

Health System Reform in Mexico 4



Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico

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Absence of financial protection in health is a recently diagnosed “disease” of health systems. The most obvious symptom is that families face economic ruin and poverty as a consequence of financing their health care. Mexico was one of the first countries to diagnose the problem, attribute it to lack of financial protection, and propose systemic therapy through health reform. In this article we assess how Mexico turned evidence on catastrophic and impoverishing health spending into a catalyst for institutional renovation through the reform that created *Seguro Popular* (Popular Health Insurance). We present 15-year trends on the evolution of catastrophic and impoverishing health spending, including evidence on how the situation is improving. The results of the Mexican experience suggest an important role for the organisation and financing of the health system in reducing impoverishment and protecting households during periods of individual and collective financial crisis.

Many middle-income countries are immersed in demographic, epidemiological, health, and economic transition. This situation poses complex challenges for health systems, yet at the same time constitutes an opportunity and a catalyst for institutional renovation. Generating efficient, fair, and sustainable mechanisms to offer universal protection is one of the most serious challenges facing health systems.

Absence of financial protection in health is a recently diagnosed disease of health systems. Following the identification of high rates of catastrophic and impoverishing health spending in several countries, the problem was internationally recognised. Treatments are being developed, tested, and applied at the health-system level, and progress is being monitored and evaluated. The most obvious symptom of this disease is that families suffer the burden not only of illness, but also of economic ruin and impoverishment from financing their health care.

International recognition of this important challenge to health systems has been growing over the past decade. Increasing awareness at the national and global level has focused on the risk faced by households of falling into poverty, deepening their level of impoverishment, or facing severe financial shocks due to health spending that force them to sell assets or reduce investment in education, food, and housing. Conscious of this problem, the 58th World Health Assembly that convened in May, 2005, adopted a resolution recognising the absence in most developing countries of financial protection mechanisms that offer prepayment and pooling of risk to all citizens.¹ In a call to Member States, the Assembly requested that experiences be shared among countries on different methods of health financing, including the development of social health insurance schemes, with

particular reference to the institutional mechanisms that are implemented to finance health systems.

Mexico was one of the first countries to diagnose the problem of catastrophic and impoverishing out-of-pocket (OOP) health spending, attribute its cause to absence of financial protection, and propose systemic therapy through health reform. In this article, we assess in detail a specific aspect of the recent Mexican experience with reform: catastrophic and impoverishing health expenditure. We describe the process and present 15-year trends, including recent evidence on how health spending is evolving alongside the reform.

First, we review the logical and descriptive international evidence on why the lack of mechanisms for prepayment, financial protection, and risk pooling are global issues that require local, evidence-based solutions. A brief description of the key aspects of the reform related to catastrophic and impoverishing health spending follows. We then analyse how and why the issue of catastrophic and impoverishing health spending in Mexico became a policy priority, one of the central messages of the reform, and a motor for social change. The analysis of the evolution and determinants of catastrophic and impoverishing health expenditure in Mexico between 1992 and 2004 follows, using data from the National Household Income and Expenditure Surveys (NHIES).² This is the longest time-series that has been presented for a developing country and covers both a period of economic crisis (end of 1994–96) and the first years of the health reform (2002–04), making it possible to observe how OOP household spending on health has evolved alongside both economic and health policy shocks. We analyse time trends of catastrophic and impoverishing health spending, the headcount index, and the poverty gap. We also present regression analysis of the 2005–06 National Survey of

Published Online
October 25, 2006
DOI:10.1016/S0140-6736(06)69565-2

This is the fourth in a [Series](#) of six papers about health system reform in Mexico

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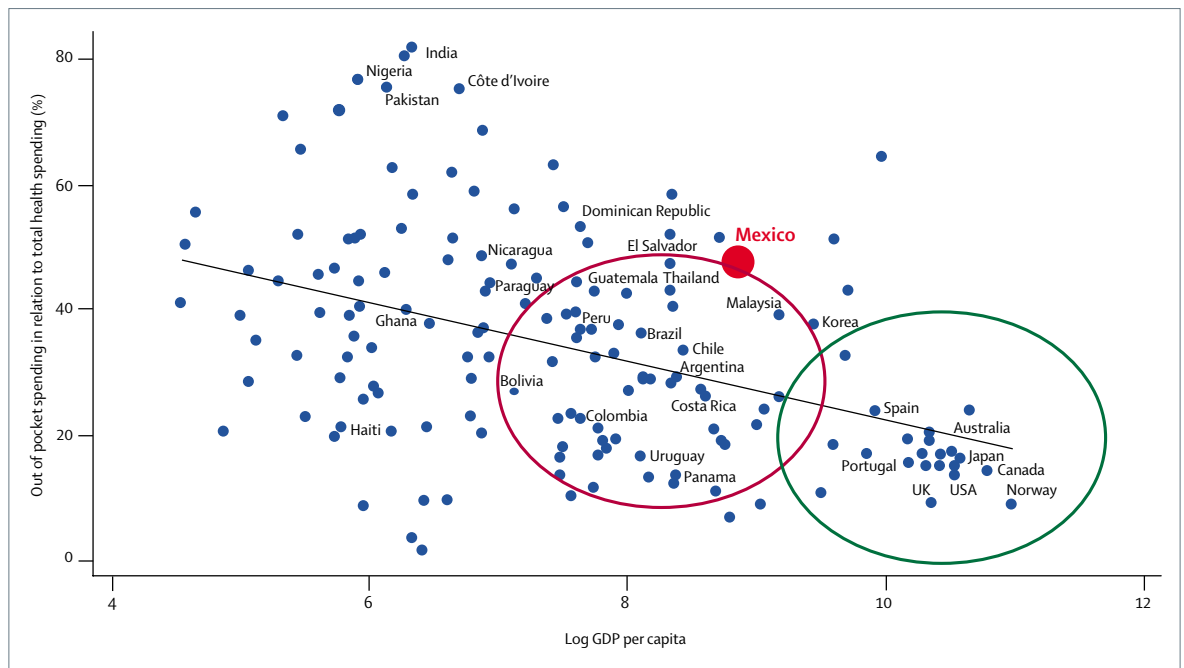


Figure 1: Out-of-pocket spending as proportion of total health system finance versus GDP per head
Source: estimates by authors based on World Bank (2003) and WHO (2003) data.

Health and Nutrition.³ The Mexican experience is then assessed to distil the global policy lessons.

The time trends show that post-crisis improvement in catastrophic and impoverishing health spending coincides with both the health reform and with economic recovery and poverty alleviation schemes such as *Oportunidades* (an integrated social development and poverty alleviation programme that includes health, nutrition, micro-finance, and education components and covers most households living in poverty in Mexico).^{4,5} The time trends and the econometric analysis suggest an association between the reduction in OOP and catastrophic spending by households and the expansion of *Seguro Popular*. The data are not sufficient to attribute any type of causality to this association, but studies of catastrophic and impoverishing health expenditure are underway as part of the formal and external randomised evaluation of *Seguro Popular*,⁶ and using the NHIES up to 2005 (available in final format in late 2006).

Catastrophic and impoverishing health spending is a global challenge

Health systems are financed mainly through three mechanisms: monies gathered by the state via specific and general taxes; contributions to social security via deductions or taxes; and private payments, which can be either out-of-pocket or for private insurance. The mix of financing among these three categories tends to vary substantially between countries.^{7,8} General taxation and payroll taxes are pre-paid and progressive, and involve a substantial degree of risk pooling. Still, these

government-financed and social insurance schemes can, but often do not, protect all citizens from catastrophic and impoverishing health expenditures. Some groups are excluded—typically the poor and independent and informal, non-salaried workers.

OOP is considered the most inefficient and inequitable means of financing a health system.^{9,10} In OOP-financed systems there is little room for risk pooling, competition among providers is reduced and patients pay more than they would with a prepayment scheme because of the fragmentation of risk and the urgency of treatment. The unfair distribution of risk and financing in OOP-based systems places a great burden on the family. Catastrophic and potentially impoverishing, expenditures arise, or necessary care is forgone, if the cost of care exceeds the ability to pay at the time of service. Families are often forced to choose between satisfying other basic needs such as education, food, and housing, or purchasing health care and saving loved ones from illness, suffering, and shortened life spans.

Furthermore, OOP financing is not only financially injurious for households, but also for countries' economies. There is an inverse association between the level of economic development of a country and the extent to which the health system is funded by OOP spending (figure 1). This association probably reflects several factors, and the relation may well be dual—health insurance coverage is both a result and a determinant of economic development.

