FINANCING HEALTH IN LATIN AMERICA

1
Volume

Household Spending and Impoverishment

Editors:
Felicia Marie Knaul
Rebeca Wong
Héctor Arreola-Ornelas

Based on the work of the Latin American Research Network on Equity and Health Systems (LAnet-EHS)

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Alberto Vindas obtained his Bachelor's degree from the University of Costa Rica. He has participated in research projects carried out by the Central American Population Center and the Development Observatory, both research centers within the University of Costa Rica. He now works as researcher in the Central Bank of Costa Rica and is about to start his Ph.D. at the London School of Economics and Political Science. Some of the research projects that he has been involved in were funded by FUNSALUD, the United Nations Development Program and the University of California, Berkeley.

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Contents

Chapter 1

Introduction

Chapter 1
Introduction

Felicia Marie Knaul,[i] Rebeca Wong,[ii] Héctor Arreola-Ornelas,[iii] Maja Pleic[iv]

I. Backround

Overwhelming evidence from low and middle income countries (LMICs) from all developing regions, and from uninsured populations in high income countries, has elucidated the devastating health and financial impact of lack of financial protection (Knaul, et al., 2006; van Doorslaer, et al., 2006; WHO, 2010). The consequences are borne by households, health systems and economies, and are especially but not uniquely focused on the most vulnerable segments of society. The organization of health financing is particularly consequential for LMICs where low rates of health insurance coverage converge with high rates of poverty.

Without prepayment and pooling mechanisms that ensure access to high quality services, households are forced to pay for health out-of-pocket (OOP). This form of financing –OOP– is the least equitable and most inefficient means of organizing a health system. Further, evidence has shown OOP health spending to be a harbinger of financial catastrophe and impoverishment and can lead families to forgo healthcare services entirely when costs are prohibitively high (WHO, 2010; Xu, Saksena, Jowett, Indikadahena, Kutzin, & Evans, 2010). Considering that approximately two-thirds of total health expenditure in LMICs is private and more than 70% of this is OOP, improving equity and efficiency of health financing constitutes a major policy priority for LMICs (Schieber, Gottret, Fleisher, & Leive, 2007).

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According to WHO, the three intrinsic goals of health systems are good health, responsiveness to population needs and expectations, and fair financial contribution (WHO, 2000). These three goals are not mutually exclusive as good health depends on both the responsiveness of the system to adverse health events, and the availability of funds to pay for those health services. Conversely, the level, sources, and organization of health financing determine to what level and to whom the health system is responsive.

Since at least the early 1990s, there has been lively debate around health system financing and how to best organize scarce resources in order to generate the highest level of population health as well as financial protection from health shocks. In Latin America, a region long characterized by inequitable and unequal access to healthcare services across populations, this debate has spurred several health system reforms as well as new and innovative financing mechanisms (Londoño & Frenk, 1997; Gómez-Dantés, Knaul, Lazcano, Sesma, & Arreola-Ornelas, 2011). Some of these reforms –in particular in Chile, Colombia and Mexico– have been closely monitored and evaluated (Barrientos & Lloyd-Sherlock, 2000; Bitrán, Muñoz, Aguad, Navarrete, & Ubilla, 2000; Bitrán, Giedion, & Muñoz, 2004; Gakidou, et al., 2006; Frenk, González-Pier, Gómez-Dantés, Lezana, & Knaul, 2006; Frenk, Gómez-Dantés, & Knaul, 2009; King, et al., 2009; Glassman, Giuffrida, Escobar, & Giedion, 2010), yet, there continues to be a shortage of cross-country comparative analyses.

Financing Health in Latin America analyzes financial protection in health and household health spending and impoverishment for a number of health systems in the region. It augments the evidence base for Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Guatemala, Mexico and Peru – and compares the results across countries in order to distill lessons for policy-makers in the region and globally, and to promote the creation of better data and new evidence through research. Together the countries under study represent the majority –85% of the total population (500 million people of a total 589 million)– of the region. Further, the variance in the size, level of economic development and health system structure of the collection of countries provides a rich base for analytic work.

II. Equitable Health Financing: a Global Priority

Health is a fundamental dimension of individual and population well-being. It is also an essential component of human and economic development. Poor health is an impediment to the development of human capabilities and a perpetuator of poverty (World Bank, 1993; Sen, 1997; Strauss & Thomas, 1998; Savedoff & Schultz, 2000).

The view that health is an investment and not a cost is decades-old (Mushkin, 1962), yet has only recently permeated policy formation in LMICs. The logic is straightforward: in order to reap the benefits of education, children must first be physically, mentally and socially well (i.e. healthy) enough to develop. Healthy members of society can participate more fully in the labor market and contribute more productive capacity than those who are ill or injured. At the macro level, poor health and lack of financial protection debilitate poverty reduction and abate overall economic development (Commission on Macroeconomics and Health, 2001; Bloom, Canning, & Sevilla, 2004).

Yet healthcare is costly, and evidence from the region and globally, surveyed in the next chapter of this volume, shows that households that lack access to quality healthcare cope with health shocks by paying OOP in order to meet their healthcare needs. In a cruel paradox and vicious circle, investment in health further impoverishes these households.

Even when OOP payments are not large in absolute terms, their share of household disposable income can be so burdensome as to trap families in the cycle of poverty or push them even deeper into poverty. Hence, the households least capable of absorbing health payments are the ones that bear the greatest risk.

III. Equitable and Efficient Health Financing: a Priority in Latin America

The Latin American region has long been characterized by fragmented and segmented health systems with multiple public and private sector insurers and providers, thus presenting a challenge for health policy-makers and scholars of financial protection in health (Londoño & Frenk, 1997; Suárez-Berenguela RM, 2001). Since the second half of the 20th century, the trend in the region has been towards labor-based social security systems restricted to salaried workers and financed by payroll taxes. Packages are generous and often infinite on paper and *de jure*, yet typically and *de facto* rationed through waiting times and other aspects of quality. Social security systems exist alongside less generous public systems, with ill-defined packages, that offer services for the non-salaried, often poorer, segments of the population. Further, large and highly fragmented and unregulated private providers of all levels of quality co-exist within the same system and serve as an outlet for unsatisfied demand.

This health system financing organization would be less precarious were it not for the fact that the Latin American region has some of the lowest rates of salaried work in the world (International Labour Organization, 2002; Perry, Maloney, Arias, Fajnzylber, & Mason, 2007). As a result, salary-based health insurance schemes often exclude more than half of the population from formal health insurance, exposing families to the risk of financial catastrophe and impoverishment from health shocks.

Political will demanding greater equity in health, coupled with growing evidence of the implications of catastrophic health expenditures (CHE), has spurred health system reforms and innovative health financing mechanisms across the region. The common goal of recent reforms has been to extend both access and financial protection in health in a quest for universal health coverage, with the explicit goal of protecting households against financial catastrophe and impoverishment from the costs of healthcare. Chile's reform dates back several decades, followed by reforms in Colombia in the early 1990s, and Mexico in the late 1990s and the early part of the 21st century, and more recent efforts in several countries include Brazil, Peru and the Dominican Republic (Bitran, et al., 2000; Frenk, et al., 2006; Glassman, et al., 2010; Knaul, Frenk, & Shulman, 2011).

A key research question is the extent to which the reforms and mechanisms that have been implemented in the countries of the region have effectively provided additional financial protection against health and financial risk. This evidence can help to inform policy-makers about the efficacy of reform efforts and assist in refining less effective policy and reinforcing success. The extent of financial protection can be at least partially measured as the proportion of households paying high fractions of their income for healthcare, and the proportion of health system financing that comes from OOP.

IV. Institutional Context

Recognizing the potential of research on financial protection to inform policy in the region, a group of researchers based in Latin America became inspired to formulate a comparative study that produced the work in this volume. Financing Health research in Latin America, as in many other LMICs, is limited both by the inadequacy of data and the dearth of institutional and human resources to undertake high quality studies. Since the outset of the project that led to this volume, the objectives included improving the quality of data and methodologies, and strengthening the human and institutional resources available for health system analysis.

The research originated in 2007 with a multi-site project entitled "Health Financing and Social Protection in Latin America and the Caribbean" coordinated by the Mexican Health Foundation.[1] This project began initially financed by the International Development Research Center of Canada[2] and included 7 countries (Argentina, Brazil, Chile, Costa Rica, Colombia, Mexico, and Peru). The LAC Health Observatory,[3] an inter-institutional project of the Carlos Slim Health Institute[4] and the Mexican Health Foundation, provided additional support as of 2008, making it possible to include Bolivia, the Dominican Republic, Guatemala and Ecuador in the network. This funding and institutional support also facilitated stronger platforms for interaction.

Core funding from the Carlos Slim Health Institute enabled the transformation of the original project into a truly regional research network on financial protection in health. The project brought together researchers –ranging from senior scholars to students– from diverse institutions across the Latin American region and solidified a strong network that continues to exchange, compare and coordinate research on health financing and equity in the region. Since the inception of this project, the network has strengthened both human and institutional capacity for the study of health system financing through training, teaching, and participation in local and global meetings and conferences.

This financial protection network was in turn pivotal in guaranteeing that the LAC Health Observatory become a larger regional network on health metrics that includes research groups working on burden of disease, comparative risk assessment, national health accounts, effective coverage and human resources for health. Overall, as of 2011, the network includes 272 researchers in 19 countries.

1. http://www.funsalud.org.mx/; http://www.funsalud.org.mx/competitividad/financiamiento
2. http://www.idrc.ca
3. http://www.observatoriodelasalud.net
4. http://www.salud.carlosslim.org

Furthermore, as of 2011, the Latin American network entered into collaboration with Strategies for Health Insurance for Equity in Less Developed Countries (SHIELD)[5] based in Africa, and Equity in Asia-Pacific Health Systems (Equitap)[6] from the Asia-Pacific, to form the Global Network for Health Equity (GNHE)[7] with further funding from IDRC Canada. Equitap has the longest history of the networks and comprises 22 institutions and countries. SHIELD initially focused on Ghana, Tanzania and South Africa and then in 2012 expanded to include Kenya, Uganda and Zambia. This global network of networks has committed itself to contributing to both research and capacity building to enhance evidence-based policy formulation.

Under this new global project, what was originally a network on financial protection is being transformed into a Latin American Network on Equity and Health Systems (LAnet-EHS). It has now grown to incorporate 38 researchers based in 12 countries committed to fortifying the evidence base on health system financing in the region in order to inform health policy. Further, as a group and through individual members, the network collaborates extensively with other regional initiatives such as the virtual community on priority setting in health sponsored by the Inter-American Development Bank.[8] With this expanded focus and reach, LAnet-EHS is collaborating with the Harvard Global Equity Initiative Program on Equity and Health Systems, and this volume is a product of this joint work.

V. Methods, Organization and Summary of the Volume

In this multi-site group of 28 researchers representing 16 institutions that collaborated to produce this volume, the majority are investigators from institutions in the participating countries. Substantial effort was dedicated to maximize the potential for systematic comparisons across the countries by developing common variable definitions, units of analysis, metrics and strategies for measurement. Further, local teams were formed and trained in financial protection analysis and survey instruments were analyzed to identify differences across

5. http://heu-uct.org.za/research/projects/shield-project
6. *http://www.equitap.org*
7. *http://gnhe.funsalud.org.mx*
8. *http://www.iadb.org/en/topics/health/priority-setting-in-health,2077.html*

countries. Also, a comparative methodology was developed to facilitate cross-country comparability and to minimize the differences in results attributable to variation in survey design (Knaul & Valdivia, 2009).

The products of the overall project include in-depth country and comparative studies in two areas: the quantitative analysis of financial protection in health presented in this volume, and the organization of health system financing presented in products such as the Atlas of Health Systems in Latin America (Gómez-Dantés, Knaul, Lazcano, Sesma, & Arreola-Ornelas, 2011). Indeed the Atlas, published as a special edition/supplement of the journal *Salud Pública de México*, provides an important complement to this volume by offering background and a mapping of the health systems and financial organization of each of the countries under study (Becerril-Montekio, Medina, & Aquino, 2011; Bello & Becerril-Montekio, 2011; Becerril-Montekio, de Dios Reyes, & Manuel, 2011; Guerrero, Gallego, Becerril-Montekio, & Vásquez, 2011; Sáenz, Acosta, Muiser, & Bermúdez, 2011; Gómez-Dantés, Sesma, Becerril-Montekio, Knaul, Arreola, & Frenk, 2011; Alcalde-Rabanal, Lazo-González, & Nigenda G, 2011).

This book is divided into 10 chapters. This introductory chapter is followed by a review of the literature and methodologies. Chapter 3 presents a cross-country comparative analysis with evidence from twelve countries in Latin America. For some of the countries studied (Bolivia, Dominican Republic, Guatemala, Ecuador and Peru) this is the first time that this type of evidence is produced, while for the others the results constitute an update of previous analyses. The subsequent seven chapters include in-depth, country-specific analyses for Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru, the countries that formed the original IDRC-funded project begun in 2007.

The literature and methodology review in Chapter 2 sets the stage for the rest of the volume by providing basic definitions and the general motivation for the study of financial protection in health in the region. From a practical point of view, financial protection in health often implies mechanisms for prepayment and pooling of resources to eliminate the financially devastating and prohibitive effects of OOP payments for health. With the goal of minimizing or eliminating the risk of excessive OOP payments, both the literature and recent reforms that promote financial protection in health are intimately tied to the achievement of universal health insurance coverage.

A large part of the existing literature addresses the issue of how to measure the extent to which societies are protected against risk, and the review provides an overview of this field of study. A household is defined as having incurred CHE if their OOP payments are higher than a given threshold of their capacity-to-pay. A household is said to have incurred impoverishing health expenditure (IHE) if the level of health spending pushes the household below the poverty line. This chapter also discusses the limitations of existing approaches as well as the need for more integrated and longitudinal data to move the field forward.

Chapter 3 of this volume presents a multi-country comparative perspective to describe the prevalence of CHE in the region and to identify the groups within each country that have a higher propensity to incur CHE. The results are summarized in descriptive as well as multivariate analyses. Despite the vast differences in the size of the countries, the level of socioeconomic development, and the structure of the healthcare systems, common findings emerge for the group of twelve countries examined. There are similar attributes that define groups and households with the highest risk of catastrophic expenses in the region. Households in rural areas, poorer households, and households with children and/or elderly membres are more at risk of incurring CHE. In most countries but not all, insurance is associated with a lower probability of CHE, yet this is dependent on the nature of coverage, a finding that is further developed in country chapters.

The seven individual country chapters that follow provide overview of a variety of health system financing organization models. There are commonalities in the analysis. Each chapter includes quantification of the incidence of CHE and IHE as measures of the extent to which specific populations are at risk of losing financial security because of healthcare expenditures, as well as analysis of the determinants of CHE. Yet, the Latin American countries examined in this volume are vastly different not only in their population size and composition, their economic and social contexts, but also in the systems that have been implemented for financial protection in health. As a result of these differences, and as a function of the availability of data, each chapter takes a country-appropriate approach to measuring and evaluating the levels of financial protection in health offered by each of the health systems. Thus, each country chapter, in addition to reviewing the questions around distribution and determinants of CHE and IHE, includes a more in-depth analysis of a research question that is particularly relevant to that country. These chapters also focus on different questions regarding financial protection that are appropriate to the context of each country at the time of study and the availability of data. They each conclude by discerning levels and gaps in financial protection in health.

The chapter on **Argentina** by Maceira and Reynosa describes an array of indicators that are used in the literature to measure the extent to which households report having CHE and IHE. The authors then examine changes between

1997 and 2005 and conclude that there have been improvements in financial protection coverage for the most disadvantaged groups. This chapter documents a declining trend in the propensity of households to incur CHE and in the rate of impoverishment due to healthcare expenses. A key finding of this study is that in Argentina insurance is associated with higher non-discretionary OOP payments and this is likely to be a function of the organization of the insurance. A series of multivariate analyses are undertaken to verify these findings.

Montoya and colleagues highlight that **Brazil** has had mandated universal health services for the entire population since 1988, albeit with a level of implementation less forthcoming than the constitutional mandate. The authors analyze determinants of CHE in a multivariate framework, and also ask whether households forego health care completely due to lack of resources. The results indicate higher propensities to CHE in certain regions, rural areas and in households with at least one elderly member. The authors point to the need for further evaluation of the care available for older individuals. Finally, as in the case of Argentina, the results show private health insurance in Brazil, rather than offering households protection from financial risk, is actually associated with increased CHE.

Chile has a mandatory health insurance system that includes a large public insurer alongside a group of private insurers, and has achieved high levels of coverage. In this paper, Bitrán and Muñoz identify the main sources of expenditures and the characteristics of those households that are at highest risk of CHE and impoverishment despite the high level of insurance coverage in the country. This study suggests that official sources underestimate OOP spending as a share of total health expenditure (1/3 of 5.4% of GDP) and that OOP spending is almost twice as high as believed, implying that total health spending in Chile is much higher at approximately 6.9% of GDP. This denotes a more unfavorable situation than what was initially believed – almost half of health expenditure in Chile is apparently financed directly by household OOP spending and primarily on supplies and medications that are not adequately covered by the financial protection schemes (FONASA or ISAPREs).

Colombia has undergone a health system reform that began in the 1990s to guarantee universal health insurance and has more than quadrupled insurance coverage, reaching approximately 95%. Flórez and co-authors focus on the distribution and determinants of healthcare expenditures. The research also examines the risk factors for catastrophic spending among households that spend the most, in contrast with those that spend the least, and for the households whose expenditure level deviates the most from the average. This approach allows identification of the households that are most vulnerable to financially destabilizing health expenditures within a system that is striving to maintain high levels of health insurance coverage. The authors show that compared to other countries in the region, Colombia has a relatively low incidence of CHE. The multivariate results indicate that public insurance and the availability of healthcare providers are the most important protective factors against catastrophic health spending. Household composition –presence of elderly or young members– does not explain differences in incidence of CHE. Another finding is that using informal rather than formal services reduces the likelihood of incurring CHE; although the lower rate of CHE may reflect inability to afford expensive formal care rather than a lack of need.

Costa Rica is renowned in the region as providing near universal health insurance coverage. As a result, catastrophic and impoverishing health spending is exceptionally low relative to other countries in the region. Zúñiga and colleagues focus on identifying the barriers faced by households to access care by considering the distance to facilities and waiting lists to receive services. This approach poses the key question of the definition of coverage. Indeed, waiting lists appear to be functioning as implicit rationing tools. The chapter also details the types of services that generate OOP expenditure such as medications and medical visits, and examines the risk factors associated with healthcare expenses focusing on the small group of households that spend the highest share of their disposable income on health.

Mexico implemented *Seguro Popular* in 2004 and is on track to reach universal coverage in 2012. This chapter by Knaul and co-authors adds to the evidence base on insurance coverage in Mexico by looking at the impact of international remittances –an important external source of finance for households– on financial protection in health before and during the implementation of *Seguro Popular*. The chapter analyzes trends in CHE and impoverishment over almost two decades –1992 to 2010– and the role of remittances in the likelihood that a household incurs CHE or IHE. The results indicate that remittances are a protection mechanism against poverty and a resource for financing health expenditures, especially for families in the poorest quintile and in rural areas. Remittance-receiving households have more CHE but less IHE. This may indicate that households receive remittances for health crises that enable them to increase health expenditure with respect to their more permanent capacity-to-pay. Further, households with the least access to formal financial protection in health are most likely to rely on remittances. These households become vulnerable to health shocks when remittances decline due to economic crises for example, and this in turn highlights the importance of providing stable sources of financial protection that transcend economic crises.

The health system in **Peru** operates with a variety of public and private funders, insurers and providers, lacking a fully functioning social protection system and covering less that 40% of the population as of 2006. Díaz and Valdivia use panel data –the only study in this volume with access to longitudinal evidence– to examine the vulnerability of the population to health shocks over time within this fragmented system. In addition to studying healthcare expenditures, the authors incorporate an assessment of the loss of income due to health shocks, adding an important dimension of the disruption in well-being that households undergo as a consequence of episodes of ill health. This paper moves away from arbitrary definitions of CHE and imposes an analytic methodology for identifying financial catastrophe. The results show that the likelihood of experiencing CHE is greater among the poor and large households, and among households with a larger share of children and elderly. Except when the main income earner is affected by a health shock, in general the results show that Peruvian households adjust total family labor income and non-health expenditures to health shocks. This implies strategies that are not sustainable over long periods, and may impact on investments such as education and nutrition and perpetuate an inter-generational transmission of poverty.

VI. Conclusions

Together, the chapters in this volume move beyond a description of the prevalence of catastrophic expenditures to an understanding of the household and systemic characteristics that are correlated with gaps in financial protection in health. Each chapter in the volume offers results that can serve health policy design by identifying the groups within each country that are most vulnerable to catastrophic and impoverishing health expenditures.

A resonating conclusion of all the studies in the region is the scarcity of data sources to support time series and longitudinal analyses of household health spending, and hence the extent to which social insurance initiatives are protecting the population. The argument is that in addition to knowing *if*, *how many* and *which* households are experiencing catastrophic or impoverishing expenditures in health, it is critical to know *how long* households stay in a financially vulnerable position after health shocks occur, how well they recover from these shocks, and whether they eventually sacrifice health by not spending. This kind of evidence can only be produced with longitudinal data and will also make it possible to more objectively measure the extent of CHE.

Another important result that emerges from several cases is the tendency towards an association between family composition and CHE. Although the proportion of the population that is in older age brackets is still relatively low compared to developed countries, Latin America is in the midst of a demographic transition and is the fastest aging region in the world. The timing is opportune for countries of the region to identify ways to encourage investment in health promotion and to protect the population from health shocks in anticipation of the increase in the older population and the related increase in chronic conditions and subsequent demands and utilization of services.

Across the spectrum of countries included in this study, it is apparent that the region has been moving towards health insurance schemes with the goal of reducing exposure to catastrophic spending from OOP payments. The results point to the importance of undertaking more causal analysis of the relationship between insurance and financial protection schemes –of all types– and household health spending. This causal analysis will require investment in rigorous, longitudinal evaluations that will provide essential evidence for the next stages of reform and for designing more equitable and efficient health financing systems that will contribute to health as well as overall human and economic development.

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Chapter 2

Household Health Spending, Equity and Poverty

Chapter 2

Household Health Spending, Equity and Poverty:

A Literature and Methodology Review

Felicia Marie Knaul[i], Héctor Arreola-Ornelas[ii], Maja Pleic[iii], Rebeca Wong[iv]

I. Introduction

Increasing attention is being given in the economics and health systems literature to the implications of lack of financial protection in health in low and middle income countries (LMICs). This literature is broad and considers the impact on household health and financial well-being, health systems, poverty and human and economic development.

Research on financial protection in health, especially in LMICs, received substantial impetus with the publication by the World Health Organization (WHO) in 2000 of the World Health Report dedicated to measuring health system performance. The Report presents financial protection as one of the three intrinsic goals of a health system and argues that this should be one of the key elements used in evaluating the performance of health systems. It generated substantial interest, sparking a branch of literature on financial protection.

Another source of impetus for the research on financial protection in health in LMICs has been the need for evidence to design policy. Financial protection took centre-stage and motivated reform as early as the beginning of the 1990s as a result of the unexpected realization by many countries of their

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reliance on inefficient and inequitable out-of-pocket (OOP) spending as a means of financing health systems; and how this drives families to financial catastrophe and impoverishment (Frenk, et al., 1994). Several countries have launched deep reform of health financing –among them Colombia, Mexico and Thailand– with one of the foremost goals being to reduce the financial burden of health on households. Other countries, such as South Africa, are designing reforms that are in part motivated by inequities in health spending and the impact of financial catastrophe on the poor.

Improvements in the quality and availability of data have also provided impetus for research on financial protection. Although there are limitations to these data, discussed in this review, overall more and better data have been collected and this has made it increasingly feasible to analyze household health spending in LMICs. Survey data (household health, income and expenditure, and living standards surveys) which include information on household health spending, while seldom longitudinal, are now of better quality, and easier to access and use as a time series.

Further, the development of National Health Accounts (NHA) in a number of LMICs during the 1990s greatly facilitated the initial analysis of financial protection. NHAs made it possible to identify the level and distribution of all sources of health financing, hence clarifying the importance of household OOP spending and motivating reform. In 2000 the Organization for Economic Cooperation and Development (OECD) produced the manual A *System of Health Accounts* (SHA), with a second revision published in 2011, providing standard guidelines for measurement and reporting of health expenditure, thus facilitating comparability across countries and over time. OECD and WHO produced standardized accounting methods and publically available NHA that, since the late 1990s, are available for the majority of countries.

Most recently, the universal health coverage (UHC) concept has become increasingly important in the global health literature and agenda with one branch focusing on financing (Ahoobim, et al., 2012). The World Health Report of 2010, *Health Systems Financing: The Path to Universal Coverage* links the work on financial protection to UHC (WHO, 2010). In the report, WHO identifies three dimensions of UHC: the degree of population coverage, the degree of coverage of services and health conditions or diseases, and the degree of financial cost coverage. WHO suggests that it is only when OOP direct payments fall to below 20% of total health expenditure that a country can achieve financial protection, demonstrated by a negligible incidence of financial catastrophe and impoverishment. Yet, as the report highlights, there are more than 30, mostly low-income, countries where OOP payments represent more than half of total health expenditure. This World Health Report, in the context of the UHC movement and increasingly strong country data that permits the application of formal evaluation techniques, is nurturing a next generation of research on financial protection closely linked to reform and policy innovations.

This review chapter provides background and context to the country-specific analyses presented in the rest of the chapters in this volume. Each component of the literature review –global, cross-country and country-specific– in this chapter is roughly chronological and goes back as far as the late 1990s. The chapter analyzes the methodologies and measures that have been developed for the study of financial protection in LMICs, as well as how these have been used in applied research.

Much of the econometric and statistical analysis is available in specific papers, and the reader is therefore referred to the appropriate publications rather than replicating the details. The analysis is limited to published books and articles and a selection of publically-accessible governmental reports. Further, the review makes only brief reference to the broad literature on country-level health spending and methods of financing healthcare, as well as to the analysis of progressivity of payments and contributions. Given that each chapter in the volume provides additional background on the literature for the specific country under study, the review in this chapter does not analyze the literature for Latin America in detail. In turn, each chapter in the volume presents only a brief overview of the specific methodology applied and reference to a selection of the most relevant international and country-specific publications.

This review is also restricted to the unidirectional relationship from health spending by the household to equity and poverty, and does not consider the reverse relationship – the impact of poverty and inequality on health spending. Further, the words "effect" and "impact" are used with care as much of the existing analysis is not causal.

The chapter is divided into five sections. Following the introduction, the second part provides a brief overview of sources of health finance. The next part presents five strands of work that seek to measure the effect of health finance on the economic well-being of the household. The rest of this volume, including both the comparative and the country-specific papers, focuses on two specific strands – catastrophic and impoverishing health spending. The fourth section of this chapter reviews some of the empirical findings from global, cross-country and country-specific work. The final section briefly discusses data limitations, and analyzes priorities for future research.

II. Overview of Sources of Finance for Health[1]

In order to analyze financial protection in health, one must study the sources and organization of health system financing. A largely ignored fact is that all funds used to finance health originate from households. As Fuchs (1988) writes: "...the public must pay for care under any system of finance... the ultimate cost falls on families and individuals even when the payment mechanism makes it appear that the bills are being sent elsewhere".

In general, health systems are financed through three main mechanisms: funding collected by the state via specific and general taxes; contributions to social security usually via payroll deductions; and private payments which can be either OOP or for private insurance (Wagstaff & van Doorslaer, 1998; Wagstaff, et al., 1999). Financing from general taxation and payroll tax mechanisms are pre-paid, tend to pool risks and have the potential to protect both rich and poor from catastrophic and impoverishing health expenditures (CHE and IHE). Yet, while these government-financed and social insurance schemes have the capacity to protect all citizens, in reality, they often do not. Particular groups are typically excluded and they are concentrated among the poor.

While private health insurance can protect individuals from catastrophic expenditures, access is usually limited to the rich, the healthy and those who live in urban areas. Yet there is no doubt that OOP is an inefficient means of financing health that tends to be highly inequitable and poverty-generating (Frenk, et al., 1994; WHO, 2000; Phelps, 2003; Xu, Evans, Kawabata & Murray, 2003; Knaul & Frenk, 2005; Knaul, et al., 2006; WHO, 2010). OOP payments are typically made at the point-of-service. Individual consumers choose, as a function of their income, how much they are able and willing to purchase. However, the nature of health shocks, in particular the urgency of need for treatment, and the asymmetry of information between the consumer and the provider, limits the capacity of the patient to search among providers for a fair price, thus violating some of the standard requirements for an efficient and competitive market. Moreover, since the ceiling on cost is the individual's maximum capacity-to-pay (CTP) at the time of purchase, the health shock can induce catastrophic and impoverishing expenditures. Since the financing of OOP payments is limited by access to credit which is often constrained by poverty, families resort to alternate sources to raise the necessary funds. This includes borrowing in an informal market; selling off assets; or foregoing consumption

1. This section is a summary and update on Knaul, Arreola, Méndez, & Miranda, 2009; and Murray, Knaul, Musgrove, Xu, & Kawabata, 2001.

of other, often essential, goods such as food and education. Otherwise, necessary healthcare is forgone with possibly devastating consequences for health status. Lastly, OOP payments are the most fragmented across individual consumers with no possibility of pooling risk. This array of factors explains why health systems financed by OOP spending tend to be associated with poverty and with lower economic development (Knaul, et al., 2006).

III. Measuring the Impact of OOP: Impact on What?

While there is general consensus that OOP payments are an inefficient and inequitable means of financing a health system, there is considerable discussion on how to measure the impact on households. Much of the literature is based on approximations using indicators or indices, but few studies have been able to isolate causality.

There are at least five alternate approaches that have been presented in the existing literature to measure the impact of health financing on equity. These are: progressivity and redistributive effects; financial catastrophe relative to household income (catastrophic health spending – CHE); financial catastrophe as impoverishment (impoverishing health spending – IHE); impact on consumption of other goods and especially basic needs; and, non-spending on health. This review provides a basic introduction on each of the five areas and especially the last four, with a particular focus on studies published between 2000 and 2010.

Most of the research to date, including the majority of the chapters in this volume, focuses on measuring CHE and IHE. These approaches are imperfect in terms of measuring the causal relation between household health spending and household poverty. Still, they do assist the policy-maker in quantifying the number of affected households, identifying groups most at risk, and approximating the amount of money that households allocate to finance healthcare (Wagstaff, 2008).

III.i. Progressivity and the Redistributive Impact on Households

Research on equity in health finance grew out of the public finance literature that analyzes the extent to which the tax system achieves one of society's goals: that of redistribution of income and wealth (Aronson, Johnson, & Lambert, 1994). In transferring this concept to the health system, equity in health finance has been analyzed in two different ways:

a) The progressivity of health payments in terms of whether households with less CTP contribute a lower share than those with greater CTP, and

b) The extent to which health payments contribute to, or detract from, the redistribution of income. The conceptualization of what a "good" distribution is varies substantially depending on what is considered fair in terms of the burden of health finance relative to CTP (Murray, Knaul, Xu, Musgrove, & Kawabata, 2000). In both cases, it is interesting to compare each type of health payment (taxes, social insurance payments, private insurance and OOP payments), as well as summing over all types to analyze the total equity effect of system finance. This methodology makes it possible to compare across health system financing mechanisms, as well as overall across health systems.

The progressivity of contributions can be measured by analyzing the distribution of payments against the distribution of CTP. The simplest descriptive form of analysis is by total expenditure quintile. Many studies analyze Lorenz dominance and/or use the Concentration and Kakwani indices which consider the degree to which a payment (for tax or healthcare) departs from proportionality, where proportionality is measured against the distribution of pre-payment income in the population. The technical details of calculating these measures are presented in O´Donnell, van Doorslaer, Wagstaff, & Lindelow (2008).

The work on progressivity and income redistribution from health finance does not take into account dimensions of financial protection related to financial catastrophe or the effect on absolute levels of poverty. These are in fact, quite distinct concepts and dimensions of fairness, and each is important to measure. For example, a change in health finance that results in more progressivity and a redistribution of income, but at the same time more financial catastrophe and poverty would not generally be considered an improvement in fairness.

III.ii. Measures of Financial Catastrophe Relative to Income (CHE)

One of the first applications of this methodology in LMICs was by WHO to evaluate health system performance (WHO, 2000). WHO has updated this methodology several times (WHO, 2005).

Based on this model, originally developed by Murray, et al. (2000), a health system that offers financial protection is one where no family faces a catastrophic payment from health spending, and each member of society contributes according to their financial capacity and independently of health status or healthcare needs. This model explores the concept of a fair distribution of contributions to the health system across households from the standpoint that income redistribution is not a goal of health systems, but rather of tax and other policies, and that, given income redistribution efforts in society, there are means of financing a health system that are more fair than others.

One approach to identifying financial catastrophe from health is to measure health payments relative to income or CTP. The simplest approach suggests that if a payment is "too high" as a proportion of income, then it can be unfair or catastrophic. A more nuanced approach relates health spending to household CTP. While there is substantial overlap in these measures: income or CPT, they are not coincident. For example, a very rich household may suffer a very high payment that might be considered "unfairly high" but that does not change their standard of living. This is a relative measure of health expenditure as a proportion of disposable income that emphasizes equity aspects and alludes to "what is too much spending for a household". Catastrophic expenditures are defined as those a household spends on health that exceed a threshold (x%) of its disposable income. The threshold level is subjective, and this is one of the reasons for using alternate measures and for comparing different thresholds (Knaul, et al., 2009).

The most basic measure is the headcount index of catastrophic payments. A variant of this is the household overshoot, defined as the average amount by which households exceed a threshold. This is a measure of the intensity of catastrophic payments (O´Donnell, et al., 2008). Yet, the level of catastrophic payments is a distribution-insensitive measure, which implies that these payments are equally "bad" independent of how poor or rich a household is prior to the payment (O´Donnell, et al., 2008). Thus, several approaches have been developed to weigh the relative impact of catastrophic payments by poor versus wealthier households.

Murray and colleagues (2000) present a distribution called the Index of Fairness in Financial Contribution (FFC). The indicator places strong emphasis on health expenditures that represent a very high proportion of income net subsistence spending. Further, by using disposable income the indicator places substantial weight on the poorest households that are likely to have low nominal expenditure on health, which nevertheless may be catastrophic. The index has the advantage of being a continuous measure, but interpretation generates some difficulties. More recent approaches attempt to separately measure each of the components of fairness of finance.

Other indices have been designed to analyze the degree to which catastrophic payments are concentrated among rich versus poor households (O´Donnell, et al., 2008). For example, distributions can be weighted by the complement of the respective concentration indices to develop distribution-sensitive measures of catastrophic payments. These measures then apply rank weights so that catastrophic expenditures for the poorest households count more than those incurred by the richest households. While these measures are distribution-sensitive, they fail to include a type of catastrophe that is likely to indicate a severe lack of financial protection in a health system: when due to health payments, households fall into absolute poverty or become further impoverished if they are already below the poverty line. Note that these may be nominally small payments that do not qualify as catastrophic based on a threshold measure relative to income.

III.iii. Measuring Financial Catastrophe as Impoverishment (IHE)

Measures of financial impoverishment seek to identify the impact of OOP health spending on the absolute level of poverty. Specifically they focus on the number of households that fall below the poverty line and the impact of health spending on the poverty gap (Wagstaff & van Doorslaer, 2003; Knaul, et al., 2006; O´Donnell, et al., 2008).

The ordered distribution of household expenditure level is plotted gross of OOP or total health contributions as well as net of these payments. The increase in the number of households suffering impoverishment is derived by comparing the poverty headcounts before and after health payments. The poverty gap identifies the degree to which households fall below the poverty line after health spending compared to their total expenditure net of health spending. This is a measure of the deepening of poverty (O´Donnell, et al., 2008).

It is both a conceptual and an empirical question as to whether or not the threshold (x%) measure of financial catastrophe relative to income, particularly with disposable income in the denominator, captures absolute impoverishment. Households may fall into poverty with very low levels of spending on health and hence do not reach the commonly used thresholds. Reducing the threshold implies greater coincidence between relative and absolute indicators in terms of the households that are identified as suffering catastrophe from health spending. Increasing the threshold level makes them differ. The difference is mostly concentrated among the poorest households, as few of the wealthiest households are pushed into absolute poverty at almost any threshold. The differences between the relative and absolute measures of financial catastrophe can be neatly plotted in a Penn's Parade diagram (O´Donnell, et al., 2008).

III.iv. Impact on Consumption of Other Goods

Neither of the measures of catastrophe –relative to income or to the poverty line– explicitly defines a health shock. These measures take as a given that health spending is the cause of the impoverishment or catastrophe, which may or may not be the case. Another important shortcoming is that these measures do not take into account that families may have to adjust their spending on other basic needs precisely because of the health shock. Since many of the empirical applications use total expenditure as a proxy for permanent income, this endogeneity is likely to be built into the measure itself.

Further, the measures only take into account the effect of the health shock via an increase in health spending. They do not consider other indirect costs that may have an even more immediate and serious impact on family health and spending. For example, a health shock may impede family members from working and thus reduce family income and lead to financial catastrophe. Indeed, an illness for a working family member may cause days or months spent out of the labor force. If they are self-employed or not affiliated with a social security system, as is the case for large segments of the population in LMICs and in particular poor families, the illness translates directly to a loss of income, especially in single-earner households.

Another important omission is the indirect costs of healthcare and caregiving. For families living in rural and isolated communities, for example, the transportation costs associated with traveling to the nearest hospital or health clinic are not usually accounted for. Yet, these may further reduce family income, add to the financial catastrophe, or prohibit the purchase of health services.

Almost all of the empirical estimates of relative and absolute impoverishment from health spending rely on cross-sectional data with a relatively short reference period (one to three months). As a result, it is impossible to introduce a time-lag into the calculations as current spending on health is compared to total current expenditure or income. Thus these measures cannot capture the catastrophic or impoverishing nature of long-term or repetitive health expenditures, such as occur with chronic illnesses.

Further, when non-food expenditure is used as the denominator in relative measures of CHE, one of the household responses that may actually represent catastrophe –a reduction in food spending– can make it less likely to detect catastrophe (by incorrectly inflating disposable income and hence CTP). These problems with measurement may generate either an underestimate or an overestimate of the level of financial catastrophe. Some of these issues could be solved with longitudinal data, but others require a more complex conceptual and empirical approach to defining a health shock.

Gertler and Gruber (2002) develop a derivative of the classic model of expected utility maximization of households, in which households choose the optimal consumption basket of goods and services. Within the basket of goods and services, households choose the level of spending/investment in human capital goods, in health and in different risk-pooling mechanisms (formal and informal). When a health shock occurs, households adjust expenditures to be able to afford healthcare and in response to reductions in income-earning capacity. Thus, one way of identifying a health shock is through the impact on the purchase of other necessities. This approach requires panel data that are not available in most countries and are unlikely to be nationally representative samples.

Using longitudinal data from Indonesia, Gertler and Gruber (2002) are able to relate health shocks to consumption and income shocks, and measure the relationship between an adverse health event, a decrease in investment in non-health human capital and withdrawal from the labor force. This model provides an explicit, causal and convincing approach to measuring catastrophe from health spending. Their findings conclude that households do in fact suffer important reductions in income and consumption in order to finance health shocks, and that this is due to a lack of adequate insurance mechanisms and borrowing opportunities.

III.v. Catastrophe Relative to Need and Accounting for Non-spending

The models discussed above are based on measures of health spending, and by definition do not account for those families that cannot afford to pay for healthcare at all and as a consequence must forego services. None of the models discussed so far identify this issue of households that have a health catastrophe but either do not spend on health, or do not spend very much, because they forego care. As one way of dealing with this issue, several authors suggest the importance of measuring health status and healthcare utilization as a complement to any analysis of household spending (WHO, 2000; Wagstaff, 2008).

Further, when faced with a health shock, families employ different coping mechanisms to deal with the financial burden. Simply measuring the ratio of OOP spending relative to household income can miss important information about how families actually behave in such situations. First, ignoring coping mechanisms that smooth consumption can overstate the loss of consumption and lead to an overestimation of CHE and IHE (Flores, Krishnakumar, O'Donnell, & van Doorslaer, 2008). Studies have shown that families may use savings, sell assets, or borrow from friends and family to finance OOP spending in the short run (Russel, 1996; McIntyre, Thiede, Dahlgren, & Whitehead, 2006). Similarly, they may alter their consumption patterns or labor market behavior, spend less on food and education, and/or find work for previously unemployed members of the household (Sauerborn, Adams, & Hien, 1996).

Pradhan and Prescott (2002) apply a novel methodology. They model and then simulate how much each household "should" spend if they were to receive sufficient healthcare based on average needs and the design of healthcare finance.

IV. Empirical Findings

The following review of the empirical literature is presented according to:

a) Global,

b) Comparative, cross-country and regional, and

c) Country-specific studies.

While this is not a complete review of all published or publically-available research, it is meant to provide an introduction to the major and illustrative work in each area.

IV.i. Global Estimates of Catastrophic and Impoverishing Health Expenditure

Global policy work includes measures of the total number of households affected by catastrophe from health spending. Yet, existing estimates of the number of households that experience catastrophe or impoverishment from health spending may be orders of magnitude understated.

The first global figures appear in the series Evidence for Policy Notes which documents that at the global level, approximately 44 million households suffer CHE annually (Xu, Evans, Carin, & Aguilar, 2005). These Notes do not provide details on how the global figure is calculated.

A publication by Xu, Evans, Carrin, Aguilar-Rivera, Musgrove, and Evans (2007) goes substantially farther in producing a global estimate of financial catastrophe by compiling data from 116 surveys for 89 countries and arrives at a figure of 150 million people worldwide. Yet, the definition of the number of households affected by financial catastrophe is narrow and likely to be underestimated. It is based on one specific measure of financial catastrophe – a 40% threshold, uses a definition of CTP around a median of food expenditure, and is derived from cross-sectional analysis.

No upper or lower boundaries for the global figure have been developed to date and this constitutes an important area for future research. Sensitivity analysis of varying measures, definitions, thresholds and surveys, as well as the use of longitudinal data would provide alternate estimates that could be especially useful for global policy and advocacy.

IV.ii. Comparative, Cross-country Results

In the 2000 World Health Report (WHO, 2000; Murray, et al., 2000) financial protection was measured for a subset of member countries and then extrapolated to generate global estimates of financial protection. This work was based on the original WHO (2000) indicator of financial protection developed and published in Murray, et al. (2000).

Xu, et al. (2003) later undertook a cross-country analysis of CHE in 59 countries. The study defines CHE as 40% or more of non-subsistence income.

However, instead of using the national poverty line (Wagstaff & van Doorslaer, 2001), the authors define the level of subsistence endogenously as the average level of consumption of households between the 45th and 55th income percentile. In this way, subsistence expenditure is measured according to what a typical family spends. Their analysis indicates that catastrophic spending is highest in countries in transition, followed by some Latin American countries, specifically Brazil, Argentina, Colombia, Paraguay and Peru. Further, they find an important relationship between catastrophic health spending and the capacity of a health system to offer risk-pooling mechanisms and insurance.

In their subsequent global study of 89 countries, Xu, et al. (2007) demonstrate an important negative association between financial catastrophe at the level of the household and access to prepayment mechanisms: the greater the reliance on OOP, the greater the proportion of households that suffer CHE or IHE (Xu, et al., 2007; Xu, et al., 2010).

Saksena, Xu and Durairaj (2010) use data from World Health Surveys in 51 countries to determine the main drivers of CHE. They find that spending on medicines leads more families to incur CHE than spending on inpatient or outpatient visits in almost all of the countries studied. In terms of household characteristics, these authors augment the body of evidence showing that poor, rural households with less educated or female household heads, and with very young or old members, are more likely to pay OOP for health.

For the African continent, Leive and Xu (2008) compare the coping mechanisms of households with OOP payments in 15 countries of low and lower-middle income. Using data from the World Health Surveys, they find that approximately 30% of OOP was financed through borrowing or selling off of assets. Their findings show that richer households are less likely to borrow and sell assets to finance healthcare than poorer ones, however there was not a substantial difference in the coping mechanisms of the bottom three income quintiles.
The Strategies for Health Insurance for Equity in Less Developed Countries (SHIELD) project began in 2006 and originally aimed to identify the major equity challenges in the health systems in Ghana, Tanzania and South Africa through an understanding of financing and benefit incidence. This network of researchers adopted a system-wide perspective, and evaluated financing as well as utilization of health services. This work resulted in a special issue of *Health Policy and Planning* (McIntyre & Mills, 2012) and a comparative publication in *The Lancet* (Mills, et al., 2012). This work continues to influence the design of health system reform, especially in South Africa and offers important insight into health financing equity issues in the Africa region.

The SHIELD research includes an analysis of the distribution of the financing burden and of healthcare benefits across socio-economic groups in Ghana, Tanzania and South Africa (Akazili, Garshong, Aikins, Gyapong, & McIntyre, 2012; Mtei, Makawia, Ally, Kuwawenaruwa, Meheus, & Borghi, 2012; Ataguba & McIntyre, 2012). These papers present the first system-wide findings on healthcare financing progressivity in Africa and evaluate the relative progressivity of a dedicated health tax in Ghana, private voluntary health insurance contributions in South Africa, and mandatory health insurance contributions in Ghana and Tanzania. The three papers also evaluate the distribution of benefits from using private and public health services compared to need for healthcare. The series models the resource requirements and potential funding sources of universal coverage options (Borghi, Mtei, & Ally, 2012; McIntyre & Ataguba, 2012). A comparative analysis showed that overall healthcare financing was progressive and OOP payments were regressive in all three countries. Further, in Ghana and Tanzania contributions by those outside the formal sector to health insurance were regressive (Mills, et al., 2012).

The work of Equity in Asia –Pacific Health Systems (Equitap) on a group of countries in the Asian-Pacific region (van Doorslaer, et al., 2006; van Doorslaer, et al., 2007; O'Donnell, et al., 2008) highlights that financial protection and equity outcomes may improve under both National Health System-type and insurance systems. Equitap's publications also illustrate a variety of analytical approaches that can be used to study issues of financial protection and equity.

Van Doorslaer, et al., (2006) cover eleven countries (Bangladesh, China, the Philipines, India, Indonesia, Malaysia, Nepal, the Republic of Kyrgyz, Sri Lanka, Thailand, and Vietnam). This study shows that an additional 2.7% of the population under study (78 million people) ended up with less than $ 1 per day after they had paid for healthcare. The prevalence of absolute poverty in these countries was 14% higher than conventional estimates that do not take account of OOP payments for healthcare; and, in countries where a large proportion of healthcare costs are paid OOP by households, the increase in absolute poverty is substantially higher ranging from an additional 1.2% of the population in Vietnam to 3.8% in Bangladesh.

Another paper, (van Doorslaer, et al., 2007) based on the Equitap data and project includes 14 countries (in addition to the above, Hong Kong SAR, South Korea and Taiwan) representing 81% of the population of Asia. The authors apply a definition of catastrophic payments relative to income and estimate, for all countries, the incidence of catastrophe using both total household expenditure and non-food expenditure, and using various thresholds ranging from 5% to 25% for the former and 15% to 40% for the latter. While this study does not analyze absolute impoverishment, the use of a variety of cutoffs permits substantial sensitivity analysis. This study documents that OOP is large in Asia – representing more than 30% of total health expenditure in all countries, over three fifths in Bangladesh and China, and over 75% in Vietnam, India and Nepal. The authors posit a relationship between OOP and household living standards by documenting that in over 10% of households these payments represent more than 50% of non-food expenditure in Bangladesh, China, India, Nepal and Vietnam. Further, catastrophic payment tends to be more common in lower-income countries that rely more heavily on OOP to finance healthcare.

Of particular interest are the comparisons between countries' health financing policies and rates of CHE. For example, although average incomes are similar in Sri Lanka and China, the former has managed to keep OOP below 50% of total health expenditure, and catastrophic payments are low and more concentrated among the rich. In contrast, China emerges as a country with little financial protection and a higher prevalence of catastrophic payments with a higher concentration of OOP among the poor.

For the region of the Western Balkans, Bredenkamp, Mendola and Gragnolati (2011) find that health expenditure is a significant source of household impoverishment in Albania, Bosnia and Herzegovina, Montenegro and Serbia. In particular, health expenditure increases the poverty headcount by 21% in Albania; 15% in Kosovo and 13% in Serbia. They find that transportation costs represent a large share of health expenditure, especially in Albania and Serbia.

Comparative research was undertaken in five Latin American countries (Argentina, Bolivia, Chile, Colombia and Mexico) by the World Bank and led by Packard and Baeza (2006). Several of the chapters in this volume build on this set of studies undertaken for the World Bank comparative research project. This research applies the consumption theory suggested by Gertler and Gruber (2002) as a theoretical framework. Although the data in these countries did not allow for measurement of the full model, it was possible to measure household impoverishment due to health spending. This research shows that the Latin American and Caribbean region is characterized by low public and high private health expenditure and that 85% of total private health spending is OOP.

In another regional study, the Economic Commission on Latin America and the Caribbean (ECLAC) looks at the progress made towards meeting the health-related Millennium Development Goals and surveys OOP spending in a group of twelve Latin American countries (United Nations, 2008). In-depth econometric analysis looks at OOP in seven of these countries and is based on the findings of Perticara (2008). However the data are nationally representative only for some countries, and the years analyzed vary substantially making comparisons across countries difficult. The study reports that medicines represent a high proportion of health expenditure.

For the Caribbean region, a more qualitative study was undertaken by ECLAC, surveying the structure and financing of health systems in 24 countries of the region (Cercone, 2006). Although the study looks at the public-private mix of health financing and the general performance of health system reforms, there is little mention of financial health protection or health equity. The study finds that healthcare in the region is predominantly financed through public mechanisms, though there is great variation across countries. Importantly, the study highlights a trend towards increasing reliance on OOP as a source of health finance.

A complementary body of research was published in 2011 as a special edition of the journal *Salud Pública de México* (Gómez-Dantés, Knaul, Lazcano, Sesma, & Arreola-Ornelas, 2011). The supplement includes a comprehensive overview and mapping of the health systems of each of 17 countries in the LAC region. The sub-maps of health financing include information on sources and levels of finance and the extent of financial protection in health, and demonstrate improvement in the levels of health spending and coverage of health services. This has been reflected in advances in major indicators of maternal and child health and other indicators of communicable disease and health burden of poverty. The maps identify recent efforts to extend financial protection in health in countries such as Chile, Colombia, Brazil, the Dominican Republic and Mexico. The country-specific atlases are complemented by a regional analysis of financial protection that is updated in Chapter 3 of this volume.

IV.iii. Country-specific Results

WHO produced a series of discussion documents dealing in greater depth with the situation of specific countries including Argentina, Bolivia, Kenya, South Africa and Senegal. These documents include detailed estimates of the levels of OOP, CHE and IHE. In addition, several of the documents analyze the determinants (household income, family composition, insurance coverage, etc) of the probability that a household suffers impoverishment from health spending using regression analysis (Cavagnero, Carrin, Xu, & Aguilar-Rivera, 2006; Xu, James, Carrin, & Muchiri, 2006; Xu, et al., 2005; Scheil-Adlung, et al., 2006). These studies complement the methodological and cross-country research highlighted above.

As discussed above, the Gertler and Gruber (2002) study on Indonesia represents an important advance in the econometric modeling of the impact of health shocks on household well-being. Their results show that Indonesian households are not able to fully insure consumption against the economic costs of illness. The more severe the illness, the less households are able to insure consumption levels. The analysis also suggests that there may be gains from introducing formal disability insurance in countries such as Indonesia as the bulk of the cost of illness is due to lost income and not medical care expenditures. Pal (2012) uses a similar measure to analyze CHE in India.

Vietnam has been an important country of study for health financing in LMICs. In addition to a host of research on levels and distribution of CHE and IHE presented immediately below, there are several evaluations of projects that are presented at the end of this chapter section. Wagstaff and van Doorslaer (2003) analyze the effects of the implementation of voluntary health insurance in Vietnam on IHE and CHE. They measure both the incidence and the intensity of catastrophic health spending, both relative to pre-payment income and CTP. In their analysis, they utilize a wide spectrum of thresholds: 10, 15, 20, 25, 30 and 40 percent of CTP allowing for comparisons across income quintiles and over the years studied. At lower thresholds, CHE is more concentrated in the poor, while at higher thresholds it is more concentrated among the rich. The study also finds it more likely for poor families to become even poorer as a result of OOP health spending than it is for families above the national poverty line to be pushed below it, highlighting the shortcomings of using a threshold-only approach to measuring impoverishing health spending. This finding has been supported by other research which has shown that the poor in Vietnam spend disproportionately more on health relative to income (Ensor & San, 1996).

