Protecting Households From Catastrophic Health Spending

Moving away from out-of-pocket health care payments to prepayment mechanisms is the key to reducing financial catastrophe.

by Ke Xu, David B. Evans, Guido Carrin, Ana Mylena Aguilar-Rivera, Philip Musgrove, and Timothy Evans

ABSTRACT: Many countries rely heavily on patients’ out-of-pocket payments to providers to finance their health care systems. This prevents some people from seeking care and results in financial catastrophe and impoverishment for others who do obtain care. Surveys in eighty-nine countries covering 89 percent of the world’s population suggest that 150 million people globally suffer financial catastrophe annually because they pay for health services. Prepayment mechanisms protect people from financial catastrophe, but there is no strong evidence that social health insurance systems offer better or worse protection than tax-based systems do. [Health Affairs 26, no. 4 (2007): 972–983; 10.1377/hlthaff.26.4.972]

Millions of people around the world are prevented from seeking and obtaining needed care each year because they cannot afford to pay the charges levied for diagnosis and treatment.1 This can lead to financial hardship and even impoverishment because people are too ill to work. The other side of the coin, less well understood, is that many of those who do seek care suffer financial catastrophe and impoverishment as a result of meeting these costs.2 This occurs in both rich and poor countries.3

This paper focuses on the second effect—the financial consequences of paying for care. It begins by presenting new data from a large data set—116 surveys covering 89 countries—allowing the first global estimates of the extent of catastrophic spending and impoverishment associated with out-of-pocket payments for health services to be made. It then explores health system and population characteristics associated with high levels of catastrophic spending across countries, as the basis for assessing the policy options available to reduce the incidence of financial catastrophe.4 Discussion and conclusions follow.

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Study Methods

Determining financial catastrophe. Catastrophic health spending is not caused simply by high-cost medical procedures or interventions. A relatively small payment can mean financial catastrophe to a poor person or household, forcing them to reduce other basic expenses such as food, shelter, or their children’s education. Similarly, large health care payments can lead to financial catastrophe and bankruptcy even for rich households.5

Although there is not complete consensus regarding the specific threshold for defining financial catastrophe, most agree that it should be measured in relation to a household’s capacity to pay.6 We used the threshold proposed by Ke Xu and colleagues that financial catastrophe occurs with health care payments at or exceeding 40 percent of a household’s capacity to pay in any year.7

In our analyses, we focused on financial catastrophe caused by out-of-pocket payments made directly to a provider for receiving services. These payments typically include consultation fees, laboratory tests and diagnostic expenses, medication purchases, and hospital bills. Fees might be levied officially or unofficially. Insurance reimbursement was deducted from reported household payments. Transportation costs required to obtain care were not included because they are not typically available from general household income and spending surveys. Lost production due to illness was excluded partly for the same reason, but also because it measures the impact of illness on household income rather than the financial impact of seeking care.

Capacity to pay. We defined capacity to pay for health services as a household’s nonsubsistence spending. It would have been preferable to use some indicator of permanent income, taking into account households’ ability to borrow and lend over the life cycle, but the available data did not permit this. However, reported spending is preferable to reported income in any given period. Income is subject to random shocks, while spending is more likely to be smoothed over time, taking into account households’ expectations for the future.8

Subsistence needs were defined, in theory, as the food spending associated with the household having the median food share in total household spending in the country.9 However, to minimize measurement error, in practice we used the average food expenditure of the households whose food share in total expenditure was in the 45–55 percentile range for the sample as a whole. This was then adjusted for household size. A household whose out-of-pocket health payments exceed 40 percent of its capacity to pay (total spending minus estimated subsistence need) is said to incur catastrophic spending. For households whose total spending is below the estimated subsistence need, capacity to pay is taken as the observed nonfood spending.10

Data source. The 116 household surveys, undertaken between 1990 and 2003, provided information on total food and health spending by household. They also allowed calculation of the proportion of households suffering financial catastrophe.
and the Gini coefficient for total spending, a measure of income inequality.11

In most cases, information on frequent expenses was collected during a one-
month period. Information on spending on durable goods or large items, mostly
including the costs of hospitalization, was collected using a six- or twelve-month
recall period because this information would stay in people’s memories longer
than smaller expenses. All spending data were converted into annual equivalents
for analysis.