Descriptive evidence supports these theories. OOP financing of health systems is generating an important

and worldwide risk that affects all countries. In a recent Technical Policy Brief, WHO showed, for a series of countries, an important negative association between the proportion of households with catastrophic health expenditures and the share of OOP payment in total health expenditure.¹¹ Health spending is also an important additional source of poverty.¹² Furthermore, if households are forced into poverty traps by health shocks because they cannot insure against illness, this phenomenon may have long, as well as short-run, implications.¹³

OOP payments for health care are more common in developing countries than in high-income countries. An analysis of 11 countries representing 79% of the Asian population concludes that OOP payments are still the principal means of financing health care throughout much of Asia and threaten millions with impoverishment.¹² Estimates show that an additional 78 million people, or 2.7% of the total population, fall below the extreme poverty threshold of \$1 per day after accounting for payments for health care. This represents a 14% increase in the rate of extreme poverty and a threat to well-being that has not been incorporated into existing poverty estimates.

Still, the citizens of wealthier countries that do not offer universal financial protection in health also suffer a risk of health spending catastrophe. In the USA, a country where a large segment of the poorer population has no access to health insurance, recent evidence shows that health spending contributes to a large proportion of bankruptcy claims.¹⁴

Given this global risk, how many families are affected? Arriving at an international estimate of the number of families affected by catastrophic or impoverishing health spending is difficult. WHO recently published estimates suggesting that more than 44 million households face financial catastrophe annually, and that about 25 million households are pushed into poverty.¹ These annual figures are based on spending as a proportion of yearly income. We suggest that the number of households affected may be even higher if health spending is analysed over a shorter period more appropriate for families living in poverty because their income is insufficient to cover basic needs. This is also true if a lower cutoff point for catastrophic health spending—to date, a figure open to debate—is used.

Furthermore, these indicators, even when presented in a dynamic or cumulative analysis, measure only the families who have actually experienced catastrophe or impoverishment from health expenditure. The potential scope of the problem is much larger. First, consider all those households that experience a health catastrophe—including permanent loss of well-being, disability, or death—because they cannot afford care. Then add to this considerable number the households at risk of financial catastrophe—all those who are not covered by financial protection in health. Finally, this is not only a function of the proportion of families that can access a public or private social insurance or social security scheme. It is

also a function of what services are included in each package. Thus, the figure should also include families with only partial financial protection in health.

The Latin American region includes many countries that rely on OOP to finance health care. Several of these countries base the finance of their health systems on payroll-based, social security models.¹⁵ Typically, the formal sector of the labour market is covered by the public, social security system, and the rest—the informal sector, independent workers and those who are out of the labour force—receive limited health benefits through a variety of under-funded, public sector schemes that do not include explicit rights to a health-care package. The modern Mexican health system was founded more than 6 decades ago using this model and the 2003 reform was designed in response.

Background of the structural reform of the Mexican health system

We highlight only the elements of the reform needed to better understand the results presented here. Readers are referred to other papers in this Series^{16,17} and others in the reference list for a description of the health reform.

The 2003 structural reform of the Mexican health system was designed to increase financial protection by offering subsidised, publicly provided health insurance to the 50 million Mexicans who are not covered by social security and are concentrated among the poor. The law was passed in April, 2003 and the reform went into effect on Jan 1, 2004.¹⁸ The nucleus of the reform that created the new System for Social Protection in Health (SSPH) is *Seguro Popular* (Popular Health Insurance; SP). The reconfiguration of the sources and allocation of funds via the reform seeks to increase the efficiency and equity of financing, as well as financial protection for households.¹⁹ The 7-year transition to universal, voluntary coverage translates into an annual goal of affiliating 14.3% of the approximately 12 million uninsured families. As stipulated by law, the affiliation process to date has focused on the poorest quintile of the population and thus the transition phase has been highly progressive.

The variation over time in the extension of SP and the affiliation of families contribute to the regression analysis presented below. Between 2001 and 2003, before the reform, SP operated as a pilot programme and 614 000 families were affiliated.²⁰ By the end of 2004 more than 1.7 million families had entered, by the end of 2005 the figure was over 3.5 million, and in September, 2006, the 4 millionth family was enrolled.^{21,22}

The 32 states that make up Mexico entered the programme gradually between 2001 and 2005. Similarly, coverage within states and geographical expansion has been gradual, and while some states have achieved universal coverage, in others only families living in certain municipalities with SP can enrol. Based on affiliation data from the National Commission for Social Protection, in 2002, 342 municipalities participated in

Panel 1: Evidence for financial protection as an input to policy**Diagnosis, 1992–97**

Work by Mexican Health Foundation with Harvard University and World Bank that showed that public funding did not dominate the health system

- Evidence to catalyse research and awareness

Recognised worldwide, 1998–2000

Development of WHO framework for health system performance assessment, including fairness of finance and financial protection

- Global rankings and evidence

Pre-reform, 2000–02

Transition Team of President Elect Fox identifies health and health sector priorities and formulates proposals for universal social insurance in health, 2000

- Global evidence as a catalyst for a national reform, priority-setting and policy

Incorporation of *Seguro Popular* as a strategy in National Health Program 2001–06, 2001

- Evidence for policy design

Large-scale piloting of *Seguro Popular*, 2002–03

- Incorporation into an evaluation scheme

Reform, 2003–06

Reform of General Health Law, 2003

- Evidence for advocacy and consensus building

Reform goes into effect, Jan 1, 2004

- Evidence for policy design specifics, budgeting, assessment

Implementation and extension of coverage, 2004–06+

- Monitoring and dissemination of progress
- External assessment of effect of policy by international organisations and academic groups
- Advocacy

the pilot, 524 were participating in 2003, and 946 in 2004. By the end of 2005, almost 1600 of Mexico's 2454 municipalities included affiliated families.

The extension of financial protection is dependent not only on who is covered, but also on what is included in the package of services. Benefits must be considered in at least three dimensions: services and technologies, health conditions, and quality of care. In Mexico, the expansion of the reform is an interrelated process of covering more people, more interventions, and more conditions, with better quality.¹⁷ The expansion of the package and the improvement of quality are central issues to the reform and both are discussed in varying degrees in each of the papers in the Series.^{6,16,17,23,24}

Catastrophe and impoverishment from health spending in Mexico: a motor for the 2003 health reform and for *Seguro Popular*

In this section we analyse how descriptive evidence on the catastrophic nature of health spending for families was a catalyst that drove and inspired policy change. The analysis of financial protection has been heavily applied in all phases of the Mexican health reform, including policy design, advocacy, budgeting, monitoring and evaluation, consensus building, benchmarking progress, introducing incentives, and disseminating results. While

financial protection is only one of many types of evidence that have been incorporated into the reform process, it was one of the most important.^{6,16,17}

We identify four periods in the development and use of evidence on financial protection in health in Mexico: the problem was identified in the early to mid 1990s; the national-level analysis fed into the WHO global work with a focus on financial fairness;⁹ between 2000 and 2003, the pre-reform period, national and international evidence were particularly salient in designing the pre-reform projects of SP, as well as for consensus-building and motivating legislators and policy-makers both within and outside of the health sector; and, since 2003, evidence at the national level has been used to enhance implementation and evaluation as well as guide the next stages of the reform process. Our analytical work in the final sections of this paper contributes to this most recent phase of the work (panel 1).

How and why was evidence on financial protection so salient in the policy process behind the reform? In the early 1990s, several major research initiatives were launched in Mexico, including a new line of analytic work on health financing, undertaken jointly by health specialists and economists. The National Institute of Public Health (INSP) and the Mexican Health Foundation (FUNSALUD) led these analyses, drawing on novel global research and methods such as national health accounts.¹⁰ This research provided key inputs for the 2003 reform. It demonstrated—almost a decade before the reform—that the Mexican health system was relying too heavily on OOP spending as a source of finance. This information broke with the common preconception that the health system was mostly financed by government through public resources.¹⁶

The evidence led to substantial research on sources and uses of health finance, and this work included generation of datasets and surveys and training researchers. It is also important to recognise that Mexico had a great advantage in that the NHIES had already been undertaken on a regular basis for several years.² The history and continuity of these surveys is a testament to the strength of data collection policy in Mexico under the leadership of the national statistical institute INEGI and enhanced by sector-specific institutions such as the INSP.