Jowett, Contoyannis, and Vinh (2003) also look at Vietnam, comparing OOP health expenditure between members of the voluntary health insurance scheme and eligible non-members. They examine the effects of affiliation to the voluntary health insurance scheme on financial risk protection and find that on average, the insured spend significantly less on health services than the uninsured. The important question –how much less– is not as clear, however. The estimates highlight the sensitivity of results to the choice of model, and thus the benefit of using multiple models on the same dataset. It also highlights the weakness of using cross-sectional data, since the average spending refers to health costs in the last three months only and does not control for unobserved individual heterogeneity. Furthermore, the study finds that although on average, the insured spent more of their income on health than the uninsured, this did not hold true for the lowest income quartile where the insured average was almost double the uninsured. This is likely to reflect adverse selection in the low income quartile with the sickest individuals affiliating first.

Sepehri, Sarma, and Simpson (2006) aim to examine the effect of insurance on OOP health expenditure in Vietnam. This study follows the framework of Wagstaff and van Doorslaer and analyzes two sets of household panel data, for 1993 and 1996, thus controlling for unobserved heterogeneity, such as the health status of the individual in the long-run, and rendering more accurate estimations of the effects of insurance on OOP spending. The study uses both random and fixed effect models and finds that when using a random effects tobit, the insured spend more on health services than the uninsured (as shown by Jowet, et al., 2003). However, when using the fixed effect model, the insured spend between 16 and 18.5% less than the uninsured. At the mean income level, insurance affiliation reduces OOP spending by 28-35%. Furthermore, they find that average OOP spending rises with income, especially for individuals in the upper income quintile. Echoing findings in other LMICs, the evidence suggests that health insurance reduces OOP spending most for those in the middle income quintiles.

In the case of India, Devadasan, Criel, van Damme, et al., (2007) find that more than 72% of health expenditure is financed OOP and at point of service. Shahrawat and Rao (2012) find this rate to be 62% for all Indian households and 52% for households below the poverty line. As a response to this, the government has promoted community health insurance (CHI) as a component of its National Rural Health Mission.

A study undertaken by Ranson (2002) examines the Self Employed Women's Association (SEWA) Medical Insurance Fund in Gujarat, India in terms of providing financial risk protection against catastrophic health spending on hospitalization. The results of the study show that the Fund was successful in incorporating the poor by charging a relatively low flat-rate premium and incorporating external assistance, and consequently reduced catastrophic and impoverishing hospitalizations by more than 50 percent.

Devadasan, Criel, van Damme, Ranson, and van der Stuyft (2007) replicate the Ranson, (2002) study, looking at SEWA in Gujarat, and ACCORD community health insurance in Gudalur, Tamil Nadur which provides health insurance for the indigenous population. Both CHIs cover hospitalization, charge a relatively low flat fee and have a low cap on health expense benefits (of USD$ 45 and USD$ 23, respectively). Nevertheless, 34% of SEWA affiliates and 67% of ACCORD affiliates that visited the hospital did not have any OOP health expenditure. Furthermore, using the Ranson (2002) threshold of 10% of income to define CHE, the study finds that in both cases the insurance scheme halved the incidence of CHE on hospitalization. Yet, insurance schemes that cover hospitalization may not be enough to protect households from the financial risks of health spending. OOP payments, mostly for medications, still remain high (72%), as well as the incidence of CHE (5%) and IHE (3.5%) (Shahrawat & Rao, 2012).

A recent and novel line of research is relating CHE to chronic and non-communicable disease. Daivadanam (2012) reviews the direct and indirect pathways that acute coronary syndrome leads to CHE in the state of Kerala. Their analysis dispels the myth that only low-income families are vulnerable to CHE and signals the need for improved financial protection for NCDs. In a national study of India, Engelgau, Karan and Mahal (2012) show that OOP and CHE are more common for households facing chronic and non-communicable disease, especially cancer. These studies stress the importance of including chronic and non-communicable disease in social insurance.

In the case of China, Liu and Mills (2002) survey the effects of market-oriented financing reforms in the 1980s on China's huge public health sector. Although there is some evidence of increased productivity and accountability of China's public health institutions (PHI), the authors suggest that the social costs of the reform outweigh the gains. Charging user fees led to the over-provision of unnecessary services and the under provision of services with positive externalities, and decreased the health systems capacity to prevent the spread of infectious diseases. The authors argue that the user fees had important unintended side effects such as a decline in the immunization rate and thus increased risk of disease transfer.

Several studies were published in 2011/12 on the Middle-East region with calls to implement social insurance for reform to ease the burden of CHE and reliance on OOP payments. These include: Holst and Gericke (2012) on Yemen; Mershed, Busse and van Ginneken (2012) on Syria; and Hajizadeh and Nghiem (2011) and Kavosi, et al. (2012) on Iran.

The success of health financing mechanisms and health system reforms are being increasingly analyzed against their success in offering financial protection. These studies use measures of OOP, CHE and IHE and many analyze different categories of health spending to provide evidence to refine the design of health financing. The strongest of these studies use formal evaluation techniques reflecting increasing investment by countries in data collection and evidence-based policy making.

A considerable body of work has been produced around the reforms in China. An early paper is Wagstaff and Yu (2005) on the impact of a health sector reform project in Gansu Province in China. A series on the China health reform was published in *The Lancet* in 2008 and includes several papers on financing. Hu, Tang, Liu, Zhao, Escobar, and de Ferranti (2008) describe the path towards universal insurance coverage and the challenges of reducing OOP. Liu, Rao, Wu, and Gakidou (2008) show that although coverage improved from 1993 to 2003, issues of affordability in rural areas worsened and for low-income families there was an increase in the probability of not seeking care or experiencing CHE. Wagstaff and Lindelow (2008) found that, counter-intuitively yet in accord with findings in several chapters in this volume, insurance increases OOP and catastrophic spending because providers are paid fee-for-service with little regulation.

Yip, Wagstaff and Hsiao (2009) summarize the results of a series published in *Health Economics* in 2009. For the urban areas, several papers question the effectiveness of the efforts to achieve affordable access to basic healthcare, financial risk protection and improved health status (Yi, Zhang, Singer, Rozelle & Atlas, 2009; Zhou, Gao, Xue, Yang, & Yan, 2009; Wang, Yip, Zhang, & Hsiao, 2009). Finally, Meng, et al. (2012) use data from the 2003, 2008 and 2011 National Health Surveys to capture important trends in healthcare access, utilization and financial protection during a period of rapid economic and health sector growth in China. They find that while there have been remarkable increases in both access and utilization of health services between 2003 and 2011, the incidence of CHE remained high, at 12.9% of households in 2011.

Additional studies have been undertaken in several countries in the Asia region. Wagstaff (2007; 2010) analyzes Vietnam's healthcare fund for the poor and demonstrates that although there has been no measurable impact on service use among those already covered, OOP spending has declined substantially. Thailand has published an official report summarizing 10 years of experience with reform to achieve universal health coverage. This study presents a significant reduction in CHE and IHE (HISRO, 2012).

For India, a High Level Expert Group Report on Universal Health Coverage presented to the Ministry of Planning (High Level Expert Group on UHC, 2011), complemented by a call to action publication in *The Lancet* (Reddy, Patel, Jha, Shiva Kumar, & Dandona, 2011) stresses the importance of reducing reliance on OOP (currently at 67% or higher) and hence CHE and IHE by generating an integrated national health system. Additional studies emphasize the need to extend financial protection beyond hospital services to cover, in particular, medicines (Shahrawat & Rao, 2011; Balarajan, Selvaraj, & Subramanian, 2011).

In South Africa, studies of inequity in health financing that form part of the SHIELD work discussed above, are swaying the course of health system reform. The analysis of South Africa shows a financing system driven mainly by private medical schemes that cover the small, wealthy population, alongside a heavily pro-rich distribution of healthcare benefits that fails to attend to the needs of the majority of the population. McIntyre and Ataguba (2012) show that universal coverage could most equitably and affordably be achieved by expanding public funding of health services through a surcharge on taxable income.

The health reform in Colombia dates back to the early 1990s and thus provides considerable opportunity to measure impact on financial protection, as well as other health systems variables. A decade of reform was reviewed in Glassman, Giuffrida, Escobar, & Giedion (2010), which includes a review by Flórez, Giedion, Pardo, & Alfonso (2010) that builds on the chapter included in this volume, and identifies a positive impact on financial protection. They conclude that there is a mitigating effect of insurance, under both the contributory and subsidized regimes, and that insurance is better for protecting households from low, common OOP expenditures than from more substantial costs and a higher catastrophic expenditure threshold, such as that faced with chronic illness.

In the case of Mexico and *Seguro Popular*, further discussed in Chapter 10 of this volume, several academic and governmental publications have analyzed the impact on financial protection, and specifically on CHE and IHE. Analysis of financial protection has been incorporated into government assessments of the progress of the reform since 2004 (Frenk J, Knaul F, Gómez-Dantés O, et al., 2004; Frenk J, González-Pier E, Gómez-Dantés O, et al., 2006; Frenk J, Gómez-Dantés O, Knaul FM, 2009; Gómez-Dantés O, 2005; Secretaría de Salud, 2006; and 2011). Further, a number of papers have been published in both international and Mexican journals. For example, a series published in *The Lancet* on health reform in Mexico includes two papers by Gakidou, et al. (2006) and Knaul, et al. (2006) that focus on household health expenditures. In addition, the topic is discussed in a rigorous pre-post, short-term evaluation presented in King, et al. (2009) also published in *The Lancet*. Several studies have been published since, including Galarraga, Sosa-Rubí, Salinas-Rodríguez & Sesma-Vázquez (2010) and Sosa-Rubí, Salinas-Rodríguez and Galárraga (2011), and these are summarized in a meta analysis in Knaul, et al. (2012).

V. Limitations and Priorities for Future Analysis

Data for the analysis of financial protection in health for LMICs have improved significantly since the early 1990s. Series of surveys –on income and expenditure, household health and poverty and living standards– have made it possible to analyze trends over time for several countries. These data have also been important in designing health financing reforms.

Despite these improvements, most surveys are cross-sectional and hence provide limited insight for causal analysis. There is a pressing need for longitudinal surveys to better measure household spending patterns and its determinants, and particularly for undertaking rigorous evaluation to analyze the impact of policy changes.

In turn, measurement and metrics have been refined, yet further work is required. Existing measures of CHE and IHE are flawed in many respects and the evidence clearly shows high sensitivity to the type of data and specifics of the indicator. The work presented in later chapters of this volume demonstrates that the estimates of the number of families affected by catastrophic or impoverishing health expenditures varies significantly depending on the threshold, measure and survey that is used. Further evidence of variation is provided using data from household diaries (Onoka, Onwujekwe, Hanson, & Uzochukwu, 2011).

Yet another source of error in measurement is periodicity – without longitudinal data it is impossible to identify how often families are forced into financial catastrophe over a given period of time. In the face of the growing burden of chronic disease, longitudinal evidence will be especially important in designing health policy. Prospective or retrospective measurements that account for periodicity will also improve on existing global estimates of the numbers of families affected by CHE and IHE.

Moreover, the impressive body of literature that has been generated on CHE, IHE and OOP since 2000 has uncovered several areas for future analysis that will benefit the design of health systems. For example, further research of the specific conditions and health financing organization that has led to increased OOP and CHE alongside expanded public insurance for health should provide key information for the design and redesign of policy.

The content and rollout of benefit packages –what is covered and what level of cost– is at the heart of the discussion of achieving UHC (WHO, 2010; Knaul, et al., 2012). In response, the Inter-American Development Bank has introduced a community of practice on priority setting and health benefit packages to train and share knowledge in the region (IDB, 2012). This is an area for future work on financial protection, especially in response to the growing burden of chronic disease.

Another important result of two decades of research on financial protection is that OOP spending may respond less quickly than CHE or IHE to health financing reforms and programs. This suggests that a certain level of OOP can co-exist with reduced levels of catastrophic and impoverishing spending. Further analysis should review the equity and efficiency aspects of households continuing to spend OOP as a response to limited quality or access, although in ways that do not challenge their financial well being. Countries may seek interim goals of decreasing catastrophic and impoverishing health expenditure and reducing reliance on OOP. These may prove to be complementary goals yet part of an iterative process of achieving universal health coverage.

The next decade of research on financial protection will increasingly go beyond the descriptive motivation of health reform to produce the analytic evidence required to evaluate and guide its implementation. This next generation of research will be an essential component of the movement towards UHC in global health and in national policy making.

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Chapter 3

Household Catastrophic Health Expenditures

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Household Catastrophic Health Expenditures

A Comparative Analysis of Twelve Latin American and Caribbean Countries*

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I. Introduction

Lack of financial protection in health is a widespread problem plaguing families throughout the developing world. As a result, families suffer the burden of illness as well as the economic ruin and impoverishment of financing their healthcare.

International attention around this challenge to health systems has been growing, originally spurred by the *World Health Report 2000*. National and international research and policy efforts increasingly recognize the importance of strengthening health systems to achieve greater financial protection (van Doorslaer, Wagstaff, & van der Burg, 1999; van Doorslaer, O'Donnell, Rannan-Eliya, et al., 2005; Knaul & Frenk, 2005; Knaul, Arreola-Ornelas, Méndez-Carniado, et al., 2006; van Doorslaer, O'Donnell, Rannan-Eliya, et al., 2007;

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Direct, out-of-pocket (OOP) payment for health at point of service is considered the most inefficient and inequitable means of financing a health system. Opportunities for risk pooling and competition among providers are reduced, and patients pay more than they would with a prepayment scheme due to the fragmentation of risk and the urgency of treatment. The burden of financing care is placed on the family. If the cost of care exceeds the ability to pay at the time of service, catastrophic and potentially impoverishing expenditures arise or necessary care is forgone. Families are often forced to choose between satisfying other basic needs such as education, food and housing, or purchasing healthcare and saving loved-ones from illness, suffering and often shortened life spans. Health spending can thus increase poverty (Wagstaff & van Doorslaer, 2003; Carrin, James & Evans, 2005; Knaul & Frenk, 2005; Baeza & Packard, 2006; van Doorslaer, O'Donnell, Rannan-Eliya, et al., 2005; Frenk, Gómez-Dantés, Knaul, 2009). If households cannot insure against health shocks, there are short and longer run implications of OOP spending (Gertler & Gruber, 2002; Wagstaff, 2005; Baeza & Packard, 2006).

Yet in many countries of the Latin America and Caribbean (LAC) region, financial protection for health continues to be segmented and fragmented. Large parts of the population are excluded from access to public prepayment options such as social security, and resort to paying directly and OOP (Londoño & Frenk, 1997).

This chapter analyzes the effects of lack of financial protection on the prevalence of catastrophic and impoverishing spending across a sample of twelve countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic (DR), Ecuador, Guatemala, Mexico, Nicaragua and Peru. The research questions analyzed in this chapter are:

a) Do countries differ in the extent to which households suffer catastrophic health payments?

b) Which population sub-groups are most severely affected by catastrophic health payments?

c) Does a pattern of differential catastrophic spending by certain sub-groups emerge across the countries in the study? and,

d) Can these basic results be linked to specific features of the healthcare systems suggesting avenues for further research?

The comparative results in this chapter are drawn from, and complemented by, the subset of in-depth country-specific studies in subsequent chapters of this volume. The study assesses the extent to which households in these twelve Latin American countries suffer catastrophic health expenditures with a focus on the relative risks for sub-groups of the population in each of the countries. Since populations in each country are exposed to different socio-economic and health sector contexts, cross-national comparisons made it possible to draw general conclusions about the relationship between certain population traits and the risk of suffering catastrophic health expenditures (CHE). The comparative results can be interpreted as measuring how certain groups are more susceptible to suffer catastrophic expenditures than others across countries.

The second part of the chapter summarizes basic socio-economic and health system characteristics of the twelve countries. The next section describes the data, variables and methodology, followed by a discussion of the descriptive and econometric results. The final part summarizes the main findings and policy conclusions of the research.

II. Overview of Countries

Cross-national and cross-cultural research provides an opportunity to enhance understanding of different health financing schemes and their consequences. Yet this type of research is under-utilized (Wong & Palloni, 2009). Adequate data and the use of methodological approaches that are comparable across countries is needed, both of which are often difficult to obtain. This chapter explores the analytical potential of a comparative approach and generates hypotheses about the relative vulnerability of the different sub-groups with a cross-national comparative perspective.

The study adds to the existing literature on catastrophic health spending by stratifying the analysis by specific population groups within countries and applying strictly comparable methodologies for measuring health spending. In addition, for several of the countries there are no published chapters on the level or distribution of catastrophic health spending, and they have not been part of previous comparative work on health spending. The chapter draws on earlier comparative research including World Health Organization (2000); Murray, Knaul, Xu, Musgrove & Kawabata (2000); Xu, Evans, Kawabata, Zeramdini, Klavu, & Murray (2003); Xu, Evans, Carrin, & Aguilar-Rivera (2005); Knaul, et al. (2006); Baeza & Packard (2006); Xu, Evans, Carrin, Aguilar-Rivera, Musgrove, & Evans (2007); van Doorslaer, et al. (2007); Leive & Xu (2008); Flores, et al. (2008); and Perticara (2008).

The twelve countries in this chapter included 486 million people and accounted for 85% of the population of the LAC region in 2008. They differ greatly in population size and structure, level of economic development, stage of demographic transition, healthcare system organization, and financial protection. With respect to population size, the countries range from Brazil with 189 million to Costa Rica with only 4.4 million. The majority of countries in the sample are largely urban with the highest rates in Argentina, Brazil, and Chile at close to 90%. The smaller and poorer countries are less urbanized and Guatemala stands out at 49%. Other than Guatemala at 2.5%, the rates of population growth are all below replacement, ranging from 1.9% per year in Bolivia to 1% in Chile and Mexico. All countries have experienced large drops in mortality and fertility rates, with consequential aging of the population (Wong & Palloni, 2009). While the majority of countries enjoy life expectancy at birth well over 70 years, the figure is 66 in Bolivia.

Of particular importance for this chapter is that the countries differ in levels of health expenditure and the mechanisms offered to provide healthcare and financial protection (Gómez Dantés, Knaul, Lazcano Ponce, et al, 2011). Despite ongoing reform of several health financing systems –most notably in Chile, Colombia, Mexico and the Dominican Republic– the systems are still characterized by fragmentation, which means that multiple systems interact to provide healthcare (Baeza & Packard, 2006; Gottret & Schieber, 2006). In addition, within each health system, different forms of pooling risk exist and poor, informal and rural populations are often excluded from formal insurance, prepayment or risk pooling schemes (WHO, 2008; Knaul, Arreola-Ornelas, Méndez-Carniado, & Torres, 2007; Knaul, Arreola-Ornelas, Méndez-Carniado, & Miranda, 2009). Notable exceptions are the single social insurance provider in Costa Rica and the systems in Colombia and Mexico that offer specific insurance options that together approach universal coverage of populations (Knaul & Frenk, 2005; Muiser, Herring, & Vargas, 2008; Frenk & Gómez-Dantés, 2009; Frenk, Gómez-Dantés, & Knaul, 2009; Glassman, Escobar, & Giedion, 2009; Musgrove, 2010). With respect to the level of government spending on health as a share of Gross Domestic Product (GDP), Peru has the lowest at 4.3% and Argentina the highest at 10%. Brazil, Argentina, the Dominican Republic, Ecuador, Guatemala and Mexico all have health systems in which private expenditures account for 50% or more of total health spending and the majority is OOP. Only Colombia has a notably low rate of private expenditure (World Bank, 2010).[1]

1. A comprehensive review of health system organization in each country is available in: Atlas of Health Systems. (2012). *Salud Pública de México*, Special Edition; 53(2).

Health financing systems, and their levels of population coverage vary widely in the region, from Brazil's unified tax-based system to Costa Rica's unified social health insurance scheme, both of which offer universal coverage. In between, there are fragmented health systems that include Health Ministries which cover the population with no capacity-to-pay (CTP) with limited-benefit packages, while social security schemes provide more effective coverage to formal workers. Innovative schemes include Colombia's regulated competition model that provides universal coverage and has encouraged reforms in countries like the Dominican Republic and Peru. Chile's *AUGE* seeks universal coverage with a limited package and guaranteed waiting times, and Mexico's *Seguro Popular* offers tax-financed coverage through social insurance covering the previously uninsured. While several countries contract private providers for their public schemes, all permit the private sector to sell services with limited regulation to those able to pay. The country-specific work in each of the chapters that follow in this volume deepen the analysis of how the patterns of catastrophic health spending are related to the features of health financing in each country.

This brief summary of the country conditions sets the stage for the comparative research that follows. The analysis of CHE embodies a wide range of variation in the relative exposure of population sub-groups within and across countries.

III. Study Design: Data, Methods, and Definition of Variables

Each of the twelve participating country research teams selected the most appropriate available household survey that met the requirements of the study. High priority was given to using surveys with detailed measures of expenditures at the household level, disaggregated by type of expenditure such as healthcare or food, and basic socio-demographic information on the household.

The decision to select the surveys in each country with the greatest amount of appropriate data for this research generated challenges for comparability. Through detailed group analysis of the results for each country and efforts to standardize variable definitions, the researchers sought to minimize the impact of these differences in survey design on the comparative results. **Table 1** presents a description of the selected surveys and how these vary in design and purpose.

The data for Bolivia, Brazil, Mexico, and Peru were derived from household expenditure surveys. By contrast, the surveys for Colombia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, and Nicaragua have as their main objective to measure social conditions and the quality of life, including income and poverty. The Argentina and Chile surveys were designed to measure health-care utilization and expenditures. All the surveys other than Chile are national. The Chile data cover only the urban areas of the country, constraining the comparability with other countries and making it impossible to compare to rural households.

Table 1

Data Sources in Twelve Latin America and Caribbean Countries

Country	Survey	Year	Sample Size (Households)	Representativeness
Argentina	*Encuesta de Consumo de los Hogares*	2004-2005	29,031	National (Rural/urban)
Bolivia	*Encuesta de Hogares (EH)*	2006	4,098	National (Rural/urban)
Brazil	*Encuesta de Gasto de Hogares **(POF)***	2002-2003	48,470	National (by States and Metropolitan Zones)
Chile	*Encuesta Nacional sobre Satisfacción y Gasto en Salud (ENSGS)*	2005	5,111	Urban national
Colombia	*Encuesta Nacional de Calidad de Vida (ECV)*	2003	22,949	National (Rural/urban)
Costa Rica	*Encuesta Ingresos y Gastos (ENIG)*	2004	4,231	National (Rural/urban)
Dominican Republic	*Encuesta Nacional de Condiciones de Vida (ENCOVI)*	2004	9,825	National (Rural/urban)
Ecuador	*Encuesta Nacional de Condiciones de Vida (ENCOVI)*	2005-2006	13,581	National (Rural/urban)
Guatemala	*Encuesta Nacional de Condiciones de Vida (ENCOVI)*	2006	13,686	National (Rural/urban)
Mexico	*Encuesta Nacional de Ingreso Gasto de los Hogares (ENIGH)*	2008	29,468	National (Rural/urban)
Nicaragua	*Encuesta Nacional Hogares sobre Medición de Vida*	2005	6,882	National (Rural/urban)
Peru	*Encuesta Nacional de Hogares (ENAHO)*	2006	20,577	National (Urban, Rural and by Departments)

Source: Official office for statistical information from each country.

III.i. Definition of Study Variables

The research group identified and then decided on the construction of the core set of variables, taking into account differences across surveys in order to measure variables that are as strictly comparable as possible across countries. To define the core, common definitions of key dependent variables were developed, such as total household expenditure, healthcare expenditure, and catastrophic health expenditure. Similarly, common definitions were established for measuring household characteristics such as size, place of residence, composition by age of members, and access to health insurance. As part of the preliminary research, the group worked with variations of each variable in order to identify the most appropriate core for this comparative work.

Catastrophic Health Expenditures (dependent variables)

a) The basic indicator (CHE1) is calculated as OOP payments for health as a proportion of income or total expenditure in a given period of time. The numerator is total health expenditure. The research group adopted a common convention and used as the denominator total household expenditure net of food spending to better capture the effect of health expenditures on disposable income (van Doorslaer, et al., 2006; O'Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008). A household is defined as having incurred catastrophic health expenditures if CHE1 exceeds 30%.

b) Following earlier research, the second indicator (CHE2) uses a slightly different definition for the denominator. Total household expenditure is measured net of a standard value. For this research, the standard value is subsistence expenditures equivalent to a poverty line of $ 1 USD PPP (international purchasing power parity dollar) (Wagstaff & van Doorslaer, 2003). A household is defined as having incurred catastrophic health expenditures if CHE2 exceeds 30%, or is positive (>0) for poor households (those below the $ 1 USD PPP line). Thus, CHE2 ≥ CHE1.

The difference between the indicators is in the point of reference used to define an expenditure as catastrophic. CHE1 uses as a reference the capacity-to-pay based on the net income of the household after meeting basic food needs. On the other hand, CHE2 uses as a reference an international standard of subsistence, which in turn facilitates cross-country comparisons. CHE2 also counts any health expenditure by a household that is already living below an absolute poverty line as catastrophic.

Stratification Variables and Hypotheses

Area of residence: urban or rural (note that for Argentina the construction of the rural residence variable differs from the other surveys).[2]

Household composition in categories according to the age of members:

- With at least one child (5 years of age or younger) but no elderly member (60 years of age or older),
- With at least one elderly member but no children,
- With both children and elderly members, and
- With neither children nor elderly members.

Household size according to the number of members in three categories:

- Large (5 or more members),
- Medium (3-4 members), and
- Small (2 or fewer).

Access to health insurance:

- "Yes" if at least one adult member of the household has coverage;
- "No" if no member of the household has coverage.

Household income: measured using total expenditure by quintiles of the distribution in each country (poorest to richest).

2. For additional information see Maceira & Reynosa, Chapter 4 in this volume.

Table 2
Descriptive Statistics for Main Variables in Study Samples in Twelve Latin America and Caribbean Countries

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Households in Rural Areas (%)	7.5	37.2	15.3	–	24.5	37.9	36.1	34.1	46.3	20.2	41.6	34.6
Household Composition												
At least one child (%)	45.0	37.6	29.2	17.5	26.5	24.9	28.0	31.4	40.6	25.6	35.3	33.6
At least one elderly member (%)	20.1	12.8	17.5	27.1	17.1	16.4	15.6	17.1	14.0	18.1	15.8	25.3
At least one child and one elderly member (%)	4.7	2.4	1.9	3.0	3.2	1.7	2.8	3.1	3.9	2.6	8.3	4.4
No child or elderly member (%)	30.2	47.2	55.2	52.5	53.2	56.9	53.5	48.5	41.5	53.7	40.6	45.5
Household Size												
One or two members (%)	19.4	26.5	28.2	28.8	25.4	25.9	27.7	23.6	15.5	23.7	12.8	22.7
Three or four members (%)	0	35.9	45.5	44.3	43.8	44.6	38.0	40.9	33.6	41.1	31.3	35.6
Five or more members (%)	0	37.7	26.3	26.9	30.8	29.5	34.2	36.1	50.9	35.2	56.0	41.7
Health Insurance: Yes (%)	65.3	27.8	27.6	88.9	67.7	90.2	36.1	42.4	37.8	55.5	31.6	62.7
Total Expenditure ($)	418	91	322	195	242	426	705	166	107	149	84	145
(S.D.) ($)	412	3	13	12	3	19	143	3	4	1	1	2
Out-of-Pocket Health Expenditure ($)	31	2	18	22	5	11	29	12	10	5	5	7
(S.D.) ($)	70	0	1	2	0	1	6	0	2	0	0	0
Expenditure on Food ($)	137	53	41	56	74	49	122	27	38	36	36	36
(S.D.) ($)	114	1	1	2	1	1	2	0	1	0	0	0
National Poverty Line ($)	75	41	66	46	74	55	73	76	38	72	55	52
International Poverty Line ($)	30	30	30	30	30	30	30	30	30	30	30	30
Expanded Number of Households (1000)	11,171	2,369	48,394	3,911	11,200	1,153	2,308	3,265	3,118	26,700	989	6,668

Note: Expenditures and Poverty Lines are given in PPP international dollar.

Source: Individual country authors' calculations using country database.

The survey distributions of the stratification variables are presented in **Table 2**. The proportion of rural households ranges from a high in Guatemala (46%) and Nicaragua (42%) to 15% in Brazil and 7% in Argentina. Recall that the Chile sample includes only urban areas. The proportion of households that have at least one elderly member ranges from a high of 30% in Chile and Peru, and 25% in Argentina, to a low of 15% in Bolivia and 18% in Costa Rica. Household size is on average the largest in Nicaragua and Guatemala, where more than 50% of households have five or more members. With respect to health insurance coverage, the range is from 27% of households with reported coverage in Brazil and Bolivia, to 90% in Costa Rica.

The hypotheses are that CHE will be more prevalent in households living in rural areas, with older adults and children, with more members, without health insurance and with lower income.

III.ii. Methods

Levels of health spending in a country depend on the composition of the population. Thus a population-standardized measure of the total prevalence of CHE is required to maximize the potential for comparability. In this study, the distribution of households by household size across the sum of all countries in the sample is used as the standard population. This method holds the distribution of the population constant so that differences in health spending across countries can be attributed to factors other than the differential composition of country populations.

To further overcome the variation in the surveys and increase the direct comparability of measures across countries, the research compares health expenditure across sub-groups within each country (for example large *versus* small households). These comparisons are appropriate assuming that the surveys captured health payments by households of the various sub-groups equally in each country.

The prevalence of CHE is calculated for the total of households in each country, and by sub-groups defined by the stratification variables. Point and interval (95%) estimates of prevalence were obtained. For each country, ratios of prevalence of catastrophic health expenditures across categories of the stratification variables are calculated, in order to assess whether some strata of the population show relatively higher exposure than others. Then the interval estimates for each of the sub-groups are compared to assess whether the ratio of the two estimates is significantly different than one. A value greater than 1.0 for the ratio implies that catastrophic spending relative to subsistence or disposable income is more common in the numerator group than in the denominator group.[3]

The multivariate regression analysis uses a probit model to analyze the probability that a household suffered a catastrophic expenditure given a series of risk factors. The formal probability function is:

$$\Pr(CHEi = 1) = F(Xiß) \quad (1)$$

Where: CHE (1, 2) is the dichotomous dependent variable set at **1** if the household has a catastrophic expenditure; **X** is the vector of explanatory variables; and, **ß** are the estimated parameters.

The independent variables are designed to be strictly comparable for the analysis of relative risk ratios discussed above:

a) Residence (1= Urban, 0=Rural),

b) Income quintile proxied by total expenditure,

c) Household composition based on presence of children less than six years of age or adults 65 years or older with the reference value being households with neither,

d) Household size with 3-4 members as the reference value, and,

e) Health insurance status (1= at least one household member has insurance).

Similar analyses have been presented by other authors for specific countries (Parker & Wong, 1997; Phelps, 1997; Sharpe, Fan, & Hong, 2001).

3. For example, if the ratio of prevalence among households *with* older adults divided by the prevalence among those *without* older adults is 1.3 in country A and 2.5 in country B, and the respective intervals do not overlap, then we conclude that, relative to households without older adults, households *with* older adults in country B are more likely to report catastrophic health expenditures than those in country A. Thus households *with* older adults seem more exposed to financial health risk and lack financial protection in B than in A.

The multivariate analysis was undertaken and is presented for both CHE1 and CHE2. Coefficients are reported as marginal effects that measure the probability that a household suffers a catastrophic expenditure, holding the other variables at mean value and changing the value of the specific dichotomous variables.

No additional control variables, such as state dummies or sex of household head are included since comparable information was not available for all countries in the sample. Also, Bolivia is not included in the multivariate analysis because the model could not be estimated.

Further, the regression results cannot be interpreted as causal because of the endogeneity of several variables, and most clearly expenditure quintiles and insurance status. The findings should be taken as associations controlling for other factors.

IV. Results

IV.i. Catastrophic Health Expenditure by Country

The prevalence of CHE varies across the countries under study and depending on the indicator (**Table 3**). Without standardizing by population, for CHE1 the range is from: 0.4% in Costa Rica; to between 2 and 5% in Colombia, Bolivia, Brazil, Mexico, and Peru; and, between 7 and 11% in Argentina, the Dominican Republic, Ecuador, Guatemala, and Nicaragua.

The population-standardized figures yield similar relative ranking of the countries. Costa Rica presents very low prevalence, while Guatemala shows the highest prevalence of catastrophic expenditures.

IV.ii. Ratios by Stratification Variables

In all countries other than Argentina (where the definition is somewhat different), catastrophic health expenditures are more prevalent in rural than in urban areas and these differences are statistically significant in almost all cases (**Table 4**). Costa Rica and the Dominican Republic have the lowest ratios, implying a smaller difference between rural and urban areas. Peru, Guatemala, and Brazil have moderate ratios compared to the rest of the countries. Bolivia, Colombia, Mexico, Nicaragua, and Ecuador show the largest gaps with prevalence around 2-4 times greater in rural compared to urban households.

Table 3

Percent of Households with **CHE** In Twelve Latin American and Caribbean Countries: Observed and Standardized

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Observed												
CHE1	8.4	3.3	2.2	15.4	2.8	0.4	9.8	7.2	11.2	2.4	10.3	5.0
	(8.1 - 8.7)	(2.5 - 4.2)	(1.9 - 2.5)	(13.7 - 17.1)	(2.5 - 3.1)	(0.2 - 0.6)	(9.1 - 10.6)	(6.7 - 7.7)	(10.3 - 12.0)	(2.2 - 2.7)	(9.5 - 11.2)	(4.6 - 5.4)
CHE2	5.2	6.0	4.0	11.1	2.6	0.6	5.7	15.6	17.2	4.0	20.7	5.7
	(4.9 - 5.5)	(5.0 - 7.0)	(3.6 - 4.4)	(9.7 - 12.6)	(2.3 - 2.9)	(0.4 - 0.8)	(5.1 - 6.4)	(14.9 - 16.3)	(15.7 - 18.6)	(3.7 - 4.4)	(19.5 - 21.9)	(5.4 - 6.1)
Standardized by Household Composition												
CHE1	8.4	3.7	2.3	14.4	2.9	0.4	10.2	7.4	11.6	2.5	10.3	5.1
CHE2	5.1	5.9	4.4	11.0	2.7	0.7	6.0	15.8	16.3	4.3	19.9	6.1

Notes: Threshold for catastrophic spending=30%.
Confidence intervals (95%) are given in parentheses.
CHE1: Calculated as out-of-pocket expenditures on health / total household expenditures net of food spending.
CHE2: Calculated as out-of-pocket expenditures on health / total household expenditures net of international poverty line.
Standardized using the total distribution by household size of all countries as the standard.

Source: Individual country authors' calculations using country database.

Table 4

Ratios of Prevalence of CHE in Twelve Latin American and Caribbean Countries (threshold=30%)

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Area of Residence	Rural: Urban=1											
CHE1	0.8*	1.6	1.6*	n.a.	2.5*	1.0	1.3*	2.1*	1.3*	1.9*	2.2*	1.4*
CHE2	0.8*	4.3*	2.2*	n.a.	2.8*	1.8	1.4*	3.0*	2.3*	3.5*	3.5*	2.3*
Income Quintiles	Poorest Quintile: Richest Quintile=1											
CHE1	1.4	0.7	2.1*	0.5*	2.4*	0.3	1.3	1.7*	0.5*	1.1	1.5*	0.8
CHE2	2.0*	28.2*	6.6*	1.0	5.0*	5.0*	1.4	10.8*	4.9*	5.8*	12.2*	4.7*
Household Composition (1)	At least one child: Rest=1											
CHE1	0.6*	0.7	0.9	1.0	1.2	1.1	0.7*	1.2	1.2	1.5	1.3*	1.6
CHE2	0.6*	2.6*	2.1*	1.3	1.5*	8.3*	0.8	1.9*	2.5*	2.5*	1.8*	2.7*
Household Composition (2)	At least one elderly member: Rest=1											
CHE1	3.5*	2.9*	4.0*	2.2*	2.3*	7.5*	2.7*	3.1*	2.3*	4.4*	2.1*	2.4*
CHE2	4.1*	1.8	2.7*	2.0*	2.4*	4.8*	4.0*	2.4*	2.1*	3.4*	1.6*	2.4*
Household Composition (3)	At least one child and elderly member: Rest=1											
CHE1	1.7*	0.9	1.6	3.1*	1.6	0.0*	1.5*	1.1	1.9*	2.8	1.6*	2.9*
CHE2	1.9*	3.1	3.1*	4.4*	3.0*	10.6*	1.7	2.2*	3.6*	6.0*	1.9*	4.0*

Table 4 *(continued)*

Ratios of Prevalence of CHE in Twelve Latin American and Caribbean Countries (threshold=30%)

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Household Size (1)	3 to 4 members: 2 or fewer members=1											
CHE1	2.1*	1.7	2.3*	1.4*	1.3	3.6	1.6*	1.7*	1.6*	2.4*	1.1	1.4*
CHE2	2.5*	0.8	1.3*	1.1	1.3*	2.3	1.8*	1.1	1.3	1.5*	0.8	1.3
Household Size (3)	3 to 4 members: 5 or more members=1											
CHE1	0.7*	0.8*	0.9*	1.2	0.9	1.3	0.7*	0.8	1.2	0.9	1.2	1.0
CHE2	0.8	2.7*	2.0*	1.7*	1.5	4.5	0.7	1.6*	2.4*	1.9*	2.3*	1.9*
Health Insurance	Uninsured: Insured=1											
CHE1	2.1*	0.8	1.3*	1.7*	0.4*	1.0	0.7*	0.6*	0.6*	0.8*	0.5*	0.7*
CHE2	2.2*	0.2*	0.6*	1.2	0.4*	1.0	0.6*	0.5*	0.4*	0.4*	0.3*	0.9

Notes: *Ratio of prevalences is significantly different than 1 (numerator and denominator 95% confidence intervals do not overlap).
CHE1: Calculated as out-of-pocket expenditures on health / total household expenditures net of food spending.
CHE2: Calculated as out-of-pocket expenditures on health / total household expenditures net of international poverty line.
Rest: Are households without children or older adults.

Source: Individual country authors' calculations using country database.

Catastrophic health expenditures, measured by CHE2, are more common in the poorest quintiles compared to the richest. CHE2 provides a clearer pattern, and in all countries except Chile, the percent with catastrophic health expenditures is higher among poor households. For CHE1 the ratios are lower overall and are below 1 for several countries. The poorer countries (such as Nicaragua and Ecuador) tend to have greater differentials, particularly for CHE2. Bolivia has very high differences between quintiles and between CHE1 and CHE2 which suggests data problems.

For countries with particularly high rates of absolute poverty, CHE1 may actually show more catastrophic spending among the richer compared to the poorest households, as is the case in Bolivia, Peru, and Guatemala. CHE2 takes into account spending on health at any level by families living below the poverty line and hence places emphasis on the catastrophic nature of spending for the poorest. Additional support for this explanation comes from the results for Brazil, Colombia, Guatemala, and Mexico where the ratio for the first indicator, though greater than 1.0, is much lower than for the second. In addition, the results may be capturing non-spending by poorer households who cannot pay for healthcare and thus are exposed to even greater health crises.

The results suggest that the propensity to suffer CHE tends to be higher for families with young children, and more so for families with elderly household members. In general, there is higher exposure to CHE among households with children compared to households with no children and no elderly. For 10 of the 12 countries using CHE2, households with children tend to be more exposed to financial crisis from health spending, with statistically significant differences in 9 of these countries. Still, the results vary across countries and are less marked for CHE1 than CHE2. All 12 countries have higher levels of catastrophic health expenditures among households with elderly members compared to households with no children and no elderly, and this holds for both indicators. The ratios are particularly high for Argentina, Costa Rica, the Dominican Republic, and Mexico. The results also show that for CHE2, all countries have higher propensity of catastrophic health expenditures among households with children and elderly compared to households with neither. For CHE1 almost all countries also have ratios over 1. In Argentina, the Dominican Republic, Ecuador, Guatemala, and Nicaragua the ratios are approximately 2:1, and in the remaining countries the ratios are substantially higher.

While this pattern may reflect expensive healthcare needs of older adults, the presence of elderly members may also reflect a coping mechanism of poor households, who may recourse to co-residence with elderly family members to meet consumption needs. Similarly, large households appear more likely to incur catastrophic health expenses, and this type of living arrangement could be a coping mechanism sought by many poor households for economic survival.

In most countries, households with 3-4 members are less likely to experience CHE than small households. The exceptions are Bolivia and Nicaragua where the ratio is above 1 for CHE2, although not statistically significant. In all countries with the exception of Argentina and the Dominican Republic, but only for CHE2, large households have higher prevalence of catastrophic health expenditures than small households. The gap is largest in Bolivia and Nicaragua.

For the majority of the countries, the propensity to incur catastrophic spending is, as expected, higher among households without insurance and the results are largely consistent for both CHE1 and CHE2, and statistically significant. The exceptions are Argentina, Chile, Costa Rica, and Peru (with ratios close to 1.0 for CHE2).

The differences between uninsured and insured households are not as great as might be expected if insurance were indeed effectively protecting households from spending OOP. While these results are somewhat surprising, it may indicate that households with insurance are spending OOP for uncovered expenses such as medications, or in order to avoid long waits. Furthermore, uninsured households may forego health spending and thus not incur financial catastrophe, although they may be subject to greater health catastrophe as a result of avoiding timely care. It may also reflect differences in the extent of the package of covered services across countries.

Another important issue is that insured populations may be self-selecting. Lack of insurance may be an indicator of particular types of households that also have a different attitude towards spending on healthcare. This may be true for some countries more than others, in particular for those countries in which affiliation to insurance is voluntary.

Overall, these results help to identify the common attributes that define households with high risk of catastrophic expenses for the region: in rural areas, uninsured, in poverty, and households with children or with elderly members (**Tables 5a and 5b**). The results for size of household are not as clear which may indicate that families adopt a variety of different living strategies to mitigate healthcare costs.

Table 5a

Summary of Significant Differences in Prevalence of CHE in Twelve Latin American and Caribbean Countries Between Sub-groups by Country, using CHE1 Measurement

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Rural *versus* Urban	X		XX	NA	XX		XX	XX	XX	XX	XX	XX
Income Quintile: Poorest *versus* Richest			XX	X	XX			XX	X		XX	
Household Composition: Children *versus* Rest	X						X				XX	
Household Composition: Elderly Members *versus* Rest	XXX	XX	XXX	XX	XX	XXXX	XX	XXX	XX	XXX	XX	XX
Household Composition: Children and Elderly Members *versus* Rest	XX			XXX		X	XX		XX		XX	XX
Household Size: 3-4 members *versus* 2 or fewer	XX		XX	XX			XX	XX	XX	XX		XX
Household Size: 5 or more members *versus* 2 or fewer	X	X	X	XX	X	XX	X	X	XX	X	XX	XX
No Health Insurance Coverage *versus* Yes	XX		XX	XX	X		X	X	X	X	X	X

Notes: Using CHE1, data comes from Table 4 (ratios of prevalence of catastrophic health expenditures using threshold=30%).
Rest: In Household Composition are households without children or older adults.
Only ratios significantly different than 1 are marked with **X** as follows: X: Ratio is significantly LESS than 1; XX: 1 < ratio ≤3; XXX: 3 < ratio ≤5; XXXX: Ratio > 5.

Source: Individual country authors' calculations using country database.

Table 5b

Summary of Significant Differences in Prevalence of CHE in Twelve Latin American and Caribbean Countries Between Sub-groups by Country, using CHE2 Measurement

	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Rural *versus* Urban	X	XXX	XX	NA	XX		XX	XX	XX	XXX	XXX	XX
Income Quintile: Poorest *versus* Richest	XX	XXXX	XXXX		XXX	XXX		XXXX	XXX	XXXX	XXXX	XXX
Household Composition: Children *versus* Rest	X	XX	XX		XX	XXXX		XX	XX	XX	XX	XX
Household Composition: Elderly Members *versus* Rest	XXX		XX	XX	XX	XXX	XXX	XX	XX	XXX	XX	XX
Household Composition: Children and Elderly Members *versus* Rest	XX		XXX	XXX	XX	XXXX		XX	XXX	XXXX	XX	XXX
Household Size: 3-4 members *versus* 2 or fewer	XX		XX		XX		XX			XX		
Household size: 5 or more members *versus* 2 or fewer	X	XX	XX	XX	XX	XX	X	XX	XX	XX	XX	XX
No Health Insurance Coverage *versus* Yes	XX	X	X		X		X	X	X	X	X	

Notes: Using CHE2, data comes from Table 4 (ratios of prevalence of catastrophic health expenditures using threshold=30%).
Rest: In Household Composition are households without children or older adults.
Only ratios significantly different than 1 are marked with **X** as follows: X: Ratio is significantly LESS than 1; XX: 1 < ratio ≤3; XXX: 3 < ratio ≤5; XXXX: Ratio > 5.

Source: Individual country authors' calculations using country database.

IV.iii. Regression Analysis

The regression results tend to reinforce the previous results. The first table summarizes the findings for CHE1 and the second for CHE2 (**Tables 6a** and **6b**). As discussed in the chapter on Costa Rica in this volume, the very small number of households with catastrophic health expenditure makes it difficult to identify significant effects with these regression models.[4]

For all countries other than Argentina and Costa Rica, households living in rural areas are significantly more likely to suffer catastrophic health expenditures. The findings hold for each of the dependent variables.

In Argentina and Brazil, using CHE1, poorer households have a higher likelihood of catastrophic expenditures. In the rest of the countries, the opposite is true – controlling for other variables, wealthier households have a greater propensity to catastrophic expenditure. Using CHE2, the results are more consistent and for the majority of countries, the poorest households are more likely to suffer catastrophic expenditure. This is not surprising given the weight that CHE2 places on households below the poverty line.

Using CHE1, in the Dominican Republic, Ecuador, Guatemala, Mexico, Nicaragua, and Peru, families with older adults and children tend to be at higher risk. The results are more consistent for CHE1. In Colombia, only families with young children have significantly higher likelihood of incurring catastrophic health expenditure.

For the majority of the countries, risk is higher among larger and in some cases also smaller families. Again, results are not significant for Colombia, Chile or Costa Rica.

Further, in the majority of countries, catastrophic expenditure is significantly more likely among uninsured households. The exceptions are Argentina and Brazil where risk appears to be higher among insured households. The results for Chile and Costa Rica are not statistically significant.

4. See Zuñiga-Brenes MP, Vargas JR, & Vindas A. "The Out-of-pocket and Catastrophic Health Expenditure Puzzle: The Costa Rican Case." Chapter 8 of this volume.

Table 6a

Determinants of Suffering Catastrophic Expenditure Using CHE1 Measurement; Marginal Effects

Independent variables		Reference	Argentina	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Rural/ urban Residence		**Urban**	-0.011*	0.009***		0.030***	0.001	0.033***	0.051***	0.038***	0.010***	0.083***	0.028***
			(0.005)	(0.002)		(0.005)	(0.002)	(0.006)	(0.005)	(0.006)	(0.002)	(0.009)	(0.004)
Poverty (Expenditure quintiles)	**Quintile I**	**Quintile V**	0.023***	0.027***	-0.081**	-0.006**	-0.003**	-0.046***	-0.015*	-0.117***	-0.013***	-0.059***	-0.035***
			(0.006)	(0.004)	(0.013)	(0.003)	(0.002)	(0.008)	(0.008)	(0.005)	(0.002)	(0.012)	(0.004)
	Quintile II		0.026***	0.024***	-0.061**	-0.006**	-0.001	-0.053***	0.003	-0.082***	-0.010***	-0.026*	-0.023***
			(0.006)	(0.004)	(0.013)	(0.003)	(0.002)	(0.008)	(0.008)	(0.006)	(0.002)	(0.013)	(0.004)
	Quintile III		0.021***	0.018***	-0.022	-0.003	-0.003**	-0.037***	0.016*	-0.064***	-0.005***	0.013	-0.016***
			(0.005)	(0.003)	(0.015)	(0.003)	(0.001)	(0.008)	(0.008)	(0.006)	(0.002)	(0.015)	(0.004)
	Quintile IV		0.012***	0.015***	0.006	-0.003	-0.001	-0.006	0.002	-0.029***	-0.004*	0.003	-0.006
			(0.004)	(0.003)	(0.015)	(0.003)	(0.002)	(0.009)	(0.008)	(0.007)	(0.002)	(0.014)	(0.004)
Household Composition	**With Children**	**No Elderly Members or Children**	0.120	0.043***	0.150**	0.021***	0.013**	0.104***	0.099***	0.125***	0.040***	0.126***	0.048***
			(0.006)	(0.003)	(0.015)	(0.004)	(0.006)	(0.011)	(0.009)	(0.011)	(0.004)	(0.016)	(0.005)
	With Elderly Members		-0.018***	0.000	0.024	0.004	0.003	-0.015**	0.016***	0.026***	0.012***	0.017	0.035***
			(0.005)	(0.002)	(0.017)	(0.003)	(0.004)	(0.008)	(0.006)	(0.007)	(0.003)	(0.009)	(0.005)
	With Children and Elderly Members		0.063***	-0.007**	0.209**	0.018		0.080***	0.054***	0.108***	0.050***	0.086***	-0.005
			(0.012)	(0.003)	(0.048)	(0.013)		(0.025)	(0.019)	(0.019)	(0.012)	(0.020)	(0.007)

Table 6a *(continued)*

Determinants of Suffering Catastrophic Expenditure Using CHE1 Measurement; Marginal Effects

Independent variables		Reference	Argentina	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Household Size	**1-2 persons**	**3-4 persons**	0.012***	0.010***	-0.002	0.002	0.004	0.042***	0.032***	-0.011	0.011***	-0.014	0.002
			(0.004)	(0.002)	(0.013)	(0.003)	(0.003)	(0.009)	(0.007)	(0.008)	(0.002)	(0.013)	(0.004)
	5+ persons		-0.006	-0.004***	0.012	0.001	0.001	-0.034***	-0.018***	0.026***	-0.001	0.025***	-0.006*
			(0.004)	(0.002)	(0.013)	(0.003)	(0.002)	(0.007)	(0.005)	(0.006)	(0.002)	(0.009)	(0.004)
Insurance Status		**Uninsured**	0.030***	0.027***	0.025	-0.019***		-0.038***	-0.020***	-0.055***	-0.016***	-0.049***	-0.023***
			(0.003)	(0.003)	(0.016)	(0.003)		(0.006)	(0.005)	(0.005)	(0.002)	(0.009)	(0.004)
Model Statistics		**Pseudo R2**	0.093	0.069	0.050	0.058	0.098	0.055	0.071	0.050	0.073	0.053	0.039
		N	29,031	48,470	4,539	16,442	3,779	9,824	13,581	13,686	29,468	6,882	20,577

Notes: Standard errors in parentheses.
Statistical significance: *** = p<0.01, ** = p<0.05, * = p<0.1.

Source: Individual country authors' calculations using country database.

