greater tendency for the better-off to exceed the payment threshold and to overshoot. Similarly, negative C_E and C_O values mean the greater tendency for the poor to exceed the payment threshold and to overshoot.

Weighted version

A difficulty is that the headcount, μ_E and the concentration index C_E could move in different directions over time. Or the former (μ_E) might be higher in worse-off than better-off, but the latter (C_E) might be lower in worse-off than better-off. In such circumstances, it would be useful to have an index trading off the two dimensions. By constructing a weighted version of the headcount that takes into account whether it is mostly poor people who exceed the threshold or better-off people. It should be done by weighting the variable indicating whether the household has exceeded the threshold E_i , by the individual's rank in the income distribution. Let r_i denote household i 's absolute rank. This is equal to 1 for household 1, 2 for household 2, and N for household N . Then define

$$(5) \quad w_i = 2 \left(\frac{N+1-r_i}{N} \right)$$

Thus w_i is equal to 2 for the most disadvantaged person, declines by $2/N$ for each one person step up through the income distribution, and reaches $2/N$ for the least disadvantaged person. Thus the difference in w_i between the most disadvantaged person and the second most

disadvantaged person is the same as the difference between the second most advantaged person and the most advantaged person. If we weight the E_i by the w_i , we get:

$$(6) \quad W_{cat}^E = 1/N \sum_{i=1}^N w_i E_i$$

Substituting Equation (5) in (6), the expanding gives

$$W_{Cat}^E = 1/N \sum_{i=1}^N 2 \left(\frac{N+1-r_i}{N} \right) E_i$$

Since $r_i/N = R_i$

$$\begin{aligned} W_{Cat}^E &= 2/N \sum_{i=1}^N \left(\frac{N+1-R_i}{N} \right) E_i \\ &= 2/N \sum_{i=1}^N \left(\frac{N+1}{N} - \frac{R_i}{N} \right) E_i \\ &= 2/N \sum_{i=1}^N \left(1 + \frac{1}{N} - R_i \right) E_i \\ &= 2/N \sum_{i=1}^N E_i + \frac{2}{N^2} \sum_{i=1}^N E_i - 2/N \sum_{i=1}^N R_i E_i \end{aligned}$$

For large sample size (N), $\frac{2}{N^2} \sum_{i=1}^N E_i \rightarrow 0$

$$= 2/N \sum_{i=1}^N E_i - 2/N \sum_{i=1}^N R_i E_i$$

$$(7) \quad W_{Cat}^E = 2/N \sum_{i=1}^N E_i - 2/N \sum_{i=1}^N R_i E_i$$

R_i is the household's relative fractional rank (Ranging from 0 to 1). This equation can be simplified. The first term is equal to $2 H_{cat}$ ($2 \mu_{cat}^E$). The second can be simplified by using the following expression for the concentration index given in Kakwani et al. (Kakwani, Wagstaff and van Doorslaer, 1997).

$$(8) C_{\text{Cat}}^E = \frac{2}{N\mu_{\text{cat}}^E} \sum_{i=1}^N R_i E_i - 1$$

So that the second term in equation (7) is equal to $(C_{\text{Cat}}^E + 1) \mu_{\text{cat}}^E$

Substituting equation (8) in second term of equation (7),

$$W_{\text{Cat}}^E = 2 \mu_{\text{cat}}^E - [(C_{\text{Cat}}^E + 1) \mu_{\text{cat}}^E]$$

$$W_{\text{Cat}}^E = \mu_{\text{cat}}^E [2 - C_{\text{Cat}}^E - 1]$$

$$W_{\text{Cat}}^E = \mu_{\text{cat}}^E [1 - C_{\text{Cat}}^E]$$

Therefore,

$$(9) \quad W_{\text{cat}}^E = \mu_E \cdot (1 - C_E)$$

Thus we can modify the catastrophic payments headcount by weighting the dummy status indicator, E_i by the person's rank in the income distribution, giving larger weights to poorer people. The weighting scheme chosen results in an attractive and simple summary measure that is simply the catastrophic payment headcount multiplied by the complement of the concentration index.

If those who exceed the threshold tend to be poor, the concentration index C_E will be negative, and this will raise W_{cat}^E above μ_E . Thus the catastrophic payment problem is worse than it appears simply by looking at the fraction of the population exceeding the threshold, since it overlooks the fact that it tends to be the poor who exceed the threshold. By contrast, if it is better-off individuals who tend to exceed the threshold, C_E will be positive and μ_E will overstate the problem of the catastrophic payments as measured by W_{cat}^E .

We can apply the same logic to the catastrophic payment excess. We define a concentration index for the overshoot variable, O_i , which we denote by C_o . Then we can define an analogue of W_{cat}^E , which can be shown to be equal to:

$$(10) \quad W_{\text{cat}}^G = \mu_o \cdot (1 - C_o)$$

A tendency for large excesses to be concentrated among poorer individuals results in a negative value of C_o , which will raise W_{cat}^G above μ_o – the excess payment problem is worse than it appears simply by looking at the mean catastrophic payment excess, since this overlooks the fact that the large catastrophic payments are concentrated among the worse off. By contrast, if it is the better-off individuals who have the largest excesses, C_o will be positive and μ_o will overstate the severity of the catastrophic payment problem as measured by W_{cat}^G .

Weighted version for Headcount measures and Gap measures can be calculated after getting means (μ_E & μ_o) and concentration indices (C_E & C_o) using equation (9) and (10).



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CHAPTER V

ANALYSIS, RESULTS AND DISCUSSIONS

Analysis is based on secondary source information on households' socio-economic status and health care access in Upper Myanmar collected by the Department of Preventive and Social Medicine for the year 2005. This survey was chosen because this is the latest available large household survey with a sample of more than eight thousand households.

The results will be described in four sections: Descriptive statistics of the sample, incidence and intensity of catastrophic health care payments, measurement of catastrophic impact that matters more for poor or rich households and rank weighted version of catastrophic health care payments followed by subsequent discussions.

5.1. Descriptive Statistics

There are approximately 8800 households where almost cent percent (99.4%) possessed the relevant data. 50 per cent households (44 thousands) belonged to urban areas and the rest belonged to rural areas. The heads of each household were target persons to be interviewed. The age of the respondent ranged from 15-49 years and the mean age is 34.45 year.

Educational level of the respondents revealed that 5% of them are illiterates. More than 60% completed elementary and middle school levels of education and only 12% of respondents are exposed to higher education where less than half of this group is college graduates (Table 5.1 and figure 5.1). In general, overall households' education status is very low.