The results of this work—knowledge, information, evidence and human resources—facilitated the research that fed into the reform. Much of this information was also used in producing the WHO World Health Report (WHR) 2000 analysis of health system performance in the sphere of financial protection and fairness of financing.⁹ At the time the report was being developed, Mexico was one of only a few developing countries that had undertaken this type of in-depth analysis. For example, Colombia, also around the issue of health reform, had undertaken national-level analysis of sources of financing through National Health Accounts.²⁵ Thus the work undertaken in Mexico fed into the production of global knowledge and frameworks.^{16,17,26}

A combination of national and international analysis catalysed reform. A very powerful piece of information was Mexico's rank in the WHR 2000.⁹ The inequity of financing and of financial protection endemic to the Mexican health system resulted in a rank of 144 on fairness of finance, as opposed to an overall rank of 51 out of 191 countries. Comparative analysis of National Health Accounts also made it possible to link two important pieces of information: Mexico was offering financial protection to less than half its population as is true of most countries in the region, but additionally it had disproportionately high levels of health spending given its level of economic development (see figure 1). Rather than generating a defensive reaction, this information fortunately came at an opportune time—only months before the change of

administration in Mexico—therefore, policymakers were in a position to use the evidence as an advocacy tool.

This poor rank on fairness of financing, coupled with the capital (both researchers and data) that had been built up in the 1990s in Mexico, catalysed more in-depth, country-level analysis. The work generated evidence that proved salient to the political debate and useful for affecting the development of policy. It showed that in 2000, an estimated 2–4 million households suffered from catastrophic and impoverishing payments for health care every year.^{21,27,28}

Additionally, the incidence of both impoverishing and catastrophic spending was shown to be much higher among the uninsured and the poor. The uninsured accounted for 86% of these families and the rate of

Panel 2: Hypothetical case studies of two Mexican families

Although often forgotten in analyses of health systems, all finance originates from households. As Fuchs has stressed: "The most basic point, often obscured in public discussions, is that 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".²⁹

Maintaining this point as a reference for analysis is important to make evidence more useful for policymaking. The following case studies depict situations faced by many families striving to pay for health care. The cases are fictitious, but are based on research of local prices and conditions (further details available online).

Case 1

For Ana Luisa—a mother of two living in the small town of San Bartolo Coyotepec in Oaxaca—two common childhood throat infections generate catastrophic health expenditure. Like many of the 1.7 million female-headed households in Mexico,² the family survives on the 57 pesos (US\$5.12)³⁰ per day that Ana Luisa earns as a hairdresser.³¹ When her 6-year-old son Eduardo complains of a sore throat and fever, she misses a day of work to take him to the doctor. In addition to the lost wages, Ana Luisa has to pay a fee of \$3.85 if she takes her child to the children's clinic, since she does not have *Seguro Popular* or any form of health insurance. If she makes an appointment for her son with a private paediatrician, she will pay \$16.60–25.00, but the waiting time will be shorter and she might be able to miss less than a day of work. Eduardo's throat infection requires a trip to the pharmacy to buy either amoxicillin (which costs \$5.40–7.90), or penicillin (\$3.85). She must also pay transportation costs and take another day off to care for Eduardo or pay a neighbour \$8–12 to care for him for 2 days while she is at work and until he is well enough to go back to school. Ana Luisa's younger son, Pedro, complains of similar symptoms 2 days later. Rather than another trip to the doctor and lost workday, Ana Luisa decides to purchase the same antibiotic and begins the same dose as for Eduardo. Luckily, the antibiotic worked for Pedro; had she been wrong, she would have faced a much more complicated and costly treatment.

Even choosing the most economical route of taking one son to the children's hospital and then purchasing the lowest priced medicine, Ana Luisa foregoes \$5.12 in earnings and spends \$13.44 on health services and medicines, \$2.69 on transport, and \$16 for 4 days of caregivers—more than six times her daily wage. If she had taken both children to the private physician and chosen the more expensive antibiotic, she would have spent more than \$70, even if she took 2–4 days off work to care for the children. This total is more than 50% of the family's monthly total income, and probably more than 30% of disposable (non-food) expenditure over 3 months. This case illustrates how even simple, common health problems can result in substantial hardship for millions of families living at or below the poverty line.⁴

Case 2

Elena lives in rural Veracruz and was diagnosed with type 2 diabetes 2 years ago. She represents the 10.7% of the population aged 20–69 years in Mexico who have diabetes.³² Her husband works as an agricultural labourer in rural Veracruz to support his wife, their five children, and his parents. As is the case for many rural families in Mexico, he usually earns less than \$300 per month^{33,34}—ie, less than \$1 per day per head. Medical expenses for a household with a diabetic family member can easily average more than \$100 per month from medical visits, medications, and supplies such as blood glucose meter strips, urine test strips, and insulin syringes.³⁵ The family already sold their two cows and television to finance her care. Uninsured and unable to incur the additional costs needed to manage her chronic disease on an ongoing basis, Elena is inconsistent with self-monitoring and insulin use, and consequently is at risk of developing serious complications.

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For further details of research related to case studies, see <http://www.funsalud.org.mx/competividad.html>

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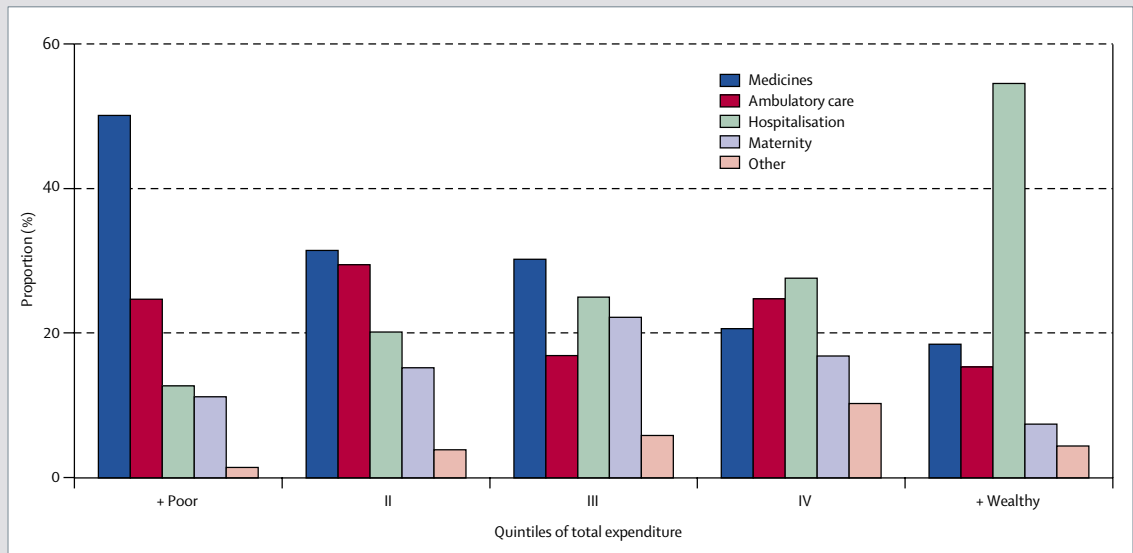


Figure 2: Distribution of catastrophic health expenditure* by category and quintile of total expenditure distribution
 Source: NHIES, 2000. *Defined as spending 30% or more of disposable income on health.

The analysis of categories of health expenditures that generate financial catastrophe coincides with the cases presented in this panel (figure 2). In poor families, catastrophic and impoverishing health expenditure is concentrated on drugs and ambulatory medical care. In richer families, such spending is concentrated in hospital admissions.

These results signal the need for social protection in health directed to poor families and designed to prevent impoverishment from health spending. Unlike traditional health insurance schemes designed to cover catastrophic illness, these programmes must include low-nominal cost items such as drugs and doctor visits for chronic illnesses and common health problems.^{27,28} This finding was incorporated into the design of *Seguro Popular* through the package of covered services and through the priority that is given to supply and provision of medicines.

impoverishing and catastrophic health spending was more than four times higher. Further, health expenditure that leads to impoverishment (being driven below the poverty line) is almost entirely concentrated among households in the poorest quintile of the income distribution, who are predominantly uninsured.^{27,28} Notably, financial catastrophe for many of these households results from health expenditures that are not nominally large and do not include hospital admissions—for the poorest, they reflect the inability to finance even the most common health problems (panel 2, figure 2).

The in-depth, country-level analysis continued after the reform was passed into law and became a useful tool for monitoring. Since 2001, the Ministry of Health has published annual benchmarking reports including information on financial protection and rates of catastrophic and impoverishment health spending. As the analytic work and survey data have evolved, so have the indicators, with the result that each year more in-depth information has been published.^{20–22,36,37} These reports are widely shared through public forums, and are available at the website of the Mexican Ministry of Health.