Systemwide determinants of financial catastrophe. Once the country esti-
mates were made, we explored the health system and population characteristics as-
associated with high rates of financial catastrophe using regression analysis (Exhibit
1).12

Age. A number of recent within-country studies have suggested that financial
catastrophe is more likely to occur in some households than in others, information
useful to policymakers seeking to focus on the people most at risk.13 Accordingly,
we included the two variables describing population characteristics that could be
derived from the survey data: the proportion of the population older than age sixty
and the proportion younger than age five. We expected a positive relationship
with the incidence of financial catastrophe, other things being equal.

Health system financing. A number of health system characteristics were also con-
sidered. The first was the extent to which a country relied on out-of-pocket pay-
ments to finance the health system. The inverse concept is the proportion of total
health spending raised through prepayment mechanisms—taxation, compulsory
social health insurance (SHI), or voluntary insurance. The hypothesis is that the
greater the extent of prepayment, the lower the risk of financial catastrophe.

We also examined whether or not there is any difference between SHI systems
and those financed more from taxes, controlling for the level of prepayment. We

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>GDP per capita (Int$)</td>
<td>1,643</td>
<td>785</td>
<td>5,427</td>
<td>1,746</td>
<td>20,569</td>
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<tr>
<td>Gini coefficient</td>
<td>0.414</td>
<td>0.076</td>
<td>0.384</td>
<td>0.099</td>
<td>0.306</td>
</tr>
<tr>
<td>Fraction of population under age 5</td>
<td>0.010</td>
<td>0.005</td>
<td>0.002</td>
<td>0.004</td>
<td>0.013</td>
</tr>
<tr>
<td>Fraction of population above age 60</td>
<td>0.000</td>
<td>0.000</td>
<td>0.002</td>
<td>0.003</td>
<td>0.002</td>
</tr>
<tr>
<td>Total health spending share in GDP</td>
<td>0.005</td>
<td>0.019</td>
<td>0.027</td>
<td>0.019</td>
<td>0.079</td>
</tr>
<tr>
<td>Prepayment share in total health spend</td>
<td>0.488</td>
<td>0.165</td>
<td>0.617</td>
<td>0.174</td>
<td>0.793</td>
</tr>
<tr>
<td>Percentage of households with catastro</td>
<td>0.031</td>
<td>0.028</td>
<td>0.018</td>
<td>0.019</td>
<td>0.006</td>
</tr>
</tbody>
</table>

SOURCE: Authors’ analysis of survey data.
NOTES: Int$ is international dollars, adjusted for purchasing power. GDP is gross domestic product. See text for definitions of
other variables.
categorized systems as tax-based if more than 60 percent of general government spending on health is derived from general taxation, and SHI-dominated, if more than 60 percent is from mandatory contributions to health insurance. Countries fitting neither description are said to have mixed systems.

We anticipated that no type of system is better than the others at protecting households from financial catastrophe after controlling for the level of prepayment. However, different types of systems might target different population groups. One might consistently provide a higher proportion of benefits to people most susceptible to financial catastrophe, for example, than the other.

Health spending as share of GDP. We also included total health spending as a proportion of gross domestic product (GDP) as a possible explanatory variable. This could be interpreted in three ways: as a proxy for the availability of services, for price differences, or for the use of expensive technologies. In all cases, a positive correlation with financial catastrophe was expected. The greater the availability, the more likely people are to use services and incur costs. The greater the use of expensive technology and the higher the prices, the greater the expenses.

Because catastrophic spending is related to a household’s capacity to pay, we also included per capita GDP in international dollars and the Gini coefficient of households’ spending as explanatory variables, reflecting the average level and distribution of income in the different countries. Other things being equal, the higher the average income level and the lower the inequality, the lower the incidence of financial catastrophe associated with health payments should be.

In addition to the data available from the household surveys, data on total health spending, the proportion derived from prepayment schemes, and GDP per capita were taken from the World Health Organization (WHO) National Health Accounts database.