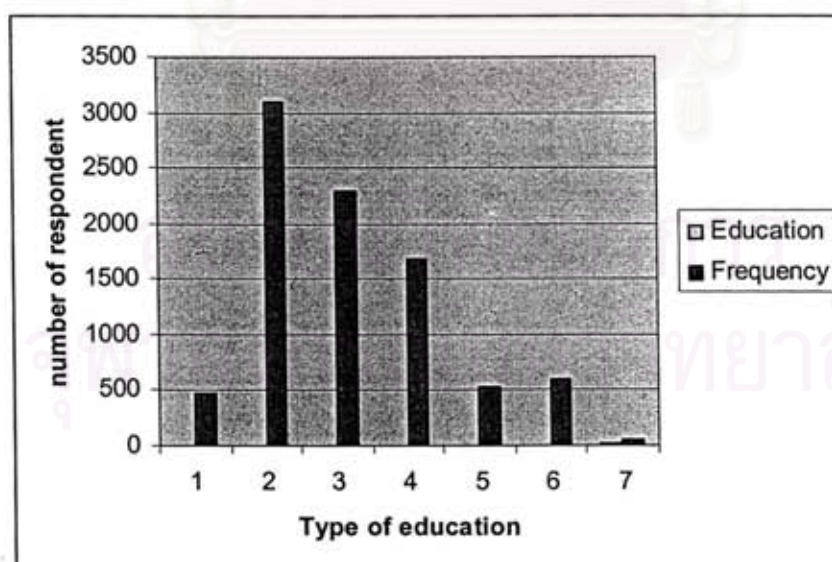
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Table 5.1 Frequency distribution of the education of the respondents

Education	Frequency	Percent
1	467	5.3
2	3101	35.5
3	2287	26.2
4	1684	19.3
5	530	6.1
6	601	6.9
7	60	0.7
Total	8730	100.0

Education levels

1. No schooling
2. Grades 1 through 4 (Elementary)
3. Grades 5 through 8 (Middle school)
4. Grade 9 or 10 (High school graduate)
5. College 1 to 3 yrs (Some college / technical school)
6. College 4 years or more (College graduate)
7. Refused

Figure: 5.1. Frequency distribution of education of the respondents

Union of Myanmar is made up of 135 national groups. The major ethnic groups are Bamar, Kachin, Kayah, Kayin, Chin, Mon, Rakhine and Shan. Since this study was conducted in Central and Upper parts of Myanmar where Bamar ethnicity is concentrated most, more than 90% of the respondents are Bamar and other ethnic groups account for less than 10%. According to national figure 89.4% of the population is Buddhists and the rests are Christians, Muslims, Hindus and Animists. In this study 96% of the sample is Buddhists.

Nearly 80 per cent of respondents' occupations are private, self employed works including small and marginal farmers and home-make small businesses. Most of the people from these households depend on physical manual labor. Only 5.3% of respondents are government employee and 2.2% are unemployed respondents (Table and figure 5.2).

By asking the respondent about household members' money income, households' average annual income was estimated by combination of individual household members' money income. Mean average annual income of the households is 377632.47 Kyats (56195 US\$) with the range of 800 Kyats (119 US\$) to 9.9 Million Kyats (1.4 Million US\$)¹.

Mean household size is 4.56 in both urban and rural areas (Table 5.3). There is very small proportion (approximately 6%) of female headed households.

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¹ Official Exchange Rate 1 US \$= 6.72 Kyats

Table 5.2 Frequency distribution of occupation of the respondents

Occupation	Frequency	Percent
1	990	11.3
2	4113	46.8
3	24	0.3
4	149	1.7
5	41	0.5
6	2908	33.1
7	63	0.7
8	32	0.4
9	468	5.3
Total	8788	100.0

Type of Occupation

1. *Employed for wages (Private Company etc.)*
2. *Private, self employed including farmers*
3. *Non paid*
4. *Unemployed (Able to work)*
5. *Unemployed (Unable to work)*
6. *Homemaker*
7. *Student*
8. *Retired*
9. *Government employed*

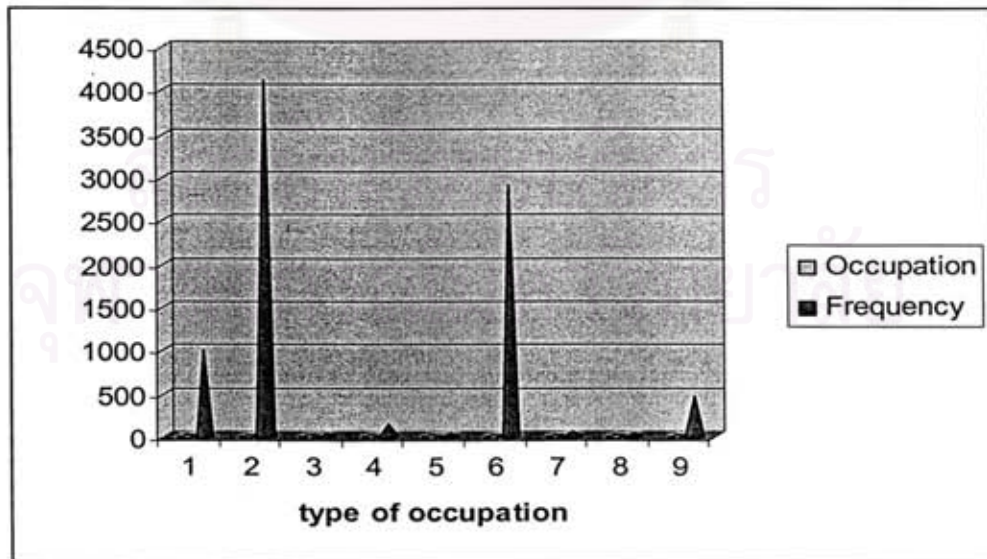
Figure: 5.2 Frequency distribution of occupation of the respondents

Table 5.3 Frequency distribution of number of household members

Household members	Frequency	Percent
1	21	0.2
2	1162	13.2
3	1633	18.6
4	2065	23.5
5	1601	18.2
6	1059	12.1
7	574	6.5
8	333	3.8
9	137	1.6
10	92	1.0
11	46	0.5
12	31	0.4
13	15	0.2
14	4	0.0
15	6	0.1
16	1	0.0
18	1	0.0
20	1	0.0
42	1	0.0
Total	8786	100.0

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5.2. Incidence and Intensity of catastrophic health care payments

Approximately 60 per cent households do not report OOP expenditure for health. 38.7% of the sample had health expenditure that is entirely Out-of-Pocket (Table 5.4). All these expenditures referred to costs of treatment for one or more of their household members. It includes costs of hospitalization, surgical operations, consultations, drug and transportation. 0.8 per cent households reported that they could not afford for health care although there were some illnesses in their households. 2.4 per cent had been suffered disease specific morbidity and mortality in one of their family member but they could not treat it and out-of-pocket health care expenditure is nil. But it is not clear that whether they could not afford to pay for health care or lack of health care access in these households (Table 5.5).

Table 5.4 Frequency distribution of households in term of expenditure for health

Expenditure for health	Number of households	Percent
OOP presents	3378	38.65
OOP absents	5363	61.35
Total	8741	100

Table 5.5 Frequency distribution of OOP absented households with health problems

Condition	Number of households	Percent of sample
Illness present but can not afford	69	0.8
Illness present but no OOP	211	2.4
Total	280	3.2

5.2.1. Incidence of catastrophic health care payments (Catastrophic Head Counts: H_{cat})

Incidence or head count of catastrophic health care payment has been defined as percentage of households spending more than certain threshold of percentage share of OOP to total annual household income. It was calculated by using the following formula;

$$H_{cat} = 1/N \sum_{i=1}^N E_i = \mu_E \quad (E_i = 1 \text{ if } T_i/X_i > Z_{cat} \text{ and } E_i = 0 \text{ if } T_i/X_i < Z_{cat})$$

In this study, 'T' is defined as OOP health payments within 12 months and 'X' as total annual household income, 'T/X' is defined as the "Share of OOP Payments" to total annual household income (X) of a household. Then, the households who represents the fraction of the sample whose expenditures as a proportion of their income exceed the 4 catastrophic thresholds of 10%, 15%, 25% and 30% (Catastrophic Headcounts) were calculated.

8.11% of total population in Upper Myanmar spends more than 10% of their income on OOP health care payments. Proportions of household spending more than 15%, 25% and 30% of total income are more than 6, 4 and 3 per cent respectively. Even at the highest defined threshold of 30%, the catastrophic headcount is more than 3 per cent or approximately 330 households (Table 5.6).