Global research greatly facilitated the in-depth, country-level analysis in Mexico that went into the National Health Plan 2001–06 and the first benchmarking reports. The methods and the cross-country analysis from WHR 2000 that were presented in background papers and that were later developed into published papers^{38,39} were incorporated and adapted to generate analyses more specific to the Mexican reform.^{27,28}

The evidence was also a tool for policy design, particularly in terms of expanding the coverage of populations and services. First, the results were used to analyse and expand SP from its early, pre-reform period when it functioned as a project that covered a relatively small proportion of the population. The results of the analysis of health spending demonstrated the importance of covering the poor—in both rural areas and cities. Second, it showed the importance of covering nominally low-cost items such as ambulatory care and drugs (panel 2). These points were incorporated into the design of the reform.

The recognition of the financial risks of high OOP was pivotal in defining many aspects of the reform. For this reason, the Mexican health reform of 2003 constitutes an example of a successful process of

Panel 3: Data

The main sources of data for this study were seven rounds of the National Household Income and Expenditure Survey (NHIES) undertaken every 2 years between 1992 and 2004. This period spans the economic crisis of 1994–96 and the economic recovery in the mid to late 1990s. It also includes the pre-reform pilot of the Popular Health Insurance scheme (2001–03) and the first year of the phase-in of the 7-year period of transition to universal social protection in health through the reform.

NHIES is a nationally representative, cross-sectional survey of households undertaken by the National Institute for Statistics, Geography, and Informatics (*Instituto Nacional de Estadística Geografía e Informática*). Detailed and standardised questions are asked about all sources of income and categories of expenditure (including a module on health at the household level). The survey also includes family composition, labour market status, and education. The time frame, methods, and questionnaires are consistent and comparable across years. The database includes the years 1992, 1994, 1996, 1998, 2000, 2002, and 2004,² with sample sizes of 10 503, 12 815, 14 042, 10 952, 10 108, 17 167, and 22 595, respectively. Further details on the NHIES series and how these data have been made comparable over years are presented by Knaul and colleagues.²⁷

We also analysed available data from the 2005 NHIES. At the time of publication of this paper, expansion factors and population weights were not available for this survey; thus inclusion of the 2005 results in the analysis was not possible, but is part of ongoing research.

For the regression analysis presented in this article we use the 2005–06 ENSANut survey, which is described by Gakidou and colleagues.⁶

The data on coverage of the *Seguro Popular* are from the database on affiliation managed by the National Commission for Social Protection. These data provide quarterly information on the number of families and people in all municipalities who are affiliated to the programme. The data available at the time of writing span the fourth quarter of 2002 to the first quarter of 2006.

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combining relevance and excellence in research and applying the evidence from research to policymaking and for the further advancement of research.^{26,40} Evidence will continue to play an important role in all future stages for innovation, monitoring, advocacy, and enhancing quality.

Evolution of catastrophic and impoverishing health spending and poverty gaps: 1992–2004

Using the household spending data for a trimester from the National Survey of Household Income and Expenditure, and the definitions put forward by Knaul and colleagues,²⁷ 6·3% of Mexican households are affected by catastrophic or impoverishing health spending (panel 3). This trimester figure represents almost 1·5 million households. Using a cutoff of 20% of disposable income for catastrophe, and without including absolute impoverishment (households below, or those that fall below, the poverty line from health spending), the figure is almost 2 million households per trimester in

2000. Given the absence of consensus on the cutoff point for catastrophe, in defining impoverishment below the poverty line, and on annualising the figures, the number of households affected in a year is given over a wide range, as suggested in the previous section of this paper.

These measurement issues are discussed in detail by Knaul and colleagues,²⁷ and we suggest that substantial in-country and cross-country-comparative work is still needed to arrive at a consensus. Indicators measure different aspects of how families are affected by shocks from health spending, and each has merit. Of particular concern is the periodicity of health expenditures in relation to the level of poverty of the family—a point that must be incorporated into both the numerator and the denominator of indicators of catastrophic and impoverishing health spending in future analysis. Another important and related issue is how to incorporate families that drop out or do not use care because they cannot afford it. In this article, we cannot address all these points because of data limitations, but use several

Panel 4: Indicators

Trends in burden of health spending on households between 1992 and 2004 were summarised with various indicators^{27,28,41}

- *Proportion of households with catastrophic health expenditures*, measured as spending more than a specific proportion of disposable income (total income less spending on basic needs approximated by expenditure on food) and based on the WHO World Health Report 2000⁹ and methods developed by Murray, Knaul, Xu, and colleagues³⁸ that include an estimate of all sources of spending on health (OOP and prepayments)
- *Proportion of households with impoverishing health expenditures*, defined as falling below the absolute poverty line due to health spending or deepening their level of poverty for those that are below the poverty line
- *Proportion of families with excessive health expenditure*, which is defined as having either catastrophic or impoverishing health expenditure, or both, and thus takes into account both absolute and relative aspects of the burden of health spending
- *Poverty headcount*, a subcomponent of the previous two indicators, defined as those households pushed below the poverty line by health spending

Panel 5: Poverty lines

We analysed the indicators described in panel 4 by use of different poverty lines established for all years for which data are available (1992, 1994, 1996, 1998, 2000, 2002, and 2004). Adjustments for purchasing power were made with the purchasing power parity index (PPP) of the Organisation for Economic Cooperation and Development.⁴² Five poverty lines were assessed: \$1 per day in US current dollars, \$1 per day in US PPP, \$2 per day in US current dollars, \$2 per day in US PPP, and the food poverty line (on the basis of calculations done by the Ministry for Social Development of Mexico and available from 2000–04 only).³⁴

different measures of catastrophe and impoverishment to demonstrate the robustness of the trends and findings.

As has been documented previously, all of the indicators of financial protection—catastrophic spending and absolute impoverishment (panel 4)—show a deterioration during the period of economic crisis and an improvement post-crisis that continues from 1998 to 2004.^{27,28} The largest changes occur in the proportion of households with impoverishing health expenditures.

These results are consistent but especially sensitive to the trends in absolute impoverishment, which are in turn sensitive to the poverty line and the analysis of expenditure among families living below the poverty line. To better analyse this pattern, we present the trends for impoverishing and catastrophic expenditure separately, using four poverty lines (see panel 5) for impoverishment and an additional cutoff of 20% for catastrophic expenditure (figure 3). Although the trends differ substantially in level and somewhat by year, and not all the differences between years are statistically significant, the picture is the same: deterioration around the economic crisis and improvement since 1998–2000 through to 2004.

We also study, using five poverty lines (panel 5), a much less common occurrence: the number and proportion of families who fall below a poverty line because of health spending (poverty headcount). Both of the one-dollar poverty lines follow a declining trend over the period. For

the other poverty lines, there is no clear trend, although there was improvement between 2000 and 2002 (figure 4).

To further clarify these results we study the poverty gap (panel 6, tables 1 and 2),⁴³ which refers to how health spending deepens poverty either by driving families who are already below the poverty line even further below (and by how much further below), or by forcing families below the poverty line (and by how much below).

We use the two-dollar, PPP poverty line, since for this line the trend is ambiguous and is likely to be a stricter test of an improvement over the reform period (tables 1 and 2). The results show that in every year health spending deepens poverty. Further, in 1994 relative to 1992, in 1994 relative to 1996, and in 1998 relative to 1994, health spending contributed substantially more to deepening poverty. By contrast, the opposite was true for 2002 relative to 2000 and for 2004 relative to 2002. In other words, health spending is now contributing less to the degree to which families are below the poverty line. The differences across periods show that the improvement (reduction) in the deepening of poverty from health spending was greater between 2002 and 2004 than in all other periods except 2000 to 2002. These results are quite robust to changing the poverty line (details available online).