Study Findings

Extent of financial catastrophe. The surveys revealed considerable variation in the incidence of financial catastrophe across countries, ranging from virtually 0 percent in the Czech Republic, Slovakia, and the United Kingdom to more than 10 percent in Brazil and Vietnam. South Africa had close to zero financial catastrophe in 1995, and it would be interesting to see if this is still the case. The average across the different surveys was 2.3 percent, while the median was only 1.47 percent. This reflects the fact that more than half of the surveys had rates lower than 2 percent. At the other extreme, eighteen countries had rates in excess of 4 percent.

Countries’ income levels. Financial catastrophe occurs in countries at all income levels: Portugal, Spain, Switzerland, and the United States had rates in excess of 0.5 percent despite being members of the Organization for Economic Cooperation and Development (OECD). However, the problem is most severe in low-income countries and more severe in middle- than high-income settings, using the World Bank income classification cut points for 2003 (Exhibit 2).
Numbers of people affected. Although these proportions might not seem high, the number of people affected is substantial. Assuming that the countries for which data were available are typical of those in the same geographical region, around 150 million people each year suffer financial catastrophe, and 100 million are pushed under the poverty level simply because they need to pay for the health services they use. More than 90 percent of these people live in low-income countries.

Health system characteristics. Twenty of the countries for which household spending data were available had SHI systems, fifty-nine had tax-based systems, and ten had mixed systems (Exhibit 3). Tax-based systems dominate in low- and middle-income countries. Only Bolivia in the low-income group had an SHI system, and only seven of the thirty-seven middle-income countries were similarly classified. Conversely, SHI systems dominate in high-income countries. We took these differences into account by grouping countries for analysis according to income category.

Other variables. Levels of prepayment. The only variables that were statistically significant at the 10 percent level and had the expected sign in all models, across all income groups, were the extent of prepayment in total health spending and the Gini coefficient. The more the prepayment and the lower the income inequality, the lower
the incidence of financial catastrophe (Exhibit 4).

Per capita GDP. Per capita GDP is negatively associated with the incidence of financial catastrophe, but only in middle-income countries. The proportion of health spending in GDP—which we interpret largely as the availability of health services—was statistically significant ($p < 0.01$) in low- and middle-income countries, with the expected positive sign.

Age. The proportion of the population under age five was not significant in any income group, which is perhaps surprising. On the other hand, the proportion of the population over age sixty increased the incidence of financial catastrophe in middle-income countries but not in high-income countries, where the elderly are relatively more numerous.

Type of prepayment. The type of prepayment was significant ($p < 0.01$) only in the middle-income countries. The negative sign of the coefficient suggests that SHI systems protect people from financial catastrophe better than tax-based systems do, after controlling for the level of prepayment.

There is an important caveat. The countries dominated by SHI tended to have a higher level of prepayment in their total health spending than the other countries—74 percent, on average, in countries with SHI and 61 percent in tax-based systems (Exhibit 5). It might be that the regressions are simply picking up this factor. If we limit the comparison only to systems where prepayment exceeds 50 percent of total health spending, there is no longer any difference in the ability of tax-based and SHI systems to protect households from financial catastrophe.

Discussion And Policy Implications

We have shown that the incidence of financial catastrophe is negatively correlated with the extent to which countries fund their health systems using prepayment of some form—taxes or insurance. Conversely, catastrophe is positively correlated with the relative importance of out-of-pocket payments in total health spending. A reduction in the incidence of financial catastrophe requires the intro-

EXHIBIT 4
Levels Of Prepayment In Different Countries’ Health Care Systems, By Model

<table>
<thead>
<tr>
<th>Health system model</th>
<th>Share of prepayment in total health spending</th>
</tr>
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<tbody>
<tr>
<td>SHI</td>
<td>![Graph showing prepayment levels]</td>
</tr>
<tr>
<td>Tax-based</td>
<td>![Graph showing prepayment levels]</td>
</tr>
<tr>
<td>Mixed</td>
<td>![Graph showing prepayment levels]</td>
</tr>
</tbody>
</table>