Table 6b

Determinants of Suffering Catastrophic Expenditure Using CHE2 Measurement; Marginal Effects

Independent variables		Reference	Argentina	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Rural/ urban Residence		Urban	-0.007**	0.013***		0.016***	-0.001	0.019***	0.069***	0.042***	0.017***	0.082***	0.014***
			(0.004)	(0.002)		(0.004)	(0.002)	(0.005)	(0.007)	(0.007)	(0.002)	(0.012)	(0.004)
Poverty (Expenditure quintiles)	Quintile I	Quintile V	0.033***	0.146***	-0.017	0.011**	0.007	-0.018***	0.356***	0.222***	0.031***	0.492***	0.063***
			(0.006)	(0.009)	(0.013)	(0.004)	(0.005)	(0.006)	(0.018)	(0.016)	(0.005)	(0.028)	(0.009)
	Quintile II		0.030***	0.092***	-0.048**	-0.004	-0.001	-0.041***	0.048***	-0.031***	-0.014***	0.099***	-0.016***
			(0.005)	(0.007)	(0.011)	(0.003)	(0.002)	(0.004)	(0.014)	(0.011)	(0.002)	(0.025)	(0.005)
	Quintile III		0.021***	0.048***	-0.046**	-0.008***	-0.004*	-0.040***	0.014	-0.059***	-0.009***	0.062***	-0.012**
			(0.005)	(0.006)	(0.012)	(0.002)	(0.002)	(0.004)	(0.013)	(0.010)	(0.003)	(0.024)	(0.005)
	Quintile IV		0.014**	0.024***	-0.009	-0.003		-0.024***	-0.016	-0.038***	-0.007**	-0.006	-0.007
			(0.004)	(0.005)	(0.013)	(0.003)		(0.005)	(0.012)	(0.010)	(0.003)	(0.023)	(0.005)
Household Composition	With children	No Elderly Members or children	-0.011***	0.053***	0.113**	0.012***	0.008	0.081***	0.092***	0.135***	0.038***	0.154***	0.034***
			(0.004)	(0.004)	(0.014)	(0.003)	(0.005)	(0.009)	(0.010)	(0.013)	(0.004)	(0.020)	(0.005)
	With Elderly Members		0.079***	0.014***	0.039*	0.001	0.014**	-0.003	0.019*	0.067***	0.018***	0.036***	0.030***
			(0.005)	(0.002)	(0.016)	(0.002)	(0.006)	(0.006)	(0.008)	(0.008)	(0.003)	(0.013)	(0.004)
	With children and Elderly Members		0.039***	-0.012***	0.205**	0.015	0.016	0.047**	0.061***	0.162***	0.058***	0.134***	0.000
			(0.009)	(0.004)	(0.046)	(0.011)	(0.022)	(0.019)	(0.021)	(0.021)	(0.011)	(0.025)	(0.008)

Table 6b *(continued)*

Determinants of Suffering Catastrophic Expenditure Using CHE2 Measurement; Marginal Effects

Independent variables		Reference	Argentina	Brazil	Chile	Colombia	Costa Rica	DR	Ecuador	Guatemala	Mexico	Nicaragua	Peru
Household Size	**1-2 persons**	**3-4 persons**	0.010***	-0.006**	-0.009	0.002	0.008	0.017***	-0.003	0.001	0.006**	-0.010	0.007
			(0.003)	-(0.002)	(0.011)	(0.002)	(0.005)	(0.006)	(0.008)	(0.012)	(0.003)	(0.020)	(0.005)
	5+ persons		0.003	0.029***	0.025*	0.003	0.004	-0.017***	0.007	0.064***	0.007***	0.058***	0.009**
			(0.004)	(0.003)	(0.012)	(0.003)	(0.003)	(0.005)	(0.007)	(0.008)	(0.002)	(0.012)	(0.004)
Insurance Status		**Uninsured**	0.021***	0.032***	0.000	-0.012***		-0.025***	-0.028***	-0.061***	-0.023***	-0.071***	-0.011***
			(0.003)	(0.004)	(0.015)	(0.003)		(0.004)	(0.007)	(0.007)	(0.002)	(0.013)	(0.004)
Model Statistics		**Pseudo R2**	0.097	0.081	0.041	0.081	0.146	0.083	0.213	0.149	0.144	0.264	0.079
		N	29,031	48,470	4,539	16,442	3,123	9,824	13,581	13,686	29,468	6,882	20,577

Notes: Standard errors in parentheses.
Statistical significance: *** = p<0.01, ** = p<0.05, * = p<0.1.

Source: Individual country authors' calculations using country database.

V. Conclusions

Examining the prevalence of household catastrophic spending portrays a heterogeneous set of countries. Prevalence of catastrophic health spending varies widely, from less than one% of households in Costa Rica and 2% in Brazil (two countries where social security covers the large majority of the population), to 10-15% of households in Nicaragua, Guatemala, the Dominican Republic, Argentina, and urban Chile.

Another important conclusion of this work is that the indicator used to estimate CHE can substantially affect the results. This was evident from using two indicators: out-of-pocket health share (CHE1) and health expenditures net of a standard value (CHE2). While the absolute values obtained with the two indicators are expected to differ by definition, the methodology applied here –using the relative standing of different groups– took into account this possible source of variation.

This chapter reflects the effort of a collection of country-specific research teams to harmonizing variables across the data sets in order to facilitate comparisons. Yet, and as is typically true for cross-national comparisons, the greatest challenge for this study was the comparability of data across countries. The data sets for the various countries were not designed with cross-country comparisons in mind. Thus there were important differences in field protocols, concepts and wording and design of questionnaires. It would be advantageous to apply a standard battery of questions in all countries for the analysis of healthcare spending. This convention would greatly facilitate cross-country analyses, but this harmonization effort also can potentially improve the quality of the national data sets. This collective effort would require concerted action, and could be led and financially supported by organizations such as the World Health Organization and its regional arm the Pan American Health Organization, and financial institutions such as the Inter-American Development Bank and the World Bank.

Another limitation is that the measure used for expenditures and to calculate the prevalence of CHE assumes that households facing potentially large medical expenditures sacrifice consumption. The definition ignores the differential ability of households to draw from savings, assets, family transfers, or other coping mechanisms to protect consumption of other goods. Previous research has argued that this approach can provide a misleading idea of the consequences for impoverishment of health shocks, in particular in the short run (Wagstaff, 2005; Knaul, et al., 2006; Flores, et al., 2008). This can be especially relevant in populations where informal coping mechanisms are common, which may be the case in many of the countries under study, and these mechanisms may further differ across sub-groups in a country or across countries. Future research on this line of work could seek to improve on these features of the data samples, and assess more accurately the impact of health shocks on the economies of households in poor societies. Considering longer time horizons of health expenditures and longitudinal data on patterns over time will be essential for answering these questions and help to identify if it is the same households that exhibit catastrophic health expenses repeatedly over time and if so, how often.

These limitations notwithstanding, the approach used to quantify and compare the patterns of catastrophic healthcare expenditures contributes to identifying the groups that most need additional financial protection to prevent the consequences of health shocks. This methodology could be used to monitor the progress of health systems in securing financial protection of vulnerable groups throughout Latin America.

The results on the relative levels of catastrophic health spending across population sub-groups show patterns that are important for designing policies to improve the equity of health financing. It is clear that for each country, certain groups of the population are more exposed to catastrophic expenses and these groups can be identified and targeted to achieve the greatest possible fairness of finance in the ongoing quest for universal health coverage and financial protection.

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Chapter 4

Catastrophic and Impoverishing Health Expenditure in Argentina, 1997–2005

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Daniel Maceira[i], Ana Reynoso[ii]

I. Introduction

Health systems face the challenge of implementing an equitable and effective network of provision, financing and regulation of services and goods to maintain or restore health. This implies allocating resources to meet the needs of the population and reducing the likelihood of facing events of illness by encouraging preventive behaviors.

The demands on a country's health system are wide-ranging, and are defined by the socio-economic and demographic characteristics of the population. Enhancing coverage, equity and the quality of health services requires an institution that is responsible for planning activities and that is able to develop the means to guarantee health rights through rules, regulations and effective funding allocation.

Health insurance mechanisms involve the transfer of resources from relatively healthy population groups to other, less healthy groups. To the extent that such transfers take place with the aim of guaranteeing equity in services, insurance can be viewed as a mechanism of solidarity or social welfare.

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In the case of Argentina, the fragmentation of insurance funding schemes, due to both the decentralization of public services and the dispersion of social security funds, leads to financing gaps among social groups and between provinces (geographic-administrative divisions) – a situation that presents challenges for equity. From this perspective, the level of out-of-pocket (OOP) health spending constitutes an indicator of the effectiveness of the healthcare model.

The aim of this study is to identify and calculate a series of indicators of household health spending and their impact on disposable income. Household surveys were used to measure the performance of Argentina's health system in terms of providing financial protection in health. The main analysis is for 2005, with comparisons to performance in 1997.

The next two sections introduce the theoretical and methodological background for the analysis of the situation in Argentina. The fourth section presents the indicators related to catastrophic and impoverishing health expenditure. This is followed by a discussion of approaches to promoting preventive health strategies, and the actions that determine the consumption of health services.

II. Theoretical Framework

The definition of household financial contribution (HFC) introduced by Xu, et al. (2003) represents the financial burden of health spending borne by households. This contribution translates as the ratio of household health expenditure (HE) via general taxes, contributions to the social security system, private insurance plans and OOP payments to household capacity-to-pay (CTP). The latter, in turn, is defined for family i as effective income minus subsistence expenditure: $HFCi = HEi/CTPi$.

Xu, et al. (2003) use household consumption as a proxy for effective income, given that the variance in current expenditure is less than the variance in current income, a fact that helps manage random shocks in the calculation of income. To facilitate comparisons among countries, the authors use the international poverty line to represent subsistence expenditure. This line remains constant as income increases, thus reducing the possibility of underestimating household CTP for families with greater resources – a potential problem when current food expenditure is used as an indicator. An endogenous poverty line is also calculated based on food prices in each country. This poverty line is calculated from the average food expenditure in households whose spending on food, in relation to total expenditure, is within the range of 45% to 55% of the population, adjusted for the number of members in the household.

The definition of this measure of household financial contribution to health gives rise to the indicators of catastrophic and impoverishing health expenditure. Health expenditure is considered catastrophic when a household reduces its basic expenditure during a period of time in order to cover the costs of healthcare. In the literature there is no consensus regarding the proportion of income spent on health that should be considered catastrophic, with standard measures ranging from 10% to 40% (Xu, et al., 2003; van Doorslaer, et al., 2005).

Xu, Evans, Kawabata, Zeramdini, Klavus, & Muray (2003) analyze 59 countries and find the highest rates of catastrophic health expenditure (CHE) in some Latin American countries. These authors claim that a positive relationship exists between the proportion of households with CHE and the share of OOP spending as a percentage of total health expenditure. In addition, given that CHE occurs when direct payments by households are high in relation to total health expenditure –assuming that all other expenses remain constant– the likelihood of incurring CHE increases when both poverty levels and healthcare levels are higher.

Van Doorsaler and Wagstaff (2002) compare two measures of equity in health system payments. The first is based on payments below a pre-specified proportion of income. The second is based on expenditure that does not force households below the poverty line. The authors design indices to determine how "catastrophic" OOP health spending is, and capture its intensity, incidence and variations with income. They propose different indicators: on the one hand, they suggest determining the proportion of the sample for whom health spending was proportionately higher than the theoretical threshold z by calculating the population that incurred a CHE. In addition, they analyze "excess" CHE to capture the intensity or severity of the expenditure.

According to a separate but in some ways similar approach, an increase in OOP spending in relatively poor countries can result in what Whitehead, Dahlgren, & Evans (2001) call the "poverty trap". McIntyre, Thiede, Dahlgren, & Whitehead (2006) review the economic consequences of illness and household payments for healthcare, and propose two methods for their analysis: one based on direct costs (financial costs incurred at the moment health services are provided), and another based on indirect costs (productive time lost due to illness of other family members).

One of the most important limitations of CHE measures is that the data sources generally do not allow for taking indirect expenses into account, and thus underestimate the financial consequences of OOP spending. A household's capacity to implement formal and informal protection mechanisms against health shocks depends in part on their financial capacity and participation in the labor market, while the state provides different types of health interventions. Interventions can take the form of financing, service provision or both, and can also comprise the regulation and promotion of social or private funds that reduce household financial risk.

Becker & Ehrlich (1972), Lustig (2001), Carrin & James (2004) and Wagstaff & van Doorslaer (2002) sustain that alternative mechanisms exist to cope with the financial shocks associated with health which come into play when formal mechanisms are not accessible. These alternatives include participation in insurance funds, "self-insurance" based mainly on savings, and "self-protection" built upon the adoption of health-promoting lifestyle habits such as sports activities and healthy eating habits. This aversion to risk suggests that by developing healthy habits or the capacity to save, consumers tend with time to spread their consumption evenly instead of relying on a cost distribution characterized by peaks and troughs. Accordingly, if contingencies such as illness arise, consumers would wish to obtain insurance plans that redistribute their income from favorable scenarios (when they enjoy good health) to contingent scenarios (when they are likely to become ill).

However, the incidence of insurance mechanisms differs depending on income level. Groups with low salaries turn to the public health systems when illness occurs. Their associated expenditures may become a financial shock, understood as an expense that pushes an individual or household below the poverty line. In contrast, moderately high and high-income groups often have access to private or social health insurance. This health insurance mechanism allows individuals adverse to risk to implement a strategy to minimize the cost of facing a catastrophic financial expenditure.

Some studies in Latin America (Baeza & Packard, 2006; among others) propose the use of the methodologies suggested by Wagstaff & van Doorslaer (2002) in the region. The latter authors point to the segmented nature of Latin American health systems, and the effects this has on the financial equity of health systems in terms of the ability of households with different incomes to participate in effective risk-sharing mechanisms (risk pooling).

On the basis of the above definitions and considering the mechanisms of social protection in health available to Argentinian families, and using data from 1997 and 1998, Maceira (2004) analyzes the relative participation and capacity of each mechanism to reduce OOP health spending, as well as the likelihood of falling below the poverty line as the result of a financial health shock. This study, using data from 2005, builds on the earlier paper and analyzes the following research questions:

- What is the level of financial protection in health, as measured by different indicators, for Argentinian households?
- How do these values change depending on household economic and demographic characteristics?
- How have these indicators changed between 1997 and 2005?
- To what extent are OOP expenses associated with mechanisms of induced demand, depending on different modes of insurance? How does this influence households' position with regard to risk, and their capacity to encourage preventive and self-protective behaviors?

III. Sources of Information and Methodology

The unit of analysis for this study is the household. Information used to create the variables and indicators was obtained from the National Household Expenditure Surveys (*Encuestas Nacionales de Gasto de los Hogares*, ENGH) for the periods 2005 and 1997, carried out by the National Statistics and Census Institute (*Instituto Nacional de Estadísticas y Censos*, INDEC) of Argentina. These surveys include information on OOP expenses related to food, clothing and other consumer goods and services including healthcare, for a nationally representative sample. The survey design makes it possible to break down the analysis by urban versus rural residence, income level and household composition according to age and sex, and health insurance status.

To complement this analysis, the final section of this chapter augments these results with data from the National Household Health Service Utilization and Expenditure Survey (*Encuesta Nacional de Utilización y Gasto en Salud de los Hogares*) of 2005. This survey, carried out by the National Ministry of Health, is stratified by geographical areas according to the Unmet Basic Needs Indicator calculated after the National Census 2001. The sample size consists of 1,546 observations, where each observation received a specific weight according to the original sample design, covering both rural and urban areas of Argentina.

The ENGH variables used as inputs to construct the indicators in this study are listed in **Table 1**, which shows mean values and standard deviations in each survey. The sample size was 27,260 households in 1997 and 29,031 in 2005.

Table 1
Description of Variables

Variable		1997 Mean	1997 Std. Dev.	2005 Mean	2005 Std. Dev.
Households residing in rural communities		13.1%	0.200	7.5%	0.002
Household composition by age of members	With children	46.2%	0.003	45.0%	0.003
	With elderly members	18.9%	0.002	20.1%	0.002
	With both children and elderly members	4.9%	0.001	4.7%	0.001
	Without children or elderly members	30.1%	0.003	30.2%	0.003
Household size	≤ 2 members	30.1%	0.005	36.6%	0.005
	3-4 members	37.2%		39.5%	
	≥ 5 members	32.7%		23.9%	
Health insurance		74.6%	0.003	65.3%	0.003
Total expenditure		835.43	4.726	1,195,212	7.052
OOP spending on health		61.61	0.907	80.988	1.186
Food expenditure		281.20	1.25	398.215	1.959
International poverty line		104.20	0.343	98.396	0.329
National poverty line		256.64	0.845	242.339	0.809
Endogenous poverty line		313.66	0.593	454.964	0.864
Indicators for capacity-to-pay (Total expenditure - subsistence expenditure)	CTP1 = Total expenditure - Food Expenditure	554.23	3.947	796.996	5.722
	CTP2 = Total expenditure -International Poverty Line	731.23	4.699	1,096,816	7.035
	CTP3 = Total expenditure - National Poverty Line	578.80	4.705	952.872	7.038
	CTP4 = Total expenditure - Endogenous Poverty Line	521.77	4.68	740.247	7.019
OOP spending on health as a share of capacity-to-pay	OOP / CTP1	9.9%	0.001	8.3%	0.001
	OOP / CTP2	7.8%	0.001	6.2%	0.001
	OOP / CTP3	14.4%	0.006	10.0%	0.007
	OOP / CTP4	25.3%	0.055	19.4%	0.015
Number of households in the survey		27,260		29,031	

Source: Authors' calculations based on ENGH 1997 and ENGH 2005.

A relatively small proportion of households reside in rural areas – 7.5% in 2005. The trend is toward an increase in the proportion residing in urban areas. Approximately 45% of the households in 2005 (46.2% in 1997) included persons younger than 14 years but no members older than 65 years, while 20% of the households in 2005 (18.9% in 1997) contained no members younger than 14 years, but did have at least one member older than 65 years. The percentage of households with at least one member younger than 14 years of age and at least one member older than 65 years of age, was 4.9% of all households surveyed in 1997, and 4.7% in 2005. Households with no members younger than 14 years of age and none older than 65 years of age represented the remaining 30.1% of all households in 1997, and 30.2% in 2005.

The variable that describes household size, measured as the number of members, was also constructed with categories to represent households with up to 2, 3 or 4, and 5 or more members, respectively. According to the 1997 survey, 37.2% of Argentinian households had 3 or 4 members. Households with up to 2 members represented 30.1% of the sample, and those with 5 or more members accounted for the remaining 32.7%.

Formal health insurance coverage (social security or private) was common. Insurance coverge was reported by 65.3% of the households in 2005 and 74.6% in 1997.[1]

The following variables are used to report the indicators of expenditure and poverty lines calculated for both periods. The expenditure variables are reported for each year in current Argentinian pesos, and therefore cannot be compared across years.

"Total expenditure" represents the sum of all monthly household purchases for all consumer items, i.e. food and beverages, apparel, health, housing, transportation, education, entertainment and culture, furniture and home appliances and miscellaneous goods and services according to INDEC categories. "OOP health spending" is a continuous variable reported here as the sum of all private household expenditures related with healthcare consumption. This variable does not consider salary deductions or employer's contributions from gross salaries and wages.

The "country line" variable refers to the national indigence line for each year analyzed. Because this variable is calculated by INDEC per adult equivalent, it was multiplied by the number of members in the household to construct the corresponding variable at the household level. "International line" refers

1. The low figure for 2005 reflects the macro-economic crisis of 2002. Since 2005, rates of formal insurance coverage recovered their 1997 rates.

to the poverty line at international price levels and corrected for inflation in that country.[2] The "endogenous poverty line" considers economies of scale that can factor in the costs of the basic basket of goods as the number of members in the household increases.[3]

The final variables in **Table 1** capture four measures of household CTP calculated as effective income net of subsistence spending. The difference between these variables lies in the way subsistence spending is defined, e.g. based on variables for food expenditure or the national, international or endogenous poverty line.

Finally, the mean percentage values for OOP spending as a share of household CTP are presented, calculated with each of the four methods described above. In 2005, health expenditures, according to the food expenditure measure, represented 8.3% of total net spending on food by an average Argentinian household, a figure below the 9.9% share found in 1997, with a low standard deviation of less than 1 per thousand. According to the variable using national poverty lines, health spending represented 10% of average household CTP in 2005 (14.4% in 1997), with a standard deviation of 6 per thousand. By contrast, the figures are lower when using the international poverty line, and much higher when using the endogenous poverty line.

IV. Indicators of Financial Protection in Health, Argentina 1997-2005

This section discusses the indicators used to measure financial protection in health, presents the results obtained, and analyzes their implications for the Argentinian health system. **Figure 1** provides an analysis of the evolution of the indicators between 1997 and 2005. The bars indicate the simple difference between 1997 and 2005 with each method, using the 30% threshold, and the numbers to the right of each bar show the percentage change. All of the indicators show a decrease in the incidence of CHE in 2005 compared to 1997.

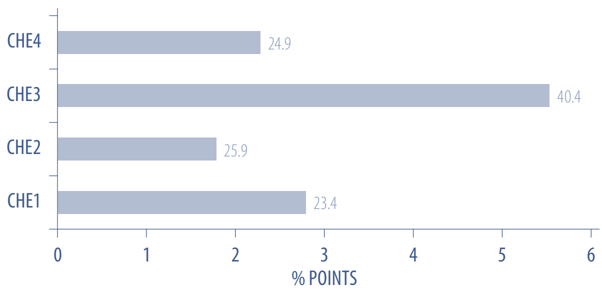
2. The procedure involves converting the international poverty line in terms of the local currency, using the PPP conversion factor for the year 1993 and applying an inflation differential with reference to the USA. Given that the unit of analysis is the household, these values need to be weighted by household size.
3. This is calculated as average food expenditure in households for which food spending accounts for between 45% and 55% of total expenditure, adjusted for household size (Xu, Evans, Kawabata, Zeramdini, Klavus, Murray, 2003).

Figure 1 shows the sensitivity of measurements to the definition of CTP used. The difference in the incidence of CHE between 1997 and 2005 is greatest with the Wagstaff-van Doorslaer method using the national poverty line (CHE3). This indicator yields a difference of 5.5 percentage points (a reduction of 40.4%) in the incidence of catastrophic health spending between the two years.

Using the Wagstaff-van Doorslaer method and the international poverty line (CHE2) yields a much lower difference of 1.8 percentage points, and a reduction of almost 26%. Between the two extremes, CHE1, calculated using the food poverty line, yields a difference of 2.8 percentage points and a reduction of 23.5%; while CHE4, calculated using the endogenous poverty line as defined by the Pan American Health Organization, yields a difference of 2.3 percentage points and a reduction of about 25%.

Figure 1

CHE % Point Reduction from 1997-2005, by Indicator, for k=30%



Notes: CHE1 = (OOP/CTP1)>30% ; CTP1: food poverty line.
CHE2 = (OOP/CTP2)>30% ; CTP2: international poverty line, Wagstaff - van Doorslaer method.
CHE3 = (OOP/CTP3)>30% ; CTP3: national poverty line, Wagstaff - van Doorslaer method.
CHE4 = (OOP/CTP4)>30% ; CTP4: endogenous poverty line, Pan American Health Organization method.
2005 reduction on 1997 level shown beside bar.

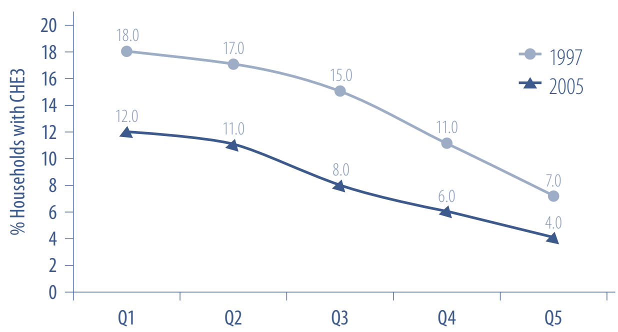
Source: Authors' calculations based on ENGH 1997 and ENGH 2005.

After 1998, Argentina experienced a profound crisis associated with a rigid set of policies that curtailed domestic productive capacity and led unemployment rates to soar above 20%. These high levels of unemployment increased the demand for public services, reducing their quality and increasing family OOP spending. This scenario in turn triggered a currency devaluation in 2001, along with a marked acceleration in productive activity beginning in 2002.

As part of the economic contingency plan, sectoral policies were developed to reduce drug prices by making the prescription of generics mandatory *(Ley de Prescripción de Medicamentos por su Nombre Genérico)*, and a program was launched to improve access to drugs for lower income families *(Programa Remediar)*. These initiatives, together with increased economic activity, brought about reductions in the burden of OOP health spending.

Figure 2 compares the incidence of CHE using the national poverty line estimated according to the Wagstaff-van Doorslaer criteria for the years 2005 and 1997. As noted earlier, CHE is lower in 2005 for all income quintiles. CHE was 33% lower in 2005 for the lowest income quintile and 45% lower for the highest quintile.

Figure 2
CHE3 Incidence by Income Quintile, 1997-2005.
National Poverty Line: Wagstaff-van Doorslaer Method



Source: Authors' calculations based on ENGH 1997 and ENGH 2005.

To complete this analysis, **Table 2** analyzes CHE for 2005 based on a 30% threshold for different groups of households according to area of residence, household composition and size, and insurance status. These data should be considered together with **Table 3**, which presents the percentage changes between 1997 and 2005 for each case.

Table 2

Prevalence of Catastrophic and Impoverishing Health Expenditure as a Share of Total Health Expenditure (%), 2005

Variable	Household Residence		Household Composition				Household Size			Household Insurance Status	
	Urban	Rural	With children	With elderly members	With both children and elderly members	Without children or elderly members	≤ 2 members	3-4 members	≥ 5 members	No insurance	With insurance
CHE1	8.5	6.6	3.8	21.3	10.7	6.1	13.4	6.5	4.7	4.8	10.2
CHE2	5.3	4.1	2.2	14.1	6.5	3.5	8.8	3.6	3.0	2.9	6.4
CHE3	8.1	8.7	6.0	17.2	12.9	4.6	10.3	5.7	8.8	7.0	8.8
CHE4	7.8	5.9	3.5	19.9	10.0	5.3	12.3	5.7	4.4	4.6	9.2
IHE1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0
IHE2	0.5	0.7	0.5	0.6	1.9	0.2	0.3	0.3	1.0	0.7	0.4

Notes: CHE1 = (OOP/CTP1)>30% ; CTP1: food poverty line.
CHE2 = (OOP/CTP2)>30% ; CTP2: international poverty line, Wagstaff- van Doorslaer method.
CHE3 = (OOP/CTP3)>30% ; CTP3: national poverty line, Wagstaff - van Doorslaer method.
CHE4 = (OOP/CTP4)>30% ; CTP4: endogenous poverty line, Pan American Health Organization method.
IHE1 = Impoverishing Health Expenditure (Relative to International Poverty line).
IHE2 = Impoverishing Health Expenditure (Relative to National Poverty line).

Source: Authors' calculations based on ENGH 1997 and ENGH 2005.

According to three of the four measurements, urban households are marginally more exposed to CHE. Depending on the methodology, between 5% and 8.5% of urban households experience a health expenditure that consumes more than 30% of their purchasing power net of subsistence expenditure, whereas the range for rural households is between 4% and 8.7%.

The different indicators are consistent in that they show households most affected by CHE to be those with older adults, who are usually more exposed to elevated health expenses. These data support the presence of economies of scale: as family size increases, most measurements show less exposure to CHE. Interestingly, the data show that CHE is higher for households with formal insurance than for households which are unprotected by insurance. According to the estimates, between 6% and 10% of insured households (depending on the methodology) spend more on health than 30% of their CTP. These values are higher than the CHE for households that lack access to formal insurance, i.e. for 3% to 7% of all households. The next section will test an explanatory hypothesis: that formal insurance plans have different incentive schemes that give them an information advantage regarding supply in the sector, thus leading to induced demand. Insurance may thus provide more health protection although it may not reduce OOP health spending.

There is some evidence of a trend toward more equity in the Argentinian health system according to statistical comparisons for the years 1997 and 2005 (**Table 3**). In all cases, the change in CHE favors the rural population in relative terms, since the indicator decreased by about 40% in 2005, depending on the methodology. Similarly, the indicator decreased significantly more for larger households than for those with two members or fewer. In the former case, the reductions in CHE levels range from 44% to 28%, whereas in the latter case, the greatest reduction was by 27%. Ultimately, policies to reduce OOP health spending favor families with children, leading to reductions of approximately 50% for households with children.

Further, in the period from 1997 to 2005 the burden of CHE declined more for families with formal insurance coverage. Reductions range from 40% to 17% depending on the methodology.

Table 3

Percentage Variation in CHE Incidence, 1997-2005

Variable	Household Residence		Household Composition				Household Size			Household Insurance Status	
	Urban	Rural	With children	With elderly members	With both children and elderly members	Without children or elderly members	≤ 2 members	3-4 members	≥ 5 members	No insurance	With insurance
CHE1	-27.3	-36.4	-42.9	-0.1	0.0	-30.0	-23.5	-30.0	-28.6	-16.7	-23.1
CHE2	-28.6	-42.9	-50.0	-0.1	-12.5	-40.0	-18.2	-33.3	-40.0	-25.0	-25.0
CHE3	-38.5	-43.8	-50.0	-0.2	-35.0	-44.4	-26.7	-45.5	-43.8	-36.4	-40.0
CHE4	-20.0	-40.0	-50.0	-0.1	0.0	-37.5	-18.8	-33.3	-33.3	-20.0	-16.7

Notes: CHE1 = (OOP/CTP1)>30% ; CTP1: food poverty line.
CHE2 = (OOP/CTP2)>30% ; CTP2: international poverty line, Wagstaff- van Doorslaer method.
CHE3 = (OOP/CTP3)>30% ; CTP3: national poverty line, Wagstaff - van Doorslaer method.
CHE4 = (OOP/CTP4)>30% ; CTP4: endogenous poverty line, Pan American Health Organization method.

Source: Authors' calculations based on ENGH 1997 and ENGH 2005.

V. Health Spending, Induced Demand and Mechanisms of Protection

The preceding sections looked at the health-related financial risks faced by Argentinian households. This exercise yielded results that merit further analysis. In particular, it is clear that the population with formal insurance coverage is more likely to incur a CHE than the population without coverage.

As reported by Maceira (2010), the indicators presented here are related with measures of health sector performance which document the ability of the health system to financially protect the population against a health shock. However, these results do not shed light on the behaviors of the actors in the system that lead to these effects.

The sections below will focus on the behavioral patterns of the population and the mechanisms of induced demand that operate within health system provision and financing structures, inasmuch as these mechanisms influence the indicators calculated above. For example, levels of CHE may be low as a result of low demand on the system, as some needs are not translated into doctor's visits or health spending. At the same time system supply, owing to the possibility of induced demand, leads to relatively high spending levels in the insured population. The framework of strategic interactions among the actors in the system is evaluated below in a two-stage econometric exercise.

In Argentina, the public health sector comprises an extensive formal insurance network covering approximately 65% of the population. This coverage is achieved through national and provincial social security institutions and private, prepaid health insurance, with a substantial proportion of voluntary affiliates. Coverage through the public sub-system, although universal, is associated with disadvantaged income levels.

As argued by Maceira & Pobrete (1998) and Maceira & Reynoso (2008), contractual and payment mechanisms define the way major risk absorption and transfer is structured among health financiers, providers and professionals. These studies confirm that in the public sector, the payment mechanism is based on a fixed salary, whereas most contracts with provincial and national welfare institutions (*Obras Sociales*), prepaid medical care plans and health service providers involve per-service payment mechanisms. Capitated contracts are estimated to account for approximately 10% of all contracts.

Through this structure, the service supply system is able to reduce its exposure to risk, but at the same time offer incentives for overprovision, within a framework of asymmetrical information.

Accordingly, the analysis tests the following hypotheses:

> **Proposition 1.** *Health professionals can establish an agency relationship with patients, thereby obtaining an information advantage. Physicians who provide care through social welfare institutions or prepaid plans are receptors in a payment mechanism in which higher spending by the health sector maximizes their earnings. This results in a trend toward induced patient demand for services as a function of their purchasing power.*

In the context of this operational scheme of health service supply, patients "react" within a framework of information asymmetry by using the tools available to them: mechanisms of self-protection, prevention and formal voluntary insurance. Both the health system and the patients are restricted by financial (resources available and time to carry out specific actions) and epidemiological variables (real or apparent health risk).

As a result, prescribing for services that require OOP spending by the patient can reduce patients' capacity to care for their own health through prevention. However, a counter-argument would suggest that this null hypothesis should be challenged: the induced demand mechanism may be sufficiently widespread to lead to an increase in all health spending, including the costs of preventive care.

> **Proposition 2**. *The likelihood of preventive health spending depends on OOP spending and the effectiveness of the induced demand mechanism. In addition, it can be argued that overprescribing reduces patients' financial capacity for self-protection. Alternatively, greater spending and induced demand may incentivize routine self-protection.*

The CHE indicator makes it possible to measure the impact of the share of total disposable expenditure used for OOP spending on family health by characterizing its impoverishing effect. However, this does not necessarily capture the cost of foregone healthcare needs or the opportunity costs of spending. Thus a low indicator may be a symptom of the limited ability of the system to capture need, or on the other hand, of an induced demand process.

In response to inequities in access to health coverage in Argentina, social insurance mechanisms have been the tools traditionally chosen by policymakers. This is based on their understanding that these mechanisms make it possible to pool funds and thus redistribute the costs of healthcare.

As noted in the introductory section, some publications (Becker & Ehrlich, 1979; Lustig, 2001, Wasgtaff & van Doorslaer, 2002) propose analyzing the mechanisms of social protection as a response to financial shocks that families face due to illness. This approach suggests the influence of other protection schemes in addition to the usual insurance mechanisms, i.e. "self-insurance" [4] and "self-protection".

Baeza and Packard (2006) review the experiences in Latin America with a methodological approach that attempts to establish the weight of each financial protection mechanism. For the specific case of Argentina, Maceira (2004) applies this view to the same National Household Expenditure Survey for 1997 used for the present analysis and illustrates the relative weights and the potential intersections among formal insurance, self-insurance and self-protection mechanisms in Argentina.

Savings is a proxy that captures self-protection, while physical activity is a proxy for prevention. These two criteria are used in combination with formal mechanisms of insurance and public or private healthcare service utilization in the event of an illness. The extent of each as a percentage of total households is presented in **Table 4**.

Table 4

Percent of Households by Risk Protection Mechanism. Argentina, 1997

		Insurance		No Insurance	
		Use of public hospitals	No use of public hospitals	Use of public hospitals	No use of public hospitals
Savings	Exercise	1.1	4.1	0.3	0.2
	No exercise	7.7	21.1	3.4	2.5
No Savings	Exercise	1.5	4.0	0.8	0.4
	No exercise	12.3	24.0	11.9	4.7

Source: Maceira (2004) based on ENGH 1997.

4. The household "self-insurance" schemes are more simplistic but akin to community-based health insurance mechanisms in very low income countries. The appearance of these schemes indicates that insurance and credit markets are limited in their capacity to cover all health financing needs, thus such schemes aim to recreate a form of shared risk on a reduced scale. However, the weaknesses of these schemes are defined by their nature, i.e. by their scale and capacity to generate savings.

Table 4 shows that in 1997, 24% of all households in the country used conventional insurance mechanisms exclusively, i.e. national – or provincial-level social security or private prepaid insurance. This group makes up the largest proportion of the sample, followed by combined conventional and self-insurance, at 21.1%. Households that use self-savings and self-protection mechanisms exclusively account for 2.5% and 0.4% of the total, respectively. In addition, 4.7% of all Argentinian households have no mechanism for social protection and do not use public hospitals. Households that have no mechanism for social protection but do have access to public facilities comprise 12% of the population. Together, these two groups represent 16.7% of all households whose only mechanism of social protection is public health insurance.

As a provisional approach to evaluating Proposition 1, **Table 5** shows the percentage of individual income used for average OOP health spending excluding health insurance payments.

Table 5
Average per Capita Weighted Out-of-Pocket Health Spending*
(Percentage of Family per Capita Income). Argentina, 1997

		Insurance		No Insurance	
		Use of public hospitals	No use of public hospitals	Use of public hospitals	No use of public hospitals
Savings	Exercise	2.6	3.4	4.4	6.9
	No exercise	4.7	3.9	2.7	2.3
No Savings	Exercise	10.1	6.8	5.1	5.9
	No exercise	14.6	12.5	14.4	9.9

Note: *Excludes expenditure on private health insurance.

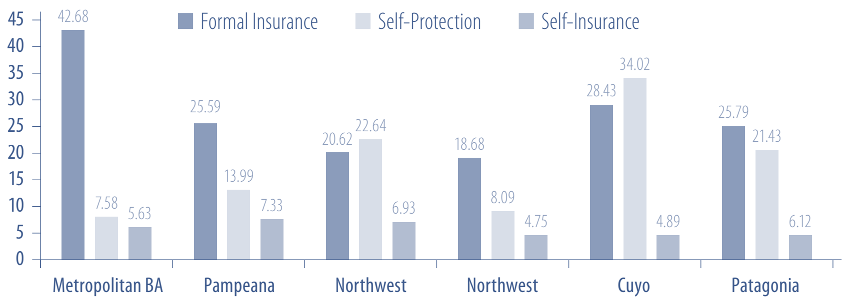
Source: Maceira (2004) based on ENGH 1997.

As the proposition predicts, individuals covered exclusively by formal insurance schemes have the second or third highest incidence of health expenditure, depending on whether they seek care at public hospitals or in the private sector. Thus, higher unit costs may lead to greater induced demand among users with insurance and copayment schemes, therefore increasing costs to both individuals and the health system. Alternatively, this indicator may suggest the presence of risk selection.

Figure 3 shows OOP spending across mechanisms of protection in each of the six regions of Argentina analyzed here. In all six cases, the formal insurance mechanism generates the highest spending, followed by self-protection and self-insurance. Similarly, the relative gaps between mechanisms in terms of the incidence of OOP spending appear to be larger in regions with greater economic development and a higher density of privately supplied healthcare (led by the Buenos Aires Metropolitan Region, followed by Patagonia, Pampeana and Cuyo). This evidence supports the notion that induced demand and size of the market have an important influence on the share of OOP expenditure in the health sector.

Figure 3

Out-of-Pocket Spending by Protection Mechanism, by Region, 1997 (in Pesos)



Source: Maceira (2004) based on ENGH 1997.

VI. Sequential Decision-Making Model

It is possible to examine the hypotheses discussed in the previous section in greater depth by modeling the strategic relationship between patients and physicians based on a dynamic game that assumes information asymmetry. Initially, the patient enters the health system according to access characteristics that depend on the patient's perceived need (explained in part by health status and educational level) and their income. Once inside the health system, depending on the type of coverage, patients can behave in different ways. They can consult a physician to enhance their health protection (preventive visits) or obtain access to the system for curative visits only. However, the likelihood that patients will seek a particular type of service is restricted by their capacity to identify their needs and obtain treatment, for which they seek to obtain the services prescribed by expert physicians.

In the second step of the game, the health professional observes the characteristics of the patient who enters the health system, and depending on the diagnosis, prescribes certain health services. This behavior arises mainly from the payment mechanisms that operate in each type of insurance scheme. In Argentina these mechanisms make over-prescribing possible, and as result induced demand becomes more likely.

Because each need, consultation and prescription event can be considered a finite game, the game ends when backward induction occurs. In econometric terms, implementation takes the form of two decision-making moments by participants who first analyze the health system's reaction and then, depending on the reaction, analyze what type of consultation the patient has decided to seek.

The empirical implementation proposed here does not aim to achieve a perfect outcome in any of the possible sub-games, but rather to characterize the outcome in each case. The analysis makes use of information from the 2005 National Household Health Service Utilization and Expenditure Survey carried out by the Ministry of Health. This survey makes it possible to identify on an individual level not only the type of coverage, and level of income and education, but also the amount and composition of OOP spending on health, broken down according to preventive and curative consultations and laboratory tests.

The first regression estimates the behavior of healthcare supply that prescribes health services. Empirically, this supply is modeled by the equation:

$$\mathbf{NDOOP} = \beta_0 + \beta_1 \underset{(+)}{\text{quintile}} + \beta_2 \underset{(+)}{\text{OS}} + \beta_3 \underset{(+)}{\text{prepay}} + \beta_4 \underset{(+)}{\text{chronic}} + \beta_5 \underset{(+)}{\text{educ}}$$

NDOOP: Nondiscretionary OOP spending
prepay: prepayed private health insurance

where *NDOOP* represents all non-discretionary health spending, i.e. spending needed to cover the cost of professionally prescribed services.

The explanatory variables in this case are those related to income and educational level, as well as the presence of chronic illness (as a mechanism to capture treatment-intensive individual health profiles), which are expected to yield coefficients with a positive value. The variables "social insurance fund" and "private health insurance" reflect the likelihood of overprovision in groups with formal coverage, corrected for income level and health status. **Table 6** presents the results of this analysis for two alternative measures: one for total expenditure, and a second for non-discretionary spending only.

Income quintile levels are presented as a proxy for patients' purchasing power. The results confirm that relative to the lowest income quintile, belonging to higher income groups increases the amount of OOP health spending. The difference in coefficients among quintiles is substantial, and in some cases is as much as twofold. These differences capture the income effect on health consumption, which increases the consumption level of wealthier groups and poses access limitations for low-income groups.

The causal effect of interest here is related to the presence of formal health insurance, as suggested by *Proposition 1*, the results indicate that households with formal health insurance, adjusted for income level, report greater non-discretionary OOP spending, which is consistent with earlier findings. On the one hand, coverage through a social insurance fund induces an increase of approximately 72 *pesos* in OOP health spending for physician-prescribed services, a difference that is marginally lower when total health spending is considered. On the other hand, non-discretionary health spending in households covered by private health insurance funds increases OOP spending by between 1 and 2.5 *pesos*. In all cases, the coefficients are significant at the 99% confidence level.[5]

The variables related to patients' health status and education show significant positive explanatory power for the levels of OOP health spending. With regard to health status, the dummy variable for the presence of chronic illness requires research into control and treatment mechanisms that goes beyond the scope of the present study. Moreover, the present analysis discloses no differences in the intensity of the effect of this variable among different specifications in either the non-discretionary spending or the total spending model, in terms of the elasticity of service demand.

5. The difference between the two coefficients (related to affiliation with social insurance funds and private health insurance funds) requires further study at the insurance-providing institution level. The existence of more than 270 social insurance funds makes large variations in coinsurance policies more likely, and this would account for the larger coefficient for social insurance providers. In addition, because of the high levels of relative income among the population affiliated with private health insurance funds, the premiums paid to these institutions are likely to facilitate payment by the insurer of higher prices (reimbursements) per consultation, along with greater restrictions on complementary payments. Both elements reduce the incentive for (or the feasibility of) copayments, which would lead to lower coefficients.

Table 6
Second Step: Need, Coverage and Induced Expenditure

	Dependent Variable			
	Involuntary OOP		OOP	
Quintile 2	12.44*	12.61*	14.91*	15.06*
	(0.12)	(0.12)	(0.13)	(0.12)
Quintile 3	24.74*	24.97*	27.68*	27.92*
	(0.10)	(0.10)	(0.10)	(0.10)
Quintile 4	41.47*	40.55*	49.33*	48.32*
	(0.12)	(0.12)	(0.13)	(0.13)
Quintile 5	81.98*	55.74*	100.00*	72.11*
	(0.13)	(0.13)	(0.14)	(0.14)
Social Security	72.77*	72.17*	68.50*	67.85*
	(0.08)	(0.08)	(0.08)	(0.08)
Prepaid	1.39*	2.57*	36.69*	39.93*
	(0.12)	(0.12)	(0.12)	(0.12)
Chronic	41.31*	41.07*	42.18*	41.90*
	(0.10)	(0.10)	(0.10)	(0.10)
Complete Secondary		4.79*		5.44*
		(0.12)		(0.12)
Complete University		293.70*		313.10*
		(0.36)		(0.36)
Constant	-11.77*	-12.42*	-12.99*	-13.70*
	(0.08)	(0.08)	(0.08)	(0.08)
Observations	1546	1546	1546	1546
R-squared	0.10	0.14	0.11	0.15

Note: * Significant at the 1% level. Standard errors in parenthesis.

Source: Authors' calculations based on 2005 National Household Health Service Utilization and Expenditure Survey.

Consumption increases with education, especially for groups of users who have completed university. A final observation of note is that the coefficient for discretionary spending is negative, showing that self-insurance acts as a mechanism of financial protection in health.

This analysis suggests predictions about non-discretionary health spending, and *Proposition 2* presents a hypothesis about the manner in which this restriction might operate, either by choosing to decrease preventive measures or increase the incentive to act retrospectively.

The first step in this game is presented in econometric terms as a simple model of discrete choice in which the patient chooses to seek preventive health services. Examples of such services include prenatal care and visits for general check-ups not motivated by illness. The following equation summarizes the two specifications considered:

$$P(\text{prevention}) = F(\beta_0 + \underset{(+)}{\beta_1\,\text{quintile}} + \underset{(+)}{\beta_2\,\text{female household head}} + \underset{(+)}{\beta_3\,\text{coverage}} + \underset{(+/-)}{\beta_4\,\text{OOP}})$$

where the variable OOP represents out-of-pocket spending for preventive health services. The likelihood that preventive care will be sought in this first step depends on the country's and the health system's basic conditions, on structural variables and on the costs that the patient expects to be induced by an informed professional care provider in the second step. The model predicts that the coefficients for all effects will have a positive value.

Our analysis shows that the null hypothesis regarding moral hazard is rejected for all specifications. Expected non-discretionary health spending appears to increase, rather than decrease, the likelihood of using a self-protection mechanism, although the increases are small, ranging from 2.5% to 3%. Households in which the head is a woman are more likely to seek preventive services. Moreover, the econometric exercise shows that the likelihood of a household member using preventive consultations is marginally associated with having formal insurance coverage.

Finally, income is identified as the most relevant variable in terms of the capacity to generate household consumption of preventive services: greater income level is associated with a greater likelihood of seeking preventive care. However, the differences among groups are clearly smaller than for OOP spending.

Table 7
First Step: Expenditure and Self-protection

	Dependent Variable	
	Probability of Spending on Preventive Services	
Quintile 2	0.038*	0.037*
	(0.003)**	(0.003)**
Quintile 3	0.150*	0.148*
	(0.003)**	(0.003)**
Quintile 4	0.114*	0.110*
	(0.004)**	(0.004)**
Quintile 5	0.163*	0.163*
	(0.005)**	(0.005)**
Female Household Head	0.002*	0.003*
	(0.002)**	(0.002)**
Insurance Coverage	0.025*	0.026*
	(0.001)**	(0.001)**
OOP	0.039*	0.030*
	(0.002)***	(0.002)***
Involuntary OOP (x 1000)		0.037*
		(0.000)
Observations	1.546	1.546
Pseudo-R2	(0.097)	(0.097)

Note: * Significant at the 1% level. Standard errors in parentheses; ** (x 10); *** (x 10,000).

Source: Authors' calculations based on 2005 National Household Health Service Utilization and Expenditure Survey.

VII. Conclusions

This study proposes a set of standardized indicators to measure catastrophic and impoverishing health expenditure in Argentina using information from the National Household Expenditure Surveys of 1997 and 2005, and the 2005 National Household Health Utilization and Expenditure Survey together with a comparative analysis based on the equivalent 1997 survey.

Considering a variety of alternative poverty lines and impoverishment thresholds yielded results that make it possible to compare indicators among groups of households. The parameters used for comparison include income level, residence in urban *versus* rural areas, household composition and size, and affiliation with formal health insurance schemes. The results show, with some exceptions, a degree of homogeneity in the values across indicators and methodologies, with an incidence of CHE ranging between 14% and 9.2% for a threshold of 20%. They also show a decline in CHE incidence as income level rises. The measurements based on area of residence showed relatively higher incidence of CHE for urban than for rural households, and also for households with older adults and fewer members.

The comparative statistical analysis based on data from the 1997 and 2005 surveys highlights systematic improvements in the groups that are less well protected in terms of income (i.e. lower income quintiles, residing in a rural area, large families and families with children). This reflects a bias towards equity in health policies in the wake of the crisis which culminated with the 2001-2002 currency devaluation.

One of the most noteworthy results, which is substantiated by indicators estimated for both years surveyed, according to type of population as well as by multivariate regression analysis, is the fact that the population covered by formal health insurance is more exposed to CHE than the uninsured population. This finding raises questions about the relationship between consumers and their service provider within the health system. This relationship creates opportunities for providers, given their information advantage, to induce health service demands at a cost that fluctuates based on patients' purchasing power. This hypothesis is evaluated here in an econometric exercise –based on data from the 2005 National Household Health Utilization and Expenditure Survey– that allows analysis of motives for consultation and whether chronic illness is related to service utilization.

In the health service game used to analyze information asymmetry, patients enter the health system with the expectation that expenses will be induced by informed professional agents depending on prevalent payment mechanisms. In response to these expectations, consumers adopt an attitude of self-protection, which informs their decision to seek preventive services. These results enrich the definition and interpretation of the CHE indicator by showing that it serves not as an univocal measure of *financially* catastrophic health expenditure, but that this system performance indicator also reflects the capacities of individuals, and of the system itself, to identify their health needs and transform them into treatment demands.

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Chapter 5

Catastrophic Health Expenditure in Brazil

Chapter 5

Catastrophic Health Expenditure in Brazil

Regional Differences, Budget Constraints and Private Health Insurance

María Dolores Montoya Díaz[i], Flavia Mori Sarti[i], Antonio Carlos Coelho Campino[i], Roberto Iunes[ii]

I. Introduction

The Brazilian national public health system, the *Sistema Único de Saúde* (SUS), introduced in the Constitution of 1988 and approved by two major laws in 1990, is characterized as universal and inclusive. Indeed, by constitutional mandate, all services offered by the SUS are free of charge. Yet, this system does not provide sufficient financial protection to prevent the advent of catastrophic health spending or to guarantee access to necessary healthcare services of high quality.

This chapter aims to contribute to the literature on household health expenditures in Brazil. Regional differences in the prevalence of catastrophic health expenditure (CHE) are analyzed in order to identify possible relations between the occurrence of CHE and characteristics of the Brazilian health system. The research focuses on determining the extent to which the Brazilian public health system truly provides an adequate financial protection structure for all low income segments of the population.

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Moreover, this study investigates the impact of *not* consuming necessary healthcare goods because of financial constraints. The Brazilian Family Budget Survey data on pharmaceutical products and health services collects unique information to identify “budget constraints” defined as situations in which the informant had the need to purchase a medication or health service, but did not acquire it due to insufficient financial resources. Not acquiring the good could prevent the occurrence of catastrophic health spending although a reduction in health could occur instead.

Finally, the effect of private health insurance on the likelihood of a household incurring CHE is analyzed. Approximately 26% of the Brazilian population is affiliated to at least one health plan or health insurance provider. This constitutes one of the main contributions of the research. Despite the fact that private, out-of-pocket (OOP) health expenditure has previously been analyzed in Brazil, few studies consider the impact on CHE. Notable exceptions are Xu, Evans, Kawabata, Zeramdini, Klavus, and Murray (2003) and Diniz, Servo, Piola and Eirado (2007), although the results are divergent. Xu, et al. (2003) base their investigation on the 1996 and 1997 Life Standards Survey (*Pesquisa sobre Padrones de Vida*) of the Brazilian Institute for Geography and Statistics (*Instituto Brasileiro de Geografía e Estatística*, IBGE). According to this study, an estimated 10.3% of Brazilian households incur CHE – that is, they commit more than 40% of their household capacity-to-pay to healthcare payments.

Diniz, et al. (2007) use data from the Family Budget Survey (*Pesquisa de Orçamentos Familiares*, POF-IBGE) of 2002 and 2003. Their study estimates that less than 1% of Brazilian households incur CHE. According to Diniz, et al. (2007), one of the likely causes of such broad divergence between the two sets of results might lie in the fact that the database used by Xu, et al. (2003) does not consider non-monetary expenses. Additionally, the authors claim that the Family Budget Survey is a more reliable data source because it is nationally representative, and is essentially a budget survey and thus not intended to investigate the standard of living. The research presented below sheds additional light on the level of CHE in Brazil. As pointed out by Diniz, et al. (2007), the methodology chosen has direct implications for the estimates obtained of the percent of households that incur CHE.

II. Overview of the Unified Health System[1]

The SUS is organized around several principles that are defined by legislation. The most important are integration and hierarchy of care, decentralization and social participation. All health services are provided by a regionally organized hierarchic network of health facilities in order to ensure continuity of care across all levels. Furthermore, all services provided by the SUS must be available for the entire municipal population, independent of who controls the services, be it the municipality, the state, the federal government, or a private provider contracted by the SUS.

The responsibility for the provision of services is decentralized and is primarily assigned to the municipalities. Given the municipal heterogeneity that exists in a country as large as Brazil, there were concerns that the decentralization process promoted by the SUS could lead to increased inequality of care across municipalities. Still, the data available do not appear to indicate that the decentralization process has led to increased inequality (Costa, 2001; Bahia, 2005; Arretche & Marques, 2007).

The participation of civil society is ensured by its presence in federal, state and municipal health councils. The evidence available regarding the achievement of this goal, however, is mixed and is related to issues of:

a) Asymmetry of information that exists between representatives of civil society and government officials, and

b) Autonomy and representativeness of the councils (Cornwall & Shankland, 2008).

The private supply of health services is permitted – with or without the intermediation of health plans or health insurance companies. It may or may not involve a contractual relationship with the SUS, which purchases the services of private providers (preferably philanthropic and non-profit organizations).