Table 5.6 Incidence of household catastrophic health care payments (H_{cat})

Households	10% threshold level	15% threshold level	25% threshold level	30% threshold level
Frequency	709	576	383	334
Sample size	8741	8741	8741	8741
Percent	8.11	6.59	4.38	3.82

709 households fall into the category of households making OOP payments greater than 10% of total household income. 10% is the lowest defined threshold in this study. The households those exceed the defined thresholds of 15%, 25% and 30% already exceed 10% threshold.

129 households not only exceeded all defined catastrophic threshold levels, but also their OOP are equivalent to and even more than their total annual income. This group should call *outlier group*. OOP payments of this group range from 100 per cent to as much as 2000 per cent (20 times) of total household income (Table 5.7).

Table 5.7 Frequency distribution of households with OOP payments exceeding all defined catastrophic thresholds (Outlier households)

OOP as % of income	Frequency of households	Percent
100- 199	91	70.6
200- 299	18	13.9
300- 399	7	5.4
400- 499	4	3.1
500- 799	4	3.1
800- 999	2	1.6
1000-2000	3	2.3
Total	129	100

These outliers accounts for 18%, 23%, 34% and 39% of households those exceeded 10%, 15%, 25% and 30% catastrophic threshold levels respectively (Table 5.8).

Table 5.8 Percentage of outlier households among catastrophic households

Households	10% threshold level	15% threshold level	25% threshold level	30% threshold level
Frequency	709	576	383	334
Outliers	129	129	129	129
Percent	18.2	22.4	33.7	38.6

There are some household characteristics associated with probability of a household exceeding catastrophic threshold. In order to estimate direction and magnitude of various household characteristics affecting probability of catastrophic payments, not only demographic variables but also economic and social variables needed. Moreover using dummy for households making catastrophic payment as independent variable, household characteristics as regressors and probit regression can explain “who is likely to incur OOP and cross the catastrophic payment?” Further, in order to know relative importance of different independent variables elasticity of probability of making OOP payments with respect to household characteristics must be

calculated. In this study, households' economic and social variables are not available and such type of analysis is beyond the scope.

However some households' characteristics such as 1) location 2) household size 3) education 4) occupation 5) availability of health care access and 6) type of regular health care provider of the households can be described in terms of simple frequency distribution tables. Descriptive statistics is followed by simple OLS estimation in order to know the impact of household characteristics on catastrophic payment. The distributions of those variables among catastrophic households (exceeding 10% catastrophic threshold) and among outliers are as follows.

Location of the households means whether the households resided in urban or rural areas. Both groups (catastrophic households and outliers) revealed that urban dwellers suffered a little bit more than rural residents (Table 5.9). However urban- rural variation is not so significant since the sample was collected equal number of households from urban and rural areas.

Table 5.9 Frequency distribution of catastrophic households and outlier households according to location

Location	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
Urban	382	53.88	67	51.94
Rural	327	46.12	62	48.06
Total	709	100	129	100

Mean household size of catastrophic households and that of outlier households are 4.85 and 5.1 respectively where mean household size of the sample is 4.56. It revealed that the average household size progressively increased with degree of OOP payment (Table 5.10).

Table 5.10 Frequency distribution of number of household members of catastrophic and outlier households

Number	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
1	3	0.42	0	0
2	74	10.44	10	7.75
3	125	17.63	19	14.73
4	151	21.3	31	24.03
5	127	17.91	29	22.48
6	101	14.25	17	13.18
7	48	6.77	6	4.65
8	40	5.64	7	5.43
9	21	2.97	5	3.87
10	7	0.99	2	1.55
11	3	0.42	0	0
12	5	0.70	0	0
13	1	0.14	1	0.78
14	1	0.14	0	0
15	2	0.28	2	1.55
Total	709	100	129	100

The two extremes of education level, illiterate and college graduated respondents among the sample households, catastrophic households and outlier households are both increased progressively. Illiterate respondents among the sample, catastrophic households exceeding 10% catastrophic threshold and outlier households are 5.3%, 6.2% and 6.98% where graduated respondents among three groups are 6.9, 8.6 and 9.3 per cent respectively (Table 5.11).

Table 5.11 Frequency distribution of the level of education of respondents of catastrophic households and outlier households

Level of education	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
1	44	6.2	9	6.98
2	240	33.8	44	34.11
3	193	27.2	29	22.48
4	114	16.1	25	19.37
5	44	6.2	7	5.43
6	61	8.6	12	9.31
7	13	1.9	3	2.32
Total	709	100	129	100

Level of education

- 1 No schooling
- 2 Grades 1 through 4 (Elementary)
- 3 Grades 5 through 8 (Middle school)
- 4 Grade 9 or 10 (High school graduate)
- 5 College 1 to 3 yrs (Some college / technical school)
- 6 College 4 years or more (College graduate)
- 7 Refused

About 80% of the respondents' occupations are private and home made small business depends mainly on physical manual labor. Unemployed respondents accounts for 2.82% in the catastrophic households and 3% in outlier households where overall unemployed respondent of the sample is only 2.2% (Table 5.12).

Table 5.12 Frequency distribution of respondents' occupation of catastrophic households and outliers

Type of occupation	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
1	80	11.28	12	9.30
2	358	50.49	64	49.61
3	0	0	0	0
4	17	2.4	3	2.33
5	3	0.42	1	0.78
6	215	30.32	44	34.10
7	5	0.71	1	0.78
8	3	0.42	1	0.78
9	28	3.95	3	2.32
Total	709	100	129	100

Type of occupation

1. *Employed for wages (Private Company etc.)*
2. *Private, self employed including farmers*
3. *Non paid*
4. *Unemployed (Able to work)*
5. *Unemployed (Unable to work)*
6. *Homemaker*
7. *Student*
8. *Retired*
9. *Government employed*

Health care access of the households refers to availability of a household for organized health care either in the form of hospital, dispensaries, health centers or private general practitioners. The respondents had been asked that “do you have access to organized health care either in the form of hospital, dispensaries, health centers and other health provider including general practitioners?” The responses were collected as 1) yes 2) no 7) don't know or not sure and 9) refused. Over 90 per cent of respondents in both catastrophic and outlier households claimed that they have an organized health care access. Being accessible to health care can be a background for catastrophic payment because if there is no health care access, no one can pay for health care even if they are affordable (Table 5.13).

Table 5.13 Frequency distribution of catastrophic households and outlier households according to health care access

Health care access	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
Yes	666	93.94	125	96.9
No	22	3.1	3	2.3
Don't know	20	2.82	1	0.8
Refused	1	0.14	0	0
Total	709	100	129	100

Health care access depends on health care provider. Availability of health care access means whether the various types of health care providers are available for the households. Most frequently used health care providers of the households are collected as 1) general doctors or specialists 2) health assistance or public health supervisor 3) nurse or midwife 4) auxiliary midwife 5) community health workers 6) quacks 7) traditional medical practitioner 8) don't know 9) refuse. 49.9 per cent of catastrophic households as well as 54.3 per cent of outlier households expressed their regular health care provider as medical doctor. This can be interpreted as these households resided in urban areas. Basic Health Staffs served as regular health care provider in 48.9 per cent of catastrophic households and 44.9 per cent of outlier households respectively. Those groups belonged to rural areas where there is scarcity of medical doctors. 6.3 per cent of the former households and 7.7 per cent of the latter used quacks as their regular health care provider although they are un-registered and disqualified medical practitioners without proper medical knowledge (Table 5.14).