Another piece of indicative information is the difference in the evolution of catastrophic and impoverishing health spending between families with access to social security

For results when poverty line is changed see <http://www.funsalud.org.mx/competitividad.html>

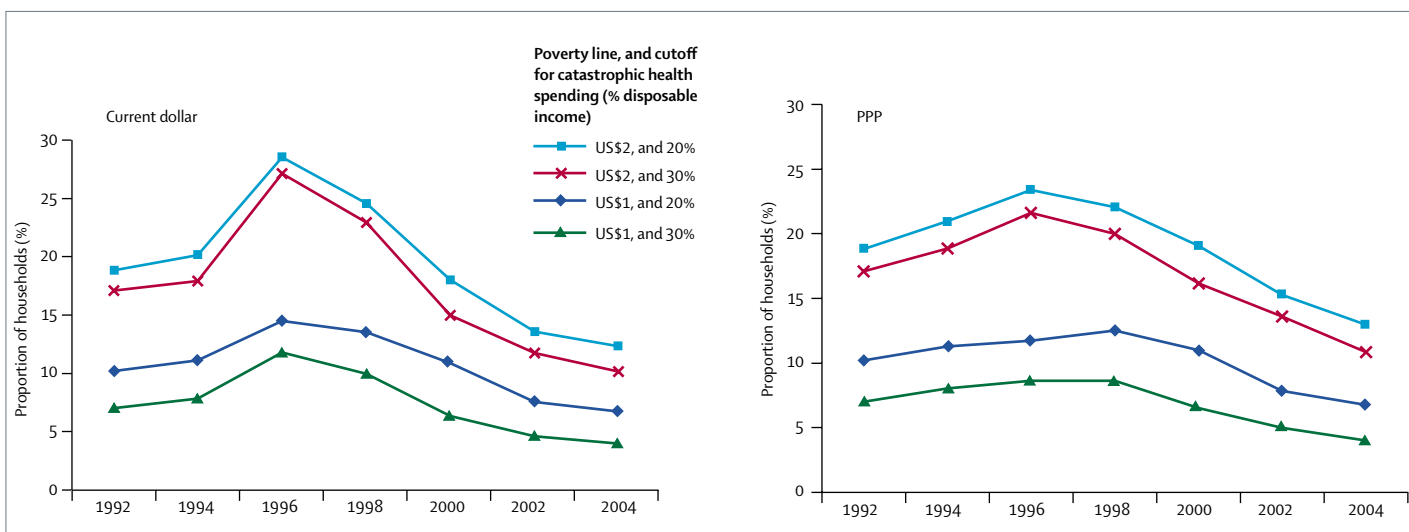


Figure 3: Households with catastrophic and impoverishing health spending with varying poverty line and cutoff point, current dollar versus PPP

Source: estimates by the authors using NHIES data, 1992–2004. For poverty line definitions see panel 5.

and those without.^{27,28} These results show that the deterioration during the crisis period affected both groups. By contrast, the improvements between 2000 and 2004 are concentrated among households without access to social security and are either uninsured or have SP. The improvements are also concentrated in the poorest quintile. In the same period and for the rest of the population there is little change. Further, while there was improvement for all families post-crisis, this trend was most evident for those with children. The improvements have been less marked among families with older adults where catastrophic health payments are likely to be greatest.

All the results up to this point are consistent with at least two possible and inter-related explanations: reductions in poverty, and the expansion of financial protection in health through SP. Over the period covered in this study, poverty first increased and then went down. The proportion of households living on less than US\$2 per day declined continually between 1998 and 2004 from more than 25% to almost 15%.⁴ This reduction is probably due to a combination of macroeconomic policies, poverty reduction programmes such as *Oportunidades*,⁴⁴ and other social programmes such as SP. In the absence of longitudinal data and a formal evaluation it is impossible to determine the causal and relative role of each factor. Still, the regression results suggest an association between SP and reductions in catastrophic health spending.

The regression analysis using the ENSANut data (see panel 7 and tables 3–5) provides evidence of a negative association between OOP and catastrophic spending and

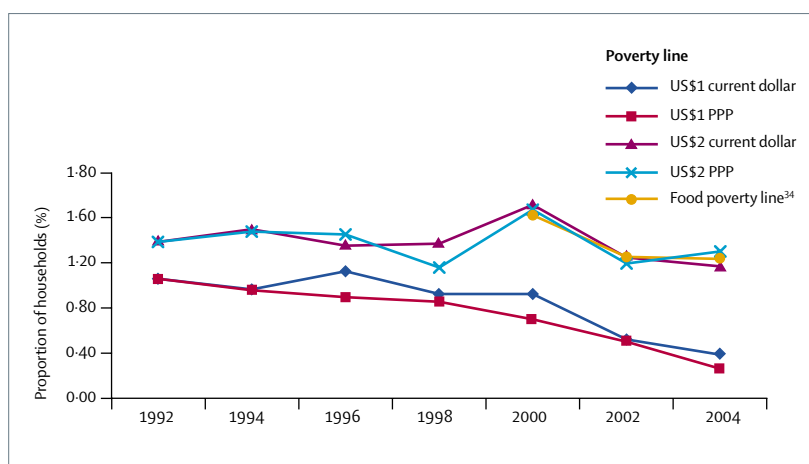


Figure 4: Households that fall below poverty line after health spending

Source: estimates by the authors using NHIES 1992–2004 and SEDESOL, 2005.³⁴

coverage of SP. The results are robust to using different specifications of the catastrophic measure and to changing the specification of the independent variables (regression results using additional measures of OOP and catastrophic and impoverishing spending are available online). The results are significant even after controlling for the level of poverty in the municipality and of the family.

Several caveats apply in interpreting the regression results on the relation between coverage of SP and catastrophic and impoverishing health spending. These results are not causal, but rather descriptive, since we do

For additional regression results see <http://www.funsalud.org.mx/competitividad.html>

Panel 6: Poverty gap

By use of methods proposed in studies for several Asian countries, we analysed the relation between health spending and impoverishment.^{12,43} We considered households that are forced below the poverty line by spending on health and those that are already below the poverty line and become further impoverished from health spending. The Wagstaff-van Doorslaer¹² method allows analysis of how far below the poverty line is the income of each household, and, aggregating all households, how large this amount is relative to total poverty before and after health spending. Basically, the poverty gap can be defined as the total value in pesos needed for households found under the poverty line to move back up to the poverty line. This exercise is undertaken before and after spending on health and then the results are compared. The steps of this process for the analysis of the data from the 1992–2004 NHIES are shown in tables 1 and 2 and follow Wagstaff and van Doorslaer.¹²

Such an analysis is sensitive to the choice of the poverty line. Therefore, we replicated the work for each of the five poverty lines described in panel 5. We chose to use the poverty line for which the results for the headcount index are ambiguous to apply the most difficult test to our question of interest, which is whether the poverty gap from health spending declined during the *Seguro Popular* period. These findings are quite robust to changing the poverty line. The analyses using the other poverty lines are available online.

Since we have a long time series, we were able to compare not only the poverty gap before and after health spending, but also the difference in the gap by year, and the difference in changes in the gap across different periods of time. We think of the first figure as the extent to which health spending deepens poverty and the second as how this differs across consecutive periods. The differences across time allow us to say whether or not the deepening of (or change in) poverty after considering health spending was greater or less in one period versus another, and allow comparison of the period of *Seguro Popular* with earlier periods, including the economic crisis of 1994–96. All differences were tested for significance by use of the expanded population figures (population weights in the surveys).

All analyses were done with Stata 8 and the significance of all differences was programmed manually to account for the population weights.

For results when poverty line is changed see <http://www.funsalud.org.mx/competitividad.html>

	1992	1994	1996	1998	2000	2002	2004
Poverty gap							
With respect to poverty line before health expenses	-177.88	-197.11	-387.63	-437.94	-383.40	-352.26	-263.51
With respect to poverty line after health expenses	-185.36	-206.55	-403.26	-456.60	-406.36	-370.26	-278.39
Post health spending vs pre health spending							
Impact of OOP health spending on poverty gap	-7.47*	-9.44*	-15.64*	-18.66*	-22.96*	-18.00*	-14.88*

Poverty line defined as \$US2 (PPP) per day per head (1992–2004 NHIES). Source: estimations made by the authors using NHIES. All values in current pesos. *Significant differences with 90% confidence level.

Table 1: Poverty gap before and after health spending, 1992–2004

	Difference
Differences between consecutive years	
1992–1994	-1.96*
1994–1996	-6.20*
1996–1998	-3.02*
1998–2000	-4.30
2000–2002	4.96*
2002–2004	3.12*
Differences between periods of time	
(1998–2000)–(2000–2002)	9.26*
(1998–2000)–(2002–2004)	7.43*
(2000–2002)–(2002–2004)	-1.84*
(1992–1994)–(2002–2004)	5.09*
(1992–1998)–(2002–2004)	14.31*

Poverty line defined as \$US2 (PPP) per day per head (1992–2004 NHIES). Source: estimations made by the authors using NHIES. All values in current pesos. *Significant differences with 90% confidence level.