Between 1998 and 2008, the proportion of the population with health insurance increased from 24.5% to 26.3%, according to the 2008 Health Supplement of the National Household Sample Survey (PNAD-IBGE). In 2008, of the 49.2 million people affiliated to at least one healthcare plan, 77.5% were affiliated to insurance plans of private companies and 22.5% to insurance plans for public servants. In urban areas, the percentage of people covered by health plans (29.7%) was significantly higher than in rural areas (6.4%). The Southeast

1. See Iunes RF, Mori Sarti F, Campino ACC, Montoya Díaz MD, Sierra R. (2012) for a more detailed description.

and South registered health insurance coverage (35.6% and 30%, respectively) approximately three times higher than in the Northern (13.3%) and Northeast (13.2%) regions (IBGE, 2008).

III. Data and Methodology

In this study, following on others in this volume, the methodology used to identify Brazilian households that incur CHE consists of calculating the proportion of direct and indirect expenditures in healthcare –including household expenditure on health plans and health insurance– on the household capacity-to-pay (CTP). The availability of resources, or CTP, is calculated using two methods: the simple method as the difference between the total expenditure reported by household members and the sum of all household expenses on food items CHE1, and the Wagstaff – van Doorslaer Method (CHE2) as the difference between the total expenditure reported by household members and the national poverty line. In the second method, it is important to note that only households with positive health expenditures are considered. The analysis uses three different thresholds (20%, 30% and 40%) of household CTP. Accordingly, if the percentage of expenditure on healthcare surpasses a given threshold, it is considered that the household has experienced CHE.

Total household expenditure is calculated as the sum of all monetary and non-monetary expenses. The variable for health expenditure is calculated as the sum of expenses on outpatient and hospitalization services, medical devices, health plans and health insurance, among other items. The variable for household expenditure in relation to the national poverty line is estimated as described by Silveira, Carvalho, Azzoni, Campolina and Ibarra (2009).

The justification for including expenditures on health plans and health insurance is provided by Diniz, et al. (2007). Exclusion of this spending is based on the assumption that prepayments toward a health plan or insurance are made to reduce the risk of a family incurring CHE. Nevertheless, in order to render this effective, the health plan or insurance must be comprehensive, otherwise a household may be forced to spend non-negligible sums on treatment that the plan does not cover.

The data source used, the Family Budget Survey of 2002 and 2003, covers the entire population of the country, which allows for sub-analyses at the geographical level, for states (or Federation Units, *Unidades da Federação*), metropolitan areas, and regions (North, Northeast, Southeast, South and Central or Mid-West). The data contain 48,470 observations representing 48,394,067 Brazilian households.

The relationship between CHE and the national poverty line is analyzed in order to determine the extent to which health expenditures represent a burden for the Brazilian population. Further, the present analysis aims to estimate models that will evaluate whether there are statistically significant differences in the prevalence of CHE across Brazilian regions using probit models encompassing a binary variable as the explanatory variable.

For the explanatory variables, a set of dummy variables for Brazilian regions are included, with the Southeast region (SE) serving as the reference category. This region was chosen as it is the most populous, with more than 80 million inhabitants, corresponding to approximately 42% of the Brazilian population in 2010. It is also the richest region in the country. In 2009, the Southeast region's economy accounted for 55.3% of Brazil's GDP, followed by the South (16.5%), the Northeast (13.5%), Central or Mid-West (9.6%) and Northern region (5%).

The following socioeconomic, geographic and demographic variables are also included in the model as controls:

- Dummy variable for the presence of one or more pregnant or breastfeeding women in the household;
- Dummy variable for the presence of one or more household members with a university-level education;
- Number of household members;
- Number of bathrooms in the dwelling;
- Dummy variable for the presence of a potable (safe drinking) water supply with indoor plumbing in the residence;
- Dummy variable for the presence of a sewage and drainage system;
- Total monthly household income in Brazilian reais;
- Dummy variable for the presence of at least one child aged 5 years or less;
- Dummy variable for the presence of any members aged 65 years or more;

- Dummy variable for the absence of household members 5 years old or less and 65 years old or more;
- Dummy variable for the presence of at least one household member affiliated with a private healthcare plan or health insurance;
- Dummy variable for the area where the dwelling is located (rural or urban).

The estimates of the prevalence of CHE in Brazilian households, as well as the models, are based on the sample design used in the Family Budget Survey. The complex aspects of the sample design, including the stratification, clustering, unequal selection probabilities and the calibration adjustments of the sample weights affecting the Family Budget Survey of IBGE, need to be incorporated into the analysis of its data (Silva, Pessoa, & Lila, 2002).

Finally, the analysis attempts to deal with the possible endogeneity of health insurance. This can be a fundamental estimation issue (Wagstaff & Lindelow, 2008). Hence, this chapter estimates an instrumental variable model (Greene, 2000), with the percentage of household members employed in the formal sector as the instrument.

According to 2010 data from the National Supplementary Health Agency (ANS), only 20.7% of private plans were single-type, while 76% were collective. The rest are not characterized. This latter type is subdivided into two categories:

a) Corporate health plans – where companies provide assistance to their employees; and

b) Collective memberships, which are hired by professional corporations or sectors, such as councils, unions and professional associations.

The assumption is that the instrument (employment in the formal sector) is correlated with the probability of an individual being insured, but is not correlated directly with the probability of incurring catastrophic expenditure.

IV. Results

Compared to other Latin American countries, Brazil does not have an especially high prevalence of CHE (Knaul, Wong, Arreola-Ornelas, & Mendez, 2011). However, considering the objectives of the SUS, it is essential to deepen our knowledge of the potential sources of socioeconomic inequalities in health, especially in order to assess if the financial protection schemes provided are functioning adequately.

First, it is interesting to note that in most Brazilian households that incur CHE, estimated with CHE1, the largest health expense is for medications (**Table 1**).[2]

Table 1

Percent of Households with CHE in which the Largest Expenditure Item is Medications. Brazil, 2003

Threshold (%)	Households (%)
20	53.9
30	55.4
40	51.2

Source: Authors' calculations based on Family Budget Survey (POF 2002-2003) microdata.

Although the Brazilian public health system includes programs intended to help households cover the cost of medications, coverage is limited to only some types of therapies and treatments for specific target diseases. There are two main public programs that provide integral healthcare and distribute costly prescription medications to patients for continuous use: the Program for STD/AIDS Treatment and Prevention, and the Program for the Dispensation of Special Medicines. Both are federal programs that aim to cover the nationwide pharmaceutical demand of the Brazilian population with respect to HIV/AIDS and various chronic diseases (such as asthma, schizophrenia and hyperlipidemia, for example). Since 1998, the National Policy for Medicines also seeks to assure access to essential drugs related to the treatment of diseases identified as major health issues, and has established a National List of Essential Medicines.

2. A more detailed analysis of the profile of medication expenses is undertaken in Iunes, Mori Sarti, Campino, Montoya Díaz & Sierra (2012). One of the conclusions is that not every single expenditure on medication can be regarded as necessary, especially considering that the practice of self-medication is widespread in Brazil (Vitor, Lopes, Menezes, & Kerkhoff, 2008).

Nevertheless, access to medicines is still limited. An analysis by the Brazilian Ministry of Health showed that for the treatment of a set of diseases, the Program for the Dispensation of Special Medicines covered less than 0.1% of patients living in different regions of Brazil, between 2007 and 2009.[3]

Using household food expenditure as the criterion for baseline subsistence expenditure, a breakdown of the figures by region shows that the countrywide pattern of CHE1 prevalence is similar to the prevalence in the Southeast region. However, the prevalence of CHE among Brazilian households is highest in the Mid-West and South regions, and lowest in the North region for all thresholds (**Table 2**).

Table 2

CHE Prevalence Estimated with Different Thresholds of Capacity-to-pay by Region. Brazil, 2003

		CHE 1			CHE 2		
		Threshold (%)			Threshold (%)		
		20	30	40	20	30	40
Region	North	5.0	1.6	0.7	15.4	11.0	8.9
	Northeast	6.2	2.1	0.8	20.3	15.5	13.2
	Southeast	6.8	1.9	0.8	16.1	10.5	8.1
	South	7.5	2.9	1.3	14.7	9.2	6.9
	Mid-West	7.8	3.3	1.4	17.9	12.5	9.5

Source: Authors' calculations based on Family Budget Survey (POF 2002-003) microdata.

When the highest threshold (40%) is used, it is noteworthy that the Northeast and Southeast regions show results closer to that of the North region, whereas the prevalence in the South region is closer to that of the Mid-West. This is an interesting result because the two regions with the highest prevalence of CHE (South and Mid-West) are not the poorest regions of the country. The South region is the second largest in terms of its contribution to GDP; while the Mid-West agribusiness is an important component of the Brazilian economy. However, the Mid-West is the region with the greatest inequality on household income, while the South has the lowest level of inequality.

3. The National Policy of Pharmaceutical Assistance (PNAF) was only published in 2004. It reinforces the idea that pharmaceutical care is part of individual and collective health care, and that medication is an essential input. (Vieira, 2010).

When the national poverty line is used as the reference point for minimal subsistence expenditure, the prevalence of CHE2 is higher as compared to using household food expenditure. The prevalence estimates tend to be higher for the Northeast. The Mid-West region estimates are slightly above the national level. The CHE prevalence levels in other regions of Brazil are lower than the national average.

The Brazilian 2002-2003 Family Budget Survey also includes a question that solicits information on health items that were not consumed by household members due to lack of resources, i.e. because of budget constraints. When these expenses are included in household health expenditure, the prevalence of CHE increases significantly, especially when the highest threshold is used (**Table 3**).

Table 3

CHE Prevalence at Different Thresholds of Household Food Expenditure: Reported Expenses and Budget Constraints. Brazil, 2003

	CHE1			CHE2		
	Threshold (%)			Threshold (%)		
	20	30	40	20	30	40
Reported expenses	6.7	2.2	0.9	17.0	11.8	9.4
Including budget constraints	10.8	5.2	3.1	21.5	15.3	12.5
Difference	61.0	136.0	244.0	26.0	30.0	33.0

Source: Authors' calculations based on Family Budget Survey (POF 2002-003) microdata.

Once again, when budget constraints are considered together with health spending, the prevalence of CHE2 is notably higher than when budget constraints are not considered. Nevertheless, the differences between the prevalence estimates based on reported health expenses and those based on budget constraints are lower when the national poverty line is used than when household food expenditure is used to estimate CTP.

The occurrence of CHE may lead the household to fall below the national poverty line. Therefore it is useful to compare the prevalence of impoverishment caused by CHE in Brazilian households across different regions. The Mid-West and Northeast regions have the highest prevalence of impoverishment due to CHE (**Table 4**). Paradoxically, the Mid-West and Northeast regions have experienced the largest increases in healthcare infrastructure during the last 20 years, especially in the number of healthcare organizations (Iunes, et al., 2012).

Table 4
Prevalence of Impoverishment due to CHE, by Region. Brazil, 2003

Region	Incidence (%)
North	0.7
Northeast	1.1
Southeast	1.0
South	0.8
Mid-West	1.6
Brazil (without budget constraints)	**1.0**
Brazil (with budget constraints)	**2.2**

Source: Authors' calculations based on Family Budget Survey (POF 2002-2003) microdata.

Table 5
CHE1 Prevalence Estimated as a Threshold of Capacity-to-pay. Brazil, 2003

Variable		Threshold (%)		
		20	30	40
Area	Urban	6.6	2.0	0.8
	Rural	7.7	3.2	1.4
Household composition	With children	4.2	1.4	0.6
	With elderly members	16.0	5.9	2.4
	With both children and elderly members	10.1	2.4	0.7
	Without children or elderly members	5.3	1.5	0.6
Household size	≤ 2 members	9.8	3.8	1.5
	3-4 members	5.9	1.6	0.8
	≥ 5 members	4.8	1.4	0.6
Health insurance	Yes	10.0	2.7	1.1
	No	5.5	2.0	0.8

Source: Authors' calculations based on Family Budget Survey (POF 2002-2003) microdata.

The following sections focus on the results of CHE1. In relation to socioeconomic, geographic and demographic variables, the data analyzed here show a higher prevalence of CHE among households with elderly individuals, and those with both children and elderly members. In addition, households with health insurance, with fewer than two members, and those located in rural areas also have higher levels of CHE (**Table 5**).

The probit model of CHE1 at each of the three thresholds (20%, 30% and 40%) is presented in **Table 6**. With respect to regional differences, we find that the coefficients in the South and Mid-West are statistically significant when the thresholds of CHE are set at 30% and 40%. The differences between the Mid-West and Southeast are significant with the lower threshold of 20%. The likelihood of incurring a CHE1 is higher for households located in rural areas.

Table 6

Marginal Effects Estimated with Probit Models at Three Thresholds of CHE1. Brazil, 2003

Variable	Threshold (%)		
	20	30	40
North region∞	-0.006	-0.001	-0.000
	-(0.820)	-(0.220)	-(0.030)
Northeast region∞ (x100)	-0.140	0.060	-0.040
	-(0.210)	-(0.210)	-(0.250)
South region∞	0.006	0.007**	0.004**
	(0.860)	(2.090)	(1.980)
Mid-West region∞	0.019**	0.015***	0.007**
	(2.230)	(3.170)	(2.390)
Presence of pregnant or breastfeeding woman∞	-0.006	-0.003	-0.000
	-(1.160)	-(1.330)	-(0.160)
Presence of member with university-level education∞	-0.014**	-0.007***	-0.004***
	-(2.120)	-(3.070)	-(2.870)
Number of household members	-0.005***	-0.003***	-0.001***
	-(4.390)	-(3.610)	-(3.410)
Number of bathrooms	-0.003	-0.002	-0.000
	-(0.920)	-(1.370)	-(0.460)
Household income (x 10,000)	-0.041**	-0.001	0.000
	-(2.430)	-(0.900)	(0.140)

Table 6 *(continued)*
Marginal Effects Estimated with Probit Models at Three Thresholds of CHE1. Brazil, 2003

Variable	Threshold (%)		
	20	30	40
Presence of potable water supply with indoor plumbing in the residence∞	-0.008*	-0.002	-0.001
	-(1.780)	-(0.800)	-(0.600)
Presence of sewage and drainage∞	-0.004	-0.003	-0.001
	-(0.850)	-(1.050)	-(1.170)
Presence of children less than 5 years old∞	-0.016	-0.010***	-0.006***
	-(0.830)	-(2.670)	-(3.010)
Presence of elderly members more than 65 years old∞	0.088**	0.018***	0.002
	(2.330)	(3.010)	(0.780)
Absence of children or elderly members ∞	-0.008	-0.012**	-0.009**
	-(0.310)	-(2.260)	-(2.470)
Presence of health insurance∞	0.066***	0.014***	0.005***
	(10.640)	(5.110)	(3.260)
Household in rural area∞	0.014**	0.008**	0.004*
	(2.250)	(2.490)	(1.830)

Notes: Marginal effects; ***t*** statistic in parenthesis.
∞ for discrete change in the dummy variable from 0 to 1
* P<0.10, ** P<0.05, *** P<0.01

Source: Authors' calculations based on Family Budget Survey (POF 2002-2003) microdata.

The presence of a household member with a university-level education is associated with a lower likelihood of incurring CHE, while the number of household members is inversely related to the likelihood of incurring CHE. Household composition also influences the prevalence of CHE. Households with no elderly individuals show a lower likelihood of incurring CHE (in models using the 30% and 40% thresholds), whereas households with elderly individuals are more likely to incur CHE (in models using the 20% and 30% thresholds). The effects of variables that characterize the living conditions of the dwelling (water supply and sewage) and the presence of pregnant or breastfeeding women are insignificant, after controlling for other factors.

The presence of health insurance has a positive marginal effect, indicating that affiliation to health insurance or a health plan may increase the likelihood of incurring CHE. This is an unusual result, since affiliation to health insurance is assumed to reduce the financial risks associated with an eventual health problem. In order to adequately investigate this result a more complex model is required to deal with endogeneity bias and selection issues. For example, households that acquire health plans or insurance –especially if coverage is not provided by the employer– tend to have at least one family member with a chronic disease.

The instrumental variable model using the percent of household members that are formally employed as the instrument incorporates the structure of the complex survey data. The results (marginal effect calculated for the average of each explanatory variable) of the instrumental variable models are shown in **Table 7**.

The results vary somewhat by threshold. For the 20% threshold, there is a reduced likelihood of CHE for presence of a household member with a university-level education, number of household members, household income, and presence of children. For the 30% threshold there is a reduced likelihood of CHE for presence of a household member with a university-level education, number of household members, domestic sewage treatment, and presence of children and elderly members. For the 40% threshold, the presence of a household member with a university-level education, number of household members, domestic sewage treatment, and presence of children and elderly members reduce the likelihood of CHE. For all levels of the threshold, there is an increased likelihood of CHE for presence of a household member aged 65 years or more, and for households located in a rural area.

Table 7
Marginal Effects of Instrumental Variable Models with Three Thresholds of CH1. Brazil, 2003

Variable	Threshold (%)		
	20	30	40
Presence of health insurance∞	-0.007	-0.007	-0.003
	-(1.110)	-(1.430)	-(1.430)
Presence of pregnant or breastfeeding woman∞	-0.003	-0.002	-0.000
	-(1.010)	-(1.270)	-(0.200)
Presence of member with university-level education∞	-0.006*	-0.004**	-0.002**
	-(1.760)	-(2.480)	-(2.160)
Number of household members	-0.003***	-0.002***	-0.001***
	-(5.580)	-(4.430)	-(3.910)
Number of bathrooms	-0.002	-0.001	-0.000
	-(1.210)	-(1.480)	-(0.300)
Presence of potable water supply with indoor plumbing in the residence∞	-0.003	-0.001	-0.001
	-(1.180)	-(0.380)	-(0.380)
Presence of sewage and drainage∞	-0.002	-0.003*	-0.001*
	-(1.080)	-(1.820)	-(1.680)
Household income	-0.015**	-0.002	0.001
	-(2.020)	-(0.580)	(0.590)
Presence of children less than 5 years old∞	-0.530**	0.040	0.080
	-(2.540)	(0.270)	(0.710)
Presence of elderly members more than 65 years old∞	0.040***	0.019***	0.009***
	(12.490)	(7.350)	-(7.330)
Presence of children and elderly members∞	-0.002	-0.005**	-0.003***
	-(0.160)	-(2.150)	-(2.800)
Household in rural area∞	0.006**	0.004**	0.002*
	(1.990)	(2.170)	(1.790)
Presence of health insurance - instrument	0.038***	0.012***	0.005***
	(25.330)	(25.300)	(25.300)

Notes: Marginal effects; ***t*** statistic of model coefficient in parenthesis.
∞ for discrete change in the dummy variable from 0 to 1
* P<0.10, ** P<0.05, *** P<0.01

Source: Authors' calculations based on Family Budget Survey (POF 2002-2003) microdata.

V. Discussion and Conclusions

With respect to the prevalence of CHE, the results indicate the existence of regional differences, as well as differences between urban and rural areas. As previously mentioned, the two regions with the highest prevalence of CHE, the Mid-West and the South, do not have similar socio-economic characteristics. The Mid-West is the region with the highest inequality rate, while the South is the one with the lowest, and neither region is amongst the poorest in the country. These results may reflect differences in the structure of the provision of health services by SUS or systemic inefficiencies in healthcare service delivery and are worthy of further research.

Another area for future research that could shed additional light on regional differences is the role of CHE in generating impoverishment. In Brazil, CHE, associated with a decentralized public health system and characterized by a profound scarcity of resources in some regions, could push households below the poverty line.

The results of this research also show that the likelihood of incurring CHE is higher in households with at least one elderly member. This result indicates the importance of further evaluation of the care currently available for older individuals within the SUS.

Finally, the results show that even under the most favorable of circumstances, private health insurance in Brazil does not contribute to reductions in household financial risk, at least in this analysis using cross-sectional data. In several models, private health insurance is shown to increase the risk of households incurring CHE. These results concur with the findings reported for China by Wagstaff and Lindelow (2008) who attribute this to insurance encouraging patients to seek care, especially from higher level providers, when ill.

In Brazil, most health insurance plans cover health services, consultations, medical examinations and hospitalizations. Few health plans include coverage of prescription drugs that may be generating large, and even catastrophic, health expenditures for households. This suggests additional avenues for research on the coverage of financial protection in health that is required by the Brazilian population.

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Chapter 6

Health Financing and Household Health Expenditure in Chile

Chapter 6

Health Financing and Household Health Expenditure in Chile

Ricardo Bitrán[i], Rodrigo Muñoz[ii]

I. Introduction

Unlike many other developing countries which prioritize coverage of populations with formal employment over those without, Chile has explicitly incorporated the poor into the social security system for decades. In part, this explains why Chile shows better health indicators than several other developing countries in the Latin American region and elsewhere. Nevertheless, the system's financial impact on households has not been studied in depth, and there are concerns as to how the organization of health system financing might affect households' capacity-to-pay for other essential goods and services. In particular, little is known about the vulnerability of Chilean families to financial catastrophe or impoverishment due to illness or accident, in part due to a lack of appropriate household surveys.

This study makes use of the only available data on household health spending in Chile from the 2005 National Health Satisfaction and Spending Study (*Estudio Nacional sobre Satisfacción y Gasto en Salud*, ENSGS). This research identifies health expenses that are not adequately covered by current insurance plans and that could therefore be a source of financial risk for households, and then compares health spending across socioeconomic levels and types of insurance.

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I.i. The Chilean Health System

The Chilean health system is characterized by the existence of a mandatory social security system with two principal agents: a single non-profit public insurer known as FONASA (*Fondo Nacional de Salud*) and a "group of multiple" for-profit and non-profit private health insurance institutions known collectively as ISAPREs (*Instituciones de Salud Previsional*). By law, all dependent workers, retirees and independent workers receiving social security benefits are required to register for mandatory health insurance, toward which they contribute a minimum of 7% of their monthly income or pension (to a maximum of USD $140). These persons may choose to be covered by FONASA or the ISAPRE of their choice. Other individuals, such as independent workers with no social security benefits may voluntarily affiliate with any of the ISAPREs. Unemployed people and indigents have the right to free coverage financed by FONASA through what is known as FONASA Group A (**Figure 1**).

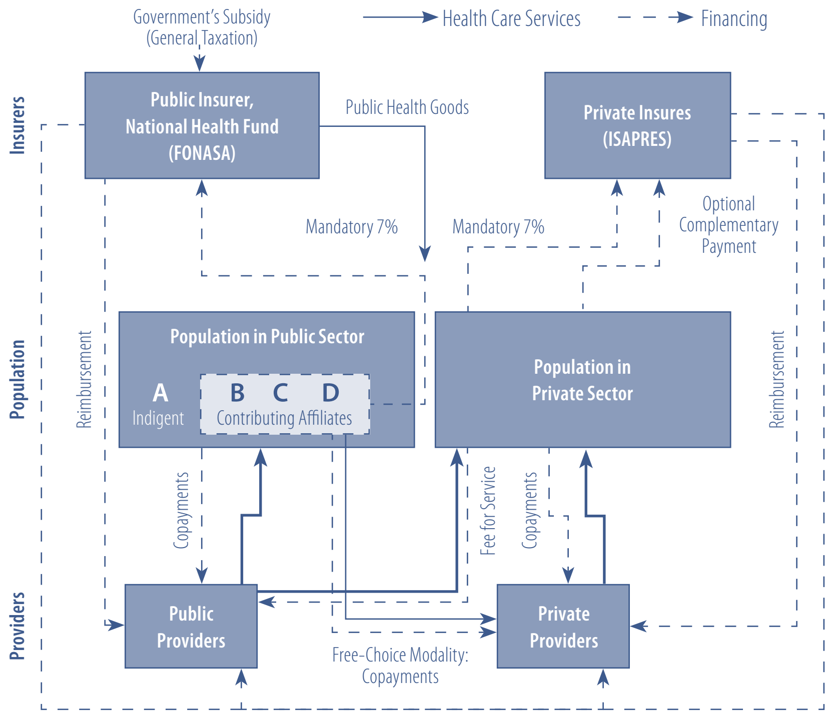
Both FONASA and ISAPRE insurers have schemes to provide coverage for catastrophic health expenses, intended to provide financial protection for households against high-cost events. FONASA completely covers the cost of some high-cost services such as heart surgery, transplants, dialysis, and others. ISAPRE insurers offer the optional benefit of Additional Catastrophic Illnesses Coverage (*Cobertura Adicional para Enfermedades Catastróficas*, CAEC), which covers all medical expenses above a threshold set at approximately $ 3,000 USD PPP[1] per event. In addition, all insurers whether public or private, are required by law to provide services to any citizen with a life-threatening emergency.

FONASA is required by law to buy the majority of its services from public providers, who are in turn required to sell the majority of their services to FONASA. However, there is a small subsidy for those FONASA beneficiaries who wish to receive care from the private sector, although their co-payments are higher than in the public sector. ISAPRE beneficiaries can choose where to receive care –in the public or private sector– by making co-payments proportional to the total cost of care up to certain coverage ceilings.

Coverage by mandatory insurance is high, covering 91% of the total population (*Superintendencia de Salud*, 2005). Seventy percent of the population is covered by FONASA; 17% is covered by an ISAPRE; 4% belong to other insurance schemes provided by institutions such as the armed forces and universities; while the remaining 9% is not covered by mandatory health insurance, although these individuals may have some type of voluntary, privately contracted insurance.

1. USD PPP: per-capita GDP purchasing power parity converted to US dollars.

Figure 1
Mandatory Insurance in Chile

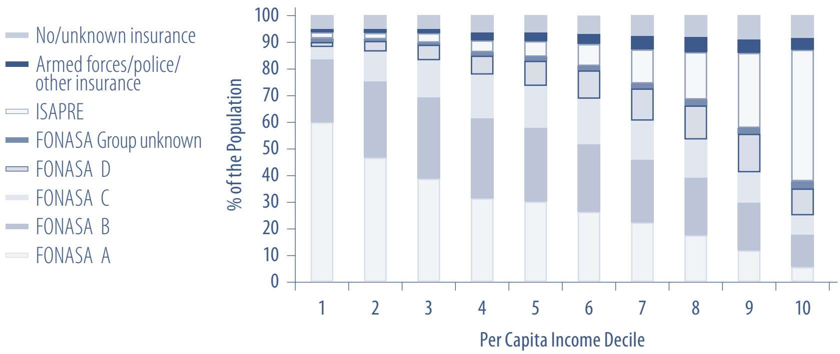


Source: Author's elaboration.

The high level of insurance coverage in Chile is maintained across different socioeconomic levels, the only difference being the type of insurer chosen. The majority of poorer beneficiaries are covered by FONASA, whereas beneficiaries in higher income deciles are concentrated among ISAPREs and other insurers (**Figure 2**). This is because the level of financial coverage provided by ISAPREs is proportional to the premium paid by the affiliate, and since mandatory insurance requires a minimum premium of 7% of income, high-income affiliates obtain a higher level of financial coverage than low-income affiliates. The level of financial coverage provided by FONASA, in contrast, does not increase as a function of the premium; in fact, coverage decreases slightly as income increases. As a result, for low-income individuals who pay low premiums, ISAPREs cannot offer better coverage than FONASA, and thus these individuals tend to choose public insurance providers. For high-income individuals who pay high premiums, ISAPREs may offer better coverage than FONASA, and therefore these persons tend to choose an ISAPRE.

Figure 2

Mandatory Insurance Coverage, by Insurer and per Capita Income Decile, 2006



Source: Encuesta CASEN, 2006.

Household health utilization, out-of-pocket (OOP) expenditure, and the quality of health services that households receive depend on the benefits that insurers deliver. For those who can afford it, ISAPREs offer a greater variety of choice among different levels of financial coverage: through payment of an additional amount above the mandatory 7%, there is practically no limit on the level of coverage that can be purchased. Moreover, the freedom of choice of providers from ISAPREs is greater than with FONASA. The coverage provided by the latter depends on the beneficiaries' income, and ranges between 100% of the cost of curative care for poorer beneficiaries (Groups A and B) and 80% of the cost for less poor beneficiaries (Groups C and D). However, this coverage is restricted to public providers. For Groups B, C and D, a free-choice modality is available that allows access to some private providers that have entered into an agreement with FONASA, although the level of reimbursement is lower. A further important restriction with both FONASA and ISAPREs is the absence of coverage for drugs, which constitutes an important source of household OOP expenditure.[2]

2. The recent Explicit Health Guarantees (*Garantías Explícitas en Salud*, GES) plan has addressed the lack of drug coverage for some health problems, however at the time of this study its coverage was marginal, and was not considered in this report. As of 2012, the use of the GES benefits package is no longer marginal, and represents approximately half of total public spending on health.

II. Methodology

Although the level of financial coverage of FONASA affiliates is a matter of public record, systematic information on the levels of coverage of ISAPRE affiliates is not available, and making it difficult to predict who will be most vulnerable to catastrophic health costs. It is reasonable to assume that all are well protected, as financial coverage through FONASA is relatively high, and ISAPRE affiliates tend to choose an ISAPRE provider because they can obtain better coverage from a private insurer than from FONASA. However, the lack of free choice for FONASA affiliates may eventually force people with certain diseases for which public sector care is inadequate to seek care in the private sector, at high cost. The lack of coverage for drugs, transportation, and other hidden costs may also imply high expenditures for affiliates of both FONASA and ISAPREs.

Using data from the 2005 National Health Satisfaction and Spending Study (*Estudio Nacional sobre Satisfacción y Gasto en Salud*, ENSGS), the analysis presented here aims to determine whether there are health expenses that current insurance plans do not cover adequately, and which thus may impose a catastrophic expenditure on households. The ENSGS was designed and directed by the Chilean Ministry of Health with the aim of measuring the degree of satisfaction with the health system and the level of OOP health expenditures. The survey, which constitutes the only available measure of current household health spending in Chile, involved approximately 4,500 households between November 2005 and January 2006, in urban areas of Regions II, V, VIII and the Metropolitan Region. The sample enabled statistical inferences only for urban areas, where 87% of the population resides.

The survey makes it possible to compare health spending across households of different socioeconomic levels and types of insurance. It also permits the analysis of expenditures according to type of healthcare purchased, e.g., medical consultations, supplies and drugs, tests, hospitalization, etc. Unfortunately, for insured persons who use health services, no information is available on the level of reimbursement provided by different insurance plans or on the total cost of care; only OOP expenditures paid directly by users are recorded. Nonetheless this information makes it possible to investigate whether any households experience catastrophic health expenditures (CHE) and what the sources of these expenditures are, as well as to identify those households that are most vulnerable. However, the survey was poorly equipped to investigate the level of protection provided by different insurance plans, thus only approximate figures are presented based on comparisons of spending by persons who were insured and persons who were uninsured.

Based on the methodology of Xu, et al. (2005), catastrophic health expenditure (CHE1) is defined as health expenses that exceed the household capacity-to-pay by 40%:

$$\frac{EXP}{CTP} > 40\% \tag{1}$$

Where EXP is health expenditure, and CTP is household capacity-to-pay. An impoverishing expenditure is defined as health expenses which force a non-poor household into poverty.

III. Results

III.i. Sources and Utilization of Health Expenditure

Health expenditure in Chile is financed almost entirely from three sources:

a) OOP spending via co-payments from households made directly at the point of service,

b) Prepayment plans, comprising premiums paid to FONASA, ISAPREs and other voluntary insurance schemes; and

c) Government revenues from general taxes.

Analysis of the 2005 ENSGS indicates that the main source of financing is OOP payments (47% of total health expenditure), the least favorable source for households in terms of financial risk protection and equity. The second largest source of financing is premium payments to prepayment schemes (31%), which allow households to lower the risk of incurring catastrophic health expenses. The third largest source is government revenues (21%), which allow the government to redistribute costs more equitably (**Table 1**).

Table 1
Health Financing Indicators adjusted by Out-of-Pocket Estimates from ENSGS, 2005 (USD PPP)

Government revenue (millions of USD$)	2.862
Prepayment schemes (millions of USD$)	4.231
Out-of-pocket payments at point of service (millions of USD$)	6.389
Non-profit health insurance institutions (millions of USD$)	3
Total health expenditure (millions of USD$)	13.484
Total health expenditure as % of GDP	6.9
Total health expenditure per capita (in USD$)	827
Total out-of-pocket health spending per capita (in USD$)	392

Source: Health Accounts Series, 2008; and authors' calculations based on ENSGS, 2005.

As **Table 2** illustrates, OOP expenses are broken down into supplies and drugs (41%), medical consultations (19%), medical treatments and hospitalizations (15%), dental treatments (13%), tests (7%) and others (6%). Unsurprisingly, out-of-pocket spending is used mainly to pay for supplies and drugs, since coverage for medications through FONASA or ISAPREs is insufficient.

Hospitalization and treatment are also relevant in terms of financial protection, as these types of care tend to be the most costly. Households with hospitalization and treatment expenditures in the previous year, which represented 13% of the population, spent $ 1,020 USD PPP per capita annually –almost three times the average. Moreover, these households also spent more on medical consultations, supplies and drugs than the general population. Households with catastrophic health expenses, which represented 6.4% of the total population, spent $ 1,620 USD PPP per capita, 36% of which was used to pay for supplies and drugs, and 30% of which was spent on medical treatment and hospitalization.

Table 2
Monthly per Capita Spending on Health Services, by per Capita Expenditure Quintile and Insurance Type, 2005 (USD PPP)

	Insurance Type					
Per Capita Expenditure Quintile	No Insurance	FONASA A	FONASA B/C/D	ISAPRE	Other Insurance	Total
Expenditure on Medical Consultation						
Quintile 1	0.6	0.4	0.9	0.9*	4.0*	0.7
Quintile 2	2.5	1.7	1.8	3.2*	12.2*	2.1
Quintile 3	3.4	2.2	4.1	8.7	6.3*	4.2
Quintile 4	6.5	4.5	7.6	8.4	9.9	7.5
Quintile 5	13.0	8.2	20.3	23.8	23.3	21.0
Total	**4.0**	**1.4**	**5.6**	**16.2**	**11.4**	**6.1**
Expenditure on Supplies and Drugs						
Quintile 1	2.2	2.0	2.8	1.8*	7.1*	2.5
Quintile 2	5.5	6.5	6.1	7.9*	8.6*	6.2
Quintile 3	7.5	10.4	10.7	10.2	15.3*	10.4
Quintile 4	13.0	16.8	20.1	18.3	21.4	18.7
Quintile 5	28.5	33.6	41.5	37.1	65.2	39.2
Total	**8.9**	**6.0**	**13.6**	**26.3**	**25.5**	**13.5**
Expenditure on Laboratory Tests and Imaging						
Quintile 1	0.1	0.2	0.4	0.5*	0.0*	0.3
Quintile 2	1.1	0.4	0.9	0.8*	0.3*	0.8
Quintile 3	2.1	1.0	1.4	3.9	3.1*	1.7
Quintile 4	1.8	1.7	2.6	2.6	3.0	2.4
Quintile 5	1.8	0.5	2.4	4.9	5.5	2.3
Total	**1.4**	**0.8**	**1.5**	**2.6**	**2.4**	**1.5**
Expenditure on Dental Care						
Quintile 1	0.2	0.1	0.8	1.0*	0.1*	0.4
Quintile 2	0.4	0.7	0.7	0.2*	3.1*	0.7
Quintile 3	1.1	1.1	2.9	3.3	0.2*	2.4
Quintile 4	3.2	1.5	5.2	6.1	3.1	4.8
Quintile 5	8.9	6.2	12.7	22.3	7.0	16.1
Total	**2.0**	**0.6**	**3.6**	**13.8**	**2.9**	**4.1**

Table 2 *(continued)*
Monthly per Capita Spending on Health Services, by per Capita Expenditure Quintile and Insurance Type, 2005 (USD PPP)

Per Capita Expenditure Quintile	Insurance Type					
	No Insurance	FONASA A	FONASA B/C/D	ISAPRE	Other Insurance	Total
Expenditure on Hospitalization and Treatment						
Quintile 1	0.1	0.1	0.5	0.0*	0.0*	0.2
Quintile 2	0.8	0.2	0.4	1.0*	0.7*	0.4
Quintile 3	0.8	0.3	2.0	6.1	7.5*	2.1
Quintile 4	3.0	0.6	4.2	5.2	2.1	3.9
Quintile 5	18.2	16.5	16.5	29.9	14.0	22.4
Total	**2.9**	**0.6**	**3.5**	**18.0**	**5.0**	**4.8**
Expenditure on Other Health Services						
Quintile 1	0.2	0.1	0.3	0.4*	0.3*	0.2
Quintile 2	1.0	0.3	0.6	0.5*	1.7*	0.6
Quintile 3	1.0	1.0	1.4	2.6	1.5*	1.4
Quintile 4	1.6	2.0	2.5	2.4	2.1	2.3
Quintile 5	4.7	3.4	5.7	8.3	2.7	6.6
Total	**1.3**	**0.5**	**1.7**	**5.4**	**1.8**	**1.9**
Total Health Expenditure						
Quintile 1	3.4	3.0	5.7	4.7*	11.5*	4.3
Quintile 2	11.4	9.8	10.6	13.5*	26.5*	10.9
Quintile 3	15.9	16.1	22.6	34.8	33.9*	22.2
Quintile 4	29.2	27.3	42.2	42.9	41.7	39.6
Quintile 5	80.3	69.6	106.7	128.3	131.5	113.9
Total	**20.8**	**9.6**	**30.3**	**84.7**	**52.1**	**32.7**

Note: * Statistics calculated with less than 30 observations.

Source: Authors' calculations based on ENSGS, 2005.

III.ii. Insurance

In order to estimate the effects of insurance by comparing the insured with the uninsured, it is critical to first acknowledge the differences between the two populations. As explained above, the population employed in the formal sector is required to obtain insurance, whereas the population without formal employment may choose whether to obtain insurance or not. Therefore, an obvious difference between the two populations is that the insured group includes people with formal or informal employment as well as unemployed persons, whereas the uninsured group includes only people employed in the informal sector or unemployed persons. The choice whether to obtain insurance through FONASA or an ISAPRE is strongly determined by socioeconomic level. However, other factors also determine whether an individual decides to become insured, and the choice of insurer. **Table 3** shows the results of three regression analyses with a probit model that predicts the likelihood of obtaining insurance through FONASA Group A, FONASA Groups B, C or D, or an ISAPRE, depending on the following household characteristics: geographical region, quintile of total household expenditure per capita, life cycle, household size and share of household members with formal employment.

The data show that households with greater health needs, specifically households with older adults, tend to obtain insurance through FONASA. Because of their greater health risks, older adults would be expected to show a stronger preference for obtaining insurance than the rest of the population. They would also be expected to prefer FONASA, given that ISAPRE premiums increase proportionately with health risk whereas the FONASA premium remains unchanged. In summary, the FONASA, ISAPRE, and uninsured populations differ in socioeconomic level and health needs, and may have different levels of health utilization and expenditure regardless of the effect of insurance. This makes it necessary to control for these variables before the populations can be compared.

Table 3
Probit Regressions of the Probability of Insuring with FONASA A, FONASA B/C/D or an ISAPRE

Model:	FONASA A	FONASA B/C/D	ISAPRE
Observations:	1,354.000	2,899.000	1,137.000
F:	10.330	9.780	22.710
Prob > F:	0.000	0.000	0.000
R-2	0.094	0.034	0.271
Variables included in the model	**dy/dx**	**dy/dx**	**dy/dx**
Geographical Region			
Region II	Omitted		
Region V	0.237*	-0.061	-0.168***
Region VIII	0.065	-0.109**	-0.244**
Metropolitan region	0.144	-0.075**	-0.057
Quintile of Total Household Expenditure per Capita			
Quintile 1	Omitted		
Quintile 2	-0.096**	0.064***	0.334***
Quintile 3	-0.170***	0.074***	0.463***
Quintile 4	-0.439***	0.028	0.579***
Quintile 5	-0.493***	0.053*	0.808***
Household Life Cycle			
w/o older adult and w/o child	Omitted		
w/ child less than 5 yrs	-0.001	-0.035	-0.016
w/ adult over 65 yrs and w/o child	0.041	0.104***	-0.018
w/ adult >65 and child <5	0.235***	0.116***	0.043
Household Size			
1-2 members	Omitted		
3-4 members	-0.040	-0.012	0.083
5+ members	-0.124**	-0.026	0.259***
% of members w/ formal employment	-0.045	0.209***	0.569***

Note: *Level of significance 0.1; **Level of significance 0.05; ***Level of significance 0.01.

Source: Authors' calculations based on ENSGS, 2005.

III.iii. Out-of-Pocket Health Spending

Out-of-pocket health spending increases with income, meaning that wealthier households devote a larger proportion of their income to health co-payments than poorer households. As **Table 4** shows, households in the wealthiest quintile devote 14.3% of their total expenditure to health co-payments, whereas the poorest households devote only 4.3% to this item. The reasons for this difference are two: the wealthiest households (i) have higher levels of utilization and (ii) consume more expensive types of care, which are presumably of higher quality and more resource-intensive. **Table 5** shows the results of three ordinary least squares regression analyses (for FONASA Group A, FONASA Groups B, C and D, and ISAPREs) used to predict the number of medical consultations per capita in the preceding month according to the following household characteristics: insurance, geographical region, quintile of total household expenditure per capita, life cycle, and household size. The data show that in all three models, the number of medical consultations increases with income quintile. This reveals difficulties with access among poorer groups, who consequently use fewer health services regardless of the type of insurance they have. The survey does not permit the identification of barriers to access; however, given the extensive coverage provided by public and private insurers in Chile, it is fair to assume that the main barrier to access is financial. The data also show that the wealthiest groups pay more per medical consultation than the poorest groups regardless of which insurer they use. The likelihood of paying an amount greater than zero increases steadily with income quintile, as does the amount paid (**Table 6**). This indicates that the wealthiest households consume more expensive types of care, which are presumably of higher quality and more resource-intensive.

The regression analyses show that utilization rates of medical consultations are higher among insured than uninsured people. Users insured through FONASA Group A tend to use 39% more medical consultations than uninsured people; FONASA Group B, C and D affiliates use 33% more; and ISAPRE affiliates use 39% more.[3] A large part of this effect definitely reflects the reduction in financial barriers to access due to insurance schemes, but another part may reflect moral risk, which tends to increase utilization by insured affiliates above optimum levels.

3. These estimates may be affected by endogeneity bias stemming from at least two sources: the omission of other health status variables correlated with life cycle, and the possible dependence between insurance effect size and health status. Unfortunately, the survey does not provide sufficient information to control for these potential endogeneity biases.

Table 4
Health Spending as a Share of Total Household Expenditure, by Per Capita Expenditure Quintile and Insurance Type, 2005

Per Capita Expenditure Quintile	Insurance Type (%)					
	No Insurance	FONASA A	FONASA B/C/D	ISAPRE	Other Insurance	Total
1	4.1	3.3	5.1	4.4*	11.3*	4.3
2	5.8	5.8	6.8	9.5*	17.5*	6.8
3	6.5	6.4	9.7	14.1	14.4*	9.2
4	8.2	7.0	11.8	11.4	12.5	10.9
5	10.1	11.8	15.1	12.5	28.3	14.3
Total	**6.6**	**5.0**	**9.7**	**12.2**	**17.9**	**9.1**

Note: * Statistics calculated based on less than 30 observations.

Source: Authors' calculations based on ENSGS, 2005.

The model used to predict the likelihood of paying an amount larger than zero (among users of health services) shows a markedly lower likelihood for FONASA Group A affiliates, attributable to the fact that reimbursement to beneficiaries in this group covers 100% of the cost. Among FONASA Group B, C and D affiliates there is no significant reduction in the likelihood of paying an amount greater than zero or in the actual amount paid. ISAPRE affiliates, in contrast, are more likely to pay an amount greater than zero and to make larger payments. Given that the reimbursements to beneficiaries are often relatively high (between 80% and 100% for FONASA Groups B, C and D depending on the group and coverage; and typically between 60% and 100% for ISAPRE beneficiaries depending on the plan and coverage), one can conclude that both FONASA B, C and D affiliates and ISAPRE affiliates obtain access to considerably more expensive types of care by paying the same (FONASA B, C and D) or more (ISAPREs) than those without insurance. The difference in costs may reflect beneficiaries' access to higher-quality and more resource-intensive types of care, either because they can afford it thanks to their insurance or because they have more severe health problems that require more specialized and therefore more expensive care. However, the difference in costs may also result from the effect of insurance on moral risk in connection with the services covered, a consequence of which is that providers tend to increase the cost of services without changing their quality or resource-intensity.

Table 5

Regressions of the Quantity of Medical Consultations and the Probability of Paying an Amount Greater than Zero

Model:	Quantity of Medical Consultations			Probability of Paying an Amount Greater than Zero		
Insurance type:	FONASA A	FONASA B/C/D	ISAPRE	FONASA A	FONASA B/C/D	ISAPRE
Model type:	OLS	OLS	OLS	Probit	Probit	Probit
Observations:	1,354.000	2,899.000	1,137.000	758.000	1,777.000	699.000
F:	2.850	0.180	9.530	7.020	11.970	7.990
Prob > F:	0.012	0.000	0.000	0.000	0.000	0.000
R-2/Pseudo R-2:	0.058	0.065	0.111	0.252	0.167	0.251
Mean dependent variable:	0.429	0.553	0.527	0.356	0.660	0.865
Marginal Effects of Independent Variables						
Insurance Type:	0.166***	0.185***	0.203***	-0.290***	-0.005	0.133***
Geographical Region						
Region II	Omitted					
Region V	-0.221*	-0.172	-0.012	0.191**	0.049	0.062
Region VIII	-0.091	-0.122	0.003	0.171**	0.018	0.117**
Metropolitan region	-0.047	-0.056	-0.008	0.149*	-0.009	0.134

Table 5 *(continued)*

Regressions of the Quantity of Medical Consultations and the Probability of Paying an Amount Greater than Zero

Model:	Quantity of Medical Consultations			Probability of Paying an Amount Greater than Zero		
Marginal Effects of Independent Variables						
Total Household Expenditure per Capita						
Quintile 1	Omitted					
Quintile 2	0.029	-0.017	0.063	0.341***	0.193***	0.139***
Quintile 3	0.020	0.197**	0.165**	0.519***	0.313***	0.190***
Quintile 4	0.168**	0.260***	0.187***	0.595***	0.411***	0.264***
Quintile 5	0.184*	0.400***	0.371***	0.614***	0.485***	0.388***
Household Life Cycle						
w/o older adult and w/o child	Omitted					
w/ child less than 5 yrs	0.132*	0.104**	0.190***	-0.029	0.059	-0.059
w/ adult over 65 yrs and w/o child	0.304***	0.238***	0.301***	0.081	-0.122**	-0.049
w/ adult >65 and child <5	0.262*	0.215*	0.350*	0.134	0.154**	0.112***
Household Size						
1-2 members	Omitted					
3-4 members	-0.033	-0.036	0.015	0.204*	0.211***	0.151**
5+ members	-0.147*	-0.072	-0.043	0.407***	0.303***	0.208***
Constant	0.340***	0.268**	0.122			

Note: *Level of significance 0.1; **Level of significance 0.05; *** Level of significance 0.01.

Source: Authors' calculations based on ENSGS, 2005.

Table 6

Regressions of Amount Disbursed and the Probability of Incurring CHE [a]

Model:	Log(Amount of OOPS for Consultation)			Probability of Incurring CHE		
Insurance type:	FONASA A	FONASA B/C/D	ISAPRE	FONASA A	FONASA B/C/D	ISAPRE
Model type:	OLS	OLS	OLS	Probit	Probit	Probit
Observations:	297.000	1.129	559.000	1.354	2.899	1.137
F:	4.870	10.460	3.960	5.610	9.710	7.060
Prob > F:	0.001	0.000	0.002	0.000	0.000	0.000
R-2/Pseudo R-2:	0.333	0.164	0.175	0.088	0.089	0.148
Mean dependent variable:	2.388	2.450	2.839	0.058	0.100	0.072
Marginal Effects of Independent Variables						
Insurance Type:	-0.048	-0.042	0.231*	-0.012	0.029*	0.028
Geographical Region						
Region II	Omitted					
Region V	0.697	0,320*	0.168	0.010	-0.035*	-0.019
Region VIII	0.757	0.229	0.367***	0.051	-0.036	0.083
Metropolitan region	0.917*	0.350*	0.368***	0.049	-0.029	0.044
Total Household Expenditure per Capita						
Quintile 1	Omitted					
Quintile 2	0.241	0.231	0.093	0.039*	-0.014	0.041
Quintile 3	0.269	0.428**	0.157	0.025	-0.005	0.033
Quintile 4	0.448***	0.632***	0.296	0.031	0.034	0.016
Quintile 5	0.992***	1.031***	0.850***	0.050	0.037	-0.008

Table 6 *(continued)*

Regressions of Amount Disbursed and the Probability of Incurring CHE [a]

Model:	Log(Amount of OOPS for Consultation)			Probability of Incurring CHE		
Marginal Effects of Independent Variables						
Household Life Cycle						
w/o older adult and w/o child	Omitted					
w/ child less than 5 yrs	0.050	-0.076	0.139	0.027	-0.013	0.030
w/ adult over 65 yrs and w/o child	0.072	0.037	-0.076	0.072***	0.048*	0.101***
w/ adult >65 and child <5	0.706***	0.180	0.308	0.306***	0.153	0.289*
Household Size						
1-2 members	Omitted					
3-4 members	-0.535***	-0.181*	-0.459***	0.010	0.031*	0.0140
5+ members	-0.420**	-0.017	-0.214	0.040	0.099***	0.060***
Constant	-0.635***	-0.240***	-0.202**	0.042***	0.055***	0.068***
Household Size	2.085***	1.934***	2.293***			

Note: *Level of significance 0.1; **Level of significance 0.05; ***Level of significance 0.01.
a CHE defined as (OOP/EXP)>40% differs from the threshold used in the other chapters where k = 30%, equivalent to CHE1.

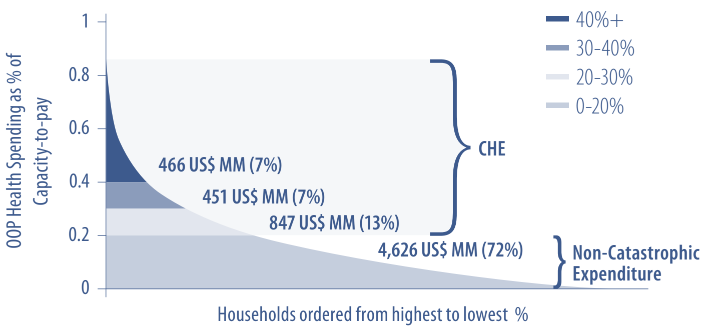
Source: Authors' calculations based on ENSGS, 2005.

III.iv. Catastrophic Health Expenditure

There is no agreement in the literature on what constitutes catastrophic health expenditure. This chapter considers that CHE occurs when a share of 40% or more of a household's capacity-to-pay is devoted to health care in a given month. According to the survey data, the incidence of CHE in Chile is 6.4%. Probit regression analyses show that the likelihood of incurring catastrophic expenditures is strongly dependent on the presence of older adults in the household and on the number of medical consultations. However, in contrast to earlier studies based on the CASEN survey, the incidence of catastrophic expenditures was not higher among the poorest groups (Bitrán, et al., 2004). The present survey also found no evidence that insurance decreased the likelihood of catastrophic expenses, which indicates that medical insurance does not adequately address the issue of CHE.

Figure 3

Out-of-Pocket Spending on Health, by Thresholds of CHE, 2005



Source: Authors' calculations based on FONASA Statistica Yearbook, 2004-2005; World Health Organization, National Accounts Series, 2008; and ENSGS, 2005.

Based on the survey data, it is possible to estimate the total amount of money associated with the catastrophic spending gap. In Chile, households that spend more than 40% of their capacity-to-pay on health account for a total annual expenditure of $ 466 million USD PPP above the threshold. This is equivalent to 7% of total OOP spending, and to 3% of total health expenditure in the country. Defining households that spend more than 30% of their capacity-to-pay on health as having CHE would add another $ 451 million USD PPP to the pool of total catastrophic health expenditure. Likewise, defining households that spend more than 20% of their capacity-to-pay on health as having catastrophic health expenditures would add another $ 847 million USD PPP to the pool of total catastrophic health expenditure (**Figure 3**).