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Table 5.14 Frequency distribution of catastrophic households and outlier households according to type of health care provider

Type of provider	Catastrophic households		Outlier households	
	Number	Percent	Number	Percent
Doctor	354	49.9	70	54.3
Health assistance	59	8.4	12	9.3
Nurse/ midwife	102	14.3	14	10.8
Auxillary midwife	6	0.8	1	0.8
Community health workers	125	17.7	20	15.5
Quacks	45	6.3	10	7.7
Traditional medical practitioner	5	0.7	1	0.8
Don't know	9	1.4	1	0.8
Refuse	4	0.5	0	0
Total	709	100	129	100

Apart from using probit regression, an alternative approach is to estimate a linear regression of the OOP budget share and compute partial effects on the probability of exceeding the 10% threshold from the estimated coefficients. By using simple OLS regression, dependent variable is the amount of OOP that exceed 10% threshold (OOP 10%) and regressing this on various households' characteristics:

$$\text{OOP 10\%} = \alpha_0 + \alpha_1 H_1 + \alpha_2 H_2 + \alpha_3 H_3 + \alpha_4 H_4 + \alpha_5 H_5 + \alpha_6 H_6 + \alpha_7 H_7 + \alpha_8 H_8 + \alpha_9 H_9 + \alpha_{10} H_{10} + \alpha_{11} H_{11} + \alpha_{12} H_{12} + \epsilon$$
, where H_s are households' characteristics (Table 5.15).

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Table 5.15 Independent variables for OLS regression on OOP 10%

Independent variables	Households' characteristics	Interpretations
H1	Location	= 1 if urban = 0 if rural
H2	Age	Age of the respondents
H3	Education 1	= 1 if illiterate = 0 if literate
H4	Education 2	= 1 if graduate = 0 if not graduate
H5	Race	= 1 if Bamar = 0 if other ethnic groups
H6	Religion	= 1 if Buddhist = 0 if other religions
H7	Head	= 1 if male = 0 if female
H8	Occupation 1	= 1 if self employed manual labor and home making small businesses = 0 others
H9	Occupation 2	= 1 if employed for wages and government employee = 0 others
H10	Household size	Size of the households exceeding 10% threshold
H11	Health care access	= 1 if present = 0 if absent
H12	Health care provider	=1 if doctor = 0 if others

The results of OLS regression are as shown in the table 5.16.

Table 5.16 Probability of households exceeding 10% catastrophic thresholds from estimated coefficients with respect to households' characteristics

Dependent variable= households' OOP exceeding 10% threshold	Coefficient	Standard error	t-statistics	Probability
Independent variables				
H1	0.115360	0.067593	1.706677	0.0883
H2	0.006896	0.004257	1.619765	0.1057
H3	-0.203065	0.138855	-1.462428	0.1441
H4	0.172656	0.119746	1.441857	0.1498
H5	0.220094	0.161840	1.359947	0.1743
H6	-0.263088	0.190398	-1.381778	0.1675
H7	-0.241693	0.113850	-2.122901	0.0341*
H8	0.104300	0.201528	0.517543	0.6049
H9	-6.329957	0.201768	-31.37251	0.0000*
H10	0.006443	0.015671	0.411167	0.6811
H11	0.045389	0.141998	0.319646	0.7493
H12	0.076236	0.067845	1.123669	0.2615

* Significant

$R^2 = 0.593267$

Adjusted $R^2 = 0.586255$

Mean = 0.6875

Probability (F-statistics) = 0.0000

Among independent variables, female headed households are more likely to exceed 10% catastrophic threshold. If household members' occupations are private employees for wages and government employees, 10% catastrophic threshold is less likely to be exceeded. These are significant statistically. Households living in urban areas are more likely to cross 10% catastrophic threshold. Young headed households are less likely to be catastrophic than old headed ones. If the respondents are more educated, the probability of catastrophic health care payments is more likely. This is an anomaly. Moreover, Bamar ethnicity is more likely to

exceed catastrophic threshold. In contrary, catastrophic payment is less likely if household members' religion is Buddhist. Regarding occupation, households are more likely to exceed catastrophic threshold if household members' occupations are self employed manual labor and home making small businesses. Also, catastrophic threshold is more likely to exceed in households_ with more family members, with organized health care access and with regular health care provider as medical doctors. But these variables are not statistically significant.

Discussion

The incidence of catastrophic health care payments in Upper Myanmar is 8.11%, 6.59%, 4.38% and 3.82% of the sample for 10%, 15%, 25% and 30% catastrophic threshold levels respectively. The hypothesis in this study stated that the incidence of catastrophic health care payments in Upper Myanmar can be more than other South East Asia Countries. In compare to SEA countries in 10% threshold level, the incidence of Upper Myanmar is more than that of Sri Lanka (2.98%), Thailand (3.52%) and Hong Kong SAR (5.86%) but less than India (10.84%), Vietnam (15.11%) and Bangladesh (15.57%) (O' Donnell 2005). But in this study, to prevent overestimation of incidence of catastrophic health care payments due to constraints in income data collection, the threshold level is set to be higher than other studies.

Although the incidence decreases progressively when the thresholds increase, it is still 3.82% based on the highest threshold (30%). The reduction of incidence in Upper Myanmar is only about 5% from lowest to highest threshold. In compared with Vietnam, according to Wagstaff & Doorslaer (2001) the incidence of household catastrophic health care payments decreases from 60.97% for the 2.5% threshold level to 9.26% for the 15% threshold level, so the reduction is over 50% from lowest to highest threshold level.

One of the major reasons for decreased reduction rate of incidence from lower to higher threshold level is the presence of outliers. Outlier households exceeded all catastrophic threshold levels. Moreover significant proportion of outliers involved in every defined catastrophic threshold levels.

30% threshold level is set to be the highest threshold level for the incidence of catastrophic health care payment in Myanmar. According to household income and expenditure survey

conducted by the Central Statistical Organization (CSO) in 2001, 71.91% of household expenditure was for food and beverages and only 28.09% was for non-food (Statistical year book, 2003). So households those exceeds 30% catastrophic threshold level generally means that they can not save their income and all of their income are used up for health care and food only.

0.8 per cent of households in this study, although one of their family members was suffering severe disease, they could not treat him or her because they could not afford the cost of health care. Actually, this condition is worse than households with catastrophic health care payments because they had no capacity to pay for health care. In addition, health care access is one of the factors that can determine the incidence of catastrophic health care payment. Households without adequate and proper health care access can not pay for health care although they can afford and have willingness and ability to pay for health care. In addition, 211 households (2.4% of the sample) had been suffered disease specific morbidity and mortality in one of their family member but they could not treat it and out-of-pocket health care expenditure is nil. But it is not clear that whether they could not afford to pay for health care or lack of health care access in these households.