Table 2: Differences across time periods in poverty gap before and after health spending

not have longitudinal data or effective instrumental variables. Furthermore, and also because instrumental variables are not available, regressions on OOP itself do not control for selection bias, which is likely to significantly affect the magnitude of the SP coefficient. We chose the ENSANut data although they are cross-sectional because they cover a longer period of SP and are therefore considered the most reliable for this part of the analysis. Follow-up work will be undertaken using the upcoming rounds of the ENSANut as part of the randomised evaluation of the SP currently in process.¹⁷ Econometric work is also underway on the cross-sectional, time series data from the NHIES. These surveys will be further exploited applying more sophisticated econometric techniques based on matching in future studies once the entire series is available, including the NHIES of 2005.

Global relevance of lessons learned from the Mexican experience

Evidence-specific messages

The Mexican experience in addressing the issue of catastrophic and impoverishing health spending provides several lessons on increasing the likelihood of successfully incorporating evidence into policymaking to improve

health systems.^{16,26,40} Many of these issues are not specific to health, but rather apply more generally in formulating policy, particularly in the social sectors.

The first lesson is to build local research capacity to stimulate links between research and policy. A key element of linking evidence to policy in the Mexican health reform was the strong institutional base for research. This suggests the importance for developing countries of investing in national research capacity—in public and private institutions, and for individuals. In the Mexican case, many of the key policymakers in the 2000–06 administration had been leaders in the development of local research institutions. Countries that invest in training researchers on how to apply evidence for policymaking, that produce the data required to generate evidence for policy, and that support research and training institutions, are more likely to have policymakers who are trained in applying evidence and are open to linking this evidence to policy.

The second lesson is to collect data and guarantee that it is comparable over time. A key ingredient for the research work that has been undertaken since the 1990s on health finance in Mexico has been the availability of good quality demographic, epidemiological, and economic data, particularly on health spending. The knowledge that has been provided by these data has also contributed to collecting better data in newer surveys.

The third lesson is to invest in research and participate in international research initiatives. The policymaking process generally includes few incentives and little time for research and publishing. In the Mexican case, special emphasis has been made to encourage the production and publication of evidence—the 2004 Global Forum for Health Research held in Mexico City and this *Lancet* Series are very important examples of what is being achieved. Another recent initiative in which Mexico is participating is the Health Financing Task Force international network. Key ingredients to making this successful are seeking effective outlets for publication in both the local language and in international journals, participating in international research networks and international comparative projects,⁴⁵ linking national and international researchers and research institutions, providing time and opportunities for senior policymakers to write up their experiences and publish, and hosting and participating in international seminars

Panel 7: Regression analysis of ENSANut data

Data from ENSANut, although cross-sectional, have two important advantages. First, they cover a period when the *Seguro Popular* was already operational in many areas of the country and covered a considerable number of families (2005–06). Second, these data include a number of different questions on health spending; thus total health expenditure can be measured in a variety of ways.

We ran regression analysis with three different measures of health spending and three different measures of disposable income, for a total of nine measures.

The denominators for capacity to pay (disposable income) were as follows. (1) Capacity to pay (CTP) was defined as total expenditure (TE) minus the food poverty line (FPL), where TE is calculated with all non-health expenditure questions extrapolated to annual spending plus health expenditure (HE). FPL was calculated as the average expenditure on food of households whose food share (ratio of food to total expenditure) falls within the 45th to 55th percentile. This measure of poverty was used to define CTP to avoid artificially lowering CTP for those wealthier households who spend more than what is needed for subsistence on food. The FPL was then adjusted on the basis of household size. (2) When the FPL was greater than a household's TE, we substituted in a household's actual food expenditure for the FPL to generate CTP. (3) We redefined CTP as TE minus food expenditure when the FPL was greater than the household's food expenditure.

We extrapolated each expenditure question to yearly values and defined three different ways to measure health expenditure per household as follows: (1) annual inpatient, quarterly outpatient, traditional care, dentist, medications, and other quarterly HE questions; (2) quarterly inpatient and all quarterly HE questions mentioned above; and (3) from questions that ask about yearly health spending from current income, savings, selling goods, and borrowing money.

Table 3 summarises the differences between the nine measures of catastrophic expenditures.

and conferences. Likewise, international journals and institutions should provide appropriate options for policymakers, particularly from developing countries, to publish their work. This effort requires strict and explicit rules about publication, but also a search for opportunities that are not as binding as full primary research articles.

The fourth lesson is that both researchers and policymakers must make a special effort to translate research results into policy messages and recommendations. This aim requires ongoing exchange, institutional support for policy-oriented research and an additional stage in the research process—to develop policy-oriented results so that they can be communicated by policymakers to each other, and to a broader audience. It is important that information be widely disseminated, not only among legislators and policymakers, but also to the general public and particularly to non-governmental organisations and special-interest groups. Perhaps the best example of a piece of evidence that has been developed in this way in Mexico is the indicator of the number of families that suffer catastrophic and impoverishing health expenditure. Although difficult to quantify precisely, the annualised figure of the number of families that suffer catastrophic and impoverishing health spending in Mexico is presented in a way that is scientifically defensible and at the same time can be communicated effectively and disseminated broadly and repeatedly to sway policy.

The fifth lesson is the importance of timing, collaboration, and objectivity in integrating international frameworks and evidence produced by international agencies. The coincidence in timing of the WHR 2000 and the change of administration in Mexico provided a

propitious environment for the findings—and the criticisms—to be used to catalyse change and to develop new policies and programmes. The existence of national evidence, research tools, data, and a group of researchers made it possible to deepen the broad global analysis to the national context for application to policymaking in Mexico.

Finally, in the Mexican case it proved very useful to link research in the health and medical sciences to

Definition of health expenditure	
Food poverty line > total expenditure	
1	Cost of inpatient visits in past year and other quarterly health expenditure questions
2	Cost of inpatient visits in past 3 months and other quarterly health expenditure questions
3	Money from income, savings, selling goods, and borrowing spent on health
Food poverty line > household food expenditure	
4	Same as 1
5	Same as 2
6	Same as 3
CTP is always total expenditure – household food expenditure	
7	Same as 1
8	Same as 2
9	Same as 3

In the text, we present results for definitions 7, 8, and 9 because these are most similar to the measures that we have using NHIES data. As noted in the text, the results are highly consistent across all of the ENSANut regressions and thus robust to different measures of health spending. Construction of the permanent income quintiles is described by Gakidou and colleagues in this Series.⁶ CTP=total expenditure minus food expenditure.

Table 3: Definitions of the nine measures used to estimate catastrophic expenditures by criteria for replacing

For descriptive statistics and additional regression results see <http://www.funsalud.org.mx/competitividad.html>

	Health expenditure >20% of disposable income			Health expenditure >30% of disposable income		
	I	II	III	I	II	III
Insurance coverage (relative to uninsured)						
Seguro Popular	-0.173†	-0.155†	-0.184*	-0.141*	-0.167*	-0.306†
Private	-0.549*	-0.543*	-0.480	-1.253‡	-1.236‡	-1.261
Social security	-0.476‡	-0.469‡	-0.570‡	-0.476‡	-0.453‡	-0.539‡
Permanent income (relative to poorest quintile) ^a						
2nd quintile	0.063	0.092	-0.019	0.065	0.085	-0.093
3rd quintile	0.047	0.091	-0.158	0.053	0.118	-0.299*
4th quintile	0.085	0.102	-0.174	-0.022	0.005	-0.268*
Richest quintile	-0.158	-0.152	-0.345†	-0.175	-0.176	-0.530‡
Female household head						
Household size	-0.042‡	-0.038†	-0.061‡	-0.087‡	-0.076‡	-0.035
Age of household head (years; relative to <30 years)						
30-39	0.006	0.010	0.068	0.152	0.073	0.037
40-49	0.042	0.063	0.188	0.294†	0.246*	0.214
50-59	0.330‡	0.353‡	0.316†	0.556‡	0.501‡	0.430†
60-69	0.386‡	0.440‡	0.293*	0.638‡	0.637‡	0.487†
≥70	0.473‡	0.509‡	0.447†	0.806‡	0.794‡	0.631†
Education of the head of household (relative to no education)						
Primary	0.023	0.025	0.000	0.013	-0.013	-0.020
Secondary	-0.023	0.018	-0.173	-0.022	0.025	-0.223
Post-secondary	0.067	0.122	-0.009	-0.015	0.002	0.068
Location of residence (relative to rural)						
Urban	-0.014	-0.004	-0.003	-0.061	-0.045	-0.047
Metropolitan	-0.154*	-0.124	-0.382‡	-0.253†	-0.212†	-0.357†
Child <5 years in household	0.272‡	0.254‡	0.378‡	0.346‡	0.340‡	0.273†
Person ≥65 years in household	0.321‡	0.310‡	0.325‡	0.273†	0.232*	0.379†
Municipality deprivation	0.002‡	0.002‡	0.001*	0.002‡	0.003‡	0.002*
Constant	-2.023‡	-2.222‡	-2.323‡	-2.521‡	-2.667‡	-2.965‡
Sample size	43 214	43 214	43 214	43 214	43 214	43 214

Source: estimations made by authors with ENSANut. I=Cost of inpatient visits in past year and other quarterly health expenditure questions. II=Cost of inpatient visits in past 3 months and other quarterly health expenditure questions. III=Money from income, savings, selling goods, and borrowing spent on health. *p<0.05. †p<0.01. ‡p<0.001.