III.v. Impoverishing Health Expenditure

Impoverishing Health Expenditures (IHE) are those which push a household below the poverty line. Data from the ENSGS survey indicate an incidence of poverty in Chile of 5.4% (based on the national indigence line). If health spending is subtracted from total household consumption, the incidence increases to 6.6%, indicating that the incidence of IHE is 1.2%. As shown in **Table 7**, impoverishing health expenditures are concentrated in the poorest quintile, where the poverty line is situated. In this quintile there are no statistically significant differences between insured and uninsured groups, i.e., there is no evidence that insurance reduced the likelihood of becoming impoverished because of high health spending.

Table 7

Impoverishing Health Expenditure Incidence,
by Per Capita Expenditure Quintile and Insurance Type, 2005

Per Capita Expenditure Quintile	Insurance Type (%)					
	No Insurance	FONASA A	FONASA B/C/D	ISAPRE	Other Insurance	Total
1	4.9	3.2	8.4	0.0*	0.0*	5.3
2	0.0	0.7	0.0	0.0*	0.0*	0.2
3	0.0	0.0	0.2	0.0	0.0*	0.1
4	0.0	0.0	0.2	0.0	0.0	0.1
5	0.0	0.0*	0.3	0.0	0.0	0.1
Total	**1.3**	**1.7**	**1.3**	0.0	0.0	**1.2**

Note: * Statistics calculated based on less than 30 observations.

Source: Authors' calculations based on ENSGS, 2005.

IV. Conclusions

This study confirms the hypothesis of a number of experts who consider that government sources underestimate household OOP expenditure on health, particularly with respect to expenditures on drugs. The official numbers indicate that total health expenditure represents 5.4% of GDP, almost one third of which is financed out-of-pocket. However, data from the ENSGS survey show that out-of-pocket spending is almost twice as high as believed, and that total health expenditure thus amounts to 6.9% of GDP. In terms of equity and financial risk protection for households, this finding denotes a worse situation than what was initially believed – almost half of health expenditure in Chile is apparently financed directly by household OOP spending. It is not surprising that the main source of OOP spending is for supplies and medications, since these items are not adequately covered by FONASA or ISAPREs.

The results show that OOP expenditures increase with income: the wealthiest households have higher levels of utilization and consume more expensive types of care, which are presumably of higher quality and more resource-intensive. This indicates that Chilean households consider healthcare a superior good; accordingly, one can expect health spending as a percentage of GDP to continue to increase in the future, as the Chilean GDP increases. Increases in health spending as income rises also reflect the presence of financial barriers to access for the poorest, including low-income households with insurance. However, there is evidence that insured households have considerably higher levels of utilization of medical consultations than uninsured households regardless of whether the latter are poor or not.

With the exception of FONASA Group A, insurance schemes do not appear to decrease OOP expenses per consultation. However, because of the relatively high reimbursements provided by insurance schemes, one may conclude that they provide access to more expensive types of care, which are presumably of higher quality and more resource-intensive, although provided at the same cost as for uninsured people.

In particular, CHE should be a topic of concern because Chile has one of the highest incidences in the world: each month, 6.4% of all households spend on health more than 40% of their capacity-to-pay. Catastrophic expenditures occur mainly to pay for supplies and drugs, but medical treatments and hospitalization are also important components. In contrast to earlier results based on the CASEN survey, which showed that the incidence of CHE in Chile was concentrated in the poorest sectors of the population, this study shows that the incidence of catastrophic expenditure does not depend on income. The incidence also does not depend on the type of insurance, a finding that indicates that FONASA and ISAPREs do not adequately address the problem of providing households with financial protection against CHE.

The amount of money required annually to finance excess costs in these households is $ 466 million USD PPP, or 3% of all health expenditure. To cover this gap, the average health insurance premium would need to increase by 11%, or alternatively, government financing would need to increase by 16%.

Unlike catastrophic expenditure, the incidence of impoverishing expenditure is on average very low in Chile, especially in high - or moderate-income households. Although IHE affects a small proportion of the population overall, it is heavily concentrated in the poorest quintile which has an incidence of 5.3%.

A future challenge will be to examine health needs that remain unmet because of barriers to access. This information will disclose the reasons why some households underuse healthcare, such as low levels of need or access. Another desirable goal is to measure the monetary value of insurance reimbursements, given the differences between plans offered by FONASA and ISAPREs. The level of reimbursement is certain to influence both usage levels and the likelihood of catastrophic expenditures. Moreover, future surveys should be designed to control appropriately for health status and for the endogeneity of health status regarding health service needs. This, in turn, would lead to better estimates of the effect of insurance on usage and health expenditures. Finally, it is necessary to evaluate whether insurance is associated with moral risk issues in supply or demand that might push utilization and prices above optimum levels.

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Chapter 7

Risk Factors for Catastrophic Health Expenditure in Colombia

Chapter 7

Risk Factors for Catastrophic Health Expenditure in Colombia

Carmen Elisa Flórez[i], Ursula Giedion[ii], Renata Pardo[iii]

I. Introduction

In recent years, there has been considerable interest around the importance of achieving efficient and equitable mechanisms for financing health systems. Providing financial protection for households that face adverse health events, especially for those most vulnerable to the financially destabilizing effects of out-of-pocket (OOP) health spending, has been proposed as one of the goals of healthcare systems (WHO, 2001; Xu, Evans, Kewabata, Zeramdini, Klavus, & Murray, 2003).

In this context, during the 1990s, Colombia completely reformed its health system with the introduction of a universal health insurance scheme. According to the Colombian government's Development Plan (2006-2010), insurance was expected to achieve universal coverage in the year 2010 (*Departamento Nacional de Planeación* DNP, 2006). As of December 2011, and according to administrative data provided by the Ministry of Social Protection, Colombia reached universal coverage (95%) with 42.2 million people insured under the universal health insurance scheme, out of a total population of 44.8 million. This is up from around 20% in 1990 (Giedion & Acosta, 1998).

In recent years, there have been important advances in the literature with regard to the analysis of the effect of health expenditures on household economic well-being. In the specific case of Colombia, this has been the subject of an increasing number of studies, most of which are based on the analysis of

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descriptive statistics on catastrophic and impoverishing health expenditures. Among these studies, those by Bitrán, Giedion, & Muñoz (2004) and by Flórez & Hernández (2005), used different measurement criteria to estimate the incidence of catastrophic and impoverishing health expenditures in Colombia.

In related studies, Baeza & Packard (2006), and Xu, Evans, Kewabata, Zeramdini, Klavus, & Murray (2003) analyze the impact of OOP health expenditure on Colombian households in a comparative context – the former with reference to other countries in the region, and the latter with countries around the world at different levels of development. More recently, by means of an impact evaluation based on retrospective data, Flórez, Giedion, & Pardo (2010) estimate the mitigating effect of insurance on OOP spending arising from household adverse health events. These authors found that both the subsidized insurance scheme that covers more than 76% of the first population quintile (2010 Demographic and Health Survey), and the contributory scheme that covers the able-to-pay population reduce the incidence of household catastrophic health expenditure (CHE).

The present study uses a standard regional methodology (Knaul & Valdivia, 2009) to recalculate the incidence of CHE estimated by others (Bitrán, Giedion, & Morales, 1997; Flórez & Hernández 2005; Florez, Giedion, & Pardo, 2010), and analyzes the determinants of CHE in Colombian households in order to identify factors that may affect household vulnerability to the economic repercussions of an adverse health event. Within this context, this study specifically addresses the following three research questions:

First, what is the incidence of CHE in Colombian households that needed to use a health service (i.e. those that experienced a health problem)?

Second, which household characteristics, e.g. socio-economic level, household size and composition, members' health status, and environmental variables, and which health system variables, increase the likelihood of incurring a catastrophic health expense?

Third, which of these variables determine the average or expected value of the financial burden faced by households, understood as the proportion of their capacity-to-pay (CTP) that is spent OOP on health, and which variables determine the volatility of this burden? As set forth in the conceptual framework, this third question will be used to explore the vulnerability factors that increase exposure to the risk of incurring a catastrophic health expense – an aspect that the second question does not address.

The present chapter is structured as follows: the following section summarizes the Colombian health system implemented since 1993, the year when the universal health insurance scheme was adopted. The second section describes the conceptual framework and the indicators used, along with the models chosen to estimate the risk factors for CHE. The third section describes the sources of information used. The fourth section presents the descriptive results, and the fifth section is devoted to the results obtained with econometric models used to evaluate the determinants of CHE. The final section presents the conclusions.

II. The Colombian Health System[1]

In 1993, Colombia initiated a process of health sector reform with the aim of achieving coverage for all Colombian citizens through a process of universal insurance. The new health system grants all Colombian citizens the benefits of a basic health service package along with the right to choose a private or public insurance provider. People with CTP are affiliated to the Contributory Health Insurance Scheme (*Régimen Contributivo*), and are registered with one of 40 Health Promoting Entities (*Entidades Promotoras de Salud*, EPS). Affiliation with an EPS requires payment of a monthly contribution equivalent to 12.5% of the worker's income, which confers access to an explicit benefits package covering the affiliate and his or her first-degree relatives. In exchange for their contribution, affiliates and their relatives receive an integral health service package known as the Compulsory Health Plan (*Plan Obligatorio de Salud*). In this plan, the contribution depends on the individual's CTP and not on the level of risk they are insured for. If they wish, affiliates can purchase additional health insurance in the form of a complementary package, a drug prepayment package or a health insurance policy.

Poor people, defined as those who lack the CTP as identified by a proxy means test known as the System of Identification of Social Subsidies Beneficiaries (*Sistema de Identificación de Beneficiarios*, SISBEN), are covered by the Subsidized Health Insurance Scheme (*Régimen Subsidiado*), and may register freely with any of the 49 EPS that operate under the subsidized scheme. The government covers the cost of the basic benefits package offered under this scheme. As of 2008, 49% of these costs were financed by transfers from the

1. A detailed description of the demographic, socio-economic, and epidemiological aspects, as well as the health system characteristics directly related to financial protection can be found in Giedion, Ávila, Flórez, & Pardo (2009).

central government treasury, 24% by the solidarity fund financed mostly through a solidarity payroll tax contribution (1.5% of payroll), and the rest mainly by territorial (departmental and municipal) health sources (Ministry of Social Protection, 2009).

It is worth noting that the benefits packages offered through the contributory and subsidized insurance schemes differed significantly until very recently. In the contributory scheme, affiliates had, and still have, the right to a very complete package that covers services such as individual health promotion, preventive care, and primary care in general, including high-complexity services; whereas the package in the subsidized scheme covered most medium-complexity services focusing on promotion and prevention, low-complexity services and expenses due to catastrophic events. This situation has changed dramatically in the last 3 years as different age and population subgroups of the subsidized regime have been granted the same benefits package as those under the contributory regime. Currently, pregnant women and all age groups except those aged 18-64 receive the same benefits package irrespective of whether they are affiliated to the subsidized or the contributory regime. Furthermore, the government plans to incorporate the remaining group in 2012.

According to the National Health Survey (*Encuesta Nacional de Salud*), in the year 2007, 78% of the population was covered by an insurance scheme, 46% of whom were covered by the subsidized scheme. By 2011, coverage reached 95% as noted above; 53% of whom were covered under the subsidized scheme.

III. Conceptual Framework: Determinants of CHE

This section provides an overall conceptual framework in order to understand the risk factors for incurring CHE which can arise from the moment an illness occurs in the household until the moment health spending occurs to alleviate it. This conceptual framework is restricted inasmuch as it deals only with the economic consequences related with OOP *expenditure* on health services, and does not consider other economic consequences such as the indirect costs of transportation or food associated with seeking healthcare, or the income lost due to illness. Nor does this framework address the medium-term economic consequences for households when illness occurs. This study thus occupies the more restricted framework of OOP health expenditure because of the unavailability to date of more detailed or longitudinal data that would make it possible to explore the real economic impact of illness on households.

Definitions of CHE

Initially, CHE is defined as a dummy variable which takes a value of *1* when OOP health expenditure exceeds the threshold ***k*** with respect to the household CTP (Wyszewianski, 1986; Wagstaff, 2008; Xu, 2005). Health spending is considered catastrophic if it satisfies the condition: (OOP/CTP) ≥ ***k***. Capacity-to-pay is understood as the actual household income after deducting subsistence spending. Household monetary expenditure is taken as a proxy for the actual income given that:

a) The variance of current spending is lower than that of income and therefore constitutes a better measure of the economic capacity of a household and,

b) Expenditure data are considered more reliable than income data, especially in developing countries.

Basic subsistence spending is approximated using an endogenous poverty line, defined as the average food expenditure of households whose per capita share of spending on food is in the 45^{th}-55^{th} percentile range (Xu, et al., 2003). In those households in which the actual income is less than subsistence spending (i.e. they are below the poverty line), the CTP is estimated as the actual income (household expenditure) less household spending on food (Xu, et al., 2003).

The present study presents only those results for a threshold of ***k=20%***. Further on in the analysis of econometric models, this definition will be complemented with two additional approaches. The first uses the financial burden of OOP health spending, i.e. the share of household CTP represented by OOP expenditure, and defines catastrophic health expenses as those which appear at the upper limit of the conditional distribution of financial burden. With this definition as a starting point, the analysis on the determinants of CHE is complemented with quantile regression estimates.

The second approach explores the risk associated with CHE by considering how OOP spending can become catastrophic not only because it represents a large financial burden for the household, but also because it is a large unforeseen expense. This approach uses an econometric model that makes it possible to examine the impact of different variables and discern between their effect on the expected value and their effect on the variability of the financial burden. Because financial burden is a continuous variable, using it as a dependent variable in the models has the advantage of providing more information for the estimates.

CHE is a Result of the Medical Care-seeking Process

The determinants of CHE are associated with different moments in the process someone experiences from the moment an illness appears until money is spent OOP on health services. The conceptual framework divides this process into five moments:

a) The appearance of the health problem and perceived need to do something to cope with the problem,

b) The decision to seek care,

c) The choice of type of provider to respond to the health problem,

d) The moment when part or all of the cost of the services received needs to be paid, and finally,

e) The classification of the expenditure as catastrophic or not depending on the share of household CTP that the expenditure in question represents (**Figure 1**).

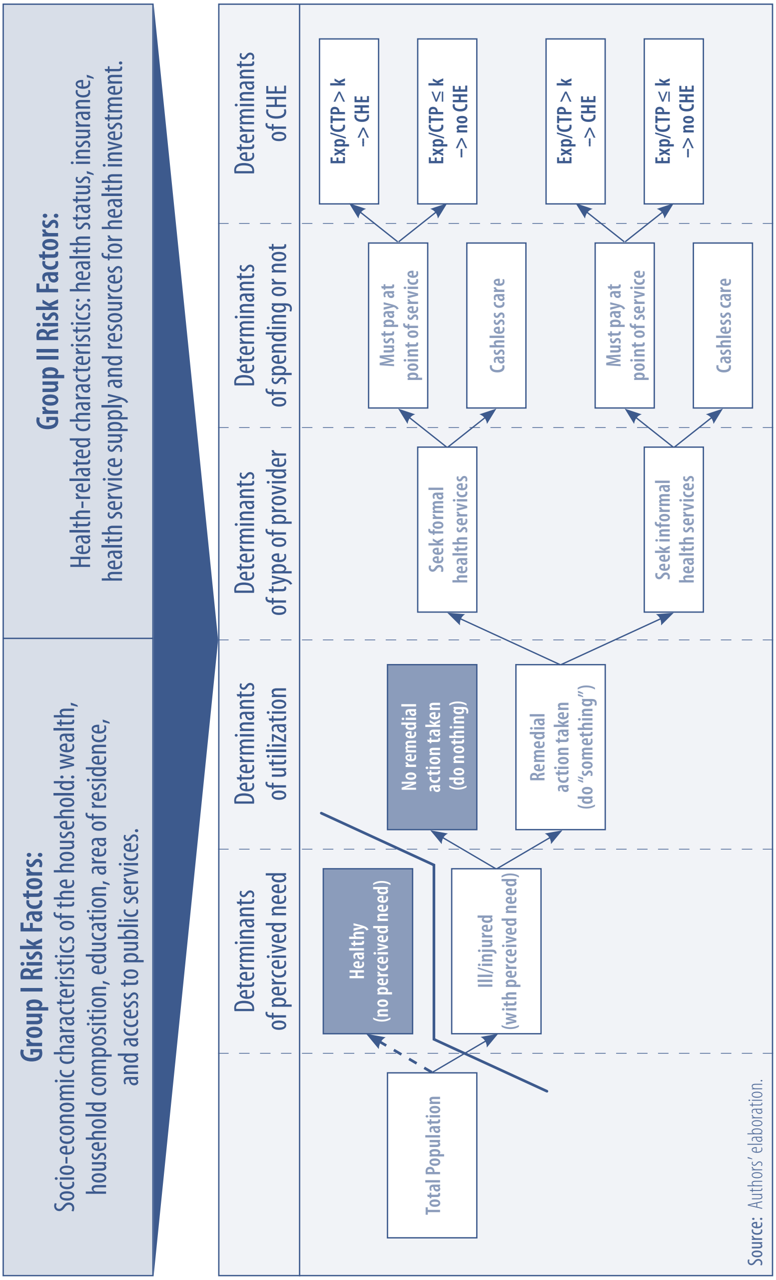
This sequential representation of the search for care to cope with a health problem clearly indicates that the final outcome –the CHE– depends on factors that come into play in each of these five moments. Thus, CHE can be described as a function of the perceived need, the decision to seek care, the choice of the type of provider, the amount paid, and household CTP. The result within each of these moments of the medical care-seeking process depends in turn on a set of variables at the individual household level (Group I risk factors, RF1), and on characteristics associated with health and the health system (Group II risk factors, RF2). This study models CHE incidence based on these two groups of risk factors, which subsume the variables described below.

- **Group I risk factors, RF1:** Socio-economic characteristics of the household. These include level of wealth as measured by a household assets index; occupation and educational level of the household head; household type, size and composition; area of residence; and household access to public services.

- **Group II risk factors, RF2:** Characteristics related with health. These include health insurance for household members; their health status; health service supply; and resources for health investment in the municipality of residence.

Figure 1

Medical Care-seeking Process and the Determinants of CHE



Source: Authors' elaboration.

The conceptual framework assumes several limitations and methodological challenges.

First, in modeling the incidence of CHE, it is not possible to identify the precise moment in the illness, care-seeking and payment process when each risk factor comes into play. For example, education level can be a determinant of a perceived need, of the decision to seek care, of the choice of provider or of household CTP. Therefore, the analysis is limited to simply evaluating whether, overall, the education level of the household head is related to CHE, with no attempt to determine whether education level changes the CTP, utilization behavior, choice of provider or severity of the illness. This limitation may have important implications for the interpretation of the results, since a given risk factor may have opposite impacts on CHE at different moments of the process. For example, there is an ample literature indicating that medical service utilization increases with level of wealth, and that this in turn increases the risk of CHE. On the other hand, however, wealth increases household CTP. In general terms, the associations found between these risk factors and CHE represent the net effect of these factors on the entirety of the care-seeking process.

Second, the focus of this analysis is on households that reported a need to use health services rather than on all households. To take the total population as the reference population would include some individuals who had no health expenditures because they were healthy. Therefore the econometric analysis of CHE would refer not only to the risk factors discussed above, but also to the determinants of morbidity in the population – a topic beyond the scope of this study. Moreover, from the standpoint of public policy, it is more relevant to identify risk factors for CHE in people who need care rather than in the general population.[2]

Third, the analysis observes health spending only in households with a perceived need and which sought healthcare. This implies that OOP spending, equal to zero in households that did not seek care, is not necessarily equivalent to potential expenditure, i.e. expenses that would have been incurred if care had been sought. Thus, if systematic differences appear between the households with observed expenditures and those without any expenditure after other explanatory factors are controlled for,

2. Nevertheless, the different indicators of CHE were also calculated for the entire population, and can be obtained from the authors.

this can be assumed to indicate issues with selection bias that need to be addressed explicitly by the model (Dow & Norton, 2003). According to data from the 2003 Quality of Life Survey (*Encuesta Calidad de Vida*) there are important barriers to access in Colombia and for a number of reasons, 13% of the population lacks access to formal health system services despite their need for these services. Therefore, one can infer that among the households that do not use health services, non-use is due to a lack of need in some cases, whereas in other cases non-use results from the fact that it is not possible for households to use these services.

In conclusion, the conceptual framework for this study, shown in **Figure 1**, illustrates some of the most important methodological challenges that arise in attempting to analyze the determinants of CHE.

IV. Methods and Data

This section describes the models and sources of data used.

Logit Model

First a logit model was used to establish the relationship between risk factors and the probability of incurring CHE for the population with perceived need. Formally, the probability function is considered as:

$$\Pr(CHE_i = 1) = F(X'_i \beta) \qquad (1)$$

Where: CHE, the dependent variable, is a discrete variable with a value of one *(1)* when OOP health spending is ≥ *20%* of the household CTP, or zero (*0*) if it is <*20%*; *F(...)* is a logistic distribution function; ***X*** is the independent or explanatory variable vector (in this case the risk factors described above); and ***β*** are the parameters to be estimated.

This study only presents those results for a CHE threshold of $k \geq 20\%$.[3] Capacity-to-pay was calculated based on the Xu methodology (Xu, 2005).

Given the hypothesis of a possible selection bias in the conceptual framework, the logit analysis was complemented with a Heckman probit model to control for possible selection bias. The results, however, showed no evidence of a selection problem in the sample of households with perceived need.[4] This may have been the case because most of the population that needed health services *did something* to deal with the problem and *spent something* on health, if only to purchase aspirin in a pharmacy. Thus very few zeros were observed in the sample of the population with perceived need. Accordingly, these results are not presented in the text.[5]

Quantile Regression Estimates

Quantiles or percentiles refer to the division of sub-populations depending on the ordering of sample observations (in this case: households with perceived need for health services) according to a random variable (in this case: the financial burden of OOP expenditure as the share of household CTP represented by OOP expenditure). Quantile regressions are linear regressions that can be used to estimate the relationship between the change in a random variable due to the effect of changes in different explanatory variables conditioned by the quantile or percentile of the random variable used for the estimate.

This type of estimate is pertinent for the present study, in which the focus is on analyzing households with CHE, i.e. those with the highest financial burdens. Regression analysis was run for different distribution percentiles of financial burden (OOP /CTP)[6] in order to:

3. The Logit model was also estimated for all households, as well as for thresholds of k=30% and k=40. The results can be requested from the authors.
4. The insignificance of the estimated parameter athrho (a transformation of rho), which represents the correlation between the errors between the main equation and that of selection, implies that rho is not significantly different from zero so that it is not possible to reject the null hypothesis that there is not a problem of selection bias and means that the logit is suitable for the estimate.
5. The results of the Heckman Probit estimation of determinants of catastrophic health expenses in the population with perceived need may be requested from the authors.
6. The estimation is performed on the observations whose financial burden is different than zero.

a) Analyze the determinants of CHE with an alternative approach by estimating the effect of risk factors on the financial burden faced by households and concentrating on households faced with large financial burdens, i.e. those with CHE in the highest (90^{th}) percentile, and

b) Examine how these determinants changed across the entire distribution.

By using financial burden as the dependent variable, this type of regression, compared to the logit model, has the advantage of using more information to derive the estimate, thus making it possible to reset the threshold of CHE without having to re-estimate the model. A drawback of this approach, however, is that the estimate does not allow a value of zero for financial burden.

Linear Regression with Multiplicative Heteroscedasticity

One of the purposes of this study is to explore the notion of risk associated with CHE. In other words, this study seeks to investigate the factors that generate uncertainty regarding the magnitude of OOP spending, i.e. when CHE as a share of the household's CTP deviates so much from its expected value as to become an unforeseen expenditure. These factors, which determine the volatility of health expenditures faced by a given household increase its exposure to risk and thus its vulnerability.

To identify the effect of risk factors on the expected value and variability in financial burden, a linear regression model was estimated with multiplicative heteroscedasticity according to the methods described by O'Donnell, van Doorslaer, Rannan-Eliya, et al. (2005). In the model shown here, as proposed by Harvey (Harvey, 1976; O'Donnell, et al., 2005), the average and log variance in financial burden (OOP spending/CTP)[7] is described by a linear function of risk factors (x_i), estimated according to maximum verisimilitude.

$$(CHE/CTP)_i = \underbrace{x'_i \beta_i}_{\text{average}} + \epsilon_i \tag{2}$$

7. The estimation is performed on the observations whose financial burden is different than zero.

$$\mathrm{var}(\epsilon_i) = \exp(x_i'\alpha_i + \omega_i) \rightarrow \log[\mathrm{var}(\epsilon_i)] = x_i'\alpha_i + \omega_i \quad (3)$$

This model makes it possible to answer questions such as: is variability of financial burden greater in insured households than in uninsured households? Is variability greater for residents of urban areas than those of rural areas? In the context of universal insurance introduced in Colombia, these questions are of particular importance given that the central aim of insurance is to reduce the risk associated with very high and unforeseen OOP expenses.

Data Sources

The 2003 Quality of Life Survey (*Encuesta de Calidad de Vida*) was used because it was, at the moment this research was carried out, the most recent and most complete available source of data, and because it provided detailed information on OOP health spending. This survey, carried out by the National Administrative Department for Statistics (*Departamento Administrativo Nacional de Estadística*) on a sample of 22,949 households, is representative at the national level as well as for urban and rural areas, the 8 major regions and each of the 19 districts of the capital city Bogotá. Among other types of information, the survey captured data on household socio-economic conditions, affiliation with the social security scheme, health service utilization, health spending, total household expenditure and income. In addition, administrative data were obtained from different municipalities for the availability of medical infrastructure and health resources, used as explanatory variables for CHE.

V. Descriptive Analysis

Given that household health spending is conditioned by health service utilization, this section begins with a characterization of household health service use and a description of the distribution and composition of health expenses. This is followed by an initial attempt to characterize risk factors for CHE through a univariate analysis of the incidence of CHE for households with perceived need.

Composition of the Sample of Households

The data indicate that in 2003, there were approximately 11.2 million households in the country. In 37% of the households (4.1 million), at least one member had a perceived need during the previous month, and of these latter, 98% (4 million) did *something* to cope with the health problem. Among user households, 89% used formal medical services, i.e. ambulatory services or hospitalization at institutions providing health services, or received care from professional medical personnel. The remaining 11% (453,000) experienced barriers to access and could not make use of formal health services. To cope with their health problems, 47% of households that faced barriers to access resorted to self-medication and 53% used traditional herbal medicine (*tegua*) or other informal healthcare mechanisms. This high percentage reflects the existence of barriers to access health services. Even more importantly, in 2003, three quarters (75%) of the barriers to access were associated with demand-related reasons, among which the lack of money accounted for 84% of all cases (Flórez, Giedion, & Pardo, 2010).

Table 1 shows that perceived need is not related to household wealth level or area of residence. The likelihood of requiring any health service is similar for all wealth levels and for residents of urban and rural areas alike. With regard to affiliation, health service needs are clearly greater in homes affiliated with the social security system, whether through the contributory or subsidized scheme, and smaller in unaffiliated households. This may suggest an adverse selection to the system, in that those with greater perceived needs are more likely to be affiliated. With regard to health service utilization, **Table 1** also shows an inverse relationship between informal service utilization and wealth level, area of residence and insurance status. The use of formal health services is greater among households at higher socio-economic levels, in urban areas and for those affiliated with the contributory scheme, a finding that suggests the existence of greater barriers to health service access among poorer households, the rural population and unaffiliated households. These results confirm earlier reports by Flórez & Acosta (2007), who concluded that lack of money is the most important reason for nonutilization in rural areas and among the poor, and by Flórez, Giedion, & Pardo (2010), who found that the health system facilitates access to health services.

In summary, the likelihood of experiencing a health problem does not appear to vary much according to wealth level in Colombia, and almost the entire population that indicated a need for services to cope with a health problem reported having *done something*, although poor people tend to resort to informal services such as herbal healers (*yerbatero*) more frequently than wealthier people. This is important to the extent that most people with a perceived need experience some type of OOP expense, so that the adverse selection problem mentioned earlier in connection with the conceptual framework does not appear to be a topic of importance in the context of the present study. Moreover, the findings reported thus far point toward certain risk factors that appear to influence the first three links in the care-seeking process: the need for access to health services, the decision to make use of services (*doing something*) and the type of service chosen (*formal versus informal*).

Table 1

Percentage of Households with Perceived Need and Health Service Utilization by Household Characteristics

Household Characteristics	% households with perceived need	% household utilization of those with need	% formal service utilization	% informal service utilization
Household Wealth Quintile				
Quintile 1	33.0	97.0	84.0	16.0
Quintile 2	35.0	97.0	87.0	13.0
Quintile 3	35.0	98.0	92.0	8.0
Quintile 4	35.0	99.0	94.0	6.0
Quintile 5	32.0	98.0	95.0	5.0
Household Area of Residence				
Rural	35.0	97.0	86.0	14.0
Urban	33.0	98.0	91.0	9.0
Household Insurance Status				
No insurance	28.0	95.0	79.0	21.0
Subsidiary scheme	31.0	98.0	90.0	10.0
Contributive scheme	31.0	98.0	95.0	5.0
Mixed	42.0	98.0	90.0	10.0

Source: Authors' calculations based on Quality of Life Survey 2003.

Health Expenditure

Analyzing income and the composition of health expenditure can help to identify household vulnerability to adverse health events. **Table 2** shows the statistics for health spending for all households and for those with perceived need.

Table 2
Descriptive Statistics of Household Income and Health Spending, by Household Type
Current 2003 Pesos

	Average	Std Dev.	Min	Max	% CtP	% Health Expenditure
All Households						
Total Income	1,015,885	1,164,642	0	60,700,000		
Capacity-to-pay	782,551	1,115,883	0	60,600,000		
% Capacity-to-pay /Total Income	*77.0*					
Total Health Expenditure (I+II)	57,871	210,407	0	60,300,000	7.0	
I. Spending on Insurance	35,127	85,143	0	3,839,840	4.0	61.0
II. Out-of-pocket spending	22,743	187,710	0	60,300,000	3.0	39.0
Observations	22,883					
Expanded population	11,171,034					
Households with Perceived Need						
Total Income	1,133,335	1,178,890	0	60,700,000		
Capacity-to-pay	875,773	1,128,682	0	60,600,000		
% Capacity-to-pay /Total Income	*77.0*					
Total Health Expenditure (I+II)	93,154	320,253	0	60,300,000	11.0	
I. Spending on Insurance	37,013	78,443	0	2,134,982	4.0	40.0
II. Out-of-pocket spending	56,141	304,580	0	60,300,000	6.0	60.0
Observations	7,721					
Expanded population	4,139,318					

Source: Authors' calculations based on Quality of Life Survey 2003.

Average monthly capacity-to-pay is 782,000 Colombian pesos (approximately USD$ 441) for Colombian households in general, and 876,000 pesos (approximately USD$ 494) for households that needed health services in the previous month. On average, this represents 77% of household income. Any OOP expenditure in excess of these amounts is considered CHE in the context of the present study.

The total sample of households includes those that did not experience illness and therefore had no need to use health services or to bear any health costs. Unsurprisingly, therefore, the average health expenditure for the total sample of households is almost half that observed in households with perceived need. Disaggregation of health spending confirms that the difference between average values is rooted, in fact, in the amount of OOP health spending, whereas insurance costs are similar in both groups of households.

The share of CTP represented by OOP health spending is 3% for the entire sample of households and 6% for households with perceived need. The largest component of health spending in households with perceived need is OOP spending, which accounts for 60% of total health expenses, whereas for the entire sample of households the largest expense is insurance, which accounts for 61% of total health spending. This suggests that the incidence of CHE is lower for the entire sample than for households with perceived need.

The type of health services used also has implications for incurred costs and hence for the incidence of CHE. As shown above, almost 11% of all households that used health services experienced barriers to access and therefore used informal health services (self-medication, herbal healer, traditional herbal medicine, etc.). **Table 3** shows that average health spending is greater in households that use formal health services than in those that use informal types of care. The use of informal health services is less costly in the short term; however in the long term it likely implies disease recurrence and probably greater costs.

Table 3 also indicates that households that use formal health services belong to higher socio-economic levels, have greater levels of risk and greater CTP than households that use informal services. However, the higher total health spending and OOP spending in the former group of households represent a larger percentage of their CTP than in the latter group. Average OOP spending accounts for 7% of CTP among users of formal services, but for only 3% among users of informal services. Given that the occurrence of CHE depends on the relationship between OOP spending and CTP, this implies that the incidence of CHE may be greater among users of formal health services, as these costs are closer to any of the thresholds used to define CHE.

Table 3
Descriptive Statistics of Household Income, Capacity-to-pay and Health Spending, by Type of Service
Current 2003 Pesos

	Average	Std Dev.	Min	Max	% CtP	% Health Expenditure
Expanded population	4,139,318					
Households - Formal Service Users						
Total Income	1,182,380	1,227,229	0	60,700,000		
Capacity-to-pay	919,821	1,178,644	0	60,600,000		
% Capacity-to-pay /Total Income	*78.0*					
Total Health Expenditure (I+II)	102,162	342,028	0	60,300,000	11.0	
I. Spending on Insurance	40,045	82,205	0	2,134,982	4.0	39.0
II. Out-of-pocket spending	62,117	326,087	0	60,300,000	7.0	61.0
Observations	6,810					
Expanded population	3,595,310					
Households - Informal Service Users						
Total Income	803,387	710,828	2,000	9,361,229		
Capacity-to-pay	580,256	649,965	2,000	9,027,206		
% Capacity-to-pay /Total Income	*72.0*					
Total Health Expenditure (I+II)	35,188	58,032	0	1,200,000	6.0	
I. Spending on Insurance	15,466	40,875	0	1,200,000	3.0	44.0
II. Out-of-pocket spending	19,722	39,093	0	607,500	3.0	56.0
Observations	733					
Expanded population	453,443					

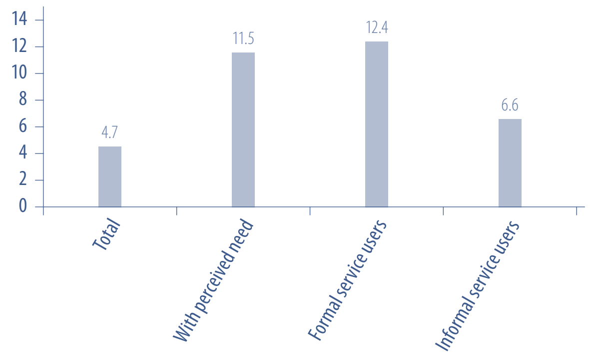
Source: Authors' calculations based on Quality of Life Survey 2003.

Although users of formal services face higher average health expenditures, **Table 3** contains no evidence to suggest which groups of households are more likely to face "catastrophic" OOP expenditures. In fact, as the standard deviation suggests (second column in **Table 3**), OOP health spending showed a wide range of values, indicating that among those who bear an OOP expense for a health service, most face relatively small costs with only a minority bearing high financial costs. This is important since the sample of households with CHE tends to be small – a factor that creates considerable challenges for attempts to model the determinants of CHE.

Catastrophic Health Expenditure

As mentioned above, an OOP expenditure is catastrophic if it exceeds threshold ***k*** of household CTP. Based on a threshold value of ***k=20%***, **Figure 2** presents the CHE incidence for all households, households with perceived need, and households that used formal or informal health services. Because of the behavior of health spending, the incidence of CHE is almost three-fold as high in households with perceived need and in those that use formal health services as in the total sample of households. Likewise, households that use formal medical services face a financial burden that is twice as high as for households that seek alternative (informal) solutions to their health problems because of barriers to access or for minor problems.

Figure 2
Catastrophic Health Expenditure Incidence by Population Group
(Percentage)



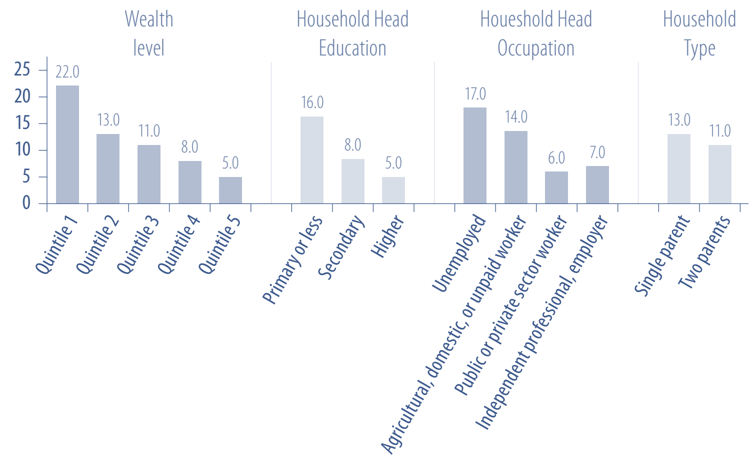
Source: Authors' calculations based on the 2003 Quality of Life Survey 2003.

Focusing on the population with perceived need, **Figure 3a** and **3b** show CHE incidence according to indicators for Group I risk factors, i.e. those related to household characteristics. The results indicate that the incidence of CHE decreases markedly as the quintile of household wealth increases. The incidence is 4.5 times as large among the poorest households as among the wealthiest.

Figure 3a also indicates that CHE incidence is greater in those households where the head has a lower level of education, is unemployed or has a low-category occupation, whereas the incidence is lower when the household head has a higher level of education or is employed in the public or private sector. In households whose head received no formal education, CHE incidence is 3.5 times as high as in households whose head received university-level education. When the household head is unemployed, CHE incidence is almost 3-fold as high as in households whose head is employed in the public or private sector. These marked differences suggest that both educational level and employment in the formal sector are protective factors against household CHE.

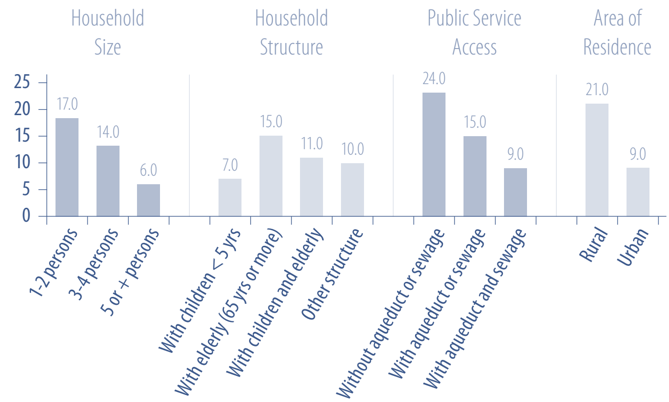
Figure 3a

Household CHE Incidence by Group 1 Risk Factors (Population with Perceived Need) (Percentage)



Source: Authors' calculations based on Quality of Life Survey 2003.

Figure 3b
Household CHE Incidence by Group 1 Risk Factors (Population with Perceived Need) (Percentage)



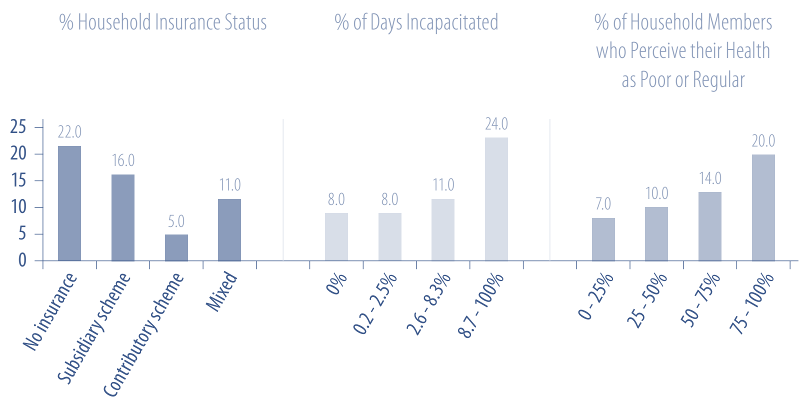
Source: Authors' calculations based on Quality of Life Survey 2003.

With regard to the demographic characteristics of households, there is evidence that CHE incidence is greater in single-parent households, smaller households, and those with older household members. The univariate analysis shows that the presence of both parents and households with more members who may be economically active (not dependent) appear to be protective factors against adverse health events that involve a CHE. However, as shown by the results of the multivariate analysis reported below, most of these household composition variables are not determinants of CHE.

Figure 3b shows a close relationship between the incidence of CHE and the household environment, characterized by access to public services and area of residence. The incidence of CHE is almost 2.5 times as high in rural areas and households that lack running water and sewage facilities than in urban areas and households with full access to public services.

Figure 4 shows CHE incidence in households according to Group II risk factors, i.e. those related to health. The results indicate that health and insurance status are related to the likelihood that a household will experience CHE. On the one hand, a lower percentage of households affiliated to the contributory scheme incur CHE, whereas the incidence is higher among uninsured households and those affiliated to the subsidized scheme. This situation illustrates that households with lower health insurance protection are more vulnerable to incurring CHE. The incidence is 4.5 times higher among uninsured households than among those covered by the contributory scheme. However, on the other hand, nothing can be inferred regarding households affiliated to both schemes (or unaffiliated), i.e. those whose members do not all have the same affiliation status.

Figure 4
Household CHE Incidence by Group II Risk Factors (Population with Perceived Need)



Source: Authors' calculations based on Quality of Life Survey 2003.

Household health status, measured as the percentage of days of incapacitation and members' perceived health status, is highly related with the incidence level of CHE. The results indicate that larger numbers of days of incapacitation and higher frequencies of poor perceived health status are related with a higher incidence of CHE. Among households in which more than three fourths of the members perceive their health status to be fair or poor, CHE incidence is 2.7-fold as high as in households in which one fourth of the members or fewer perceive their health status to be fair or poor.

In summary, the univariate analysis indicates that the Group I and Group II risk factors analyzed here were clearly related with the incidence of household CHE. As protective factors, the analysis identified greater wealth, higher educational level of the household head, employment in the formal sector, more economically active members in the household, access to public services, residing in an urban area, having insurance, and good health status. The multivariate analysis presented in the next section will attempt to confirm these relationships when the remaining factors are controlled for.

VI. Risk Factors for CHE

This section discusses the results obtained with the three econometric models used to analyze the determinants of CHE in the population with perceived need. **Table 4** presents the estimates yielded by the logit model (LOGIT), for quantile regression analysis (QR) and the multiplicative heteroscedasticity model (MHC).

Results of the Logit Model

The first columns in **Table 4** present the results of the logit model for a threshold value ***k*=20%** for CHE. Also shown are the coefficients and marginal effects (Mg Effect)[8], in order to illustrate the relative importance of each variable identified as a determinant of CHE. For the logit model, the odds ratios (OR) are also shown.[9] To facilitate interpretation of the results, these are reported for the two main groups of risk factors described earlier for household socio-economic and health characteristics.

8. The marginal effect represents the change in the probability of having a catastrophic expense with a one unit change of the independent variable, holding all other variables constant. For the dichotomous independent variables (dummies) the marginal effect is the change in the probability of facing a catastrophic health expense with a change in the dummy variable from zero to one.
9. The OR is a ratio between the probability of the occurrence of an even in one group and the probability of occurrence of the same event in another group. If the OR> 1 then the probability of the occurrence of a catastrophic expense in the first group is higher than in the second group. For example, one could say that the probability of incurring CHE for the households in the 5^{th} quintile of assets is 40% [0.6-1= -0.4] less than for households in the 1^{st} quintile of assets.

Socio-economic and Environmental Characteristics of the Household

As **Table 4** shows, the likelihood of incurring CHE appears to be inversely related with household level of wealth. However, this result is significant only for the highest quintile. This is surprising given that the data indicate that capacity-to-pay increases more rapidly with increasing level of wealth than OOP spending, and thus the likelihood of incurring CHE would be expected to decrease significantly with increasing wealth. However, within the conceptual framework of the present analysis, the associations between risk factors and CHE represent their net effect throughout the entire care-seeking process, and the direction of this effect can vary during the process.

Thus, wealth increases the CTP (and therefore reduces the likelihood of CHE) while at the same time increasing health service utilization and the intensity of the services used (thereby increasing the likelihood of CHE). In the second, third and fourth quintiles the positive impact of wealth on capacity-to-pay may have been cancelled out by its negative effect on utilization and intensity of service utilization. This once again indicates the importance of exercising caution in attempts to analyze the determinants of CHE.

Employment appears to constitute a protective factor against an adverse health event although the effect appears to be less important compared to other variables, especially health-related ones. With regard to the education level of the household head, only university-level education is significant: this factor reduces the likelihood of incurring CHE. The set of variables related with household composition yielded no important findings: households with small children (<5 years) or elderly members (>65 years) –both categories usually related with high health costs– do not appear to be more exposed to the risk of incurring a CHE than other households. Only very large households (5 or more members) appear to have a lower likelihood of CHE than other households. This may be an indication that large households are better able to smooth high health expenses.

With regard to access to public services, none of the results are statistically significant. Residing in an urban area acts as a protective factor against adverse health events. This may reflect the better access to health services, public services or highly subsidized services (such as a network of public hospitals) in urban than in rural areas. In summary, low educational level of the household head, residing in a rural area, and belonging to the poorest quintile appear to constitute factors that increase vulnerability to adverse health events. Other household socio-economic variables play only a marginal role.

Health-related Variables

In general, health-related variables not only tended to yield significant results, but also played an important role in the models. In fact, most of these variables were among those with the largest marginal effects.

With regard to variables related with the health system at the local level, a larger supply of health service providers decreased the risk of incurring CHE. However, resources devoted to investments in health had no effect. In terms of the type of household health insurance,[10] having insurance and, to a greater extent, coverage under the contributory scheme, which covers a broader range of services, decreases the likelihood of experiencing CHE. This is a significant result as it indicates that the health system can make a substantial difference in household financial protection.

With regard to health status it was expected that the likelihood of CHE would increase with increasing level of incapacitation or worse perceived health status, given that both variables are an indicator of the need for health services. Greater levels of incapacitation and more negative perceived health status are associated with greater levels of health service need and hence greater utilization and spending on health.

Finally, the type of care sought for a perceived need has an important impact: using formal rather than informal health services increases the likelihood of incurring CHE. This may be a reflection of the relatively lower costs of informal services (self-medication, traditional healers, etc.) compared to formal services (doctor's visits, diagnostic tests, etc.). If it is true that the utilization of informal services is concentrated in households at a lower socio-economic level (see the descriptive analysis in section V), the use of informal services should be seen as reflecting greater barriers to access (and the consequent decision to use lower-quality services that cost less) rather than as a protective factor against an adverse health event.

10. For a description of the insurance variable at the household level, see Appendix 1.

Table 4
Econometric Model Results

Model:	Logit			Quantile Regression				Multiplicative Heteroscedasticity	
CHE Incidence	k = 20%			50^{th} Percentile	70^{th} Percentile	80^{th} Percentile	90^{th} Percentile	Mean Effect	Variance Effect
	OR	Coeff	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect
Socio-economics status									
Quintile of assets 1	1.00	1.00							
Quintile of assets 2	0.94	-0.06	-0.004	-0.012***	-0.009	-0.022*	-0.032*	-0.012	-0.245
Quintile of assets 3	0.87	-0.14	-0.010	-0.011**	-0.023***	-0.045***	-0.059***	-0.023**	-0.511**
Quintile of assets 4	0.72	-0.33	-0.025	-0.012**	-0.026***	-0.050***	-0.059***	-0.021**	-0.312
Quintile of assets 5	0.60	-0.52	-0.038**	-0.011**	-0.020**	-0.045***	-0.066***	-0.024**	-0.568**
Occupation of Household Head									
Unemployed	1.00	1.00							
Agricultural, domestic or unpaid worker, unskilled, self-employed	0.83	-0.19	-0.014*	-0.002	-0.012***	-0.020***	-0.048***	-0.013***	-0.464***
Private or public sector worker	0.72	-0.33	-0.024**	-0.002	-0.009**	-0.014*	-0.043***	-0.010**	-0.402**
Independent professional, owner or employer, retired	0.79	-0.24	-0.017*	0.000	-0.009**	-0.018**	-0.057***	-0.011***	-0.462***

Table 4 *(continued)*
Econometric Model Results

Model:	Logit			Quantile Regression				Multiplicative Heteroscedasticity	
CHE Incidence	k = 20%			50th Percentile	70th Percentile	80th Percentile	90th Percentile	Mean Effect	Variance Effect
	OR	Coeff	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect
Education of Household Head									
Primary or less	1.00	1.00							
Secondary	0.94	-0.06	-0.004	0.001	0.000	-0.002	-0.003	-0.002	-0.061
Higher	0.72	-0.33	-0.024**	0.001	-0.001	-0.005	-0.009	-0.006*	-0.357**
Household Characteristics									
Two parents	1.00	1.00							
Single Parent	0.98	-0.02	-0.001	0.000	-0.001	-0.001	-0.009	-0.004*	-0.210**
Household size 1-2 persons	1.00	1.00							
Household size 3-4 persons	0.96	-0.04	-0.003	-0.007***	-0.013***	-0.011*	-0.027***	-0.008**	-0.205
Household size 5 + persons	0.75	-0.29	-0.022**	-0.011***	-0.024***	-0.027***	-0.044***	-0.016***	-0.448***
Other	1.00	1.00							
Household with Child < 5 years	1.02	0.02	0.002	0.002	0.000***	0.000***	0.000***	0.002	0.032

Table 4 *(continued)*
Econometric Model Results

Model:	Logit			Quantile Regression				Multiplicative Heteroscedasticity	
CHE Incidence	k = 20%			50th Percentile	70th Percentile	80th Percentile	90th Percentile	Mean Effect	Variance Effect
	OR	Coeff	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect
Household Characteristics									
Household with member aged 65 +	1.08	0.08	0.006	0.008***	0.000***	0.000***	0.000***	0.010***	0.151
Household with children and elderly	1.08	0.07	0.005	0.009**	0.000***	0.000***	0.000***	0.002	-0.154
Area of Residence									
Rural	1.00	1.00							
Urban	0.70	-0.36	-0.027***	-0.019***	-0.025***	-0.038***	-0.046***	-0.021***	-0.186
Public Service Access									
Without aqueduct or sewage	1.00	1.00							
With aqueduct or sewage	0.82	-0.20	-0.015	-0.019***	-0.038***	-0.061***	-0.094***	-0.021**	
With aqueduct and sewage	0.85	-0.16	-0.012	-0.019***	-0.040***	-0.051***	-0.080***	-0.016*	

Table 4 *(continued)*
Econometric Model Results

Model:	Logit			Quantile Regression				Multiplicative Heteroscedasticity	
CHE Incidence	k = 20%			50th Percentile	70th Percentile	80th Percentile	90th Percentile	Mean Effect	Variance Effect
	OR	Coeff	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect
Local Health System									
No. of health service providers in the municipality X 1000 hab.	0.29	-1.22	-0.090***	-0.024***	-0.059***	-0.076***	-0.103***	-0.047***	-1.471***
Investment resources for municipal health per capita	1.06	0.06	0.004	-0.003	-0.005	0.002	0.010	0.000	
Insurance									
No insurance	1.00	1.00							
Subsidiary scheme	0.53	-0.64	-0.047***	-0.024***	-0.040***	-0.048***	-0.074***	-0.025***	-0.285*
Contributive scheme	0.37	-0.99	-0.073***	-0.038***	-0.070***	-0.083***	-0.137***	-0.050***	-0.879***
Health Status									
% of days incapacitated	6.00	1.79	0.132***	0.108***	0.209***	0.273***	0.339***	0.170***	1.901***
% of household members who percieve health status as poor or regular	1.74	0.56	0.041***	0.026***	0.045***	0.067***	0.081***	0.034***	0.371**

Table 4 *(continued)*
Econometric Model Results

Model:	Logit			Quantile Regression				Multiplicative Heteroscedasticity	
CHE Incidence	k = 20%			50th Percentile	70th Percentile	80th Percentile	90th Percentile	Mean Effect	Variance Effect
	OR	Coeff	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect	Mg Effect
Service Utilization									
Formal health srevices utilization	3.98	1.38	0.102***	0.011***	0.024***	0.041***	0.073***	0.029***	0.873***
Number of obs =	7,721			6,540	6,540	6,540	6,540		6,540
Wald chi2(26) =	582			F(25, 6514) = 95.6	90.82	59.03	61.29	Model chi2(47) =	3,065.9
Prob > chi2 =	0.00			Prob > F = 0.00	0.000	0.000	0.000	Prob > chi2 =	0.000
Pseudo R2 =	0.12			Pseudo R2 = 0.07	0.120	0.149	0.187	VWLS R2 =	0.118

Note: * Statistically significant at 99% level; ** Statistically significant at 95% level; *** Statistically significant at 90% level.