**SOURCE:** Authors’ analysis of survey data.

**NOTES:** Regarding prepayment levels, the lower point is at the fifth percentile; the upper point is at the ninety-fifth percentile. SHI is social health insurance.
We used the term prepayment to describe any mechanism that allows financial contributions to health to be collected before someone falls ill so that they can be drawn on when needed. Financial contributions would typically be drawn from households, firms, and governments and sometimes from external donors. Generally these funds are also pooled across individuals to spread the financial risks associated with illness. There are many different ways of encouraging greater prepayment, although two broad organizational options are often identified: taxes and SHI. In tax-based systems, the insurance function is implicit, whereas in SHI, it is explicit.20

Although these concepts are useful in understanding basic principles, in reality many systems are mixed.21 They may be organized so that one part of the population is provided risk protection through insurance while another part is protected through taxes. The sources of funding may also be mixed; for example, in a number of countries with SHI-based systems, tax-funded government subsidies for the poor or other vulnerable groups are transferred directly into the SHI fund(s). In other cases, the SHI agency or its intermediaries purchase services from public facilities at a price lower than the true cost of providing care, with the remaining costs met by government from tax revenues.
There is also much diversity in the ways in which all systems, tax or insurance based, collect contributions, pool them, and use them to purchase services. There is no universal formula that can be used to help poor countries design ways to increase reliance on prepayment and reduce out-of-pocket payments. Countries at different stages of economic development and in different social and political contexts have different problems and will develop different solutions. Because all types of systems take time to fully mature, mixes of prepayment mechanism types, including taxes and insurance contributions, are likely to be found in the transition period.

However, many of the poorest countries are unlikely to be able to raise sufficient funding domestically to meet all of their health needs in the short to medium term. Governments in these countries have limited ability to collect taxes or health insurance contributions because people are poor, and many work in the informal sector, which makes revenue collection difficult.

As a result, in 2003, forty-eight of the fifty-nine low-income countries spent less than US$30 per capita on health, including monies derived from donors. In twelve of them, total health spending was less than US$10 per capita. Even a very basic set of services for prevention and treatment would cost in excess of US$34 per person per year. Increased, predictable flows of external funding for these countries will be required to supplement the funds that become available through the development of domestic prepayment mechanisms.

Limitations of the analysis. Before discussing the policy implications, it is important to note possible limitations of the analysis. First, it captures only the population making out-of-pocket payments for health services and does not consider people who need services but cannot afford them. It was not possible to explore the extent and nature of nonuse of services from the data contained in our household surveys.

Second, no data on transportation costs were available, so the analysis underestimates the financial consequences of obtaining care. Third, people suffer financial problems because of lost income associated with ill health. The results presented here deliberately focus only on the financial catastrophe associated with out-of-pocket payments made to health care providers, so they provide only one part of the story of the financial consequences of illness.

Fourth, the questionnaires used in each survey were not identical, with out-of-pocket payment recorded for different recall periods using different questions. Longer recall periods probably capture the distribution of financial shocks resulting from health payments over a year better than shorter recalls can, but they introduce more memory bias. Preliminary analysis suggests that in a small set of sur-
veys, there was no correlation between the incidence of catastrophic spending and the recall period, but more research on this is needed.24

**Positive aspects of the study.** On the positive side, this study used data from 116 surveys covering 89 countries, which allows us to show that some degree of financial catastrophe occurs in almost all countries, even the richest. Globally, 150 million people suffer financial catastrophe each year because they must pay for care. These are the only surveys available to us, and although we cannot be certain that the countries we examined are typical of all countries in the world, they account for 89 percent of the world’s population, which gives some confidence in the study’s generalizability.

The study also furthers knowledge by extending the existing literature in a number of ways, including considering more health system and population variables that could influence the incidence of financial catastrophe. Some omitted variables could also be important—for example, the nature and extent of exemptions for user charges or copayments and the geographical distribution of health workers and facilities. However, data were not available for enough countries to be included.