Table 4: Determinants of the probability of suffering a catastrophic health expenditure (ENSANut 2005-2006)

For definitions of variables see
<http://www.funsalud.org.mx/competitividad.html>

economics and economic policy and to emphasise the links between health and the economy in health policymaking. Again, this included an explicit effort to apply international frameworks such as the Macroeconomic and Health Commission.^{46,47} The result has been a powerful tool for health policy in terms of convincing economic policymakers of the vital role of health and the health sector for economic as well as social development.

Policy-specific messages

This paper analyses two issues surrounding catastrophic and impoverishing health spending and its relationship to the reform. First, we assessed how Mexico turned evidence on the failure to offer financial protection and the resulting high rates of catastrophic and impoverishing health spending, into a catalyst for institutional renovation through health reform and the implementation of the *Seguro Popular*. We then examined one of the most

important expected results of the reform: a reduction in the burden of OOP spending among previously uninsured families and hence in the incidence of catastrophic and impoverishing spending, particularly among the poor.

The Mexican experience shows that there is a relation between financial protection in health and economic performance. Financial protection in health can serve as a safety net for families in the face of economic shocks. The number of families with catastrophic and impoverishing health spending increased substantially during the economic crisis and this would probably have been less marked if they had been covered by health insurance. Periods of economic downturn tend to be associated with loss of formal sector jobs, and this in turn means loss of social security and hence financial protection in health. Additionally, there is typically an increase in poverty and hence in the ability to finance health care. Health insurance can have the dual function of protecting families against health shocks that increase

health care needs, and against economic shocks that reduce their capacity to finance health care. Financial protection in health helps guarantee that illness does not force families to choose between economic ruin and health, and that temporary health shocks are not converted into permanent impoverishment.

Health spending constitutes an additional source of poverty, over and above the impoverishment that can result from illness itself. It is important for countries to begin to consider the additional impoverishment—both in terms of the impact on specific groups of families and on the overall level of poverty—caused by health spending. The Mexican experience shows the importance of recognising this fact and incorporating it into the design of health insurance programmes in order to guarantee that both rich and poor are protected from catastrophic and impoverishing health spending. This has meant incorporating a design of social insurance that differs substantially from traditional medical-care insurance models. The Mexican model seeks to cover the risks faced by the poor that include low-cost items such as drugs and ambulatory care. It also seeks to cover individuals and families that have difficulty participating in formal labour-market social health insurance, such as people living with disability, the unemployed, migrant workers, and female-headed households.

The evidence also signals the important symbiosis and mutual reinforcement that can exist between health insurance and integrated social programmes such as *Oportunidades*. In the case of Mexico and as discussed by Frenk¹⁶ this was a deliberate strategy that helped to guarantee the success of SP given that *Oportunidades* was already in place and included a roster of 5 million families, most of whom were uninsured. In addition to the programme design component, it is clear that poor families are more vulnerable and at risk of catastrophic and impoverishing health spending. Thus, social programmes that prevent poverty also help prevent catastrophic and impoverishing health spending and vice versa.

Finally, the findings presented in this paper, and in other research on catastrophic and impoverishing health spending in Mexico, allude to an important challenge that Mexico will face in the future as the epidemiological transition and the ageing process proceed. The evidence presented in this paper suggests that several key components of SP—insuring the poorest quintiles, covering medications and ambulatory care, and including a package of catastrophic expenditures—are effective strategies to combat catastrophic and impoverishing health spending. The evidence also suggests that families that include older adults are particularly vulnerable to catastrophic and impoverishing health spending.⁴⁸ Although this segment of the population is still not large, it is a rapidly growing group. As the reform proceeds, it will be necessary to cover these families and to continually expand the package to include higher-cost interventions. Population ageing is rapidly progressing not only in

Mexico, but in most middle-income developing countries and programmes for social protection in health will have to adapt to meet this new challenge.

The results of the Mexican experience in offering financial protection are positive. They suggest an important role of the organisation and financing of the health system in increasing the health of the population, but also in reducing impoverishment, promoting equity, and protecting households during periods of individual and collective financial crisis.

Lancet Health System Reform in Mexico Series steering committee

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Contributors

F M Knaul wrote the paper and directed all the statistical, qualitative, and policy analysis. F M Knaul, H Arreola-Ornelas, O Méndez-Carniado, M Miranda, and S Sesma developed the indicators. H Arreola-Ornelas coordinated the statistical analysis. O Méndez-Carniado undertook the analysis of the NHIES surveys. C Bryson-Cahn and J Barofsky undertook the analysis of the ENSANut data and developed the measures and indicators used for this part of the analysis. R Maguire undertook the analysis and wrote the case studies, and coordinated the compilation of the revised text with F M Knaul. All authors have participated in the definition and production of figures, writing, and overall review of the paper.

Conflict of interest statement

F M Knaul collaborates on an ongoing basis with the Ministry of Health of Mexico. As the wife of the Minister of Health of Mexico, this work is undertaken on a voluntary basis. S Sesma worked for the Ministry of Health of Mexico and has participated in analyses of the reform. All authors declare that they have no conflict of interest.

Acknowledgments

Special thanks are given to the memory of Lorena whose scarce time with her family was devoted in part to this paper and whose memory inspires several of its authors to continue their dedication to improving the health sector in Mexico. We thank the following for their valuable assistance: Maja Pleic, Efrén Motta Santiago, Julio Frenk, Emmanuela Gakidou, Christopher Murray, Chunling Lu, Ana Mylena Aguilar-Rivera, Fabrizio Almazán Casali, Wendy Arrieta, Carlos Cabrera Hidalgo, Javier Dorantes, David Evans, María Agustina González, Miguel Ángel Lezana, Rafael Lozano, Daniel Murcia, Teresa Nateras, Sonia X Ortega, Teresa Pérez, Héctor Peña, Kyle Rattray, and Francisco Javier Salcedo. We are grateful for comments and suggestions from reviewers and from commentators and participants in the International Conference on Evidence for Health System Reform, Oct 4–6, 2006. We also thank the Instituto Nacional de Estadística Geografía e Informática (INEGI) for data, and acknowledge and thank the International Development Research Centre of Canada (IDRC) and its Research Matters program, the Health Financing Task Force, the Consejo Nacional de Ciencia y Tecnología (CONACYT) and the Health and Competitiveness Council of the Mexican Health Foundation as well as the Foundation itself for support for this research. None of these institutions has proprietary or financial interest in the outcome of this study. Furthermore, none of the funding sources had any role in the study design, the collection, analysis and interpretation of data, or the writing of the report or the final decision to submit it for publication. The authors had full access to all data in this study and take complete responsibility for the integrity and accuracy of the data and its analysis. This paper contains the views of the authors, and does not necessarily reflect the points of view of the organisations that employ them or the organisations that have contributed with financial support.

References

- 1 Carrin G, James C, Evans D. Achieving universal health coverage: developing the health financing system. Technical briefs for policy-makers no 1. Geneva: World Health Organization, 2005.
- 2 Instituto Nacional de Estadística Geografía e Informática. Encuesta Nacional de Ingresos y Gastos de los Hogares. Aguascalientes: INEGI, 1992, 1994, 1996, 1998, 2000, 2002, 2004. <http://www.inegi.gob.mx/est/default.asp?c=4366> (accessed Oct 3, 2006).