Source: Authors' calculations based on The 2003 Quality of Life Survey.

Quantile Regression (QR) Results

Quantile regression makes it possible to analyze the determinants of CHE with an alternative approach: by estimating the effect of risk factors on the OOP/CTP ratio along the distribution of said ratio. This in turns makes it possible to focus on the upper part of the distribution, where CHE occurs, and to examine the heterogeneity of the coefficients throughout the distribution. As shown in **Table 5**, in most households with perceived need, the financial burden was less than 4.5% of their CTP, and it is only in the 90th percentile where financial burdens begin to represent a substantial financial concern (>22.6%). On the bases of these findings, one can assume that households with CHE fall into the 90th percentile.

Table 5
Distribution of Financial Burden (OOP/CTP)

OOP/CTP	Average (%)	Min (%)	Max (%)
50th Percentile	3.7	2.9	4.5
60th Percentile	5.7	4.5	7.2
70th Percentile	9.4	7.2	11.8
80th Percentile	16.2	11.8	22.6
90th Percentile	40.8	22.6	100.0

Source: Authors' calculations based on the 2003 Quality of Life Survey.

Socioeconomic Characteristics of the Household and its Environment

As shown in **Table 4**, financial burden decreases as household wealth increases, which indicates that in general terms, wealth tends to increase more rapidly than OOP spending. Note also that the marginal effect of this variable, as well as that of most other variables, tends to increase with wealth percentile, which may indicate a greater protective effect of wealth at the higher end of the distribution of financial burden values. As in the logit model for the determinants of CHE, employment and residing in an urban area act as protective factors against the financial burden represented by OOP spending. Likewise, the variables related with household configuration were not found to be significant or had only small, marginal effects. The exception was household size: large households for all percentiles tended to incur smaller financial burdens than small households.

The insurance variable tended to decrease the likelihood of experiencing CHE, as seen in the logit model and confirmed by the coefficient associated with having insurance in the 90th percentile. Moreover, having insurance reduced the financial burden across all percentiles. Once again, the impact was greater for insurance under the contributory than the subsidized scheme. The analysis also finds that as in the previous model, poor health, as measured by household members' perceived health status or the percentage of days of incapacitation incurred by the household, increased financial burdens across the entire distribution.

Results of the Linear Regression with Multiplicative Heteroscedasticity

Thus far, this study has analyzed the determinants of CHE and financial burden arising from OOP spending across the distribution of spending. However, incurring a CHE is related not only with experiencing a large financial burden but also with the unpredictability of the magnitude of the burden, an uncertainty that translates into greater vulnerability and risk for the household. This situation is extremely important in the context of the Colombian health system which has opted for a universal insurance system with the fundamental aim of mitigating risk. As explained in the section on methods, and in light of the universal scope of the current health insurance system in Colombia, the next section complements the previous analysis with a model that makes it possible to distinguish between the effects that determine the expected value of the financial burden (average effects) and those that determine its variance.

As shown in the right-hand panels of **Table 4** (variance effect), wealth, employment, university-level education, large household size, and belonging to a single-parent (rather than a two-parent) household reduce the spread of financial burden from OOP spending.

The impact of insurance on the variation in financial burden constitutes the most noteworthy result from the multiplicative heteroscedasticity model. As shown in **Table 4**, the volatility of the financial burden of health decreases with insurance. Once again, the results show that the effect is greater with the contributory than with the subsidized scheme. Likewise, variability in the financial burden of health is greater for households that choose formal health services than for those that choose informal services, as was also shown in the models discussed earlier. Finally, the variation in the financial burden of health increases significantly when household members' perceived health status is poor, and even more so as the percentage of days of incapacitation rises.

Summary of Results with Different Models

In summary, the three angles from which CHE has been addressed in these econometric models appear to yield consistent results. Some variables always appear to act as protective factors against OOP spending and the financial burdens they give rise to. Among these variables are wealth level, employment, large households, and residing in an urban area. The effects of other factors such as household composition remain unclear. With regard to CHE, financial burden and the volatility of financial burden, it appears not to matter whether small children or older persons are among the household members. Finally, all models show that insurance is a fundamental variable for financial protection, a result of immense importance in the Colombian context given that this country has opted since the mid-1990s for a health scheme that provides universal insurance for its population. The results presented here indicate that this course appears to have had positive outcomes with respect to one of the main objectives of this scheme: to provide financial protection for all. Moreover, these findings confirm those of an earlier study by Flórez, Giedion, & Pardo (2010) that focused on evaluating the impact of insurance on financial protection.

VII. Main Findings and Conclusions

This study finds that in 2003, Colombian households devoted approximately 3% of their capacity-to-pay (available income after subsistence costs are paid) to OOP health spending. The analysis is based on the WHO methodology, which assumes that any OOP health expense that absorbs a share of available income of 20% or more after subsistence needs have been met should be considered CHE. The results show that 4.7% of Colombian households and 11.5% of households with perceived need experienced CHE. It is difficult to know whether these figures are high or low, but it is nonetheless interesting to note that compared to the other countries in this regional study of financial protection, the incidence levels of CHE in the total population place Colombia, along with Costa Rica, among the countries with the lowest incidence of CHE.

The univariate analysis indicates that higher levels of wealth, higher education level of the household head, formal employment, the presence of economically active members in the household, access to public services, residing in an urban area, insurance, and good health status were protective factors. The present study complements the univariate analysis with econometric models to identify the determinants at the household level and within the context of CHE in Colombia. The results indicate that insurance and the availability of healthcare providers are the most important protective factors against catastrophic health spending. For example, a higher level of insurance coverage in the contributory scheme significantly decreases the likelihood of experiencing CHE compared to households with no insurance, and the effect is much greater than for insurance in the subsidized scheme. This result is relevant not only within the context of Colombia and its universal health insurance scheme, but also within the international context where discussions take place regarding the financial mechanisms best suited to improving financial protection, especially for the most vulnerable. These results are consistent with an earlier study that specifically evaluated the impact of insurance in Colombia on CHE incidence (Flórez, Giedion, & Pardo, 2010).

Another finding is that using informal rather than formal services reduces the likelihood of incurring CHE. As noted above, this result may conceal barriers to access among the poor population. Thus people who use informal health services may have a lower rate of CHE not because they have no need for more expensive formal services, but because they cannot afford them.

The results indicate that residing in an urban area, university-level education, and employment are variables that act as protective factors against CHE. Many socio-economic variables, especially those related with wealth and household composition, do not appear to constitute either important risk factors or protective factors. This may reflect the fact that the direction of the effect these variables have can change during the care-seeking process from the moment someone becomes ill until the moment high health costs are incurred. For example, rising income increases the capacity-to-pay but at the same time increases service utilization and may increase the use of more expensive services.

Finally, this study finds that household composition does not appear to affect the likelihood of incurring CHE. Thus the incidence of CHE is not higher in families with older adults or small children than in other families.

A final consideration relates to the methodologies used here to measure the incidence of CHE. The approaches used are based on a snapshot view of the consequences of adverse health events at a given point in time. However, the economic consequences of an adverse health event constitute, almost by definition, a chain of events in time. Only by following a given household in time will it be possible to know whether an adverse health event actually destabilizes household finances or whether, in contrast, the household can cope successfully with high OOP health spending without dire consequences for consumption. This makes it imperative for countries to begin to complement these statistical measures of the economic consequences of OOP health spending with more dynamic views that consider events at the individual household level. To achieve this aim, a joint regional perspective on how to measure these economic consequences of illness through longer time frames would be extremely useful.

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Appendix 1

The Definition and Construction of the Variables that make up the Risk Factors

	Variables	Definition	Construction
Dependent	CHE = (OOP > k/CTP)	Catastrophic health expenditure is out-of-pocket spending on health that exceeds a threshold k of household capacity-to-pay (k = 20%, 30%, 40%)	CHE = 1 if OOP > k CHE = 0 otherwise
	CHE / CTP	Financial burden of health, measured as out-of-pocket health spending as a share of household capacity-to-pay	OOP/CTP
Independent	Quintile of household assets	Identifies the household economic level according to the index of household assets	Using principal component analysis, weights are assigned to each physical asset of the household (radio, television, refrigerator, washing machine, DVD, PC, microwave, car, etc.) and the characteristics of the home (access to public services, floor and wall materials, health services, water supply, etc.). The sum of the weights makes up the index of household assets which determines the quintile to which the household belongs.
	Household head occupation (4 categories)	Variable that characterizes the labour status of the household head	1. "Dummy" variable = 1 if household head is unemployed, and 0 otherwise. 2. "Dummy" variable = 1 if household head is a day-labourer, unskilled labour, self-employed, unsalaried, domestic worker, or farm hand; and 0 otherwise. 3. "Dummy" variable = 1 if household head is a private or public sector worker, and 0 otherwise. 4. "Dummy" variable = 1 if household head is an owner, employer, independent professional, or retired; and 0 otherwise.
	Household head education (3 categories)	Variable that characterizes the education level of the household head	1. **Primary or less:** "dummy" variable = 1 if household head has no education or has a maximum of one year primary education, and 0 otherwise. 2. **Secondary:** "dummy" variable = 1 if household head reached any level of secondary education, and 0 otherwise. 3. **Higher:** "dummy" variable = 1 if household head has any higher education, and 0 otherwise.

The Definition and Construction of the Variables that make up the Risk Factors *(continued)*

	Variables	Definition	Construction
Independent	Household type (2 catagories)	Variable that characterizes marital status of houshold head	1. **Two parents:** "dummy" variable = 1 if household head lives with his/her spouse or partner, and 0 otherwise. 2. **Single parent:** "dummy" variable = 1 if household head does not live with his/her spouse or partner, and 0 otherwise.
	Household size (3 categories)	Variable that characterizes household size by number of members	1. "Dummy" variable = 1 if household has 2 or less members and 0 otherwise. 2. "Dummy" variable = 1 if household has 3 or 4 members, and 0 otherwise. 3. "Dummy" variable = 1 if household has 5 or more members and 0 otherwise.
	Household composition (4 categories)	Variable that characterizes household composition by age of its members	1. "Dummy" variable = 1 if household has at least one member under the age of 5 and no members over the age of 65; and 0 otherwise. 2. "Dummy" variable = 1 if household has at least one member over the age of 65 and no members under the age of 5; and 0 otherwise. 3. "Dummy" variable = 1 if household has at least one member under the age of 5 and one member over the age of 65. 4. "Dummy" variable = 1 if household has no member under the age of 5 and no member over the age of 65.
	Area of residence (2 categories)	Identifies the household area of residence	5. "Dummy" variable = 1 if houseohld residence is in rural area, and 0 otherwise. 6. "Dummy" variable = 1 if houseohld residence is in urban area, and 0 otherwise.
	Access to public service (3 categories)	Variable that characterizes household access to running water and sewage facilities	7. "Dummy" variable =1 if household has no access to aqueduct or sewage facilities; and 0 otherwise. 8. "Dummy" variable =1 if household has access to aqueduct or sewage facilities; and 0 otherwise. 9. "Dummy" variable =1 if household has access to aqueduct and sewage facilities; and 0 otherwise.
	No. of health service providers per 1000 residents in the municipality	Variable that quantifies the supply of health services available in the municipality of residence	(No. of health service providers in municipality/ No. of residents in municipality) * 1000

The Definition and Construction of the Variables that make up the Risk Factors *(continued)*

	Variables	Definition	Construction
Independent	Investment resources for health per resident in the municipality	Variable that identifies the quantity of resources available for health per resident	Investment resources for health in municipality / No. of residents in municipality.
	Health insurance status (3 categories)	Characterizes the household in terms of insurance status	1. **Without insurance:** percent of household members with no health insurance. 2. **Subsidized Scheme:** percent of household members affiliated to the subsidized health insurance scheme. 3. **Contributory Scheme:** percent of household members affiliated to the contributory health insurance scheme.
	Percent of days incapacitated	Proxy variable for severity of household health problem	(Sum of incapacited days of household members who experienced a health problem) / (30 * no. of household members) * 100 If numerator> denominator the variable =100
	Percent of household members with fair or poor perceived health status	Proxy variable for health status of household members	(No. of household members with fair or poor perceived health/ no. of household members) * 100
	Utilization of health services (2 categories)	Variable that characterizes the type of health service (formal or informal) sought by household members with health problems	1. **Informal:** "dummy" variable = 1 if the the majority of household members with a health problem sought care at formal and informal pharmacist, midwife, healer, herbalist, or alternative therapies or used household remedies, or they self-prescribed, and 0 if otherwise. 2. **Formal:** "dummy" variable = 1 if the percent of household members with a health problem who sought care from a doctor, odontologist, healthcare institution, health promoting institution, or nurse is ≥ the % of household members who use informal services; and 0 otherwise.

Source: Author's elaboration.

Chapter 8

The Out-of-Pocket and Catastrophic Health Expenditure Puzzle: The Costa Rican Case

Chapter 8

The Out-of-Pocket and Catastrophic Health Expenditure Puzzle: The Costa Rican Case

María Paola Zúñiga-Brenes[i], Juan Rafael Vargas[ii], Alberto Vindas[iii]

I. Introduction

Equity in the provision and financing of healthcare are key goals for health systems worldwide. Funding mechanisms for health systems should aim to raise funds to financially protect the health needs of individuals by pooling risk and resources over time and people.

Accordingly, the World Health Organization (WHO) recommends reducing the dependence on out-of-pocket (OOP) spending to fund healthcare for individuals and their families. WHO posits that health expenditure is more likely to be catastrophic when prepayment mechanisms are insufficient or when capacity-to-pay (CTP) is reduced. To reduce dependence on OOP financing, WHO recommends designing benefits packages with the aim of increasing coverage through prepayment mechanisms in order to protect the poor, and determining appropriate levels of copayment.

Costa Rica –a lower middle income country with very high levels of human development and health coverage– presents a puzzle for the analysis of household health spending. Although OOP spending is above 15% of total health expenditure, levels of catastrophic and impoverishing health spending are very low. This suggests a series of questions concerning the impact of OOP and the measures that mitigate the relationship between OOP spending and

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financial catastrophe for households. This puzzle is closely related to the specifics of the Costa Rican health and social systems.

This chapter analyzes levels and determinants of OOP spending in Costa Rica. The main hypothesis is that OOP payments in Costa Rica are high but not catastrophic, a result of the nature of the financial protection offered by the national health system and the rationing of services through waiting times.

The analysis uses the following measures: the financial burden of health (FBH),[1] and the incidence of catastrophic health expenditure (CHE) and impoverishing health expenditure (IHE) in Costa Rica. The contribution of this chapter is empirical as well as methodological. From an empirical standpoint, it combines composition analysis with a study of progressivity to help elucidate the factors that determine each of these measures. It also explores the health system characteristics that influence FBH. From a methodological point of view, the main contribution of this chapter is a discussion of the robustness of the results yielded by different indicators of capacity-to-pay (CTP) and different thresholds. Additionally, a novel feature of this chapter is that it combines survey data with data on waiting times for health services that vary across the country.

The second section describes the Costa Rican health system. The third section of the paper reviews some earlier studies on health spending in Costa Rica. The fourth section presents the data and basic measures. The fifth section presents the results for the analysis of the progressivity of OOP spending, as well as levels of CHE and IHE, and compares the robustness of the results with different indicators based on how affordability is defined and on replications with different thresholds. The sixth section discusses the possible risk factors that affect FBH. Data from the 2004 National Income and Expenditure Survey are complemented with information on waiting times by geographic region.

II. Summary of the Costa Rican Health System

Costa Rica is a lower-middle income country, yet has a high Human Development Index (HDI), ranking 69th in the world in 2011. The country also enjoys the second highest life expectancy in the Western Hemisphere, after Canada. These achievements are generally related to the high levels of human development – 20% of GDP is devoted to social programs, with approximately 6% devoted to public expenditure on health.

1. FBH is defined as out-of-pocket expenditure as a share of household capacity-to-pay.

Further, health coverage through prepaid mechanisms is high and 90% of the population is insured. There is a non-contributory system of protection in health for the poor, and there are no copayments in the public insurance system (this includes the cost of prescriptions, which are free to all patients).[2] Indeed, healthcare is a universal right in Costa Rica and no one can be denied first-time or emergency care even if they are not insured. Although there is an established procedure to try to collect payment, it is contingent on finding the person after the care is given.

The Costa Rican health system is organized into three service networks, each led by a tertiary level hospital. Each network organizes services into three levels of complexity with EBAIS acting as the local primary care service point. Each of the almost 1,000 centers provides care for about 1,000 households throughout the country, and is designed to serve as the gateway to the health system. Muiser and Vargas (2012) provide more details on the workings of these healthcare networks.

Waiting lists are endemic in Costa Rica's public health facilities but can also occur, although to a much lesser degree, in private or non-healthcare facilities. In general terms, waiting lists are a major problem that can induce OOP spending for those households that can afford it.

Waiting lists appear at a specific point of service when there are more patients than service delivery opportunities and hence act as a de facto means of rationing access to healthcare. The lists arise because of the interaction between supply factors (the provision of resources and the efficiency of their utilization) and demand factors (a complex set of preferences and protocols used by both patients and physicians).

The problem has been addressed with different levels of priority, usually in programs within the purview of the office of the Vice President for Medical Affairs at each health center. Thus, the number of patients on waiting lists fluctuates over time. The number of patients on a waiting list exceeded 300,000 individuals in 2000, declined to approximately 104,000 in 2004 and then rose again to over 295,000 in 2008 (CCSS, 2008).

2. The organization of the Costa Rican health system is described in greater detail in Muiser & Vargas (2012).

Patients on waiting lists can be classified into three groups: those on waiting lists for:

a) External or specialized medical consultations such as ophthalmology, cardiology, gastroenterology, etc.,

b) Procedures such us ultrasound, electrocardiogram, mammogram, etc. and

c) Surgeries.

In 2004, specialized medical consultations accounted for 47% of patients on waiting lists, procedures accounted for 43%, and surgery for 10%. Among the waiting lists for specialized medical consultations, ophthalmologic care accounted for 28% of the lists, and orthopedic care for an additional 14%. Among surgery waiting lists, orthopedic surgery accounted for 20%. Among procedures, waiting lists for ultrasound (31%) and X-rays (20%) were the largest components.

Available evidence suggests that in 2004 ophthalmology services, general surgery, urology, and peripheral vascular disease services in national hospitals had a waiting time of one year or more (CSSS, 2005). Among the seven regional hospitals, five had waiting lists longer than a year, and one of the hospitals had a waiting list of a year or longer for six specialties. The specialized Children's Hospital had waiting lists of over one year in dentistry, reconstructive surgery, orthopedics, and urology.

III. Literature on OOP Spending, CHE and IHE in Costa Rica

Several studies have analyzed CHE in Costa Rica and concur that it is relatively small. Zúñiga-Brenes (2006a) estimates a financial health contribution index, and also estimates CHE with data from the 1988 ENIG and the 1992 Social Investment Survey (*Encuesta de Inversión Social*). Xu, Evans, Kewabata, Zeramdini, Klavus, & Murray (2003) present results for CHE in Costa Rica in a multi-country study, and Briceño, Elizondo-Jara, & González Zúñiga (2006)

3. Zúñiga-Brenes (2008) examines whether health funding is equitable from the point of view of progressivity, using the stochastic dominance approach proposed by Davidson and Duclos (1997) to analyze progressivity in taxes.

calculate CHE with data from the 2004 ENIG. Zúñiga-Brenes (2008) measures progressivity with the Davidson and Duclos (1997) approach.[3] **Table 1** summarizes the findings on CHE in these studies.

The variation in results across studies can be explained by:

a) The different types of surveys used (in 1988 and 2004 the survey used is the ENIG, whereas in 1992, the survey used is a more wide-ranging quality of life study);

b) The use of different thresholds (30%, between 30% and 50%, 40%, and over 50%);

c) The use of different measures of SE;

d) Different adjustments are made for consistency with national health accounts; and

e) The application of different scales for household size. Zúñiga-Brenes (2008) highlight the importance of comparative studies of different survey designs and methodology, measurements and definitions of CTP.

Table 1
Summary of CHE Studies in Costa Rica

Study	CHE Indicator (%)	Year	Threshold (%)	Denominator
Xu, et al. (2003)	0.12	1992	40	Expenditures - endogenous poverty line
Zúñiga-Brenes (2006)	0.13	1992	30	WHO original definition (expenditures-food)
	0.12	1992	50	
	1.72	1988	30	
	0.52	1988	50	
Briseño, Elizondo, et al. (2006)	0.79	2004	30	Income- food
	0.42	2004	40	
	0.16	2004	30	Income-poverty
	0.73	2004	40	

Source: Authors' own elaboration based on review of literature.

IV. Measures and Data

Equity in financing is typically understood to mean that each agent contributes according to their CTP, whereas equity in access requires that individuals receive care according to their need (Wagstaff & van Doorslaer, 2003). This definition seeks to separate the use of healthcare services from a household's CTP. A system that depends heavily on OOP spending to finance healthcare is considered inequitable because it may lead to financial catastrophe or impoverishment, or prevent individuals from accessing healthcare services. Equity in financing can be assessed by examining the progressivity of OOP spending or by measuring levels of CHE and IHE.

In this research, FBH is measured as OOP spending as a share of household CTP. CHE is defined as the proportion of OOP payments that exceeds a certain threshold percentage of CTP. An IHE is an expense that pushes a person or household previously above the poverty line, below it after health expenses.

Capacity-to-pay is defined as total spending[4] less subsistence expenditure (SE). Household expenditure capacity is defined as all monetary expenditures, excluding expenditures in kind (donated by another household or by an institution) but including imputed rental value of owner-occupied housing (which is often the most important asset for poor families and senior citizen households). This indicator can be estimated with three criteria depending on how SE is defined:

a) As household food expenditure (WHO, 2000);

b) With reference to the national or international poverty line; and

c) With reference to the endogenous poverty line (EPL) (Xu, et al., 2003).[5]

4. The World Bank (Deaton, 1997) recommends using expenditure rather than income because **i)** income is often under-reported, especially when a significant proportion of the workforce is self-employed or classified as an employer, and **ii)** income has a seasonal component, and expenditure better reflects the notion of permanent income, and **iii)** the use of cost is based on the micro approach to the monetary gain metric.

5. Xu, et al. (2003) use the share of average food expenditure between 45% and 55% of household capacity-to-pay. If food expenditure is less than this, household food expenditure is used instead.

These definitions are used to calculate six indicators for CHE:

a) The WHO method (WHO, 2000),

b) The Xu method (Xu, et al., 2003),

c) W-vD1, developed by Wagstaff & van Doorslaer (2003) using the national poverty line (NPL),

d) W-vD2 using Wagstaff & van Doorslaer (2003) with the international poverty line (IPL)

e) A hybrid indicator based on the NPL (Hybrid1),[6] and

f) A hybrid indicator based on the IPL (Hybrid2).

OOP health spending is defined as the sum of payments for medical consultation, drugs, hospitalization (at public or private institutions), laboratory tests and on therapeutic devices such as prosthetics, eyeglasses, etc. It does not include spending on private health insurance.

This study analyzes equity using the progressivity curve, a method described by Davidson and Duclos (1997). The method considers the difference (area) between the Lorenz curve for CTP and the concentration curve for health payments. When the difference between the curves is positive, the cumulative share of CTP in the lowest ***p*** percent (p%) of the population is greater than the cumulative share of health expenditures they incur. For example, if p% of the population at the bottom of the distribution account for 10% of the whole distribution of CTP (cumulative share), and 8% of the whole distribution of health expenditure, progressivity is 2% because people are contributing to health 2% less than their cumulative share of CTP.

The analysis of determinants of the burden of OOP uses quantile regression and the dependent variable is FBH=(OOP/CTP).[7] CTP is defined using the endogenous poverty line as a measure of SE. Covariates include socio-economic characteristics of the household and the place of residence including household income, area of residence (urban versus rural), household size (scale effect), education of the household head, household living conditions, and access to basic facilities such as electricity, drinking water and sanitation. The share of health spending that is not financed by cash payments is included in the equations to capture how households finance their health expenditures. With respect

6. The hybrid indicator is similar to the W-vD approach but is replaced by total household spending on food when CTP is less than zero and subsistence expenditure is at the national poverty line.

7. The dependent variable is the logarithm of OOP spending as a share of CTP.

to the endogeneity of health insurance, a two-step process is used: first the likelihood that at least one household member is insured is calculated based on type of job and socio-economic characteristics, then the estimate is included in the FBH estimation as an explanatory variable.

One of the key control variables is the type of waiting lists faced by the household accessing a given health services network.[8] Awareness of the waiting list might lead some individuals to choose to incur an OOP expense rather than waiting for their turn in the queue. As will be discussed below, this seems to occur only for waiting lists for medical procedures. Regarding waiting list information, three explanatory variables are used: procedures (related to radiological tests), surgeries and specialist medical consultations waiting lists. Then waiting list information is assigned to the household based on how families access the health service network: the geographic information referral system.

Several specifications of the equation were calculated including:

a) Household socio-economic characteristics based on survey data only;

b) Household information combined with geographic information on network referral systems;

c) Household information on waiting lists with different definitions of CTP (the denominator of dependent variable).

The data used in this research come from the 2004 National Income and Expenditure Survey (*Encuesta Nacional de Ingresos y Gastos*, ENIG), prepared by the National Statistics and Census Institute (*Instituto Nacional de Estadística y Censos*). The main objectives of the survey are to characterize:

a) The basic basket of consumer goods and its composition to construct the consumer price index, and

b) The basic needs basket to measure poverty. Unfortunately, the survey provides no information on health status or health system characteristics, and this constitutes a limitation for the purposes of the present analysis.

8. This information is available from hospitals and clinics for specialist medical consultations, some specific procedures and surgery. For these cases, it was not possible to establish where the health expenditure was incurred, and the assumption used is that the person receives care in the public system at a specific institution assigned to users according to where they live; therefore users are subject to the relevant waiting list at their assigned facility.

The survey is nationally representative and includes a sample size of 4,132 families. The survey design is probabilistic for geographic area, stratified (17 layers), and follows a two-stage procedure. The household is the unit of study.

Combining the survey data with data generated for specific geographic regions may introduce bias, as the survey includes information only from the districts selected in the sample. For example, some hospitals with waiting lists for certain specialties or procedures might be located in districts that are not in the ENIG sample. In addition, no information is available on waiting lists for drugs and therapeutic devices. Institutional efforts notwithstanding, it is not possible to detect waiting lists in all cases, especially when the doctor tells the patient not to return before a certain period of time, at which point a place in the queue becomes available. Further, with the available data it is not feasible to consider the interaction between the duration of the wait and the number of patients on the list.

The analysis of the determinants of FBH has several limitations. First, there is no information on health status and this can generate omitted variable bias. Further, insurance status is endogenous, as the household is assured of being able to cope with higher health costs, and available options for correcting for this bias are limited. Third, given the low rate of catastrophic expenditure in Costa Rica and the small population size, the sample includes a very small percentage of families with CHE, even at the 20% threshold. Finally, information on access to the healthcare services network is limited to the waiting list variable.

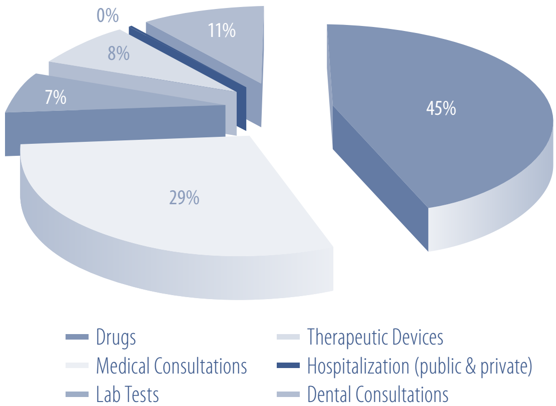
V. Distribution of OOP Spending, Catastrophic Expenditure and Impoverishment

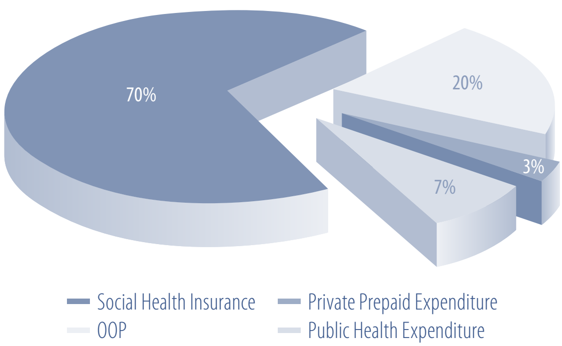
This section is divided into three parts: the first presents an analysis of progressivity in OOP spending by type; the second reports the results for CHE, and the third reports the results for IHE. The results for CHE are calculated for all six indicators mentioned in Section I, using the household as the unit of analysis, however only two of these are presented below.

Figure 1 shows the composition of OOP spending, which includes private expenditure on drugs, medical consultations, hospitalization, laboratory tests and other items. In 2004, nearly 86% of OOP expenditure was devoted to private medical consultations and drugs, although private hospital expenditure amounted to less than 0.4%. The bottom panel shows the composition of total health expenditure, of which almost 70% was financed through social health insurance.

Figure 1

Breakdown of OOP Expenditure (top) and Total Health Expenditure (bottom) in Costa Rica, 2004



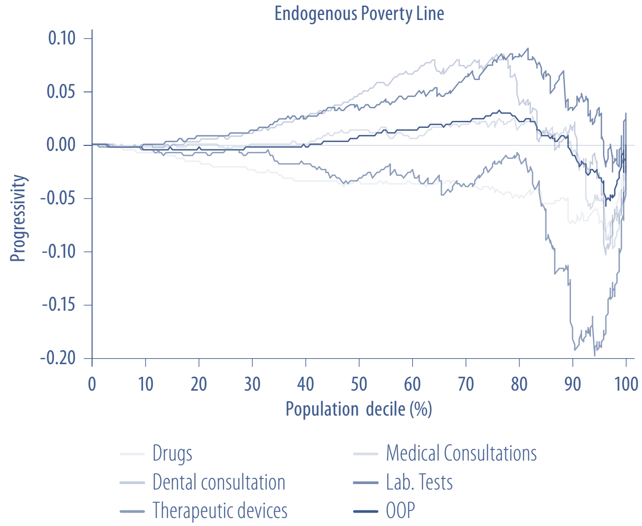


Source: Authors' calculations based on data from the ENIG 2004.

V.i. Progressivity of OOP Expenditure

In **Figure 2**, we present the progressivity of total OOP spending as well as by type of OOP payment. Progressivity is measured as the household cumulative share of CTP using the endogenous poverty line minus the household cumulative share of health expenditure. Using the national poverty line produces similar results.

Figure 2
Progressivity of Out-of-Pocket Spending



Source: Authors' calculations based on ENGH 1997 and ENGH 2004.

The results highlight the progressive nature of OOP spending up to the middle CTP deciles. The contributions to health expenditure of households below the 8th decile is less than proportional to their CTP, whereas in higher (wealthier) deciles, household contributions to health expenditure are more than proportional to their CTP. This measure differs from the average share of health payments relative to CTP because it takes into account the entire cumulative distribution, not just at a specific decile rank.

Progressivity in OOP spending for drugs, therapeutic devices, medical and dental consultations, and laboratory tests is also shown in **Figure 2**. Spending on drugs and medical devices is regressive especially in terms of the impact on low CTP deciles.

V.ii. Catastrophic Health Expenditure

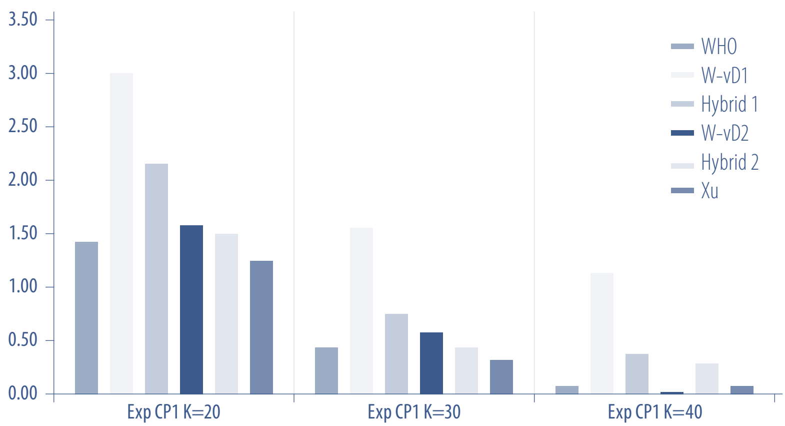
Catastrophic health spending is defined as household OOP expenses in excess of a given threshold, namely ***k%*** of capacity-to-pay. The percentage of households with CHE is sensitive to:

a) The definition of capacity-to-pay

b) How expenditure is measured; and

c) The indicator used for CHE.

Figure 3
Percentage of Households with CHE, by Indicator and Threshold



Source: Authors' calculations based on data from the ENIG 2004.

Figure 3 presents the proportion of Costa Rican households with CHE for the three thresholds and each of the six indicators mentioned in Section I. The percentage of households with CHE is relatively small, varying between 0.3% and 1.6% for a threshold of ***k=30%***. This is a distinguishing feature of Costa Rica, as was first reported by Xu, et al., 2003.

At the 30% threshold, the percentage of households with CHE is highest for the W-vD1 indicator (1.6%), and lowest when the indicator proposed by Xu, et al. (2003) is used (0.3%). The latter is slightly lower than when the WHO method is used to calculate CHE (0.4%). The differences in the results across indicators are due to the way ***W-vD1*** and ***W-vD2*** treat the data for poor households with CHE. These two approaches, unlike the other four, do not consider the possibility that households may reduce their SE (food expenditure) to cope with health costs.

These results are consistent for the 20% and 30% thresholds. For the 40% threshold, however, there are too few observations to yield a reliable measure.

The Costa Rican national poverty line (NPL) is almost double the international poverty line (IPL). Therefore the ***W-vD2*** method, which uses the IPL, tends to yield results closer to the rest of the calculations (which consider food spending adjustments), although it does not consider possible reductions in SE to cover spending on health.

Another important aspect to take into consideration is that CHE may occur not because OOP spending is high in absolute terms, but because CTP is very small. Therefore, the incidence of CHE may be higher for households with a low CTP. Since the frequency of households with CHE is very low, the robustness of the results is further reduced when the analysis is broken down by quintiles or by household composition.

V.iii. CHE and Insurance Status

Costa Rica has a long-standing public policy of expanding health insurance coverage, and has enacted measures to protect the poor (households in the first quintile). This policy has had the consequence of reducing household OOP spending.

At the 30% threshold, the percentage of households with CHE is zero for some CHE indicators when no member is insured, but is positive for households with at least one insured member. This may suggest that uninsured households do not incur CHE because they do not use the system – a conceptual limitation of CHE analyses. In the case of Costa Rica, however, the data do not support this explanation. At least 90% of Costa Rican households have at least one insured family member, and 96% of them report using health services, yet 35% of households report no health expenditures. Therefore no expenditure is not a consequence of non-use since many households who use health services do not have OOP expenditures.

Further, according to the 2006 National Health Survey (*Encuesta Nacional de Salud*) only 3% of the population reports an unmet need for medical care at an Integrated Basic Health Services Delivery Center (*Equipo Básico de Atención Integral de Salud*, EBAIS). Of this 3%, approximately 70% report the reason being that an appointment could not be made.

V.iv. CHE, Household Composition, and Expenditure Type

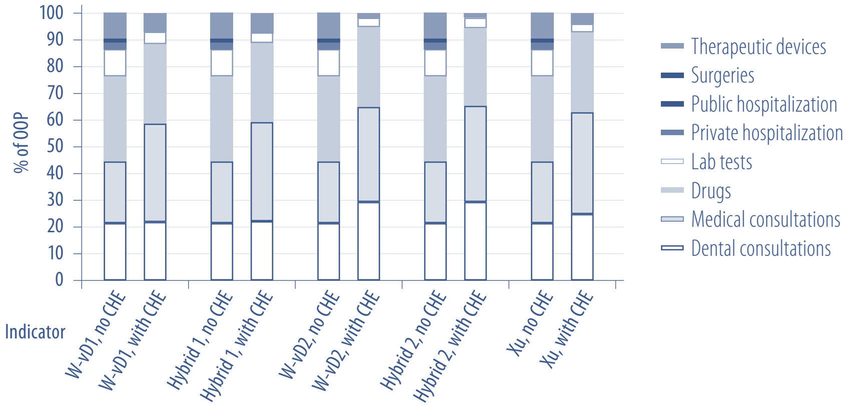
Another household feature that increases the likelihood of experiencing CHE is the presence of dependent family members as these families have special healthcare needs and are therefore more likely to face higher costs. The findings for Costa Rica show that CHE is less frequent in families with no elderly members or children, and is most frequent in households with elderly members, except when CHE is calculated with the **W-vD1** and **W-vD2** methods (30% and 40% thresholds). The second highest frequencies of CHE occur in households with children.

The results also show that progressivity in health expenditures differ by the type of expenditure. As previously mentioned, drugs and medical devices are regressive for low CTP deciles. **Figure 4** shows the average composition of OOP spending for households with and without CHE.

Spending on hospitalization is likely to be a major source of CHE since it is uncommon and often unexpected, and usually cannot be postponed. However, this explanation also does not seem to apply to Costa Rican households. For families with CHE, **Figure 4** shows that medical consultations comprise the largest proportion of OOP spending with all five indicators. Hospitalization (public or private, including surgery) represents a null proportion of OOP spending in households with CHE (at the 30% threshold).

Interestingly, for households without CHE, drugs are a relatively important component of OOP spending, as are therapeutic devices and laboratory tests. Moreover, both therapeutic devices and laboratory tests represent a much larger share of total OOP spending in households without CHE than in those with CHE. However, it is important to keep the small sample size for CHE in mind.

Figure 4
Composition of OOP Spending With and Without CHE (30% Threshold)



Source: Authors' calculations based on data from the ENIG 2004.

The results also differ depending on how CTP is defined. The above results compare six measures of CTP, all of which involve various spending levels minus SE. **Table 2** summarizes the results for the 30% threshold. The use of the income share instead of the expenditure share of SE increases the percentage of households with CHE, which is slightly higher for almost all indicators and thresholds. For example, the ***W-vD1*** indicator with the NPL yields an incidence of 1.8% at the 20% threshold and 3.3% at the 30% threshold. Zúñiga-Brenes (2006b) also finds that households in lower income deciles report expenditures higher than their income, in contrast to households in higher income deciles. This raises the possibility that CHE is less frequent when CTP is defined on the basis of expenditure.

The inclusion or exclusion of imputed rental value of owner-occupied housing has an important effect on the measurement of CHE that is greater than that caused by using income as opposed to expenditure to define SE. **Table 2** shows that the differences in variation increase with the threshold value. For instance, at the 20% threshold, the inclusion of imputed rental value of owner-occupied housing decreases the proportion of households with CHE. Thus, CHE decreases from 6.1% without imputed rental value to 3.3% with imputed rental value.

Table 2
Extreme Values of Catastrophic Health Expenditure

Capacity-to-pay		Threshold	Max value	Min value
Expenditure - SE	Without imputed rental value	20	5.78	2.76
		30	3.58	1.14
		40	2.76	0.56
Income- SE	Without imputed rental value	20	6.07	3.48
		30	3.66	1.97
		40	2.82	1.04
Expenditure - SE	With imputed rental value	20	2.99	1.28
		30	1.56	0.31
		40	1.18	0.05
Income - SE	With imputed rental value	20	3.25	1.88
		30	1.84	0.65
		40	1.30	0.33

Source: Authors' calculations based on data from the ENIG 2004.

The results thus far demonstrate that a number of variables can influence CHE. However, possible correlations between the different variables themselves need to be taken into account. For example, the proportion of households with at least one insured member may increase with spending quintile or household size. This is why efforts to explain what factors influence CHE call for multivariate analysis.

V.v. Impoverishing Health Expenditure

Using data on total health expenditure including imputed rental value of owner-occupied housing from the ENIG 2004, shows that 3.6% of households are in extreme poverty. The proportion of these families impoverished through health spending is in turn very low and difficult to measure.

The CHE results show that only 0.14% of households become impoverished as a result of OOP expenses when the NPL is used and this figure is 0.1% when the IPL is used. IHE is present only in the first quintile, with estimated rates of 0.7% (NPL) and 0.5% (IPL). However, these figures should be viewed with caution because of the low number of observations (6 households).[9] Excluding imputed income from home ownership increases the percentage of households with IHE to 0.4%.

VI. Financial Burden of Health: a Multivariate Analysis

VI.i. Financial Burden of Out-of-Pocket Payments (OOP/CTP)

Quantile regression is estimated for the 60th, 80th, 90th, 98th, and 99th percentiles to analyze the effects of the variables for different segments of the FBH (OOP/CTP) distribution. The 98th and 99th percentile of the OOP/CTP distribution are selected because Costa Rican households at these parts of the distribution have OOP expenses that account for more than 20% of their CTP, i.e. households near the top 2% of the FBH distribution experience CHE, using a 20% threshold for CHE.

Table 3 presents results for OOP/CTP using the endogenous poverty line as CTP. The adjusted pseudo R^2 shows a better fit when waiting list information is included.

The most interesting results of the analysis are that the explanatory variables show a different effect at different percentiles of the distribution. Waiting lists for procedures (tests) seem to increase OOP/CTP for households with no CHE (60th percentile) but the effect is not significant for those who do experience CHE (98th percentile). Waiting lists for medical consultations also seem to reduce OOP/CTP for the 60th percentile, but the effect is also not significant for the 98th percentile. Waiting lists for surgery have no significant effect, probably because surgeries represent only 10% of waiting lists. Similarly, waiting lists for medical consultations are mostly for ophthalmologic and orthopedic care; therefore these users are still willing to stay in the system as long as no additional outlay is required. However, users of procedures (tests) may not be willing to wait for a diagnosis once doctors have requested special tests.

9. This does not reflect the robustness of the survey, but is rather a result of quasi-universal national health coverage in the Costa Rican system.

Table 3
Quantile Regressions for the FBH of CTP with Waiting List: Endogenous Poverty Line

Quantile	Endogenous poverty line				
	60th	80th	90th	98th	99th
Urban	0.055	0.094	0.069	0.032	0.019
	(0.060)	(0.068)	(0.099)	(0.122)	(0.150)
Quantile 2	0.550	-0.122	-0.329	-0.445	-0.560
	(0.113)***	(0.125)	(0.114)***	(0.202)**	(0.243)**
Quantile 3	0.731	-0.179	-0.349	-0.682	-0.888
	(0.111)***	(0.139)	(0.146)**	(0.167)***	(0.255)***
Quantile 4	0.976	-0.112	-0.433	-0.597	-0.704
	(0.105)***	(0.144)	(0.135)***	(0.168)***	(0.245)***
Quantile 5	1.194	0.008	-0.337	-0.487	-0.482
	(0.116)***	(0.142)	(0.142)**	(0.205)**	(0.313)
Household with children	0.140	0.095	0.039	-0.134	0.299
	(0.048)***	(0.058)	(0.075)	(0.136)	(0.180)*
Household with elderly	0.497	0.648	0.626	0.706	0.540
	(0.110)***	(0.120)***	(0.120)***	(0.154)***	(0.202)***
Household with elderly and children	-0.054	0.109	0.067	-0.224	0.504
	(0.191)	(0.215)	(0.201)	(0.580)	(0.474)
Household size	0.164	-0.094	-0.150	-0.139	-0.209
	(0.047)***	(0.060)	(0.069)**	(0.082)*	(0.089)**
Probability of having insurance	-1.162	-0.354	-0.543	-2.036	-0.735
	(0.532)**	(0.980)	(0.910)	(1.250)	(1.428)
Household with access to electricity	0.167	-0.103	0.053	0.514	0.578
	(0.183)	(0.542)	(0.361)	(0.439)	(0.521)
Household with access to improved sanitary cond	0.349	0.327	0.175	0.550	-0.078
	(0.119)***	(0.304)	(0.219)	(0.369)	(0.395)
Household with access to improved water	-0.048	-0.129	-0.174	-0.121	-0.181
	(0.141)	(0.173)	(0.145)	(0.197)	(0.214)
Household with access to waste disposal	-0.065	-0.176	-0.136	-0.264	-0.211
	(0.086)	(0.089)**	(0.123)	(0.167)	(0.180)

Table 3 *(continued)*
Quantile Regressions for the FBH of CTP with Waiting List: Endogenous Poverty Line

Quantile	Endogenous poverty line				
	60th	80th	90th	98th	99th
Household head years of schooling	0.019	0.011	0.003	0.003	-0.009
	(0.027)	(0.026)	(0.024)	(0.036)	(0.061)
Financed with cash	-0.194	-0.282	-0.140	0.106	-0.120
	(0.073)***	(0.143)**	(0.128)	(0.294)	(0.286)
No. of cases on waiting list for surgery	0.008	0.016	0.003	0.008	0.021
	(0.008)	(0.011)	(0.013)	(0.015)	(0.017)
No. of cases on waiting list for medical consultations	-0.025	-0.034	-0.044	-0.022	-0.019
	(0.010)**	(0.017)**	(0.018)**	(0.027)	(0.037)
No. of cases on waiting list for lab test and procedures	0.023	0.029	0.039	0.018	0.023
	(0.007)***	(0.012)**	(0.014)***	(0.022)	(0.033)
Constant	0.320	2.189	3.361	4.789	4.470
	(0.282)	(0.691)***	(0.516)***	(0.649)***	(0.869)***
PseudoR^2	0.055	0.030	0.049	0.084	0.107

Note: * Significant at 10%, ** 5% and *** 1%. Standard errors in parenthesis.

Source: Authors' estimates based on data from the 2004 ENIG and information regarding waiting lists from health center.

Being insured has a negative impact on OOP/CTP but is significant only for households at the 60th percentile. Variables such as access to improved sanitation and share of health expenditure financed with cash are significant only at the 60th percentile. Being in quintile 2-quintile 5 is associated with higher FBH for those with FBH at the 60th percentile but negative for those with higher FBH (at the 99th percentile). The presence of an elderly member in the household always shows a positive (and significant) impact throughout the distribution.

VII. Conclusions

This chapter seeks to explain the paradox of low rates of CHE despite high OOP health expenditures in Costa Rica. Substantial evidence is provided on the composition of OOP spending and its progressivity, the financial burden of OOP expenditures, the incidence of CHE and IHE for different measures of CTP, and different thresholds. Some risk factors that may explain OOP spending and FBH, including socio-economic variables, were successfully identified, along with characteristics of the health system that contribute to FBH. This latter objective involved combining information from the 2004 National Income and Expenditure Survey with data on geographical access to the health service network and waiting times.

Costa Rica is a country with relatively high OOP spending despite a low incidence of CHE. Medical consultations and drugs are the two main components of OOP spending, accounting for more than 80%, with laboratory tests representing about 7%.

Health expenditures are progressive with minor exceptions at the top of the distribution depending on the definition of CTP. Medicines and therapeutic devices are regressive throughout distribution, whereas laboratory tests are progressive. An important finding is that OOP expenses for hospitalization are minimal. Interestingly, households with CHE at the 30% threshold report very little spending on hospitalization; instead medical consultations represent the largest spending item in this group.

Although levels of CHE are low, the results are highly sensitive to the indicator chosen and to the definition of CTP. This may say more about the nature of the definitions than about the specific results for Costa Rica. Whether the imputed income from home ownership is used or not significantly affects the results, and to a much greater extent than the use of income rather than expenditure in the analysis. The ***W-vD1*** indicator (with the NPL) yields the highest proportion of households with CHE. This can be explained by two factors:

a) Viewing all poor households as having CHE, and

b) The fact that the NPL line is much higher than the IPL or EPL, thus magnifying the results.

There is some evidence that CHE is less common among households without any insured members. This finding does not seem to be explained by non-use among families without insurance. The results also show that households with elderly members have higher CHE.

In addition, the results suggest that procedures (tests) (including ultrasound and other tests) increase FBH, but not for those households with CHE. This may be because laboratory tests do not represent a large share of OOP spending (7%), and because this expense is clearly progressive.

Finally it is important to understand that low CHE is a product of the specific characteristics of the Costa Rican health system (Muiser & Vargas, 2012). This system provides very high insurance coverage, requires no copayments for healthcare services, and includes a complementary private healthcare system. Still, the results suggest that waiting lists are functioning as rationing tools and that households pay OOP to avoid these lists although in ways that do not generate severe economic hardship.

As in many other countries, meeting the challenge of population ageing and epidemiological transition will place increasing burdens on the Costa Rican health system and possibly on OOP spending. These changing epidemiological and demographic features may increase healthcare costs and present challenges for the financial sustainability of the Costa Rican healthcare system in the future. From the standpoint of public health policies, future research should investigate the nature and interactions of the service networks in explaining the incidence of CHE. Such studies should focus on specific cases rather than on more general approaches.

Finally, database quality is a pending issue. The household expenditure survey was used for this analysis but presents limitations as the survey was not designed to measure health issues. Quality-of-life type surveys would be a welcome alternative as they can combine information on health expenditures, health status, health system utilization and health system characteristics such as access, quality, waiting lists, etc. Such surveys have the potential to enhance the quality of risk factor analyses designed to explain OOP spending and catastrophic health spending.

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Chapter 9

Catastrophic and Impoverishing Health Expenditure in Mexico

Chapter 9

Catastrophic and Impoverishing Health Expenditure in Mexico

Remittances as a Financial Protection Mechanism: A propensity-score matching analysis

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I. Introduction

Lack of financial protection in health and limited access to high-quality health services lead households, particularly the poor and uninsured, to self-finance their healthcare through out-of-pocket (OOP) spending. This exposes families to catastrophic and impoverishing health expenditures and forces many to turn to informal methods to mediate this risk (WHO, 2000; Knaul, et al., 2006; Cavagnero, Carrin, Xu, & Aguilar-Rivera, 2006; Baeza & Packard, 2006).

Health shocks are random phenomena that can impact any household and have serious implications for family finances and income, driving many into poverty. This is especially true for households without social security or other kinds of health insurance or financial protection (Gertler & Gruber, 2002; Wagstaff, 2005; Baeza & Packard, 2006). Families often choose to face financial ruin rather than have loved ones go without care, and resort to selling productive

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assets or reducing expenditure on basic needs to cover their healthcare expenses. The implications are particularly daunting for households that already live in poverty, as they have very limited access to healthcare financing options and are faced with either deepening their level of poverty or forgoing care and suffering the health consequences.

Lack of access to formal risk pooling mechanisms such as social or community health insurance schemes drive households to identify mechanisms of self-protection against health shocks, or self-insurance through informal coping mechanisms (Baeza & Packard, 2006). One way of reducing the volatility of family income in the face of health shocks is by diversifying the sources of household finances. Remittances are a clear example of an additional source of finances (Lucas & Stark, 1985; Esquivel & Huerta-Pineda, 2007; Rapoport & Docquier, 2006) with which households are able to reduce their risk of impoverishment and protect themselves against not only economic but also health shocks. In contrast to inefficient risk-coping mechanisms that contribute to the persistence of poverty by lowering family income-earning potential, remittances represent an additional transitory or permanent flow of resources.

Remittances represent a substantial source of income for many low and middle income countries (LMICs), especially in Latin America. Remittances worldwide totaled USD$ 297 billion in 2006, of which almost 75% corresponded to flows received by developing regions (Ratha & Xu, 2008). Latin American countries have especially high levels of emigration and inflows of remittances, which correspond to approximately 26% of the global total. Indeed, the Latin American and Caribbean region has the largest absolute volume of remittances received and the highest growth rate. Households with migrant members tend to be concentrated in rural areas, belong to the poorest income quintiles, and are less likely to have access to formal health insurance or social security schemes which are typically linked to formal employment (Baeza & Packard, 2006).

In the case of Mexico, lack of financial protection in health inspired and spurred a comprehensive health system reform that came into effect in 2004 and put in place the System of Social Protection in Health (SSPH) and the *Seguro Popular*. At the time of the reform, an estimated 4.1% of households were experiencing catastrophic or impoverishing health expenditures every quarter, with annual figures likely to be substantially higher. Financial catastrophe and impoverishment from health spending was heavily concentrated in the poorest quintile and among the uninsured (Knaul, Arreola-Ornelas, & Mendez, 2005; Knaul, et al., 2006). The reform was designed to provide access to financial risk pooling and improve access and equity of healthcare coverage for the more than 50 million families that had been excluded from social security (Knaul & Frenk, 2004; Frenk, Gómez-Dantés, & Knaul, 2009).