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5.2.2. Intensity of catastrophic health care payments (Catastrophic Gap: G_{cat})

Intensity or catastrophic gap is the average excess of the sample which payment as a proportion of income exceeds the catastrophic threshold. It was calculated by using the following formula;

$$G_{cat} = 1/N \sum_{i=1}^N O_i = \mu_o \text{ (If } E_i = 1 \text{ then } O_i = T_i/X_i \text{ (\%)} - Z_{cat} \text{ (\%)), If } E_i = 0 \text{ then } O_i = 0)$$

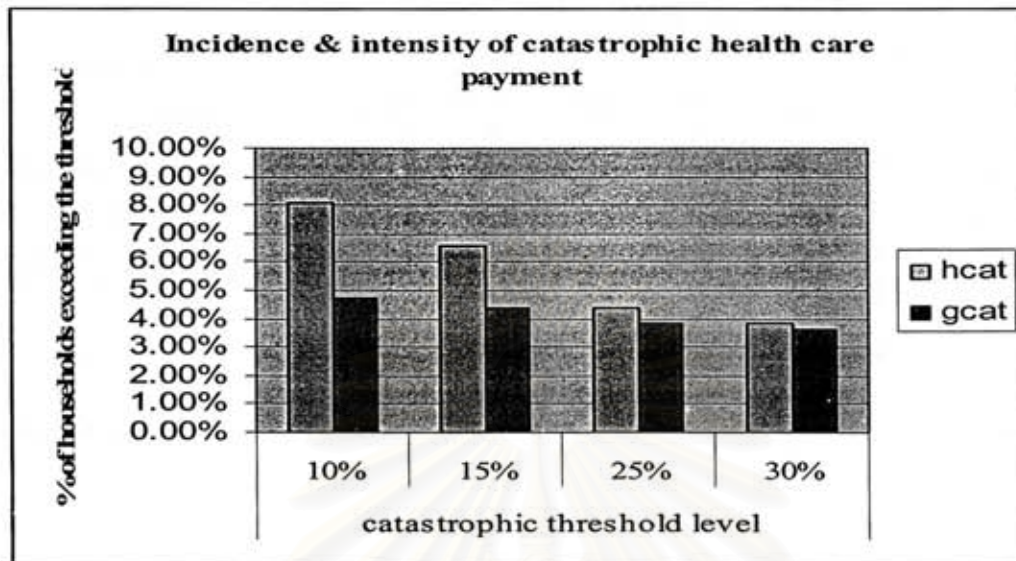
Then, OOP health care payments of the households as a proportion of their income exceeding the 4 catastrophic threshold levels were calculated and dividing those by the sample size resulting the average excess for 4 catastrophic threshold levels. It is also known as catastrophic payment excess or overshoot. Table 5.17 summarizes the intensity of catastrophic health care payments for 4 catastrophic threshold levels. The intensities are 4.76%, 4.39%, 3.84% and 3.63% at the threshold per cents of 10, 15, 25 and 30 respectively. The households exceeding 10 per cent catastrophic threshold spend 4.76% in excess of 10% of their income. It means they spend 14.76% of their income. The same is true for 15%, 25% and 30% thresholds where catastrophic households used up 19.4%, 28.8% and 33.6% of their income for health care respectively.

Table 5.17 Intensity of household catastrophic health care payments (G_{cat})

Intensity	10% threshold level	15% threshold level	25% threshold level	30% threshold level
G_{cat} (%)	4.76	4.39	3.84	3.63

Figure 5.3 shows the incidence and intensity of catastrophic health care payment in Upper Myanmar where intensity represents in excess of each defined threshold.

Figure: 5.3 Incidence and intensity of catastrophic health care payment



5.2.3. Mean Positive Gap

Mean Positive Gap (MPG) or Mean Positive Overshoot (MPO) reflects the mean Out-of-Pocket payments for health care in excess of the threshold over all households *exceeding the threshold*. It can be calculated by following formula;

$$\text{MPG} = G_{\text{cat}}/H_{\text{cat}} = \mu_O/\mu_E$$

Table 5.18 is the summary finding of Incidence, Intensity and Mean Positive Gap of households with catastrophic health care payments for 4 defined thresholds.

Table 5.18 Catastrophic impact of out-of-pocket payments

OOP health expenditure as % of total money income	Threshold level z			
	10%	15%	25%	30%
Headcount (H)	8.11%	6.59%	4.38%	3.82%
Mean Gap (G)	4.76%	4.39%	3.84%	3.63%
Mean Positive Gap	58.7%	66.6%	87.7%	95%

Discussion

The intensity or catastrophic gap or overshoot of catastrophic health care payments is the average percentage excess of health expenditure of households for each threshold level. In this study the intensities are 4.76%, 4.39%, 3.84% and 3.63% at 10%, 15%, 25% and 30% threshold levels, respectively. It is the highest range for intensity of catastrophic health care payments among similar studies. Wagstaff (2001) stated that in Vietnam, the average overshoot for 10% catastrophic threshold was 1.51% in 1993 and only 1.24% in 1998. Average overshoot for 15% catastrophic threshold was only 0.84% in 1993 & 0.71% in 1998. In compare to this, the average overshoot in Upper Myanmar is significantly high.

It is more obvious by the results of mean positive gaps (MPG). MPG reflects the mean out-of-pocket payments for health care in excess of the threshold over all households exceeding the threshold. By calculating MPG, one can know that the average percentage of out-of-pocket payment in excess of the threshold in terms of annual income among the households with catastrophic health care payment. Intensity reflects only the average degree by which households' payments as a proportion of total expenditure (income) exceed a given threshold of the sample. MPG is the indicator of mean overshoot among households with catastrophic health care payments. It amplifies the intensity of catastrophic health care payment problem. In this study, MPG at 10%, 15%, 25% and 30% threshold levels are 58.7%, 66.6%, 87.7% and 95% respectively. It means households which exceed 10% threshold level pay 68.7% of their income for health and those exceed 30% threshold spend 125% of their income for health. According to its formula, $MPG = G_{cat} / H_{cat}$, MPG is dominated by the incidence. Since the majority of the

sample do not incur catastrophic payments, the denominator is small and it is not surprising therefore, that MPGs are very large. In compare to other Asian countries at 10%, 15% & 25% threshold levels (Table 5.19), MPG in Upper Myanmar is highest.

Table 5.19 Mean Positive Gap of catastrophic OOP payments for health care among Asian Countries

Country	Catastrophic Thresholds		
	10%	15%	25%
Bangladesh	12.98%	14.15%	16.07%
China	10.12%	11.52%	12.38%
Hong Kong SAR	9.4%	11.08%	12.06%
India	8.49%	9.65%	11.03%
Indonesia	11.48%	13.09%	14.64%
Rep of Korea	11.23%	12.48%	13.94%
Kyrgyz Rep.	6.02%	6.71%	7.46%
Malaysia	8.58%	10.58%	13.15%
Nepal	10.85%	13.88%	20.59%
Philippines	10.81%	12.01%	12.68%
Sri Lanka	8.89%	10.41%	15.56%
Taiwan	7.46%	9.39%	11.79%
Thailand	9.39%	10.41%	9.05%
Vietnam	9.18%	9.58%	10.46%

Source: Paying out-of-pocket for health care in Asia: Catastrophic and poverty impact, Doorslaer et al 2005.

Again, the main reason behind this finding is the presence of outlier households. Among that outlier group, as much as 2000% of income was used up for health care. The presence of these outliers may be due to underestimation of household annual income. As described in chapter IV, this study was conducted by public health academic staffs from university of medicine and medical students. They are neither economists nor social scientists thus income estimation was not their expertise subject. Estimation of household annual income thus had some limitations. Asking only income of household members in money term, exclusion of non monetary part of

income, and possible existence of recall bias can underestimate the household income. Since income is the denominator for calculation of household out-of-pocket share for health care, underestimation of income may develop outliers. In addition, out-of-pocket health care payment within one year (numerator for OOP share for health care) can also be erroneous because of recall bias. But this can have positive and negative biases. Another possibility is that if a household can afford for health care as much as 20 times of their annual income, apart from dissolving their assets and borrowing, they may have other source of unreported earnings.

High intensity and large MPG can be a serious problem if the data are reliable. However, it should be noted that the data of similar study in other countries include non money income. Then, based on this, both intensity and MPG of Myanmar is overestimated. Thus, the actual difference between Upper Myanmar and other Asian countries may not be that much.