- 3 Instituto Nacional de Salud Pública and Secretaría de Salud. National Survey of Health and Nutrition. Cuernavaca: INSP, 2006.
- 4 World Bank. Income generation and social protection for the poor. Vol 1 and 2. México, DF: World Bank, 2005.
- 5 Instituto Nacional de Salud Pública. Evaluación externa de Impacto del Programa Oportunidades. Cuernavaca: INSP, 2005.
- 6 Gakidou E, Lozano R, González-Pier E, et al. Assessing the effect of the 2001–06 Mexican health reform: an interim report card. *Lancet* 2006; published online Oct 25. DOI:10.1016/S0140-6736(06)69568-8.
- 7 Wagstaff A, Van Doorslaer E. Equity in the finance and delivery of health care: an introduction to the equity project. In: Barer ML, Getzen TE, Stoddart GL, eds. Health care and health economics: Perspectives on distribution. Sussex: Wiley 1998: 179–207.
- 8 Wagstaff A, Van Doorslaer E. Equity in the finance of health care: some further international comparisons. *Health Econ* 1999; 18: 263–90.
- 9 WHO. The World Health Report 2000. Health systems: improving performance. Geneva: World Health Organization, 2000.
- 10 Frenk J, Lozano R, González Block MA, et al. Economía y salud: propuesta para el avance del sistema de salud en México. Informe Final. México, DF: Fundación Mexicana para la Salud, 1994.
- 11 Xu K, Evans D, Carrin G, Aguilar-River AM. Designing health financing systems to reduce catastrophic health expenditure. technical briefs for policy-makers No 2. Geneva: World Health Organization, 2005.
- 12 Van Doorslaer E, O'Donnell O, Ranna-Eliya RP, et al. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet* 2006; 368: 1357–64.
- 13 Gertler P, Gruber J. Insuring consumption against illness. *Amer Econ Rev* 2002; 92: 51–70.
- 14 Himmelstein DU, Warren E, Thorne D, et al. Illness and injury as contributors to bankruptcy. *Health Aff (Millwood)* 2005; suppl: W5–64.
- 15 Londoño JL, Frenk J. Structured pluralism: towards an innovative model for health system reform in Latin America. *Health Policy* 1997; 41: 1–36.
- 16 Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. *Lancet* 2006; 368: 954–61.
- 17 Frenk J, González-Pier E, Gómez-Dantés O, Lezana MA, Knaul FM. Comprehensive reform to improve health-system performance in Mexico. *Lancet* 2006; 368: 1524–34.
- 18 Secretaría de Salud. Sistema de Protección en Salud: Hacia un sistema universal de salud. Firma del Decreto por el que se reforma y adiciona la Ley General de Salud. México, DF: Diario Oficial de la Federación, 2003.
- 19 Knaul F, Frenk J. Health insurance in Mexico: achieving universal coverage through structural reform. *Health Affairs* 2005; 24: 1467–76.
- 20 Secretaría de Salud. Salud: México 2003. Información para la rendición de cuentas. México, DF: Secretaría de Salud, 2004.
- 21 Secretaría de Salud. Salud: México 2004. Información para la rendición de cuentas. México, DF: Secretaría de Salud, 2005.
- 22 Secretaría de Salud. Salud: México 2001–2005. Información para la rendición de cuentas. México, DF: Secretaría de Salud, 2006.
- 23 González-Pier E, Gutiérrez-Delgado C, Stevens G, et al. Priority setting for health interventions in Mexico's System of Social Protection in Health. *Lancet* 2006; published online Oct 25. DOI: 10.1016/S0140-6736(06)69567-6.
- 24 Lozano R, Soliz P, Gakidou E, et al. Benchmarking of performance of Mexican states with effective coverage. *Lancet* 2006; published online Oct 25. DOI:10.1016/S0140-6736(06)69566-4.
- 25 Berman P. National Health Accounts in developing countries: Appropriate methods and recent applications. Cambridge: Data for Decision Making (DDM) Project, 1996.
- 26 Frenk J, Knaul FM, and Gómez-Dantés O. Closing the relevance-excellence gap in health research: the use of evidence in the Mexican health reform. London: Global Forum Update on Research for Health, 2005; 48–53.
- 27 Knaul F, Arreola H, Méndez O, Miranda M. Preventing impoverishment, promoting equity and protecting households from financial crisis: universal health insurance through institutional reform in Mexico. Paper presented at the Global Development Network Conference in St Petersburg, Russia, 2006. Mexico City: Fundación Mexicana para la Salud, 2006. http://www.gdnet.org/pdf2/gdn_library/awards_medals/2005/medals_cat3_first.pdf (accessed Oct 3, 2006).
- 28 Knaul F, Arreola H, Méndez O. Protección Financiera en Salud, México 1992 a 2004. *Salud Pública de México* 2005; 47: 430–39.
- 29 Fuchs VR. Who shall live? Health, economics, and social choice. Great Britain: World Scientific Publications, 1998.
- 30 Banco de México. Mercado de cambios CF102. Tipo de cambios diarios periodo 02/02/1992-24/08/2006. Mexico, DF: BANXICO, 2006. <http://www.banxico.org.mx/eInfoFinanciera/FSinfoFinanciera.html> (accessed Aug 25, 2006).
- 31 Comisión Nacional de Salarios Mínimos. Salarios mínimos: vigentes a partir de 1 de enero de 2004. México, DF: CONOSAMI, 2005. <http://www.conasami.gob.mx/Archivos/TABLA%20DE%20SALARIOS%20MINIMOS%20PROFESIONALES/2004.pdf> (accessed Jul 24, 2006).
- 32 Federación Mexicana de Diabetes, A.C. Diabetes en números. México, DF: Federación Mexicana de Diabetes, A.C. 2006. <http://www.fmdiabetes.com/www/diabetes/dnúmeros.asp> (accessed Aug 24, 2006).
- 33 Secretaría del Trabajo y Previsión Social. Estadísticas laborales. México, DF: STPS, 2005. http://www.stps.gob.mx/01_oficina/05_cgpeet/302_0057.htm (accessed Aug 24, 2006).
- 34 Comité Técnico para la Medición de la Pobreza. Medición de la pobreza 2002–2004. México, DF: SEDESOL, 2005. <http://www.sedesol.gob.mx/prensa/comunicados/presentaciones/MediciondePobreza2002-2004.ppt>. (accessed Aug 24, 2006).
- 35 Arredondo A. Requerimientos financieros para la demanda de servicios de salud por diabetes e hipertensión. *La Revista de Investigación Clínica* 2001; 53: 422–429.
- 36 Secretaría de Salud. Salud: México 2001. Información para la rendición de cuentas. México, DF: Secretaría de Salud, 2002.
- 37 Secretaría de Salud. Salud: México 2002. Información para la rendición de cuentas. México, DF: Secretaría de Salud, 2003.
- 38 Murray CJL, Knaul F, Xu K, et al. Defining and measuring fairness of financial contribution. Geneva: World Health Organization, 2000. http://www.who.int/whosis/discussion_papers/discussion_papers.cf?m?path=whosis,evidence,discussion_papers&language=english# (accessed Sept 17, 2006).
- 39 Xu K, Evans D, Kawabata K, Murray C. Household catastrophic health expenditure: a multi-country analysis. *Lancet* 2003; 362: 111–17.
- 40 Knaul F, Arreola H, Méndez O. The role of evidence on financial protection in the Mexican health reform of 2003: identification, diagnosis, monitoring, prognosis and dissemination of learning. Working paper produced for the International Development Research Centre (IDRC), Research Matters project, 2005. http://www.idrc.ca/uploads/user-S/11587455291Knaul_-_Mexico_Health_Reform.pdf (accessed Oct 3, 2006).
- 41 Knaul F, Arreola H, Mendez O, Leyva V. Catastrophic and impoverishing health expenditure: increasing risk pooling in the Mexican health system. Background paper for the regional study "Beyond survival: protecting households from the impoverishing effects of health shocks." Washington DC: World Bank, 2004.
- 42 Organization for Economic Co-operation and Development. OECD reviews of health care systems: Mexico. Paris: OECD, 2005.
- 43 Wagstaff A, Van Doorslaer E. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–98. *Health Econ* 2003; 12: 921–34.
- 44 Secretaría de Desarrollo Social. Oportunidades: Informe de labores 2004. México, DF: SEDESOL, 2005.
- 45 Baeza C, Packard T. Beyond survival: protecting households from health shocks in Latin America. Washington DC: World Bank, 2006.
- 46 Mexican Commission on Macroeconomics and Health. To invest in health for economic development. Executive summary. Puebla: Universidad de la Américas, 2004.
- 47 Commission on Macroeconomics and Health. Macroeconomics and health: investing in health for economic development. Report of the Commission on Macroeconomics and Health. Geneva: WHO, 2003.
- 48 Knaul F, Arreola H, Méndez O, Torres, AC. Impoverishing and catastrophic household health spending among families with older adults in Mexico: a health reform priority. In: Angel J, Whitfield K, eds. The health of aging Hispanics: the Mexican-Origin population. New York: Springer (in press).