In Mexico, family remittances totaled USD$ 21 billion in 2010 (a reduction from previous years), represented 2.6% of GDP, and were the second most important source of foreign exchange (Bank of Mexico, 2011; Norton, 2008). Indeed, remittance revenues are valued at two thirds of crude oil exports, the main source of foreign income. More that 67 million remittance transactions are made annually, with an average value of USD$ 315 per transaction.

The purpose of this paper is to analyze the impact of remittances on the likelihood of facing catastrophic or impoverishing health expenditures. The analysis takes into account the availability of social security and the public insurance program, *Seguro Popular*, rolled out as of 2004. Using propensity score matching, the analysis presented herein controls for observable differences between remittance-receiving and non-receiving households. The data are from the National Income and Expenditure Surveys from 1992 to 2010, which include detailed information on both health spending and remittances. A number of studies have analyzed catastrophic and impoverishing health expenditure in Mexico using similar data, yet none have focused on the impact of remittances as a method of mitigating the financial consequences of health shocks (Knaul, et al., 2006).

Several studies have analyzed the impact of remittances on healthcare access and household health expenditure and most find a positive impact on health spending and access to care (Amuedo-Dorantes, Sainz, & Pozo, 2007; Frank, et al., 2009; Valero-Gil, 2009; Amuedo-Dorantes & Pozo, 2011). A number of authors have identified a positive impact of remittance on child health outcomes and specifically infant mortality and anthropometric measures (Frank & Hummer, 2002; López-Córdova, 2005; Acosta, Calderón, Fajnzylber, & López, 2008; Frank, et al., 2009). López-Córdova (2005) reveals a significant negative relationship between remittances and infant mortality at the municipal level in Mexico. In addition, there is evidence that suggests a positive effect of remittances on households' marginal investment in human capital such as health and schooling, as opposed to consumption expenditure (Acosta, et al., 2007). Moreover, studies show that the main reason Mexican migrants send remittances is the health of their relatives (Amuedo-Dorantes, Sainz, & Pozo, 2007). Close to 47% of the migrants who send remittances do so because their relatives have health problems.

This study contributes to the existing literature in three ways. First, the analytic methodology is designed to mitigate the problem of self-selection and better assess the unbiased effect of remittances given that these are not randomly assigned; second, by focusing on catastrophic and impoverishing health spending as opposed to overall OOP spending; and third, by seeking unbiased estimates that control at least partially for the presence of *Seguro Popular*.

The first section provides an overview of remittance payments and health expenditure in the context of the Mexican health system. The next section presents the data and methodology, followed by a description of the empirical model. Then descriptive and econometric results are presented, followed by a section on conclusions and recommendations for future research.

II. Remittances, Health Reform and Health Expenditures in Mexico

Migration of household members is considered a form of investing in human capital and augmenting the generation of household income (Schultz, 1961; Becker, 1962; Rozelle, Taylor, & de Brauw, 1999). Similarly, remittances are a mechanism for households to overcome poverty or to finance basic needs such as health and food expenditures, education and housing (Esquivel & Huerta-Pineda, 2007).

There are several economic theories to explain why migrants send their resources steadily to their relatives and loved ones, and healthcare financing is one of the main factors (Lucas & Stark, 1985; Rapoport & Docquier, 2006). The impact of remittances on recipient households' poverty level, human capital investment and household expenditure behavior in Latin America is a subject of ongoing research, particularly for Mexico (Cox-Edwards & Ureta, 2003; Adams, 2005; Acosta, et al., 2007; Amuedo-Dorantes, Sainz, & Pozo, 2007; Canales, 2007; Frankel, 2009; Amuedo-Dorantes & Pozo, 2011).

In Mexico, a large number of poor households, many of whom do not participate in the formal sector of the economy and hence lack access to social security, send one or more of their family members abroad with the purpose of meeting their basic household needs via remittances. Health expenditure stands out among these basic needs (Amuedo-Dorantes, Sainz, & Pozo, 2007).

Approximately 4.7% of Mexican households receive remittance-based income according to the National Income and Expenditure Survey of 2010 (described in detail below) (**Table 1**). For these households, this inflow of resources represents a third of their total income. Over 42% of households that receive remittances are found in the first quintile of income net remittances, and the proportion declines as income rises. Still, almost 10% of households with remittances are in the richest quintile net remittances. The majority of households with remittances live in rural areas. Overall, almost 10% of rural households receive remittances, in contrast to only 3.4% of households residing in urban areas.

Table 1
Distribution of Remittance-Receiving Households by Income Quintile

Household Type		Income Quintile*					Total
		I (pooorest)	II	III	IV	V	
No remittances	N	5,241,945	5,539,594	5,581,283	5,669,784	5,684,696	27,717,302
	% row	18.9	20.0	20.1	20.5	20.5	100.0
	% column	90.1	95.3	96.0	97.5	97.8	95.3
Remittances	N	573,082	275,854	233,424	145,719	128,951	1,357,030
	% row	42.2	20.3	17.2	10.7	9.5	100.0
	% column	9.9	4.7	4.0	2.5	2.2	4.7
Total	N	5,815,027	5,815,448	5,814,707	5,815,503	5,813,647	29,074,332
	% row	20.0	20.0	20.0	20.0	20.0	100.0
	% column	100.0	100.0	100.0	100.0	100.0	100.0

Note: *Income defined as total household expenditure net remittances.

Source: Authors' estimates based on data from ENIGH 2010.

Despite receiving a continuous flow of remittances, most migrant households are not insured. This phenomenon occurs for two main reasons. First, prior to the 2003 health reform, access to social security in Mexico was limited to the formal sector. This left large segments of the population without access to pre-payment mechanisms for health or other areas of social insurance. Second, prices in the private insurance market are so high that only 3.9% of the Mexican population is covered by private health insurance.

Seguro Popular represents a new opportunity for families without access to social security in health –many of whom rely on remittances– to obtain financial protection in health. Until the beginning of the present century, and as continues to be the case in many countries, regular access to healthcare with financial protection was guaranteed only to salaried workers and their families through social security mechanisms – the Mexican Institute for Social Security (IMSS) and the Institute for Security and Social Services for Civil Servants (ISSSTE). Many households relied on the poorly-regulated and costly private sector, and paid OOP at point of service. High catastrophic expenditure reflected the exclusion of the poor from prepayment and pooling mechanisms, and thus from financial protection in health.

The creation of the SSPH and the launch of *Seguro Popular* in 2004 involved a major legislative reform focused on financial reorganization and the commitment to increase funding for health by 1% of GDP, primarily through public resources. The overall goal of the reform was to achieve universal health coverage by including the more than 50 million Mexicans who had previously been excluded from public, social insurance.

Indeed, the mobilization of additional public resources for *Seguro Popular* created the financial conditions necessary to expand the coverage of public health insurance in Mexico. The most recent data from the Ministry of Health (MOH) indicate that the number of *Seguro Popular* affiliates reached 52.5 million in February 2012. The majority of *Seguro Popular* affiliates belong to the poorest four income deciles and 35% live in rural communities.

III. Data and Methodology

For the purpose of this study, we analyze the evolution of catastrophic and impoverishing health expenditures between 1992 and 2006 in a biennial data series.[1]

III.i. Data

The analysis presented herein uses the National Household Income and Expenditure Survey (ENIGH) carried out by the National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía, INEGI*) with the aim of documenting household consumption patterns. Both the descriptive and econometric work are based on biennial data spanning 1992 to 2010 (with an additional survey undertaken in 2005).

The sample size of the ENIGH varies from 10,497 households in 1992 to 27,655 in 2010. In all years, it is representative at the national level as well as by strata of population density. In order to be able to compare across years in the surveys, monetary variables were deflated based on the national consumer price index from the national Bank of Mexico. **Table 2** shows the descriptive statistics of the main variables by survey year.

1. The frequency of the data series is biennial from 1992 to 2006 and is comparable. In 2005 an extraordinary database broke this periodicity, and is also used in this analysis.

III.ii. Financial Risk Protection Indicators

Three variables are used to analyze the level of household financial protection in health: OOP spending (OOPS), the prevalence of households with catastrophic health expenditure (CHE), and the prevalence of households with impoverishing health expenditure (IHE), Equation 1.

As in other studies of this volume, a household is said to incur CHE when its spending on health exceeds 30% of its capacity-to-pay (CTP), which is in turn defined as total household expenditure (TE), a proxy of its permanent income, minus subsistence expenditure (SE), equation 2. OOPS is a continuous variable between zero and any positive value.

$$CHE = \begin{cases} 1 \text{ } if \text{ } (OOPS/CTP) > 0.30 \\ 0 \text{ } in \text{ } other \text{ } case \end{cases} \tag{1}$$

$$CTP = TE - SE \tag{2}$$

In this study, two methods of measuring subsistence expenditure are used:

a) The simple method whereby subsistence expenditure is equal to household food expenditure, and

b) The poverty line method, which herein is considered as equivalent to a dollar-per-day-per-capita line in purchasing power parity terms. In the first methodology, food expenditure is contained within total expenditure, and therefore household CTP is always defined between zero and one.

In the second methodology, the poverty line may be above total expenditure for poor households; hence CTP becomes negative, causing a negative value in the OOP/CTP ratio. To avoid this problem, this study uses the methodology proposed by Wagstaff and van Doorslaer (2003). Consequently, when the poverty line exceeds health expenditure, any health spending greater than zero is considered catastrophic.

Further, a household is said to incur IHE if prior to its health spending it was a non-poor household, but due to its health spending, it falls below the poverty line, i.e. it is counted as “new poor” due to health spending. This is represented as follows:

$$IHE = \begin{cases} 1 \textit{ if } TE > SE \textit{ and } TE - OOPS > SE \\ 0 \textit{ in other case} \end{cases} \quad (3)$$

In the multivariate models of household expenditure, the key explanatory variable analyzed in this paper is the availability of remittances measured as whether households in the survey received remittances or not from any migrant member. The issue of households' self-selection into receiving remittances arises because many of the factors that determine remittances also determine health expenditure in the household, thus introducing bias in the regression estimates. To isolate the effect of remittances on health expenditure, ideally one would want to compare health expenditure among households that receive remittances versus the same households under a no-remittance scheme. Since the latter counter-factual is impossible to observe, the estimates are obtained using propensity score matching estimates, which address the selection issue.

The underlying idea is that the decision to send and/or receive remittances by households is similar to that of pertaining to a treatment group in an experimental study. Therefore, what should ideally be estimated is the effect of treatment (receiving remittances) on the probability of incurring CHE or IHE by households receiving remittances and those in a "control" group, which is constructed by matching each observation in the remittance-receiving group with their best match according to a series of factors that determine remittances. This would allow comparisons of the probability of incurring CHE or IHE between households that receive remittances and those that do not.

III.iii. Estimation of the Average Effect of Remittances on Health Expenditure Based on Propensity Score Matching (PSM)

Since there is no randomized assignment of remittances, this analysis applies propensity score matching as a methodology to generate a comparison group. PSM summarizes the pre-treatment features of each observation, in this case the household, in an index variable called the "propensity score" (Rosenbaum & Rubin, 1983; Dehejia & Wahba 2002). This score is used to generate matching between the treatment and control subgroups (households with and without remittances). In the absence of a true experimental design, the rationale behind this propensity score is the conformation of a control group with characteristics very similar to those of the treatment group based on observable variables to produce a less biased estimate of the average treatment effect. The critical assumption used in this methodology is that belonging to the treatment group, i.e. receiving remittances, though not random, ultimately lies on observable variables.

Following Dehejia and Wahba (2002), the primary effect of treatment for a single household, τ_i, corresponds to $\tau_i = Y_{i1} - Y_{i0}$, where Y_{i1} corresponds to the value of the variable of interest (health expenditure) when household i is subject to treatment, and Y_{i0} is the value of the same variable when household i is exposed to being the control (0). In non-experimental studies τ_i corresponds to the expected effect of treatment for the treated population (ATT).

$$\tau_{T=1} = E(\tau_i \mid T_i = 1) = E(Y_{i1} \mid T_i = 1) - E(Y_{i0} \mid T_i = 1) \qquad (4)$$

where $T_i=1$ (0) if the 1th household was assigned to treatment (control). Because we do not observe the same households under both control and treatment circumstances, and assignment to treatment is not random, pre-treatment variables and potential outcomes such as the probability of facing catastrophic health payments may differ systematically between households with and without remittances in both observable and unobservable characteristics.

To substitute for a randomly-assigned control group, PSM creates a comparison group of households based on the conditional probability of assignment to treatment given a vector of observable characteristics X_i (Rosenbaum & Rubin, 1983). The variable $p(X_i)$ is the probability of household i being assigned to treatment, defined as $p(X_i) \equiv Pr(T_i = 1 \mid X_i) = E(T_i \mid X_i)$.

This model assumes that the comparison between two households with the same observable pre-treatment characteristics, one with remittances and the other without, would yield an unbiased estimator of the treatment. This occurs when potential outcomes are independent of assignment to treatment conditional of observable, pre-treatment characteristics. This corresponds to the conditional independence assumption of the model and ensures that whether or not a household received remittances is based exclusively on observable characteristics. While this assumption is not easily testable, it is reasonable when program participation is not to be determined by unobserved features. The second assumption ensures that an adequate overlapping exists within the propensity score distribution between treated and control households (a large common support). If this balancing property is violated then comparability cannot be ensured (Heckman, Ichimura, & Todd, 1997; Rosenbaum & Rubin, 1983; Dehejia & Wahba, 2002).

Four different matching criteria have been proposed in the literature and are applied in this paper: nearest neighbor, radius, kernel and stratification. By using the entire database spanning 1992 to 2010 and summing over all years, the estimates are based on a larger common support. The matching criteria, however, are based on individual years so that households are paired only within a given survey year.

IV. Results

IV.i. Trends

Mexico has devoted significant resources to data collection and there is a long and reliable time trend available as a result of the regularity and comparability of the ENIGH data. These data span a period of pre-economic crisis (1992 and 1994 because the survey was undertaken before December), post crisis (1996 to 2006), and economic downturn (2008 and 2010). Data on remittances, poverty and health spending are summarized from the period 1992 to 2010 in **Figure 1**.

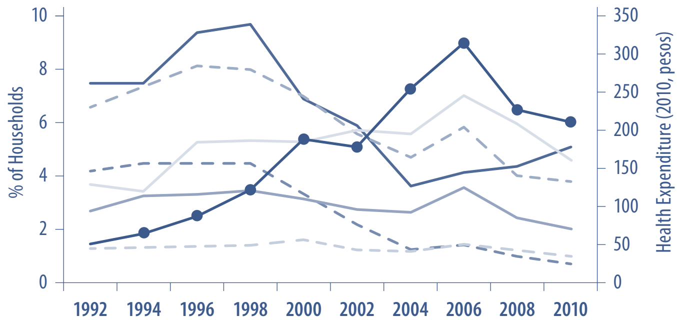
The proportion of households receiving remittances rose quite steadily from 3.7% in 1992 to 7.0% in 2006. It then fell to 4.7% in 2010 – a level approaching pre-1996 rates. Per capita spending on health shows a similar pattern.

Further, the proportion of families living in poverty is counter-cyclical. The rate rose dramatically following the economic crisis of late 1994 and 1995, and then fell steadily to 3.1% in 2004. It has been increasing since then, although without reaching the level of 2002.

All measures of the proportion of households with catastrophic or impoverishing health spending declined over the period 2000-2010. There was an increase in 2006 that could be associated with increased rates of poverty between 2004 and 2006. Still and most importantly, all of the measures also declined over the 2004 to 2010 period. Further, there has been an overall decline (improvement) through the period of economic crisis of the late 1990's (**Figure 1**).

Figure 1

Descriptive Statistics of the Population Under Analysis, by Survey Year



	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010
Remittance-receivers	3.7	3.4	5.3	5.3	5.3	5.7	5.6	7.0	5.9	4.7
Below poverty line	7.4	7.5	9.3	9.7	6.9	5.9	3.6	4.1	4.4	5.1
CHE 1	2.8	3.3	3.3	3.5	3.1	2.7	2.7	3.5	2.4	2.0
CHE2	6.6	7.4	8.1	8.0	7.0	5.6	4.7	5.8	4.0	3.8
IHE USD$ 1 PPP poverty line	4.2	4.5	4.5	4.5	3.3	2.2	1.3	1.5	1.0	0.8
IHE National food poverty line	1.3	1.4	1.4	1.4	1.6	1.2	1.2	1.5	1.2	1.0
Health Expenditure	51.0	66.0	86.0	120.0	188.0	180.0	254.0	314.0	227.0	210.0

Source: Authors' estimates based on data from ENIGH 1992-2006.

The data described above also cover the first six years of the *Seguro Popular* that moved from a pilot project, in 2002, to a legislated program in January of 2004. According to these ENIGH data, the proportion of households with *Seguro Popular* grew from just over 3% of households in 2004, to 11.8% in 2006, 23.4% in 2008 and 37.1% in 2010 (**Table 2**).

Table 2
Descriptive Statistics (Mexico-ENIGH, 1992-2010)

Survey year	1992		1994		1996		1998	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
% of households								
Remittance-receiving	3.7	18.9	3.4	18.2	5.3	22.3	5.3	22.4
Under $ 1 (PPP) poverty line	7.4	26.3	7.5	26.3	9.3	29.1	9.7	29.6
Under national food-poverty line	29.2	45.5	31.3	46.4	43.2	49.5	39.6	48.9
Health insurance coverage								
Social security health insurance	44.1	49.7	40.5	49.1	40.6	49.1	42.8	49.5
Seguro Popular de Salud	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-pocket health expenditure (current Mexican pesos)	50.9	193.2	65.9	427.1	85.9	356.2	119.8	505.6
With catastrophic health expenditure (%)								
CHE1								
k=20%	5.3	22.4	6.4	24.4	6.0	23.8	6.3	24.3
k=30%	2.8	16.4	3.3	17.8	3.3	18.0	3.5	18.3
k=40%	1.5	12.3	1.8	13.4	1.8	13.1	1.9	13.8
CHE2								
k=20%	8.6	28.1	10.1	30.1	10.5	30.7	10.3	30.3
k=30%	6.6	24.8	7.4	26.1	8.1	27.3	8.0	27.1
k=40%	5.4	22.6	6.1	24.0	6.9	25.3	6.7	25.0
With impoverishing health expenditure (%)								
Below $ 1 (PPP) poverty line	4.2	20.1	4.5	20.7	4.5	20.7	4.5	20.8
Below national food-poverty line	1.3	11.3	1.4	11.6	1.4	11.9	1.4	11.7

Table 2

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2000		2002		2004		2005		2006		2008		2010		Pooled cross-sections (1992-2010)	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
5.3	22.5	5.7	23.2	5.6	22.9	6.0	23.7	7.0	25.5	5.9	23.6	4.7	21.1	5.3	22.5
6.9	25.3	5.9	23.5	3.6	18.7	6.2	24.0	4.1	19.8	4.4	20.4	5.1	21.9	6.2	24.1
29.1	45.4	26.4	44.1	18.5	38.8	24.3	42.9	19.0	39.2	24.2	42.8	27.7	44.7	27.8	44.8
43.8	49.6	42.1	49.4	43.3	49.5	41.9	49.3	42.1	49.4	55.5	49.7	55.7	49.7	45.2	49.8
0.0	0.0	0.0	0.0	3.4	18.2	0.0	0.0	11.8	32.2	23.4	42.4	37.1	48.3	8.1	27.2
187.9	551.5	179.7	669.8	253.8	1340.8	238.2	838.4	313.6	1344.1	227.2	985.1	210.0	1133.5	185.6	890.8
6.2	24.1	5.2	22.2	5.2	22.2	5.6	23.0	6.1	23.9	4.5	20.8	3.7	18.8	5.4	22.7
3.1	17.5	2.7	16.3	2.7	16.1	3.2	17.6	3.5	18.5	2.4	15.4	2.0	14.0	2.9	16.9
1.9	13.6	1.5	12.3	1.5	12.2	1.7	12.9	2.1	14.3	1.4	11.9	1.1	10.4	1.7	12.7
9.4	29.2	7.8	26.8	7.0	25.5	9.4	29.2	8.7	28.1	6.1	23.9	5.3	22.5	8.3	27.6
7.0	25.5	5.6	22.9	4.7	21.2	6.9	25.4	5.8	23.4	4.0	19.6	3.8	19.1	6.0	23.8
5.8	23.3	4.3	20.3	3.7	18.8	5.5	22.8	4.6	20.8	3.0	17.2	3.0	17.0	4.9	21.5
3.3	17.7	2.2	14.7	1.3	11.3	2.2	14.7	1.5	12.0	1.0	10.0	0.8	8.7	2.5	15.7
1.6	12.7	1.2	11.1	1.2	11.0	1.6	12.4	1.5	12.0	1.2	10.9	1.0	10.0	1.3	11.5

Table 2 *(continued)*
Descriptive Statistics (Mexico-ENIGH, 1992-2010)

Survey year	1992		1994		1996		1998	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Household characteristics								
Female household head	13.9	34.6	14.7	35.4	16.1	36.8	17.5	38.0
Household size (average # of members)	4.7	2.3	4.6	2.3	4.5	2.3	4.3	2.1
Household head education								
No education	15.8	36.5	17.3	37.8	13.9	34.6	16.4	37.1
Incomplete primary school	29.2	45.5	26.7	44.2	26.2	44.0	43.0	49.5
Complete primary school	20.9	40.7	20.7	40.5	21.0	40.7	1.7	13.1
Incomplete junior high school	3.9	19.4	4.4	20.5	3.9	19.2	17.7	38.1
Complete junior high school	12.1	32.6	12.4	32.9	14.2	34.9	10.0	30.0
Incomplete high school	2.9	16.7	2.5	15.5	3.3	17.8	0.4	6.6
Complete high school	4.7	21.1	5.2	22.2	6.2	24.1	5.8	23.4
Some college education	3.8	19.1	4.0	19.5	4.3	20.2	0.1	2.6
Complete college	6.0	23.7	6.2	24.1	6.0	23.8	4.0	19.6
Some graduate school	0.7	8.5	0.7	8.6	1.1	10.4	0.9	9.5
Household composition								
With member(s) over 65 years old	14.1	34.8	15.1	35.8	14.5	35.2	14.0	34.7
With elderly and children	2.2	14.5	2.4	15.4	2.3	14.8	3.0	17.2
With children under 5 years old	26.8	44.3	24.4	43.0	24.9	43.2	32.3	46.8
Without elderly or children	56.9	31.2	58.0	31.4	58.4	31.1	50.6	32.9

Table 2

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2000		2002		2004		2005		2006		2008		2010		Pooled cross-sections (1992-2010)	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
18.3	38.7	20.0	40.0	23.3	42.3	23.2	42.2	25.0	43.3	25.0	43.3	24.6	43.1	20.7	40.5
4.2	2.0	4.1	2.0	4.0	2.0	4.1	2.0	4.0	2.0	4.0	2.0	3.9	2.0	4.2	2.1
12.8	33.4	13.5	34.2	11.5	31.9	10.5	30.7	9.9	29.9	9.5	29.3	9.2	29.0	12.4	33.0
20.7	40.5	22.7	41.9	23.3	42.3	21.7	41.2	20.2	40.2	21.5	41.1	19.3	39.4	24.4	43.0
2.4	15.4	19.9	39.9	18.5	38.8	18.6	38.9	18.8	39.1	18.6	38.9	19.0	39.2	16.4	37.0
22.6	41.8	3.6	18.6	3.8	19.2	4.2	20.0	3.7	18.9	4.0	19.6	4.0	19.6	6.8	25.1
3.3	17.8	17.4	37.9	15.8	36.5	15.8	36.5	16.7	37.3	21.2	40.9	22.0	41.4	15.0	35.7
17.0	37.5	3.3	17.9	4.6	21.0	4.9	21.6	4.9	21.7	3.3	17.8	3.4	18.2	4.7	21.1
2.8	16.5	5.7	23.2	9.4	29.1	10.8	31.0	11.7	32.2	8.2	27.5	8.5	27.9	7.4	26.2
6.1	23.9	4.7	21.3	2.5	15.6	2.8	16.5	2.7	16.1	2.6	16.0	2.6	16.0	3.2	17.7
3.8	19.2	7.9	26.9	8.9	28.5	9.1	28.8	9.5	29.4	9.6	29.5	10.0	30.0	7.6	26.5
8.5	27.9	1.3	11.3	1.6	12.6	1.5	12.2	1.8	13.1	1.5	12.3	1.9	13.7	2.0	14.1
15.0	35.7	16.1	36.7	16.3	37.0	17.0	37.5	17.3	37.8	18.1	38.5	12.5	33.1	15.5	36.2
2.6	16.0	2.5	15.5	3.0	16.9	2.8	16.5	2.7	16.3	2.6	15.8	1.6	12.5	2.5	15.6
29.5	45.6	28.3	45.0	27.7	44.8	26.6	44.2	27.5	44.7	25.6	43.7	18.5	38.9	26.4	44.1
52.9	32.4	53.2	32.4	53.0	32.9	53.6	32.7	52.5	32.9	53.7	32.6	67.4	28.1	55.5	32.0

Table 2 *(continued)*
Descriptive Statistics (Mexico-ENIGH, 1992-2010)

Survey year	1992		1994		1996		1998	
Variable	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Area of residence characteristics								
Place of residence								
Strata 1 (Urban: City of 100,000 or more inhabitants)	51.3	50.0	52.0	50.0	51.9	50.0	59.9	49.0
Strata 2 (Locality of 15,000 to 99,999 inhabitants)	11.2	31.5	9.1	28.8	10.7	31.0	2.2	14.5
Strata 3 (Locality of 2,500 to 14,999 inhabitants)	13.1	33.8	14.7	35.4	13.3	34.0	13.4	34.1
Strata 4 (Rural: Locality with fewer than 2,500 inhabitants)	24.4	43.0	24.2	42.8	24.0	42.7	24.5	43.0
High-migration state	19.1	39.3	20.3	40.3	18.9	39.1	18.3	38.7
Marginalization at the municipal level								
Very high	3.5	18.4	3.7	18.8	2.2	14.7	4.3	20.2
High	11.6	32.0	12.0	32.5	12.6	33.1	11.2	31.5
Average	10.4	30.5	10.6	30.8	15.0	35.7	12.1	32.6
Low	17.7	38.1	18.9	39.2	15.4	36.1	17.2	37.8
Very low	56.8	49.5	54.8	49.8	54.8	49.8	53.7	49.9
n	10,497		12,777		14,008		10,903	
N	17,778,008		19,399,579		20,424,558		22,075,429	

Note: *Income defined as total expenditure net remittances.

Source: Authors' estimates based on data from ENIGH 1992-2010.

Table 2

...continued from previous page

2000		2002		2004		2005		2006		2008		2010		Pooled cross-sections (1992-2010)	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
50.6	50.0	49.8	50.0	50.0	50.0	51.5	50.0	51.4	50.0	52.6	49.9	50.5	50.0	51.9	50.0
13.3	34.0	13.4	34.1	13.8	34.5	14.0	34.7	14.1	34.8	14.0	34.7	14.5	35.2	12.1	32.6
13.3	34.0	13.3	34.0	13.7	34.3	12.5	33.0	12.4	33.0	13.2	33.8	13.6	34.3	13.3	34.0
22.8	41.9	23.5	42.4	22.5	41.7	22.1	41.5	22.0	41.5	20.2	40.1	21.4	41.0	22.7	41.9
18.4	38.7	19.2	39.4	18.3	38.7	18.1	38.5	18.4	38.7	17.9	38.4	18.8	39.1	18.7	39.0
2.9	16.7	4.0	19.7	3.8	19.0	3.7	18.8	3.3	17.8	3.7	18.8	0.8	9.0	3.2	17.6
13.0	33.7	13.2	33.9	13.3	34.0	13.0	33.7	10.0	29.9	11.1	31.4	5.5	22.9	11.4	31.7
11.0	31.3	11.3	31.7	12.3	32.9	11.7	32.1	11.7	32.1	11.0	31.3	4.9	21.6	11.0	31.2
17.2	37.8	15.4	36.1	15.5	36.2	15.5	36.2	13.8	34.5	14.6	35.3	11.7	32.2	15.5	36.2
55.8	49.7	55.9	49.6	55.2	49.7	56.1	49.6	61.3	48.7	59.6	49.1	77.0	42.1	58.8	49.2
10,077		17,123		22,569		23,124		20,836		29,468		27,655		199,037	
23,604,771		24,478,820		25,536,478		25,659,796		26,503,852		26,732,594		29,074,332			

IV.ii. Descriptive characteristics of remittance-receiving households

Households receiving remittances differ from other households in measurable ways (**Table 3**). First, they have lower average income per capita and a slightly higher proportion live below the $ 1 PPP poverty line (6.3% *versus* 5.4%). By contrast, there is no statistically significant difference in the proportion living below the USD$ 2 poverty line.

Table 3

Access to Health Insurance by Household Type and Income Quintile, 2006

Variable		Household		Difference*	t
		No remittances	Remittances		
Total income		$ 2,309	$ 1,812	**$ 497**	8.3
% households under poverty line 1		6.3	5.4	**1.0**	1.5
% households under poverty line 2		30.5	29.7	0.9	0.6
OOP health expenditure		$ 198	$ 246	**-$ 48**	-1.5
Prevalence of CHE1 (%)	k = 20%	3.7	6.8	**-3.1**	-4.4
	k = 30%	2.0	3.9	**-2.0**	-3.6
	k = 40%	1.1	2.5	**-1.4**	-3.2
Prevalence of CHE2 (%)	k = 20%	5.4	8.7	**-3.3**	-4.1
	k =30%	3.9	6.5	**-2.6**	-3.7
	k = 40%	3.1	4.7	**-1.7**	-2.7
Prevalence of IHE (%)	With $ 1 (PPP) per capita per day	0.8	0.9	-0.1	-0.2
	With national food-poverty line	1.0	1.3	-0.4	-1.1
n		26,388	1,267		

Note: *Bold indicates difference is statistically significant at the 5% level.

Source: Authors' estimates based on data from ENIGH 2010.

Remittance-receiving households have higher OOP spending on health and significantly higher rates of CHE than households that do not receive any remittances. These results are consistent across all measures of catastrophic spending. OOP payments for health represented 4% of total income for households that did not receive any remittances and 6.7% for those that did receive them. IHE is also more common in households that receive remittances; however the differences are not statistically significant.

The characteristics of remittance-receiving households are further analyzed using simple regression analysis. The results regarding the probability and/or propensity of a household receiving remittances are grouped by three variable vectors:

a) Household characteristics,

b) Characteristics of the locality where the household resides, and

c) Control year of observation and state of residence (fixed-effects) (**Table 4**).

The results for the complete sample show that households with a female household head, and the presence of elderly family members or children in the home increase the probability of receiving remittances. These are likely to be households with greater healthcare needs.

Households in the poorest 40% of the income distribution are also more likely to be remittance receivers. Rural residence also increases the likelihood of receiving remittances, with a clear gradient from most rural to least. Remittances are more common among households living in a state with high levels of emigration or marginalization (high levels of poverty and limited access to services). The year dummies show a constant increase in remittances relative to the base year of 1992. When the sample is restricted to households in the poorest income quintile, or to rural residents in the poorest quintile, the stratification results are consistent with the whole sample estimations and the effects are more pronounced.

Table 4

Probit Estimation. Dependent Variable: Whether a household receives remittances, 1992 to 2010

	Complete sample		Subsample of households							
			Quintile I (poorest)		Rural		High migration states		Rural and pooorest quintile	
Variables	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.
Household Characteristics										
Female household head	0.043***	0.001	0.162***	0.009	0.093***	0.005	0.089***	0.005	0.204***	0.014
Household size	0.002***	0.000	0.013***	0.002	0.002***	0.001	0.002**	0.001	0.014***	0.003
Household head years of schooling	-0.003***	0.000	0.016***	0.002	-0.006***	0.001	-0.008***	0.001	0.024***	0.004
Household composition (Reference: households without children or elderly)										
With members over 65 years old	0.004***	0.001	-0.028***	0.008	0.005	0.003	0.007	0.005	-0.029**	0.013
With elderly and children	0.019***	0.003	0.081***	0.026	0.027***	0.008	0.050***	0.013	0.091***	0.035
With children under 5 years old	0.000	0.001	0.009	0.009	-0.004	0.003	-0.006	0.004	0.016	0.014
Income quintile (Reference: households in quintile III to V)										
I (poorest)	0.104***	0.003			0.140***	0.005	0.212***	0.009		
II	0.014***	0.002			0.015***	0.004	0.033***	0.006		
Place of residency (reference: urban areas, strata 1)										
Strata 2 (Localities of 15.000 to 99.999 inhabitants)	0.016***	0.002	0.071***	0.016			0.021***	0.007		

Table 4 *(continued)*

Probit Estimation. Dependent Variable: Whether a household receives remittances, 1992 to 2010

Variables	Complete sample		Subsample of households: Quintile I (poorest)		Rural		High migration states		Rural and pooorest quintile	
	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.
Household Characteristics										
Place of residency (reference: urban areas, strata 1)										
Strata 3 (Localities of 2,500 to 14,999 inhabitants)	0.026***	0.002	0.059***	0.015			0.063***	0.009		
Strata 4 (rural: Localities with fewer than 2,500 inhabitants)	0.048***	0.002	0.145***	0.013			0.116***	0.008		
Area of residence characteristics										
High-migration state	0.061***	0.002	0.215***	0.010	0.134***	0.004			0.278***	0.015
Marginalization at the Municipal level (reference=low marginalization)										
Very high	-0.008***	0.002	-0.077***	0.012	-0.003	0.005	-0.020*	0.010	-0.129***	0.018
High	-0.001	0.002	-0.040***	0.012	0.014***	0.005	0.007	0.009	-0.094***	0.019
Average	0.010***	0.002	0.014	0.013	0.035***	0.005	0.054***	0.007	-0.041**	0.020
Low	0.013***	0.002	0.044***	0.012	0.042***	0.005	0.047***	0.006	0.005	0.022

Table 4 *(continued)*

Probit Estimation. Dependent Variable: Whether a household receives remittances, 1992 to 2010

	Complete sample		Subsample of households							
			Quintile I (poorest)		Rural		High migration states		Rural and pooorest quintile	
Variables	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.
Survey year (Reference 1992)										
1994	-0.002	0.002	0.014	0.021	0.007	0.007	-0.003	0.010	0.027	0.030
1996	**0.013*****	0.003	**0.100*****	0.022	**0.027*****	0.007	**0.016***	0.010	**0.128*****	0.032
1998	**0.023*****	0.003	**0.081*****	0.022	**0.054*****	0.009	**0.034*****	0.011	**0.080*****	0.031
2000	**0.025*****	0.004	**0.083*****	0.024	**0.052*****	0.009	0.015	0.011	**0.110*****	0.037
2002	**0.024*****	0.003	**0.149*****	0.024	**0.057*****	0.009	**0.050*****	0.011	**0.187*****	0.034
2004	**0.019*****	0.003	**0.088*****	0.023	**0.050*****	0.008	0.009	0.010	**0.103*****	0.034
2006	**0.030*****	0.003	**0.109*****	0.022	**0.068*****	0.009	**0.031*****	0.010	**0.126*****	0.032
2008	**0.024*****	0.003	**0.073*****	0.020	**0.052*****	0.008	**0.024*****	0.009	**0.090*****	0.029
2010	**0.012*****	0.003	-0.012	0.017	**0.031*****	0.007	**0.024*****	0.010	-0.023	0.026
Pseudo R2	0.1584		0.1274		0.1384		0.1552		0.1468	
No. of observations	175,721		14,122		49,388		31,279		6,868	

Note: *Income defined as net-remittance total expenditure .
Coefficients are marginal effects with figures in bold indicating statistically significant difference at the 5% level.

Source: Authors' estimates based on data from ENIGH 1992-2010.

IV.iii. Propensity score estimates

The propensity score was calculated for each household for the entire sample and for each subsample (**Table 5**). In general, the results show, similar to previous authors (Esquivel & Huerta-Pineda, 2007), that remittances are associated with reduced poverty.

In summary, remittance-receiving households are less likely to be poor or to be impoverished. They also have higher levels of OOP spending and consequently higher prevalence of catastrophic health payments. These results are robust to varying the method for matching or pairing (near neighbor, kernel or stratification). There are, however, important differences when the sample is stratified by income group and rural residence.

Remittances are associated with a lower likelihood that the household is poor. Between 10% and 14.5% fewer remittance-receiving households fall under the $ 1 PPP poverty line than non-remittance receiving households. This result is more pronounced in the subsample of rural households in the poorest income quintile – 30% fewer families with remittances are poor. When the national food-poverty line is used, remittances are associated with 35% less poverty in the poorest rural families.

Remittances are also associated with higher levels of health spending. Families benefiting from this extra income spent approximately $ 200 Mexican pesos (approx. USD$ 16) more on health than families that do not receive remittances. These positive and statistically significant effects of remittances are consistent across the four subsamples analyzed. The absolute spending increase is lower for the poorest subgroup living in rural areas (ranging between $ 92 and $ 107 Mexican pesos – USD$ 7.4 and $ 8.6). These findings suggest that remittances are used partially or entirely to finance healthcare expenditures.

With respect to the impact on financial risk indicators, remittances are associated with catastrophic health expenditures. The estimates using the full sample and the simple measure of catastrophic spending range between 1.7% and 2.7% depending on the matching method. For households residing in rural areas, the estimates range between 1.6% and 2.3%. Considering only families residing in high-migration states the effect is larger than for other subsamples (approximately 3%).

Table 5
Estimation of the Average Treatment Effect of Receiving Remittances on CHE & IHE Indicators, Stratified by Poorest Quintile and Rural Residence, 1992-2010

Variable	Matching	Complete sample				Subsample of households (common support) Quintile I (poorest)*			
		n. treat.	n. contr.	ATT	Std. Error	n. treat.	n. contr.	ATT	Std. Error
Poverty status ($ 1 PPP poverty line)	Nearest neighbor	8,059	48,928	**-0.145**	0.005	2,334	4,032	**-0.270**	0.010
	Kernel	8,059	167,853	**-0.103**	0.008	2,334	13,186	**-0.265**	0.008
	Stratification	8,059	167,853	**-0.114**	0.017	2,334	13,186	**-0.189**	0.015
Poverty status (national food-poverty line)	Nearest neighbor	8,059	48,928	**-0.262**	0.007	2,334	4,032	**-0.385**	0.011
	Kernel	8,059	167,853	**-0.166**	0.012	2,334	13,186	**-0.364**	0.012
	Stratification	8,059	167,853	**-0.236**	0.012	2,334	13,186	**-0.349**	0.021
OOP health expenditures	Nearest neighbor	8,059	48,928	**227.800**	31.849	2,334	4,032	**162.640**	49.173
	Kernel	8,059	167,853	**194.150**	33.868	2,334	13,186	**165.020**	14.191
	Stratification	8,059	167,853	**200.840**	33.215	2,334	13,186	**111.240**	14.215
CHE (Simple method)	Nearest neighbor	8,059	48,928	**0.021**	0.003	2,334	4,032	**0.013**	0.006
	Kernel	8,059	167,853	**0.027**	0.007	2,334	13,186	**0.017**	0.007
	Stratification	8,059	167,853	**0.017**	0.007	2,334	13,186	0.009	0.011
CHE (Wagstaff & van Doorslaer method)	Nearest neighbor	8,059	48,928	**-0.039**	0.005	2,334	4,032	**-0.095**	0.009
	Kernel	8,059	167,853	**-0.007**	0.009	2,334	13,186	**-0.079**	0.009
	Stratification	8,059	167,853	**-0.026**	0.010	2,334	13,186	**-0.070**	0.016
IHE ($ 1 PPP poverty line)	Nearest neighbor	8,059	48,928	**-0.004**	0.001	2,334	4,032	**-0.006**	0.003
	Kernel	8,059	167,853	**-0.001**	0.003	2,334	13,186	**-0.004**	0.003
	Stratification	8,059	167,853	**-0.009**	0.003	2,334	13,186	**-0.012**	0.004
IH (national food-poverty line)	Nearest neighbor	8,059	48,928	**0.009**	0.002	2,334	4,032	**0.014**	0.004
	Kernel	8,059	167,853	**0.011**	0.005	2,334	13,186	0.014	0.005
	Stratification	8,059	167,853	0.003	0.005	2,334	13,186	0.001	0.007

Note: *Income defined as total expenditure net remittances.
Coefficients are marginal effects; figures in bold are statistically significant at the 5% level. All models include controls for age, sex, place of residency characteristics, health insurance coverage (social health insurance and/or seguro popular), survey year and state fixed-effects.

Source: Authors' estimates based on data from ENIGH 1992-2010 using nearest neighbor, kernel and stratification matching.

Table 5

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Subsample of households (common support)											
Rural				High migration states				Rural and poorest quintile*			
n. treat.	n. contr.	ATT	Std. Error	n. treat.	n. contr.	ATT	Std. Error	n. treat.	n. contr.	ATT	Std. Error
3,708	9,528	**-0.194**	0.008	3,447	7,855	**-0.153**	0.008	1,284	1,730	**-0.292**	0.013
3,708	35,239	**-0.180**	0.008	3,447	25,342	**-0.142**	0.008	1,284	5,063	**-0.311**	0.008
3,676	35,271	**-0.160**	0.014	3,441	24,909	**-0.136**	0.017	1,278	5,069	**-0.286**	0.024
3,708	9,528	**-0.287**	0.011	3,447	7,855	**-0.274**	0.013	1,284	1,730	**-0.340**	0.013
3,708	35,239	**-0.245**	0.012	3,447	25,342	**-0.236**	0.012	1,284	5,063	**-0.349**	0.012
3,676	35,271	**-0.250**	0.013	3,441	24,909	**-0.260**	0.013	1,278	5,069	**-0.346**	0.029
3,708	9,528	**199.290**	30.968	3,447	7,855	**183.62**	36.474	1,284	1,730	**101.890**	6.820
3,708	35,239	**204.980**	49.010	3,447	25,342	**166.700**	56.509	1,284	5,063	**107.010**	14.687
3,676	35,271	**225.540**	47.211	3,441	24,909	**197.100**	61.283	1,278	5,069	**92.760**	17.205
3,708	9,528	**0.016**	0.005	3,447	7,855	**0.029**	0.007	1,284	1,730	**0.015**	0.007
3,708	35,239	**0.023**	0.007	3,447	25,342	**0.035**	0.007	1,284	5,063	**0.016**	0.007
3,676	35,271	**0.022**	0.011	3,441	24,909	**0.030**	0.007	1,278	5,069	0.000	0.014
3,708	9,528	**-0.058**	0.008	3,447	7,855	**-0.032**	0.009	1,284	1,730	**-0.100**	0.012
3,708	35,239	**-0.036**	0.009	3,447	25,342	**-0.032**	0.009	1,284	5,063	**-0.085**	0.009
3,676	35,271	-0.017	0.016	3,441	24,909	**-0.035**	0.011	1,278	5,069	**-0.089**	0.025
3,708	9,528	**-0.006**	0.003	3,447	7,855	**-0.008**	0.003	1,284	1,730	**-0.009**	0.004
3,708	35,239	**-0.003**	0.007	3,447	25,342	**-0.005**	0.003	1,284	5,063	**-0.003**	0.003
3,676	35,271	-0.006	0.004	3,441	24,909	**-0.012**	0.003	1,278	5,069	**-0.011**	0.007
3,708	9,528	**0.010**	0.003	3,447	7,855	**-0.011**	0.004	1,284	1,730	**-0.016**	0.004
3,708	35,239	**0.010**	0.005	3,447	25,342	**-0.011**	0.006	1,284	5,063	-0.015	0.005
3,676	35,271	0.001	0.007	3,441	24,909	**-0.005**	0.005	1,278	5,069	-0.009	0.012

By contrast, the measured association tends to be large and in the opposite direction using the Wagstaff and van Doorslaer method of calculating CHE which takes into account the effect on poverty. For the overall sample the measured association is consistently negative across pairing methods, and the size of the association varies substantially. This suggests that while remittances increase household health spending, they prevent the poorest households from falling below the poverty line or becoming more deeply impoverished due to health spending.

In the case of impoverishment from health expenditures, the effects of remittances on the findings show a small but statistically significant inverse association using the $ 1 PPP per capita per day poverty line. For the full sample, the estimates are less than 1%. For the restricted samples, the measured association tends to be close to 1%. The exception is the sample of rural residents where the association is lower and insignificant for one matching method. For the $ 2 PPP per capita per day measure, the findings are less conclusive except for high-out migration states that show a significant negative association.

V. Conclusions

This study analyzes a time series of data on health spending and income that spans almost two decades of highly comparable cross-sectional surveys: the ENIGH 1992-2010. This is a particularly rich source of data and is indicative of the investment that Mexico has made in building an evidence base for policy making.

The results of this study indicate that remittances are used as a protection mechanism against poverty and as a resource to finance health expenditures. Remittances are especially important for families in the poorest income quintile and for those living in rural areas.

Remittance-receiving households have a higher likelihood of incurring CHE, but at the same time lower likelihood of impoverishment. Risk of impoverishment from health spending for households below the $ 1 PPP poverty line tends to be lower for those who receive remittances. By contrast, risk is higher for remittance-receiving households if measured as household spending on health of 30% or more of CTP (that is, catastrophic). Using a combined measure that considers both high health spending relative to CTP as well as health spending at any level by families below the poverty line, remittances are associated with a reduced risk of impoverishment.

This finding of higher catastrophic spending among households that receive remittances may be explained in several ways. Households may receive an influx of remittances when there is a health crisis and directly in response to the health crisis. Thus, remittances between families and migrants may create a temporary wealth effect. This enables the family to increase their expenditure on health with respect to their more permanent CTP, and appears as a CHE. The income of remittance-receiving families increases, yet health spending increases by a more than proportional amount. This explanation suggests that the health crisis is the cause of the remittance. Another related possibility is that households restrict necessary health spending and once remittance funding is available –not necessarily in response to a specific health crisis– the family increases spending on health more than proportionally to spending on other items.

Using a more permanent measure of income (over a longer period than what is available from the ENIGH surveys), these households might be less likely to present CHE. On the other hand, without the remittance funding, the household would either suffer a more permanent catastrophic expenditure, or not spend on health. At the same time, remittances are associated with a higher likelihood of a health catastrophe that could also affect the income earning ability of the household in the longer-run.

This study cannot shed direct light on the causal relationship between health spending and remittances because the analysis data were a series of cross-sectional surveys. It is thus unclear if remittances induce higher health spending, or if the need for health services due to health shocks induces remittances. Further studies will be needed to make inferences regarding the causality between health shocks and remittances.

Nevertheless, the results do strongly suggest that the households that have the least access to formal financial protection in health are those that are most likely to rely on remittances. More than likely, these households become vulnerable when economic crises or other factors cause remittances to decline as this means losing a key source of protection against health shocks. This highlights the importance of providing stable sources of financial protection in health to these families, the objective of *Seguro Popular*. A topic for future research with the same data applied in this paper will consider the interaction between access to *Seguro Popular*, remittances and household health spending.

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Chapter 10

The Vulnerability of the Uninsured to Health Shocks in Peru

Chapter 10

The Vulnerability of the Uninsured to Health Shocks in Peru

Juan José Diaz[i], Martin Valdivia[ii]

I. Introduction

Equitable health financing to offer adequate financial protection to the poor against health shocks has been gaining importance as a policy priority in Latin America (Baeza & Packard, 2006; ECLAC, 2008). Indeed, the World Health Organization (WHO) has included protection from catastrophic health expenditure as a key indicator of fairness in health system financing (WHO, 2000).

Many factors explain the significant progress in reducing fertility and infant mortality[1] over the past two decades, including long-term urbanization trends and increased education, especially of women, as well as the implementation of publicly-financed targeted health interventions (Cutler, Deaton, & Lleras-Muney, 2006). Indeed, innovations in delivery and financing mechanisms have been important in shaping healthcare policies to provide preventive and basic services to the most vulnerable, in most cases for reproductive health and early childhood development. Many of these interventions, however, were organized circumventing the health sector that continued to supply low-quality healthcare for other health issues, and for the rest of the uninsured population. Moreover, the non-eligible, uninsured were exposed to the risk of large health expenditures in the event of a serious health shock, resulting in drastic, and sometimes permanent, reductions in welfare.

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1. See reports by the UN Statistics Division on monitoring progress towards the Millennium Development Goals (MDGs). Available at: *http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Products/ProgressReports.htm*. Valdivia (2006) reports a summary table based on those estimates. Progress in the reduction of maternal mortality, though, has remained slow in many Latin American countries.

The large proportion of informal employment in low and middle income countries (LMICs) is a major explanatory factor for the large segments of populations living without health insurance. Consequently, the past decade saw an increasing number of studies discussing the different implications of this disadvantage for the health status and use of health services by the poor. These studies used different indicators to show that the poor were spending a larger share of their budgets on out-of-pocket (OOP) health expenditures than the rich.[2]

This chapter first discusses the advantages and limitations of recent research on catastrophic health expenditures. Next, section III discusses the key characteristics of the Peruvian health sector focusing on financial protection. section IV presents the estimates of catastrophic health expenditures for Peru, a country that has been omitted in several of the previous regional studies. The research then uses longitudinal data to analyze the relative impact of catastrophic health expenditures, compared to reductions in non-medical consumption and income losses, as the key consequence of large health shocks for those who are not fully insured (section V). The paper ends with a summary and a discussion of the limitations of the analysis, and the policy implications for reducing the financial vulnerability of the Peruvian, uninsured poor to large health shocks.

II. Health Shocks and the Vulnerability of the Poor: A Review of Recent Literature

Health shocks can have dramatic effects on the way a family interacts and operates to obtain a certain living standard. Specific adjustments differ depending on the type of shock being considered, the severity of the illness, and the cost of medical treatment. If OOP expenditures are large in relation to the household disposable income, then catastrophic health expenditures occur. However, even if medical treatment costs are not large, there may be a catastrophic financial shock induced by illness if the family experiences a large income loss as a result of lost wages.

2. See Chapter 2: Household Health Spending, Equity and Poverty: A Literature and Methodology Review by Knaul FM, Arreola-Ornelas H, Pleic M, & Wong R in this Volume.

An illness by a working adult, for instance, may imply several days out of work, which would imply an income loss if the individual is self-employed or is not affiliated to a standard system of social security (as is the case for about 3 out of every 4 Peruvian workers).[3] If the illness or injury is mild, a few days of rest may be enough, but otherwise the individual would need to see a doctor who might prescribe medications or even hospitalization, which would imply large OOP payments if they are not affiliated to a health insurance scheme that covers such an ailment.[4] If the sick individual is a non-working child or elderly person or becomes dependent due to illness, income losses may still occur as a working adult may need to take time off work to care for the ill family member, or accompany them to medical appointments. The burden often falls most heavily on women. If OOP health expenditures are large in relation to household disposable income, then catastrophic health expenditures occur. However, even if medical treatment costs are not large, there may be a catastrophic health shock if the working individual experiences a large income loss as a result of lost wages.

If the treatment of illness or injury demands large OOP payments, the uninsured family may pursue a combination of strategies in order to afford such expenses. If payments are relatively small, a temporary adjustment in other household expenditures may suffice; but if they are larger, the household may need to *dis-save*, or sell off some of their assets. If medical costs are larger than their savings, households may still be able to borrow money to afford such payments, either from a formal or informal lender, or through their social network (relatives, neighbors, and friends). If savings or credit is relatively easy to access, the household may not need to sacrifice much current consumption to afford the corresponding OOP expenditures.

Most likely, however, poor and uninsured households will need to drastically adjust their current consumption to afford large OOP health expenditures. Furthermore, these temporary adjustments may have permanent consequences. If food expenditures are reduced, children's nutrition may suffer, with possibly permanent effects on their learning abilities, thus affecting their future performance at school and in the labor market. Children may also be forced to drop out of school altogether, or change from a private to a public school if the

3. Only employment-based social insurance covers disability. Other insurance schemes tend to limit their coverage to health expenditures.

4. In reality, affiliation to public health insurance in Peru, and other LMICs, may not be enough to avoid OOP expenditures since public and social security health centers are often under-budgeted and therefore need to ask insured patients to pay for some medications or exams if they want quality and timely treatment.