In this study, income data in the survey does not include non money income and it causes underestimation of households' annual average income. Moreover, the definition of money income in this study is not a completed one. In order to generate households' non money income, regression estimates that explain the non money income by money income from the North region of Thailand is used up (National Economic and Social Development Board/ Asian Development Bank, 2001). These households' non money income is assumed to be equivalent to those in Upper Myanmar and is incorporated into households' money income to generate households' total income. After that, incidence, intensity and MPG of Upper Myanmar are re-calculated. The results are as follows (Table 5.20)

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Estimates of the relationship between non money and money income in North region of Thailand

$$\text{Ln (non money income)} = 17.340 + 0.624 \text{ Ln (money income)}$$

Table 5.20 Catastrophic impact of out-of-pocket payments

OOP health expenditure as % of total money income	Threshold level z			
	10%	15%	25%	30%
Headcount (H)	8.11%	6.59%	4.38%	3.82%
Mean Gap (G)	4.76%	4.39%	3.84%	3.63%
Mean Positive Gap	58.7%	66.6%	87.7%	95%
OOP health expenditure as % of total income (money + non money)	Threshold level z			
	10%	15%	25%	30%
Headcount (H)	5.83%	4.06%	2.75%	2.29%
Mean Gap (G)	2.19%	1.95%	1.62%	1.49%
Mean Positive Gap (MPG)	37.56%	48.06%	58.77%	65.08%

Incidences, intensities and MPGs for all defined catastrophic threshold levels reduced significantly when non money income is incorporated into households' money income. So it is obvious that high intensities and MPG in Upper Myanmar is partly because of using money income alone which is not sufficient.

5.3. Catastrophic Impact sensitive to income rank

Catastrophic impact matters more for the poor or rich households is measured by calculation of concentration indices for headcount (C_E) and overshoot (C_O) for each catastrophic threshold level. Concentration index was calculated by using convenient covariance formula. There are altogether 4 C_E and 4 C_O for 10%, 15%, 25% and 30% catastrophic threshold levels. The results are presented in table 5.21 (Appendix IV).

Table 5.21 Concentration Indices for headcount and overshoot

Thresholds	10%	15%	25%	30%
C_E	- 0.001972	- 0.002124	- 0.002283	-0.002618
C_O	- 0.00504	- 0.00501	-0.00573	-0.00551

Discussion

Concentration index for head count measures (C_E) at 10%, 15%, 25% and 30% are – 0.001972, – 0.002124, – 0.002283 and – 0.002618 respectively. All concentration indices close to zero. It means that there is little income related inequality of incidence of catastrophic health care payment. However, negative values of concentration indices indicate a greater tendency for the worse-off to exceed the payment threshold.

The same is true for concentration index for gap measures (C_O). Concentration indices of – 0.00504, – 0.00501, – 0.00573 and – 0.00551 for 10%, 15%, 25% and 30% catastrophic threshold indicate that although there is very little income inequality among overshoot households, but the poorer households still pay more for health care.

5.4. Rank-weighted Version (W_{Cat}^E and W_{Cat}^G)

Rank- Weighted version of catastrophic headcount (W_{Cat}^E) and catastrophic overshoot (W_{Cat}^G) was calculated by using the formula $W = \mu \cdot (1 - C)$, where μ is the average headcount (μ_E) for W_{Cat}^E and average excess (μ_O) for W_{Cat}^G respectively. For 4 catastrophic threshold levels, there are altogether 4 W_{Cat}^E and 4 W_{Cat}^G (Table 5.22).

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Table 5.22 Rank-weighted incidence (Headcount) and intensity (or gap) of catastrophic out-of-pocket payments

OOP health expenditure as % of total expenditure per cap	Threshold level z			
	10%	15%	25%	30%
Rank weighted headcount (W^E)	8.13%	6.60%	4.39%	3.83%
Rank-weighted overshoot (W^G)	4.78%	4.41%	3.86%	3.65%

Table 5.23 summarizes the overall figure of catastrophic health care payment in Upper Myanmar. It includes incidence, intensity, mean positive gap, concentration indices and rank-weighted incidence and intensity for 10%, 15%, 25% and 30% catastrophic threshold levels.

Table 5.23 Incidence and intensity of catastrophic health care payments in Upper Myanmar

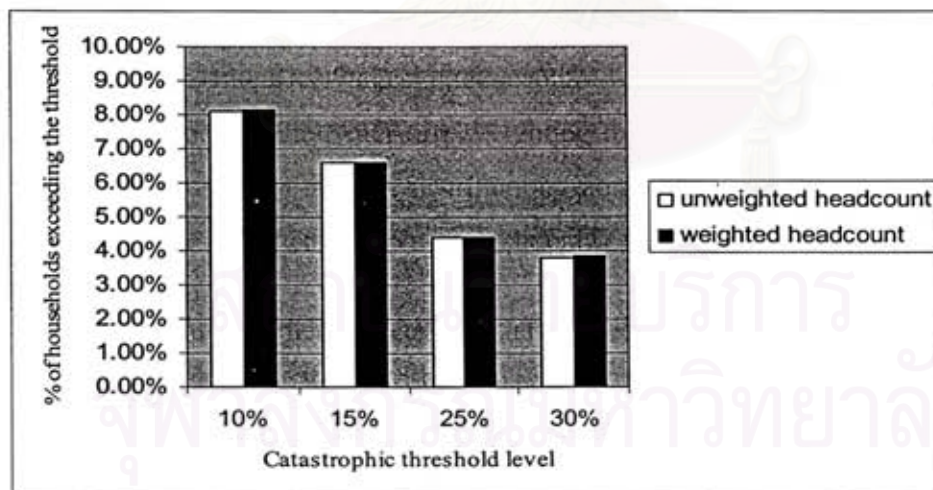
Z_{cat}	10%	15%	25%	30%
<i>Headcount measures</i>				
H_{cat}	8.11%	6.59%	4.38%	3.82%
C_E	-0.001972	-0.002124	-0.002283	-0.002618
W^E_{Cat}	8.13%	6.60%	4.39%	3.83%
<i>Gap measures</i>				
G_{cat}	4.76%	4.39%	3.84%	3.63%
MPG_{cat}	58.7%	66.6%	87.7%	95%
C_O	-0.00504	-0.00501	-0.00573	-0.00551
W^G_{Cat}	4.78%	4.41%	3.86%	3.65%

Weighted versions for headcount and overshoot measures of catastrophic health care payments are modifications of the unweighted catastrophic payments headcount and overshoot by weighting the dummy status indicators (E_i for headcount and O_i for overshoot) by the person's rank in the income distribution, giving *larger weights to poorer people*.

Constructing weighted version for level measures of catastrophic health care payments (Incidence and Intensity) takes into account whether the excess are concentrated mostly amongst the poor or the better-off. Weighting the excess indicator variable (E_i or O_i) by the individual's rank in the income distribution, rank dependent weighted indices for catastrophic headcount (W_{Cat}^E) and catastrophic overshoot (W_{Cat}^G) occurred.

Rank dependent weighted indices for catastrophic headcount (W_{Cat}^E) for each threshold levels are 8.27%, 6.73%, 4.48% and 3.92%. Those are greater than incidence of catastrophic health care payment (H_{cat}) (8.11%, 6.59%, 4.38% and 3.82%). By constructing W_{Cat}^E , the incidence is worse than it appears simply by looking at the unweighted mean catastrophic headcount (Figure 5.4).

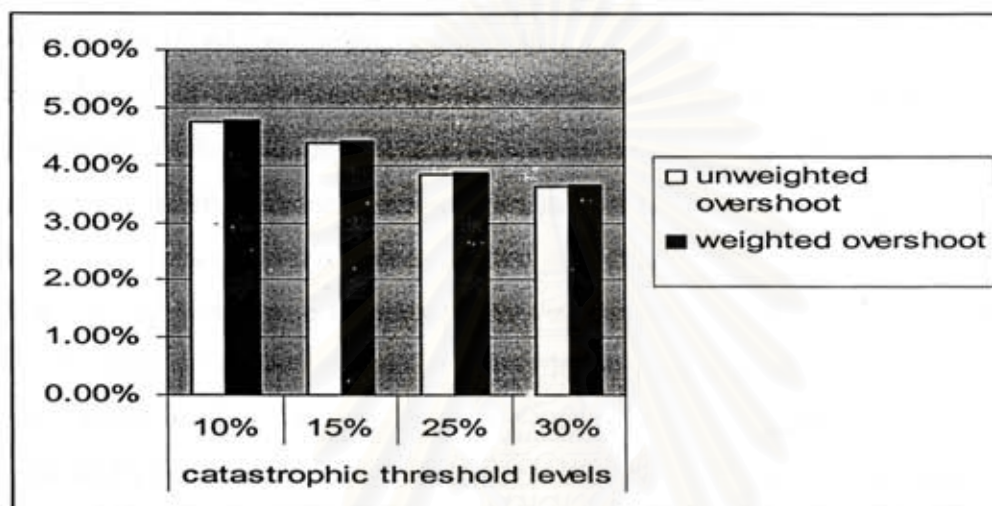
Figure: 5.4 Distribution of weighted and unweighted incidence of catastrophic health care payments



W_{Cat}^G for each catastrophic threshold levels are also greater than the intensity of catastrophic health care payments (G_{cat}). In the figure 5.5, W_{cat}^G rises above mean intensity at every

threshold level, it is clear that greater share of the catastrophic overshoots occurs amongst the poorer households. Then the excess payment problem is worse than it appears simply by looking at the mean catastrophic payment excess, since this overlooks the fact that the large catastrophic payments are concentrated among the worse-offs.

Figure 5.5 Distribution of weighted and unweighted intensity of catastrophic health care payments



But in this study, all concentration indices are although negative, all close to zero. Rank dependent weighted indices of incidence and intensity are not too much different from unweighted incidence and intensity because of small values of concentration indices.

CHAPTER VI

CONCLUSION, POLICY IMPLICATION AND RECOMMENDATION

6.1. Conclusion

Out-of-pocket payments are the principal means of financing health care throughout much of Asia where Myanmar is of no exception. According to WHO (2003), out of pocket payments account for 1/3 of total health care spending in 2/3 of all low-income countries. In Myanmar, the amount of out-of-pocket health care payment is well above this average. This has consequences for the utilization of health care and subsequently health. There are also potentially important consequences for household living standards. Households may be able to borrow to cover unexpected medical bills but at the risk of being trapped in long-term debt. As a result, opportunities to escape poverty through investments in human resources can be lost. Where there is a lack of access to credit, a characteristic of less-developed economies particularly binding for the financing of investments in health, medical expenses must be covered by the current household income and from wealth. Some households might be able to finance medical expenses from savings, by selling assets or by cutting back on expendable items of consumption. More severely economically constrained households may be forced to cut back on necessities and consequently pushed into or further into poverty. This might result in a vicious cycle of poverty from which it is difficult to escape in an already impoverished environment. Illness then presents a difficult choice between diverting a large fraction of household resources to cover the costs of treatment and forgoing treatment at the expense of health.

The threat that OOP payments pose to household living standards is increasingly recognized as a major consideration in the financing of health care. The extent to which such concern is justified depends upon the unpredictability of OOP payments, their magnitude relative to household resources and their distribution in relation to that of income.

The magnitude and distribution of OOP payments for health care can be examined by two minimal standard (threshold) approaches. The first minimal standard approach is catastrophic health care payment which was done in this study. The threshold is in terms of payments and

set as a proportion of pre-payment income. Payments resulting in households crossing the threshold are classified as “catastrophic”. In the second approach, the threshold is set in terms of post-payment income, in terms of a poverty line while payments resulting in households crossing the second threshold are classified as “impoverishing” that can not be done in this study.

By using the data from household living standard and life style survey in 2005, the study of catastrophic health care payment in Upper Myanmar is done. The results are categorized as 1) incidence and intensity of catastrophic health care payments in terms of 4 defined threshold levels 2) Impact of catastrophic health care payment matters more for poor or rich households by calculating concentration indices and 3) rank-weighted indices of incidence and intensity of catastrophic health care payments.

Incidence of catastrophic health care payment of Upper Myanmar is calculated by household catastrophic headcounts. Since the majority of the sample did not incur catastrophic payments, the incidence is not so high. But there may be under-reporting of health care payments and lack of health care access can lower the incidence than the level it should be. Although incidence is not high, the average overshoot and mean positive gap results implying an extremely high intensity of catastrophic health care payments in Upper Myanmar. As described above, there was an existence of outlier households those belonged to all 4 catastrophic threshold levels and used up all of their income and assets by health care payments. Underestimation of income may be the main possible underlying reason but if it is reliable, those figures indicate the alarming state. There is little income related inequality for OOP health care payments but the incidence and intensity of catastrophic health care payment become more concentrated among the poor households because of all negative concentration indices. The incidence of catastrophic health care payment in Upper Myanmar is more concentrated among the poor for all thresholds. More over the magnitude of the catastrophic overshoot is also more concentrated among the poor. Because all concentration indices are negative, the rank-weighted indices are higher than the ordinary headcount measures and gap measures.

6.2. Policy Implications and Recommendations

Policy Implications

In the light of foregoing discussion and conclusion, following policy implications can be identified.

- 1) In order to reduce financial burden of health care services especially in rural areas, rural health care services has to strengthen with special emphasis on making these services available to poor households free. It is of utmost importance that rural health center and sub-center must deliver effectively so that there should be less commuting from rural to urban areas in order to avail basic minimum health services.
- 2) Higher catastrophic impact for poor households is generally associated with foregoing initial formal treatment due to lack of purchasing power. It is warranted that poor households should be targeted for providing minimum health services.
- 3) Providing access to affordable health services can alleviate the financial burden of the households. Recently, there is an increasing focus on social health protection via health insurance as a potential promising way to better deal with health risks in developing countries. The organizational and financial arrangements of health systems play a critical role in improving health service access and protecting households from severe financial loss. In Myanmar, all populations are entitled to free primary health services from public facilities since 1978. In 1996, community cost sharing scheme was implemented for the essential drugs and hospital treatments but the poor are still entitled to free health care from public facilities in principle. But there is no uniform standard on whom, how much and what services are entitled for the poor. Although both pre-payment and OOP payments are expenditure made eventually by households, they are fundamentally different in financing health care. Pre- payment mechanisms improve equal access to services and protect households from financial loss while out-of-pocket payments can be a barrier for accessing health services and a heavy financial burden of ill health to a low income household. The analysis of catastrophic health care payments revealed that health care cost constitute a very high barrier to access health services for

households in need. In order to alleviate this situation, policy makers should consider some form of social health protection.