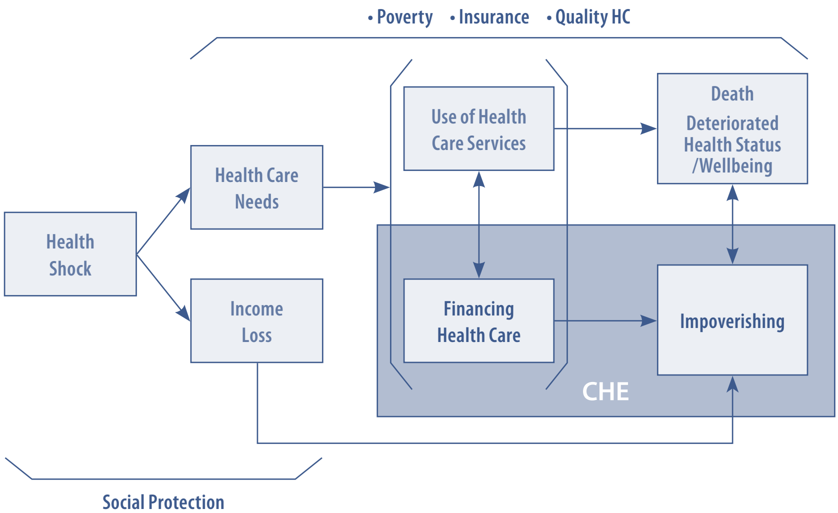
health shock lasts long enough. In any event, either catastrophic health expenditures or income losses may push the family of a severely ill or injured person into poverty. That is, households may need to shrink their non-medical expenditures below the poverty line.[5]

Another possible, yet excruciating, decision would be for the household to forgo the required medical expenditures, hoping that time will help the healing process. The potential consequences of the injury or illness can lead to permanent disability, or permit a disease to turn into a chronic condition or even premature death. These painful trade-offs are considered by household members and decisions are affected by the preferences and bargaining power of the different members. **Figure 1** summarizes the different mechanisms through which a large health shock can affect the welfare of an individual or family. Nevertheless, the recent literature on financial protection from health shocks has focused on the impoverishing consequences of a family having to absorb large OOP health expenditures, i.e., catastrophic health expenditures (CHE). This is often because of the absence of either longitudinal or even cross-sectional data on income and other losses from ill health. The dotted lines in **Figure 1** indicate the subset of issues that are discussed by this literature while at the same time illustrating the mechanisms that are omitted.

The recent focus of health financing literature on CHE is based on the idea that the largest impact of living without health insurance is that households have to pay large health costs direct and OOP in the event of a serious illness or accident. However, as discussed above, households need to have some resources to afford such expenses, either by selling their household or business assets or by borrowing from friends, neighbors, village banks, the healthcare provider or formal credit institutions. Households that are poor in assets or social capital are not able to do so. Moreover, quality healthcare is often not available in their neighborhoods. Thus, when the poorest households face a serious health shock, they often have to assume deteriorated health conditions, permanent disabilities or even death. Another aspect often underemphasized in studies of CHE are the severe temporary or permanent income losses. All of these factors are typically ignored when discussing policy options around universal health insurance.

5. Official poverty measures in Peru are defined as per capita household expenditures that fall below a poverty line estimated by the costs to buy a food basket (extreme poverty line) or a consumption basket (regular poverty line). Impoverishment effects may thus be underestimated as a household's total expenditures may remain high precisely as a result of out-of-pocket health expenditures.

Figure 1
The Vulnerability of the Poor/Uninsured to Health Shocks



Source: Authors elaboration.

III. Access and Financing of Healthcare in Peru

The Peruvian health system includes a mixture of private and public funders, insurers and providers. The main insurers are *EsSalud* and the Integral Health Insurance (SIS). *EsSalud* is part of the social security system which covers formal sector workers who contribute a proportion of their salary to health insurance and the pension system. Under social security health insurance, contributions can be split between *EsSalud* and other previously defined and contracted private providers, called healthcare provider enterprises (EPS), with the latter usually offering health plans that cover mainly low complexity care. *EsSalud*, however, covers all levels levels of care at their own network of health facilities and cannot use exclusionary policies or copayments.

SIS is a Ministry of Health (MOH) decentralized agency funded by fiscal resources directly provided by the Ministry of Economics and Finance. It fully subsidizes the poor population but with a benefit package that is much more restricted than that of *EsSalud*. The SIS package includes mostly preventive and curative care at MOH health facilities for a set of procedures that give priority to reproductive health and early childhood development. Recent adjustments included benefits for other adults and the elderly, especially for particularly vulnerable population groups. Partial subsidies are offered to the population that can pay a small premium.

Affiliation to the fully subsidized program is determined based on a specially designed proxy-means test that determines if the individual is poor or extremely poor. With respect to payments to health facilities, once a SIS affiliate is treated, the health facility files a reimbursement request for the specific procedures applied to the patient, based on a previously published price list that covers only variable costs.

Other insurance providers include private insurance firms, and EPS for army and police forces. These account for a very small fraction of the population.

The annual National Houshold Surdey (*Encuesta Nacional de Hogares* – ENAHO) provides an estimate of access to health insurance by the Peruvian population.

Table 1 presents the percentage of individuals who reported having access to health insurance in 2000, 2002 and 2006. For 2000, prior to the creation of the SIS, the data refer to affiliation to predecessor institutions – the mother-child health insurance (SMI) and the school-based health insurance (SEG).

Table 1

Access to Insurance and Health Services Utilization (%)

	2000	2002	2006
Affiliated to a health insurance plan	44.3	40.4	37.9
EsSalud	18.3	17.1	18.4
SEG-SMI / SIS*	24.6	20.0	16.4
Other private	5.4	4.7	4.2
Utilization of medical services (last 4 weeks)	20.5	19.7	15.2

Note: *For 2000, the figure refers to affiliation to the SIS predecessors, the school-based health insurance (SEG) and the mother-child health insurance (SMI).

Source: ENAHO 2000, 2002, 2006.

In 2000, 44% of individuals reported being covered by health insurance while in 2006 the figure was only 38%. The decline can be primarily explained by the affiliation to SEG-SMI in 2000 and the SIS in 2006. This is likely the result of the way SIS has organized its process to affiliate its targeted population which is based on individuals, especially women of reproductive age and children, showing up at MOH health centers with their ID card to be categorized according to their socio-economic status.[6]

These data confirm that *EsSalud* and SIS are the main insurance plans available for the Peruvian population.[7] In 2006, 18% of individuals reported being affiliated to *EsSalud* while 16% reported affiliation to SIS. All other insurance alternatives are used by only 4.2% of the Peruvian population. A very important difference between these two insurance plans is the distribution of their affiliates across income quintiles. **Table 2** shows that the publicly subsidized SIS is clearly more pro-poor. While 34% of people in the poorest quintile report affiliation to SIS, only 1% are affiliated to *EsSalud*. On the other hand, among the richest quintile, 43% report affiliation to *EsSalud* while only 2% report affiliation to SIS.

Table 2

Access to Health Insurance by Type and Income Quintile, 2006

Per Capita Income Quintile	Insured	EsSalud	SIS
I (poorest)	34.8	1.1	33.7
II	31.0	6.1	24.6
III	31.0	15.0	14.6
IV	37.5	27.4	7.0
V (richest)	55.3	42.6	2.1
Total	37.9	18.4	16.4

Source: Author's calculations based on ENAHO 2006.

6. This differs from the way SEG worked as any child attending a public school was automatically affiliated to the insurance program and mothers and children were aware of that situation.

7. Note that affiliation by source is not exclusive as an individual may have private health insurance in addition to *EsSalud* or SIS. However, the SIS affiliation process tries explicitly to avoid affiliating individuals already covered by *EsSalud*.

There are some factors that limit how these affiliation indicators reflect the proportion of the population protected from catastrophic OOP health expenditures. On the one hand, financial protection may be underestimated as it is possible that some individuals who report not having insurance may learn to be SIS beneficiaries when they go to an MOH health facility in search of medical attention. This situation may be important considering that subsidized affiliation requires individuals to show up at an MOH health facility and be classified as poor, which they likely do when they actually need healthcare. On the other hand, financial protection may be overestimated as many affiliates to SIS or *EsSalud* still have to pay OOP for some of the medicines, instruments or exams, etc. in order to secure quality healthcare.

Table 3 shows the importance of OOP payments for health by income quintile based on the share of per capita household income devoted to OOP health payments. The percentage is 4.4% for the total population but varies significantly by insurance status and across income levels. The ratio goes up to 5% for the uninsured while it goes down to 1.7% for those affiliated to SIS. This suggests that SIS affiliates tend to have lower OOP health expenditures. *EsSalud* affiliates, on the other hand, report as much OOP health expenditure as the uninsured, although the level and quality of healthcare received may be very different from those without insurance. Another important feature is that reported payments are very pro-rich in the case of *EsSalud* affiliates while they are somewhat pro-poor in the case of SIS affiliates. Again, these patterns may hide differences in the amount and quality of the healthcare received from the different insurance plans.

Table 3

OOP Health Expenditures by Type of Insurance (%)*

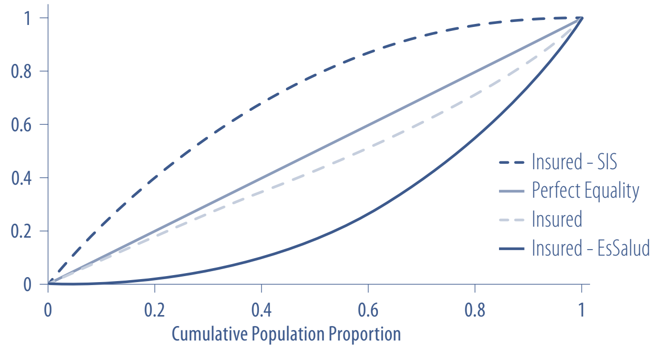
Income Quintile	Total	EsSalud	SIS	No Insurance
I (poorest)	4.8	8.7	1.1	6.6
II	4.2	5.5	1.7	5.1
III	4.4	4.3	2.5	4.8
IV	4.4	4.4	3.1	4.6
V (richest)	4.0	4.4	2.1	3.7
Total	4.4	4.5	1.7	5.0

Note: *Numbers reported refer to the percentage of per capita income assigned to OOP health expenditure by individuals.

Source: Author's calculations based on ENAHO 2006.

Figure 2

Affiliation by Type of Insurance - Concentration Curves



Source: Authors' calculations based on ENAHO 2006.

Figure 3

OOP Health Expenditure by Type of Insurance – Concentration Curves

Source: Authors' calculations based on ENAHO 2006.

These differences across the income distribution between *EsSalud* and SIS affiliates can be further analyzed with concentration curves. **Figure 2** and **Figure 3** show the distribution of affiliation and OOP health expenditure by the two groups of affiliates analyzed thus far, confirming the patterns observed in **Table 2** and **Table 3**. **Figure 2** shows that SIS affiliates are clearly concentrated in the poorest tail of the income distribution. About 65% of SIS affiliates are concentrated in the poorest 40% of the population while only 7% of *EsSalud* affiliates are found in this income group. In addition, **Figure 3** shows that OOP health expenditure among SIS affiliates is relatively pro-poor in comparison to that of *EsSalud* affiliates. The poorest 40% accumulate about 10% of the OOP health expenditure generated by SIS affiliates, while the figure is 20% for *EsSalud* affiliates.

IV. Catastrophic and Impoverishing Health Expenditures

The analysis of the distribution of OOP health expenditure may not adequately reflect the financial vulnerability of Peruvian households to a large health shock. Many who report non-zero OOP health spending pay minimal costs associated with minor health shocks that they can handle without much suffering and with the help of their savings or their social network, including relatives and friends. This study seeks to focus on those households that face serious health shocks that prompt them to spend a disruptive proportion of their disposable income in order to provide the ill or injured member with good, timely medical care. This is what is often referred to as catastrophic health expenditure. Although easy to define, this concept is not as easy to operationalize. An important literature discusses the relative advantages of alternative definitions, considering that the results tend to vary significantly with adjustments in the definition used to calculate the incidence of CHE.[8]

This section first reviews some of the most important definitions used in the literature. It then describes the database used to analyze the incidence of CHE in Peru. Finally, key results about the magnitude and nature of CHE among the Peruvian population are presented.

8. See Chapter 2: Household Health Spending, Equity and Poverty: A Literature and Methodology Review by Knaul FM, Arreola-Ornelas H, Pleic M, & Wong R in this Volume.

IV.i. Methodology

Operationalizing the definition of a CHE event demands defining disposable income, and for that one needs to define a level of subsistence expenditure, as well as the threshold for the proportion of OOP health spending to be considered catastrophic given the level of disposable income by a particular household. Wagstaff & van Doorslaer (2001) and Xu, et al. (2003), among others, discuss the definition carefully, based on the capacity-to-pay of each household.

A household's capacity-to-pay (***CTPi***) is defined as the difference between household income or expenditures (***Yi***) and the cost of a basket of non-health basic needs (***S***) adjusted for household size:

$$CTP_i = Y_i - S \quad (1)$$

Let y_i^h denote household i's OOP health expenditures. Then, a household suffers a CHE if $y_i^h \geq x \cdot CTP$, where $x > 0$ is the pre-defined threshold level. In that sense, the incidence of CHE can be described with the following ratio:

$$\alpha = \frac{\#\{i \in I : y_i^h \geq x \cdot CTP_i\}}{\#\{i \in I_i\}} \quad (2)$$

Wagstaff & van Doorslaer (2001) use the official local poverty line to define the level of subsistence expenditure. Xu, et al. (2003), on the other hand, define it endogenously as the average level of consumption of households between the 45th and 55th percentile. They also adjust consumption for economies of scale, arguing it is more consistent with their key objective: international comparisons of the incidence of CHE. Another important difference between these two previous methods is the way they handle the situation of the poor ($CTP_i \leq 0$). Thus any positive OOP health expense by the poor would be considered catastrophic, regardless of its size, which is reasonable considering that these families are already unable to afford basic consumption needs. However, Xu, et al. (2003) deal with health expenditures by the poor in a different way. They replace the subsistence level of consumption with the actual levels of food expenditures for those with food expenditures below the subsistence level. Thus, no household has a negative capacity-to-pay ($CTP_i \leq 0$), and some poor households with positive OOP health expenditure may not be considered as having incurred CHE.

The definition of large OOP health expenditures ends up being arbitrary. The general idea is that OOP spending beyond a given threshold seriously disrupts the welfare of the household.[9] One way to make sense of such operationalization is to make a connection to the idea that CHE may have impoverishing consequences. Thus, one first needs to define the poor, with S being a natural choice for a poverty line. Then a household is defined as poor if $CTP_i \leq 0$. It follows that y_i^h has an impoverishing effect if $\hat{CTP_i} = CTP_i - y_i^h = (Yi - y_i^h) - S \leq 0$.

In other words, if non-health expenditures are not sufficient to afford basic non-health needs. Clearly, the uninsured are more vulnerable to larger OOP health expenditures. Also, the lower the CTP_i, the higher the probability that a certain level of y_i^h will push a household into poverty. It follows that the incidence of impoverishing health expenditures (IHE) can be estimated through the following ratio:

$$ß = \frac{\#\{i \in I : y_i^h \geq CTP_i\}}{\#\{i \in I\}} \tag{3}$$

These definitions help to clarify the nature of the relation between catastrophic health expenditures and impoverishment. They are equivalent for threshold $x = 1$. However, measures are normally not that strict (Baeza & Packard, 2006; Xu, et al., 2003; Wagstaff & van Doorslaer, 2001). The question is, then, what is an appropriate value for x? The lower the value of x, the larger is the incidence of CHE, but also the lower the probability that CHE leads to poverty. It follows that, for $x \in (0,1)$, CHE is necessary but not sufficient for a household to be impoverished as a result of the health shock. That is, households that become poor due to large health expenditures definitely face CHE, but some households with CHE do not fall into poverty.

If $x > 1$, there would be a lower proportion of households with CHE than if $x \leq 1$, but CHE would then be a sufficient condition to be impoverished by health spending. Households without CHE can fall into poverty as a result of health expenditures only if $x > 1$, unless a different poverty line is defined somewhere to the right of S. The choice of that different poverty line can also be an artificial way to increase both the incidence of CHE and IHE. The issue is that it is hard to justify a way to sustain two different poverty lines. Whatever reason could justify setting the poverty line to the right of S, would also justify its use in the calculation of capacity-to-pay.

9. See O'Donnell, et al. (2008), chapter 18.

Keeping in mind the relationship between health impoverishment and CHE, one can agree on a meaningful value of x. Then following Wagstaff & van Doorslaer (2001) it is possible to analyze the regressiveness (progressiveness) of both measures (CHE and IHE) using already familiar indicators such as the headcount ratio (α *or* β) and the concentration index.

Previous studies that have analyzed inequalities in CHE across the income distribution seek to find an indicator that could describe such distribution with one scalar. The poor-to-rich ratio, for instance, compares the situation of the extremes, establishing the number of times the ratio of the poor was compared to that for the rich. The limitation of this indicator is that it is based only on the extreme, and therefore does not capture changes in the situation of the in-between groups. Van Doorslaer & Wagstaff (1997) provide a variety of methodological alternatives to better characterize the distribution of OOP health expenditures along the income distribution. One such indicator is the concentration index (C) which is a generalization of the Gini coefficient. Let "$L(y)$" denote the concentration curve which identifies, for each point in the income distribution, the proportion of OOP health expenditure incurred by the lower tail. Then, C can be defined as follows:

$$2C = 1 - 2\int_0^1 L(y)\,dy \qquad (4)$$

C takes a value of zero when $L(y)$ coincides with the diagonal line, and will take a positive (negative) value when $L(y)$ is located below (above) the diagonal. However, C will take a positive or negative value even when $L(y)$ crosses the diagonal. In the case of a positive (negative) value, the distribution of OOP health expenditures is considered to benefit the poorest (richest), as the poorest tend to spend less on health than their share of the total population. This inequality indicator is sensitive to all movements along the income distribution, although it tends to fail to transmit the level of injustice or urgency that is captured in the poor-rich ratio.

More recently, concerns have focused on the impoverishing consequences of catastrophic health expenditures, as averages tend to hide the catastrophic consequences of the lack of health insurance for those facing serious health events. The following section discusses this line of literature.

IV.ii. Incidence and Inequalities in CHE and IHE

This sub-section presents the estimates of the incidence of CHE and IHE among Peruvian households using the methods described above. According to **Table 4**, and based on ENAHO 2006, Peruvian households spend on average about 812 soles a year on OOP health spending, while average total household expenditures is 18,072 soles a year. An important and telling feature of the Peruvian health system is that inequality of the distribution of OOP health spending is higher than inequality of total household expenditure. The concentration index (**C**) for OOP health spending is 0.41 while the Gini coefficient for total expenditures is only 0.32. That is, OOP health expenditure is more concentrated among the rich than other household expenditures. However, as discussed before, it is not possible to say whether this is a positive distributional outcome as the lower expenditures by the poor may still be associated with lower levels of healthcare utilization, or lower quality care.

The incidence of CHE (headcount ratio – HR) is presented using Xu, et al. (2001 and 2003) (hereafter referred to as CHE1) and the one used by Wagstaff & van Doorslaer (2001) (hereafter referred to CHE2). **Table 4** presents the estimates of the headcount ratio (HR) for both definitions, using three different thresholds: 20%, 30% and 40%.

Clearly the method CHE2 implies a higher headcount ratio. The results are consistent across the thresholds. For instance, for the 20% threshold, according to the CHE2 method, up to 16% of Peruvian households incurred CHE in 2006. However, that proportion is only 10% when the CHE1 is used.

These differences are partly definitional as the methods vary in how subsistence level **S** is determined and in the treatment of OOP spending for the poor. CHE2 defines any positive OOP spending as catastrophic, while Xu adjusts the subsistence level **S** to the level of food expenditures actually incurred by the poor household. Thus, the CHE1 artificially increases the household's capacity-to-pay, reducing the incidence of CHE. **Table 4** also presents the estimates of a hybrid method for which **S** is determined as in the CHE1, but OOP spending by the poor is determined as proposed by the CHE2 method. The HR estimates with the hybrid method are very similar to the standard CHE1, so that one can conclude that the differences between the CHE1 and CHE2 correspond almost entirely to the choice of how to handle OOP spending by the poor.

Table 4
Average OOP Health Expenditure and CHE and IHE Incidence

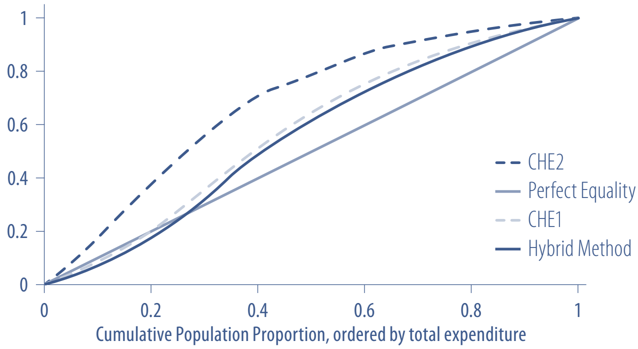
	Mean	CI
OOPHE (annual soles)	812	0.41
Total expenditures (annual soles)	18,073	0.32
CHE	**HR**	**CI**
CHE1 method		
20%	10.1	-0.20
30%	5.7	-0.32
40%	3.5	-0.42
CHE2 method		
20%	16.3	-0.45
30%	12.3	-0.61
40%	10.3	-0.71
Hybrid method		
20%	9.4	-0.14
30%	5.3	-0.28
40%	3.4	-0.40
IHE	0.8	-0.67

Source: Authors calculations based on ENAHO 2006.

The estimated concentration indices for each of the headcount ratios are negative suggesting that poorer households are more vulnerable to CHE events.[10] The CHE2 method implies not only a higher incidence of CHE but also that vulnerability is even more concentrated among the poorer households. The concentration curves show more clearly the greater vulnerability of the poorer. For the CHE2 method and the 30% threshold, the poorest 40% of Peruvian households incur 72% of CHE events. That proportion is only 50% when CHE1 is used. Overall, these results suggest that financial vulnerability to health expenditure in Peru is not only a result of large OOP payments for long-term, expensive treatments, which are less likely to be afforded by the poor; it is also a result of the poor being more likely to have to pay for the healthcare they need given that they are not fully insured.

10. See the explanation of expression (section IV) in sub-section IV.1 for a reminder of this implication.

Figure 4
Concentration Curves of CHE by Method (30% threshold)

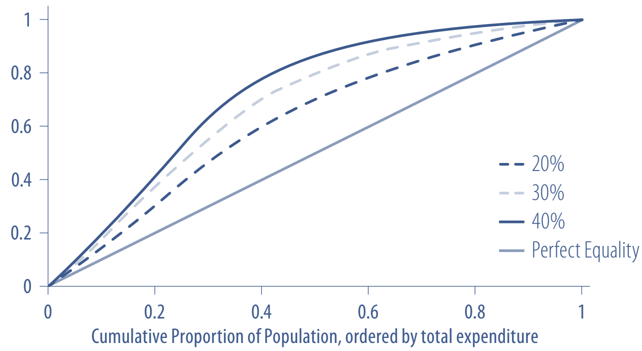


Source: Authors' calculations based on ENAHO 2006.

The final point associated with the distribution of the incidence of CHE among the Peruvian population refers to the sensitivity of the estimates presented to the threshold chosen. As shown in **Table 4**, a higher threshold implies a lower incidence. In the case of the CHE2 method, for instance, the proportion of households with CHE in 2006 is 16% when using the 20% threshold, but goes down to 10% when using the 40% threshold. However, the higher the threshold, the more pronounced is the vulnerability of the poor. Higher thresholds are associated with higher absolute values of the concentration indices. This is also evident in the concentration curves reported in **Figure 5** for the CHE2 method. When using the 20% threshold, about 62% of all CHE events are concentrated in the poorest 40% of the population, while that proportion goes up to 82% when using the 40% threshold.

In sum, although the concept of CHE as payments that severely disrupt the welfare of the population is very sensible, its operationalization requires some arbitrary definitions. Moreover, the specific estimates of financial vulnerability are significantly affected by some of the key methodological choices identified in the literature. However, the analysis helps in choosing an appropriate measure. The ENAHO survey estimates for the Peruvian population show that there are many poor households that are forced to pay OOP for their healthcare needs, which is particularly strenuous for these households considering that they do not have enough resources to buy the food they need. In this sense, it would seem reasonable to consider any positive OOP payments by these households as catastrophic; hence Xu's method underestimates the financial vulnerability faced by these households.

Figure 5
Concentration Curves CHE (CHE2 method) for Different Thresholds



Source: Authors' calculations based on ENAHO 2006.

Second, **Figure 5** shows that although a higher threshold reduces the incidence of CHE among the Peruvian population, it also implies a higher concentration of these negative events among poorer households. Thus, this study argues that regardless of the choice of threshold, the financial vulnerability to health shocks is a serious problem that demands policy action.

In order to define specific policy recommendations, it is useful to examine the factors that increase the vulnerability of Peruvian households to these shocks. The following sub-section presents this analysis.

IV.iii. Socio-Economic Determinants of CHE

Socio-economic characteristics affect a household's propensity to face a CHE event in a given period, either by increasing the probability of a negative health shock or by improving their capacity to afford the cost of medical care. First, household size, composition and area of residence may affect the propensity by increasing or reducing the probability that a household member falls ill or gets injured. A larger household with small children or elderly members residing in an urban area is more likely to face a negative health shock than a household with fewer members and no children or elderly. Household income, on the other hand, may not only affect the probability of an illness occurring but also the capacity of a household to afford medical care, either through OOP payments or through its effects on the likelihood of a household having family health insurance that covers the costs of medical care.

In this section, a multivariate econometric model is used to analyze the relative importance of these socio-economic factors as determinants of a household's financial vulnerability to health shocks, measured by the presence of a CHE event. **Table 5** reports the coefficients for the marginal effects for four models combining the two methods (CHE1 and CHE2) with and without access to health insurance as a determinant, at the 30% threshold. Although this analysis cannot prove causality, it is nevertheless useful to know the marginal predictive power of each variable in the presence of the others.

Household size, composition and income bracket are important determinants of CHE (**Table 5**). For the CHE2 method, being in the poorest quintile implies a reduction of about 12 percentage points in the probability of a household facing a CHE event, and the inclusion of the variable for access to health insurance does not seem to affect this pattern.[11] Having both small children (under 5 years of age) and elders (above 65 years of age) among the household members is associated with a higher likelihood of facing a CHE event (7 percentage points relative to households that have neither). The same is true for household size. Households with 5 or more members are 7 percentage points more likely to incur CHE than households with less than 3 members. Having access to insurance for all household members is associated with a lower likelihood of facing a CHE event, 5 percentage points less than those that have no member affiliated to an insurance program. Finally, although rural households appear to be more vulnerable to CHE events (**Appendix A**), the place of residence does not appear to be a significant determinant once household size, composition and income bracket are controlled for.

11. Notice that the simple difference in the incidence of CHE by quintile is much larger if one does not control for the other socio-economic determinants. According to Appendix A, a household in the second poorest quintile is 36 percentage points less likely to face a CHE event.

Table 5
Socio-economic Determinants of CHE – Probit model (CHE2 *versus* Xu at the 30% threshold)

	CHE2		CHE1	
	(1)	(2)	(3)	(4)
Residence area				
Urban (= 1 if urban)	0	0.001	0.004	0.005
	(0.03)	(0.21)	(1.32)	(1.36)
Income quintile				
Quintile II	-0.118	-0.119	-0.022	-0.022
	(35.97)***	(35.90)***	(6.30)***	(6.22)***
Quintile III	-0.132	-0.134	-0.047	-0.048
	(36.05)***	(36.14)***	(12.61)***	(12.69)***
Quintile IV	-0.129	-0.133	-0.049	-0.051
	(32.51)***	(33.36)***	(12.07)***	(12.75)***
Quintile V (richest)	-0.117	-0.123	-0.048	-0.053
	(26.39)***	(28.84)***	(10.37)***	(12.25)***
Household composition				
With children under 5	0.039	0.031	0.023	0.018
	(7.61)***	(6.34)***	(5.63)***	(4.58)***
With elders (above 65)	0.031	0.032	0.025	0.026
	(4.89)***	(5.06)***	(5.12)***	(5.18)***
Both	0.07	0.068	0.048	0.046
	(6.49)***	(6.26)***	(5.48)***	(5.26)***
Household size				
3 - 4 members	0.041	0.034	0.019	0.014
	(5.96)***	(5.01)***	(3.62)***	(2.76)***
5 or more members	0.066	0.057	0.022	0.016
	(9.39)***	(8.18)***	(4.26)***	(3.16)***
Insurance				
% hh members with insurance	-0.047		-0.032	
	(6.89)***		(6.07)***	
Observations	**20,577**	**20,577**	**20,577**	**20,577**
Pseudo R2	**0.27**	**0.27**	**0.06**	**0.06**

Notes: Marginal effects reported. Absolute value of t statistics in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Source: Authors' calculations based on ENAHO 2006.

The effect of omitting/including the health insurance variable is not significant in any of the models, in the sense that the coefficients of the other socio-economic determinants remain almost unchanged. Second, the proposed model of determinants is substantially less appropriate when CHE1 is used as compared to CHE2. The pseudo R^2 is much lower (0.06 *versus* 0.27). More importantly, although both methods result in the same significant variables, the estimated marginal effects are much smaller for CHE1.

Finally, it is important to note that by no means can the marginal effects reported in **Table 5** be interpreted as reflecting a causal relationship, especially in the case of access to health insurance. An instrument such as the geographical distribution of health facilities could have been used to identify a more causal effect. However, this avenue was not pursued here given the limitations of such an approach to identify an instrument that satisfies the exclusion restriction. Also, a panel of households could have been used to control for household fixed effects and to better approximate a causal effect. This approach is being undertaken in a related study (Bitrán & Associates, 2009).

Instead, this study uses unique panel data on health shocks in order to analyze the ability of households to cope with large negative health shocks. The research aims to contribute to the literature by revealing some other mechanisms through which Peruvian households are vulnerable to health shocks. The results of this analysis are presented in the following section.

V. Health Shocks, Private Social Protection Mechanisms and the Welfare of Peruvian Households

In this section, the Gertler and Gruber (2002) method is used to explore the effects of health shocks on households' OOP health expenditures, earnings capacity, and non-medical household consumption. In particular, the aim is to assess the capacity of households to finance episodes of illness that require large OOP expenditures. This analysis will contribute to our knowledge of household strategies and the role of the public health system to cope with health shocks.

V.i. Data

This part of the research uses the 2002-2003 rotating panel of the ENAHO which includes a subsample of 3,066 households. The survey questionnaire is comparable over time, and conveys information on aggregate household consumption, as well as information on household members' education, health, employment and earnings.

The ENAHO includes information on individual and household earnings, aggregate non-medical household consumption, OOP health expenditures and the occurrence of health shocks. There are two alternative ways to identify health shocks using ENAHO. The first consists of using information from the individual health section of the survey that records whether the household members report having a chronic illness. The occurrence of a chronic illness is a major negative health event, surely affecting household medical expenditures and likely affecting income-earning potential. Exploiting the longitudinal dimension of the data, the indicator registers the occurrence of a health shock when a household member changes from reporting not having a chronic illness in the 2002 survey to reporting having one in the 2003 survey. Since all the analysis is at the household level, health shock indicators are computed for the household as a whole. A set of shock indicators is defined as binary (dummy) variables that reflect whether:

a) Any household member changed to having a chronic illness from 2002 to 2003,

b) Any 14-55 year old member gets ill,

c) The head of the household gets ill, or

d) The household head's partner gets ill.

The second way to define health shocks is based on information from the perception section of the ENAHO. In this section of the survey, the household head is the informant. This study uses one of the questions regarding adverse events that affected household well being or household welfare during the last year. In particular, two negative events that reflect adverse health conditions are analyzed:

a) The death of a household member, and

b) The occurrence of a severe illness for any income-earning household member.

Unfortunately, there is no further information on the details regarding either the cause of death or the nature of the illnesses.

V.ii. Identifying Health Shocks in the ENAHO

Overall, 26% of households in the 2002-2003 panel experienced a health shock for at least one of their members, irrespective of age (**Table 6**). Concentrating on working age household members between 14 and 55 years of age only, gives a figure of 16% of households that experienced a health shock. In 11% of the households, it was the household head, and in 18% the partner of the head who suffered the occurrence of a new chronic illness. Using health shocks reported by the household head, less than 1% of households experienced the death of a member and about 5% experienced a severe illness for at least one of their income-earning members.

Since the response to the occurrence of health shocks might depend on the structure of the household, it is useful to explore the occurrence of shocks using several partitions of the sample according to the household composition. First, the sample is classified into households without children (980 households), households with any child present related or unrelated to the household head (2,086 households), and households with children whose mother or father is the household head (1,520 households). Then the last two groups are split into households where the household head's partner is present (1,735 households with any child and 1,369 households with children of the head) and households where the head's partner is absent (351 households with any children and 151 households with children of the head). Using the definition of health shocks in terms of new chronic illnesses, the results show that shocks affect all types of households almost equally. In general, one third of each type of household report a new chronic illness.

V.iii. Health Shocks, Health Expenditures and Earnings Potential

Next, this study explores whether these health shocks generate a sizable cost of illness that might affect the household consumption profile. In particular, the effects of health shocks on household per capita OOP healthcare expenditures and per capita labor earnings are analyzed.

Regressions of OOP health expenditures and labor earnings are run using the following specification:

$$\Delta\, Outcome_{ij} = \alpha_j + \beta \Delta h_{ij} + \sum_k \lambda_k X_{ijk} + \eta_{ij} \qquad (5)$$

where $\Delta\, Outcome_{ij}$ denotes the log change between 2002 and 2003 in per capita health expenditures and per capita labor earnings of household i from region j; α_j denotes region specific fixed-effects; Δh_{ij} represents the health shocks, either the occurrence of a new chronic condition, or the occurrence of an adverse health event; X_{ijk} denotes a vector of household characteristics, such as gender, age, and education of the household head, dwelling characteristics, number of household members and the proportion of household members aged 0-5 years; and η_{ij} denotes a random error.

Table 7 reports the regression results for per capita OOP healthcare expenditures for each health shock indicator and for every household type described earlier. The results show that health shocks, defined by the change in the presence of a chronic illness, generate sizable increments in per capita healthcare expenditures for all types of households. For the whole sample, per capita OOP healthcare expenditures between 2002 and 2003 were 0.6 log points more for households affected by a new chronic illness. When the health shock indicator refers to the head of the household, healthcare expenditures also increases by 0.6 log points. By contrast, when health shocks are defined using adverse events reported by the household, there is no statistically significant effect of health shocks defined by the death of a member on the change in per capita OOP health expenditures or by a severe illness among income earners.

With respect to the effect of health shocks on labor earnings, the picture is less clear. Although one would expect to find negative effects of health shocks on labor earnings, **Table 8** shows that there is no general pattern in terms of the effect of health shocks on per capita labor earnings. Although several of the estimated regression coefficients for changes in chronic conditions are negative, none are statistically significant.

On the other hand, several coefficients are positive and statistically significant. For instance, for the full sample the household labor earnings are positively related to the occurrence of a health shock for any household member and for the household head. One possible explanation is that other household members become engaged in income generating activities, even if these activities are not necessarily formal or permanent employment.

To summarize, the results show that new chronic illnesses and an income earner falling severely ill generate large increases in household per capita OOP health expenditures. On the other hand, no clear pattern emerges from the relationship between health shocks and per capita labor earnings.

Table 6
Health Shocks by Type of Household

	Full sample of households	Households with only adults	With kids in the household		With children of the household head	
			Head and partner present	Only head present	Head and partner present	Only head present
	(N=3,066)	(N=980)	(N=1,735)	(N=351)	(N=1,369)	(N=151)
Change in chronic conditions						
Any household member becomes ill (%)	25.8	25.7	26.1	24.8	24.0	19.9
Any household member 14-55 becomes ill (%)	15.6	12.4	17.6	14.5	17.8	12.6
Household head becomes ill (%)	10.8	13.2	8.9	13.7	7.7	11.9
Partner of the household head becomes ill (%)	17.8	20.2	17.3		15.5	
Main income earner becomes ill (%)	9.8	12.8	8.1	9.1	7.4	7.9
Adverse events reported by the household head						
A death of any household member (%)	0.8	0.9	0.2	3.1	0.2	4.6
Any household member becomes severely ill (%)	5.3	6.1	4.9	4.8	5.0	4.0

Notes: The table reports the percentage of households that suffer deterioration on the health status of their members. This deterioration is defined as the occurrence of a new chronic disease using information from the health section from ENAHO 2002 and 2003. The table also reports the percentage of households that suffer the death of a household member or experienced events of severe illness among household members as reported by the household head in ENAHO 2003.

Source: Authors calculations using a 2002-2003 panel of households constructed from ENAHO 2002 and 2003.

Table 7

Impact of Health Shocks on per Capita OOP Health Expenditures

	Full sample of households	Households with only adults	With kids in the household		With children of the household head	
			Head andpartner present	Only head present	Head and partner present	Only head present
	(N=3,066)	(N=980)	(N=1,735)	(N=351)	(N=1,369)	(N=151)
Change in chronic conditions						
Any household member becomes ill	0.625	0.717	0.471	1.428	0.481	1.394
	(0.118)	(0.246)	(0.142)	(0.378)	(0.165)	(0.696)
Any household member 14-55 becomes ill	0.613	0.872	0.417	1.553	0.463	2.027
	(0.142)	(0.329)	(0.163)	(0.453)	(0.184)	(0.819)
Household head becomes ill	0.623	0.796	0.269	1.425	0.156	1.871
	(0.166)	(0.313)	(0.220)	(0.469)	(0.264)	(0.850)
Partner of the household head becomes ill	0.443	0.418	0.537		0.612	
	(0.183)	(0.382)	(0.201)		(0.237)	
Main income earner becomes ill	0.729	0.960	0.371	1.674	0.475	2.129
	(0.172)	(0.312)	(0.227)	(0.560)	(0.267)	(1.025)
Adverse events reported by the household head						
A death of any household member	-0.459	-1.130	-1.880	-0.167	-0.788	-0.281
	(0.595)	(1.084)	(1.491)	(0.972)	(1.831)	(1.376)
Any household member becomes severely ill	-0.416	-0.339	-0.455	-0.993	-0.228	0.311
	(0.228)	(0.432)	(0.287)	(0.758)	(0.322)	(1.423)

Note: Standard errors in parentheses. Coefficients estimated from separated first differenced regressions of the change in per capita medical expenditures on health shocks and additional covariates.

Source: Authors calculations using a 2002-2003 panel of households constructed from ENAHO 2002 and 2003.

Table 8
Impact of Health Shocks on per Capita Labor Earnings

	Full sample of households	Households with only adults	With kids in the household		With children of the household head	
			Head andpartner present	Only head present	Head and partner present	Only head present
	(N=3,066)	(N=980)	(N=1,735)	(N=351)	(N=1,369)	(N=151)
Change in chronic conditions						
Any household member becomes ill	0.142	0.159	0.134	0.426	0.028	-0.059
	(0.087)	(0.200)	(0.086)	(0.343)	(0.096)	(0.519)
Any household member 14-55 becomes ill	0.040	-0.025	-0.020	0.829	-0.106	-0.121
	(0.105)	(0.267)	(0.099)	(0.407)	(0.107)	(0.616)
Household head becomes ill	-0.045	-0.137	-0.012	0.327	-0.117	-0.364
	(0.122)	(0.254)	(0.133)	(0.423)	(0.153)	(0.635)
Partner of the household head becomes ill	0.045	0.200	-0.024		-0.033	
	(0.135)	(0.309)	(0.122)		(0.138)	
Main income earner becomes ill	0.297	0.154	0.288	0.915	0.276	0.573
	(0.127)	(0.254)	(0.137)	(0.503)	(0.155)	(0.763)
Adverse events reported by the household head						
A death of any household member	-0.133	-0.083	-1.735	0.157	-0.779	-0.120
	(0.437)	(0.877)	(0.902)	(0.864)	(1.063)	(1.008)
Any household member becomes severely ill	0.054	-0.158	0.341	-0.225	0.409	0.638
	(0.168)	(0.350)	(0.173)	(0.676)	(0.187)	(1.040)

Note: Standard errors in parentheses. Coefficients estimated from separated first differenced regressions of the change in per capita family labor earnings on health shocks and additional covariates.

Source: Authors calculations using a 2002-2003 panel of households constructed from ENAHO 2002 and 2003.

V.iv. Health Shocks, Consumption Smoothing and the Welfare of Peruvian Households

This subsection assesses whether Peruvian households are able to insure their consumption profile from health shocks. First, the analysis explores whether health shocks generate changes in non-health consumption, and later, whether these changes track household labor earnings net of health expenditures.

If households were able to insure their consumption profile against illness, one would expect that changes in health events do not affect household's per capita consumption net of health expenditures. First-difference regressions of non-health per capita consumption on region fixed-effects, household characteristics, and health shocks are used to test this. The following estimating equation is used:

$$\Delta \ln\left(\frac{C_{ij}}{n_{ij}}\right) = \alpha_j + ß\Delta h_{ij} + \sum_k \lambda_k X_{ijk} + \xi_{ij} \tag{6}$$

where $\Delta \boldsymbol{ln}(C_{ij}/n_{ij})$ measures the log change in per capita non-health consumption expenditures of household $\boldsymbol{i}$ from region $\boldsymbol{j}$; α_j are region specific fixed-effects; $\Delta \boldsymbol{h}_{ij}$ represents the health shocks; $\boldsymbol{X}_{ijk}$ denotes a vector of household characteristics; and ξ_{ij} denotes a random error. If households are able to smooth consumption, one would expect that health shocks do not affect non-health consumption. That is, under full consumption insurance one expects to find $\beta = 0$. **Table 9** reports the results of the regression analysis. Contrary to what was expected, the results show that in general, per capita non-health consumption expenditures increase with the occurrence of new chronic illnesses.

Table 9

Impact of Health Shocks on per Capita Non-health Expenditures

	Full sample of households	Households with only adults	With kids in the household		With children of the household head	
			Head andpartner present	Only head present	Head and partner present	Only head present
	(N=3,066)	(N=980)	(N=1,735)	(N=351)	(N=1,369)	(N=151)
Change in chronic conditions						
Any household member becomes ill	0.071	0.070	0.076	-0.006	0.098	-0.080
	(0.019)	(0.041)	(0.023)	(0.062)	(0.027)	(0.107)
Any household member 14-55 becomes ill	0.056	0.060	0.059	-0.033	0.080	-0.120
	(0.023)	(0.055)	(0.027)	(0.074)	(0.030)	(0.126)
Household head becomes ill	0.042	0.019	0.074	-0.055	0.077	-0.171
	(0.027)	(0.052)	(0.036)	(0.076)	(0.043)	(0.130)
Partner of the household head becomes ill	0.087	0.136	0.057		0.078	
	(0.030)	(0.063)	(0.033)		(0.039)	
Main income earner becomes ill	0.069	0.024	0.081	0.094	0.073	0.059
	(0.022)	(0.052)	(0.037)	(0.091)	(0.044)	(0.158)
Adverse events reported by the household head						
A death of any household member	-0.231	-0.354	-0.484	-0.123	-0.341	0.039
	(0.098)	(0.179)	(0.244)	(0.155)	(0.299)	(0.208)
Any household member becomes severely ill	-0.023	0.038	-0.050	-0.110	-0.063	0.107
	(0.038)	(0.072)	(0.047)	(0.122)	(0.053)	(0.214)

Note: Standard errors in parentheses. Coefficients estimated from separated first differenced regressions of the change in per capita non-medical expenditures on health shocks and additional covariates.

Source: Authors calculations using a 2002-2003 panel of households constructed from ENAHO 2002 and 2003.

V.v. The extent of consumption insurance

The last step in the study consists of testing the extent of consumption insurance. To this end, regressions of non-medical consumption on labor earnings are run in order to measure how much of the cost of illness is financed from non-health consumption. The specification of the estimating equations is similar to the previous equations, except that now per capita labor earnings are included instead of health shocks:

$$\Delta \ln\left(\frac{C_{ij}}{n_{ij}}\right) = \alpha_j + \beta \Delta Y_{ij} + \sum_k \lambda_k X_{ijk} + \xi_{ij} \qquad (7)$$

In this specification, ΔY_{ij} represents the change in log per capita labor earnings net of health expenditures of household i from region j. All the other variables in the equation are defined as before.

Following Gertler and Gruber (2002), the fixed-effect regression is estimated by 2SLS, using health shocks as the instrumental variables for labor earnings. The idea is to avoid two potential sources of bias. The first is that labor income and the error term in the consumption equation are correlated through the household production process (Morduch, 1995). The second is the potential bias related to measurement error in the growth of labor earnings that might be correlated with the error term.

The estimation results are reported in **Table 10** for the estimated coefficient associated to the change in per capita labor earnings net of healthcare expenditures. Each row of **Table 10** reports a coefficient from a separate 2SLS regression where the indicated health shock is the instrumental variable for net labor earnings.

As it turns out, despite the absence of a clear pattern, most of the point estimates are not statistically significant in the estimated 2SLS regressions. Taken at face value, these results would appear to suggest that Peruvian households are able to insure consumption completely against negative health shocks. However, it must be recalled that most of the first stage regressions, the regressions of labor earnings on health shocks, showed no robust relationship between these variables. There is evidence, however, that when the household head becomes ill, there is a positive relationship between earnings and consumption (but only statistically significant at the 10% level) for the full sample, suggesting no consumption smoothing.

Table 10

Consumption Smoothing Regressions

	Full sample of households	Households with only adults	With kids in the household		With children of the household head	
			Head andpartner present	Only head present	Head and partner present	Only head present
	(N=3,066)	(N=980)	(N=1,735)	(N=351)	(N=1,369)	(N=151)
Change in chronic conditions						
Any household member becomes ill	0.503	0.440	0.566	-0.014	3.457	1.380
	(0.325)	(0.602)	(0.370)	(0.147)	(11.633)	(12.038)
Any household member 14-55 becomes ill	1.380	-2.424	-2.924	-0.040	-0.759	0.999
	(3.576)	(26.323)	(14.695)	(0.093)	(0.875)	(5.006)
Household head becomes ill	-0.938	-0.138	-6.214	-0.170	-0.659	0.471
	(2.710)	(0.464)	(70.156)	(0.333)	(1.009)	(0.836)
Partner of the household head becomes ill	1.940	0.683	-2.402		-2.335	
	(5.788)	(1.090)	(12.598)		(9.940)	
Main income earner becomes ill	0.225	0.157	0.279	0.103	0.263	0.102
	(0.128)	(0.418)	(0.180)	(0.110)	(0.192)	(0.283)
Adverse events reported by the household head						
A death of any household member	1.734	4.264	0.279	-0.782	0.437	-0.325
	(5.667)	(45.036)	(0.180)	(4.490)	(0.637)	(3.503)
Any household member becomes severely ill	-0.421	-0.240	-0.147	0.491	-0.153	0.168
	(1.553)	(0.711)	(0.170)	(1.527)	(0.159)	(0.393)

Note: Standard errors in parentheses. Coefficients estimated from separated first differenced regressions of the change in per capita non-medical expenditures on family labor earnings. All regressions estimated by 2SLS, using health shocks as the instrumental variables for labor earnings. All regressions include additional covariates as described in the text.

Source: Authors calculations using a 2002-2003 panel of households constructed from ENAHO 2002 and 2003.

Since in Peru there is no fully functional social insurance system, and credit for consumption is restricted to relatively wealthy families, it is likely that households are financing health shocks out of savings, from borrowing, depletion of household assets, or by diverting resources from other consumption needs. These are necessary strategies in the absence of credit or when there is credit rationing.

VI. Conclusions

Catastrophic health expenditures are one of the major concerns of uninsured individuals when they get seriously sick or injured as such payments can severely disrupt the welfare of their household. Although conceptually clear, an operational definition requires some arbitrary decisions about household's disposable income and the threshold above which some payments can be called catastrophic. Despite these flaws, it is still possible to show the dramatic nature of the vulnerability of the uninsured poor in Peru.

In order to quantify catastrophic health expenditures, this study uses the methodologies proposed by Wagstaff & van Doorslaer (2001) and Xu, et al. (2003). Using data from ENAHO 2006, this analysis demonstrates that 10 to 16% of Peruvian households suffered catastrophic health expenditures, depending on the threshold used. The larger the threshold, the smaller is the incidence, but also the larger the concentration among the poor. The results also show that the likelihood of experiencing catastrophic health expenditures is larger among the poor and largest households, and among households with a larger share of children and elders.

Using longitudinal data from ENAHO 2002-2003, the results show that health shocks –defined as the occurrence of new chronic illnesses– always increase OOP health expenditures. In general, the increase in OOP health expenditures is not fully translated into reductions in non-health household expenditures. Except in the case when the main income earner is affected by a health shock, the results show that Peruvian households seem to be able to smooth total family labor income and non-health expenditures.

An immediate conclusion would be that Peruvian households use their cumulated assets or social networks to mitigate with the financial burden of health shocks. This strategy, however, is not sustainable over long periods and households may divert resources for longer-term investments such as education and nutrition in order to meet current expenditure needs. This strategy is unsustainable and may perpetuate an inter-generational transmission of poverty. Another alternative explanation is that Peruvian households rely on informal safety nets, such as extended families or community organizations, to cope with the financial costs of health shocks.

Coverage rates of formal health insurance are relatively low in Peru, especially among the poorest population. In 2006, only 38% of the Peruvian population had access to formal health insurance. The two main formal health insurers are *EsSalud*, which provided coverage to 18% of the population; and the Integral Health Insurance (SIS), which provided coverage to 16% of the population. *EsSalud* provides health insurance for a fairly comprehensive health care plan, yet only to formal workers and their families. On the other hand, SIS is clearly not enough to protect the poorest Peruvian households from severe health shocks as it only covers treatments for reproductive health and early childhood development. It is still clear that protecting the uninsured from severe health shocks should be a high priority on the policy agenda.

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Appendix A

Household Charasteristics and Incidence of CHE (30% threshold)

	% in the sample	CHE2	CHE1
Residence area			
Urban (= 1 if urban)	56.52	9.85	6.99
		(29.80)	(25.50)
Rural (=1 if rural)	43.48	23.13	10.09
		(42.17)	(30.13)
Income quintile			
Quintile 1 (poorest)	22.40	46.94	14.43
		(49.91)	(35.14)
Quintile 2	21.99	10.23	10.23
		(30.31)	(30.31)
Quintile 3	20.46	5.60	5.60
		(23.00)	(23.00)
Quintile 4	19.40	5.09	5.09
		(21.97)	(21.97)
Quintile 5 (richest)	15.75	4.60	4.60
		(20.95)	(20.95)
Household composition			
With children under 5	31.14	23.27	10.05
		(42.26)	(30.07)
With elders (above 65)	18.81	15.50	10.64
		(36.20)	(30.84)
Both	4.17	28.87	15.60
		(45.34)	(36.31)
Neither	45.88	9.28	5.57
		(29.02)	(22.94)

Household Charasteristics and Incidence of CHE (30% threshold) *(continued)*

	% in the sample	CHE2	CHE1
Household size			
1 - 2 members	23.19	9.24	7.17
		(28.96)	(25.80)
3 - 4 members	34.55	11.46	7.20
		(31.86)	(25.85)
5 or more members	42.26	22.53	9.91
		(41.78)	(29.88)
Insurance			
% hh members with insurance	36.17	3.54	3.37
		(18.47)	(18.04)
Ethnicity			
Indian (=1 if head is Indian.)	31.77	19.81	8.11
		(39.86)	(27.30)
Indian (=1 if head or partner is Indian.)	34.80	19.33	8.13
		(39.49)	(27.33)
No Indian (=1 if head or partner is no Indian.)	65.20	13.65	8.45
		(34.33)	(27.81)
Observations	**20,577**		

Source: Authors elaboration based on ENAHO 2006.

FINANCING HEALTH IN LATIN AMERICA
Household Spending and Impoverishment

One of the most serious challenges facing health systems in lower and middle income countries is establishing efficient, fair, and sustainable financing mechanisms that offer universal coverage. In Latin America, a region long characterized by inequitable and unequal access to healthcare services across populations, financial protection in health continues to be segmented and fragmented, and health is mainly financed through out-of-pocket payments. Lack of financial protection forces families to suffer the burden not only of illness, but also of economic ruin and impoverishment.

Household Spending and Impoverishment, Volume 1 of the *Financing Health in Latin America Series*, analyzes the level and determinants of catastrophic health expenditures across 12 countries, and presents new and important insights into the crucial issue of financial protection in health in the region. The results demonstrate that out-of-pocket health spending is pushing large portions of the population into poverty and that the most vulnerable segments of society are also those at greatest risk of financial catastrophe due to health spending.

This volume is a collaborative product of 26 researchers, representing the Latin American Research Network on Equity and Health Systems (LAnet-EHS).

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