Recommendations for further studies

- 1) This study is the first study of catastrophic health care payments in Myanmar. The data used in this study were collected for the other purposes and were not specific for catastrophic health care payments. Also, study area focused on Upper Myanmar that is not nationally representative. Further studies of catastrophic health care payments should be done in Myanmar with more specific data and nationally representative surveys.
- 2) In order to know the trends of catastrophic health care payments, we have to do this type of studies in time series manner. By doing this, we can determine whether the payment problem is more or less intensified in the future.
- 3) The first step in health equity analysis is to identify appropriate data and to understand its potential and limitations. Although some data can be collected through routine information systems and population censuses, more detailed data are only available through surveys. Catastrophic health care payment is the study of health equity analysis in terms of health financing. It inevitably requires household surveys. There are an increasing number of multi-round integrated survey programs which are much better than *ad hoc* basis household surveys. Among them, *Living Standards Measurement Study* (LSMS) of World Bank and *Household Budget Surveys* (Sometimes called family expenditure surveys or expenditure and consumption surveys or income and expenditure surveys) are typical surveys for equity measurements in health financing. These surveys can collect all the data not only for catastrophic health care payments, but for progressivity and redistributive effect and poverty impact of out-of-pocket health care payments. So further studies in this field should follow the typical surveys for data collection.
- 4) Catastrophic health care payment is one of the two minimum standard or threshold approaches, both of which are built up around the notion that a focal variable ought not to exceed or fall short of a threshold. In the catastrophic health care payment, the threshold is in terms of payments and set as a proportion of pre-payment income. In the second approach, the threshold is set in terms of post-payment income, in terms of a poverty line.

Payments resulting in households crossing the first threshold are classified as *catastrophic* while payments resulting in households crossing the second threshold are classified as *impoverishing*. In this study, only the first approach can be done. The incidence and intensity of impoverishing impact should be done as a supplementary to catastrophic health care payments in order to accomplish the mission.

- 5) In order to know which characteristics are associated with the likelihood that a household will incur catastrophic health care payments (*determinants of catastrophic health care payments*), one must use data from household expenditure surveys that document not only OOP payments for health care but also all other items of expenditure, allowing the OOP budget share to be estimated with accuracy. More over, one can examine the sources of variation in the incidence of catastrophic payments by simply defining a dummy variable equal to one if OOP payments for health care exceed 10% of household budget and regressing this on covariates using probit. This should be done in the future.



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APPENDICES

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APPENDICES

APPENDIX I

Brown's formula for Gini coefficient and concentration index

$$G = 1 - \sum (Y_{i+1} + Y_i) (X_{i+1} - X_i)$$

Where

Y_i = the cumulative proportion of health variables of the group i

X_i = the cumulative proportion for the population of the group i



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APPENDIX II**Kakwani's formula for concentration index**

$$C = (p_1L_2 - p_2L_1) + (p_2L_3 - p_3L_2) + \dots + (p_{T-1}L_T - p_TL_{T-1})$$

Where

p = the cumulative percent of the sample ranked by socioeconomic status

L = the corresponding concentration curve ordinate

T = the number of socioeconomic group



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APPENDIX III

Computing concentration index by convenient covariance formula in SPSS

It can be computed easily by commanding SPSS syntax. If sample is not nationally representative, weights or expansion factors should be used. These weights indicate the number of people in the sample which each represents. If so, the commands should use sample weights (WT). But when the sample is sub-national, weights command is not necessary.

The following command (SPSS syntax) can generate concentration index for each catastrophic threshold level. All these commands need to be preceded by the WEIGHT option if the sample is weighted.

The fractional rank variable (R_i) can be computed by the RANK command. The CORRELATION command with the covariance option can be used to obtain the covariance between catastrophic health expenditure variable (E_i or O_i) and the fractional rank variable. The DESCRIPTIVES command can then be used to calculate the mean of catastrophic health expenditure variable (μ_E or μ_O).

The SPSS syntax below is for concentration index for catastrophic headcount (C_E)

```
RANK VARIABLES= inc (A) / RFRACTION into RNKINC / PRINT= YES / TIES= MEAN.
CORRELATIONS /VARIABLES= rinc hcat /STATISTICS XPROD / MISSING=PAIRWISE.
DESCRIPTIVES VARIABLES= hcat rinc /STATISTICS= MEAN.
```

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APPENDIX IV**Concentration Index for Headcount (C_E) at 10% threshold level**

Correlations

		RFRACTION of INC	HCAT10
RFRACTION of INC	Pearson Correlation	1	-.099
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	725.547	-68.373
	Covariance	.083	-.008
	N	8741	8741
HCAT10	Pearson Correlation	-.099	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-68.373	651.492
	Covariance	-.008	.075
	N	8741	8741

$$C_E H_{cat\ 10} = 2 \times (-0.008) / 8.11 = -0.001972$$

Concentration Index for Headcount (C_E) at 15% threshold level

Correlations

		HCAT15	RFRACTION of INC
HCAT15	Pearson Correlation	1	-.098
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	538.044	-61.316
	Covariance	.062	-.007
	N	8741	8741
RFRACTION of INC	Pearson Correlation	-.098	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-61.316	725.547
	Covariance	-.007	.083
	N	8741	8741

$$C_E H_{cat\ 15} = 2 \times (-0.007) / 6.59 = -0.002124$$

Concentration Index for Headcount (C_E) at 25% threshold level

Correlations

		HCAT25	RFRACTION of INCOME
HCAT25	Pearson Correlation	1	-.086
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	366.218	-44.584
	Covariance	.042	-.005
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.086	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-44.584	725.547
	Covariance	-.005	.083
	N	8741	8741

$$C_E H_{cat\ 25} = 2 \times (-0.005) / 4.38 = -0.002283$$

Concentration Index for Headcount (C_E) at 30% threshold level

Correlations

		HCAT30	RFRACTION of INCOME
HCAT30	Pearson Correlation	1	-.096
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	321.238	-46.263
	Covariance	.037	-.005
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.096	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-46.263	725.547
	Covariance	-.005	.083
	N	8741	8741

$$C_E H_{cat\ 30} = 2 \times (-0.005) / 3.82 = -0.002618$$

Concentration Index for Overshoot (C_O)

Concentration Index for Overshoot (C_O) at 10% threshold level

Correlations

		GCAT10	RFRACTION of INCOME
GCAT10	Pearson Correlation	1	-.096
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	1564.874	-101.784
	Covariance	.179	-.012
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.096	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-101.784	725.547
	Covariance	-.012	.083
	N	8741	8741

$$C_O G_{cat10} = 2 \times (-0.012) / 4.76 = -0.00504$$

Concentration Index for Overshoot (C_O) at 15% threshold level

Correlations

		GCAT15	RFRACTION of INCOME
GCAT15	Pearson Correlation	1	-.094
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	1527.924	-98.548
	Covariance	.175	-.011
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.094	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-98.548	725.547
	Covariance	-.011	.083
	N	8741	8741

$$C_O G_{cat15} = 2 \times (-0.011) / 4.39 = -0.00501$$

Concentration Index for Overshoot (C_0) at 25% threshold level

Correlations

		GCAT25	RFRACTION of INCOME
GCAT25	Pearson Correlation	1	-.091
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	1460.296	-93.558
	Covariance	.167	-.011
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.091	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-93.558	725.547
	Covariance	-.011	.083
	N	8741	8741

$$C_0 G_{cat25} = 2 \times (-0.011) / 3.84 = -0.00573$$

Concentration Index for Overshoot (C_0) at 30% threshold level

Correlations

		GCAT30	RFRACTION of INCOME
GCAT30	Pearson Correlation	1	-.090
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	1429.059	-91.266
	Covariance	.164	-.010
	N	8741	8741
RFRACTION of INCOME	Pearson Correlation	-.090	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	-91.266	725.547
	Covariance	-.010	.083
	N	8741	8741

$$C_0 G_{cat30} = 2 \times (-0.010) / 3.63 = -0.00551$$

BIOGRAPHY

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