Although it is undoubtedly important to continue to develop the database and the methods to strengthen knowledge about this important topic, some key findings are already emerging. As expected, the greater the reliance on prepayment mechanisms, the lower the incidence of financial catastrophe. The results indicate no difference between tax-based and SHI systems in low-income countries, although only one of them had a SHI system. They also show no differences in financial protection between SHI and tax-based systems in high-income countries, controlling for the level of prepayment.

Interestingly, SHI seemed to protect people from financial catastrophe better than tax-based systems in middle-income countries. We believe, however, that this might be more a statistical artifact than a clear indication that the different types of financing systems protect their populations differently. SHI’s apparent advantage disappears when the analysis is limited to countries with prepayment as a proportion of total health spending greater than 50 percent.

Variation in the extent of financial risk protection for countries with the same overall proportions of prepayment to total health spending is inevitable, because some of them will be able to better target their benefits to people or services most at risk of financial catastrophe. Although the evidence that tax-based or SHI-based systems systematically perform differently in this respect is not convincing, it is important to continually monitor and research the extent to which financing systems protect the most vulnerable groups in society.

**Highlights of the study.** The study also highlights some important facts. First, SHI systems are only observed in middle- and high-income countries and in those with a relatively high level of prepayment in their total health spending. This does not mean that low-income countries with low prepayment levels should rule out
“Countries that do not reduce inequalities in disposable income seem less willing to protect households from financial catastrophe.”

SHI in the longer run, but it does suggest some preconditions required to reach universal coverage through SHI. Some of these prerequisites are the overall level of national income and its growth, the structure of the economy, the geographical distribution of the population, the availability of administrative skills to run an insurance scheme or tax-based system, and social preferences for solidarity.

Second, unlike earlier studies, the availability of services proved to be significantly positively correlated with catastrophic spending in low- and middle-income countries but not in high-income countries. This is probably because most people in high-income countries can access most of the services they need and are protected from the financial risks involved. In low- and middle-income countries, supply constraints limit the use of services, so countries with greater supply show higher levels of use and more financial catastrophe. Increasing the availability of services in poor countries is important to improving health, but this needs to be accompanied by ways of protecting households from the financial consequences of out-of-pocket payments.

Third, increasing inequality in overall household spending is associated with higher rates of financial catastrophe across countries in all income groups, although the correlation is weakest in high-income countries. Countries that do not seek to reduce or are less successful at reducing inequalities in disposable income seem less willing, or able, to protect households from financial catastrophe.

Finally, the young and the aging populations generally need more health services than others. The study suggested that neither the proportion of the population under age five nor the proportion above age sixty is associated with a higher likelihood of financial catastrophe in high-income countries, and even in low-income countries the correlation can best be interpreted as weak. The relationship is strongest in middle-income countries. The relatively weak relationship in low-income countries might be because governments provide services for children such as routine immunization free of charge or because many children die quickly without incurring health spending. On the other hand, it could also mean that households do not seek care for children or the aged if they cannot afford it. This emphasizes the earlier point that it is also important to explore the extent to which households do not use services because of inability to pay.

Policy implications. Our study leads to three important implications for health policymakers. First, moving away from out-of-pocket payments to prepayment mechanisms is the key to reducing financial catastrophe. The choice between increasing prepayment through taxes or some form of insurance contributions will depend on a country’s current institutional structures, culture and traditions, and economic development. In poor countries, continued external funding will be re-
quired to supplement funds raised domestically; with careful thought, these could be used to strengthen the development of domestic prepayment mechanisms or institutions.

Second, decisionmakers can use the information presented in this paper to better target financial risk-protection strategies. Importantly, in middle-income countries, it is time to develop ways to better protect households with elderly members against the financial catastrophe associated with paying for care.

Third, although decisionmakers in the health sector do not control many of the levers necessary to reduce income inequality and poverty directly, they can do so indirectly. Ministries of Health, for example, can actively advocate for complementary policies to reduce social inequalities and increased funding for health because they can improve health, reduce the chances of financial catastrophe, help poor households escape from poverty, and contribute to overall economic growth.

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NOTES


3. Xu et al., “Household Catastrophic Health Expenditure.”


6. Previous thresholds vary from 5 percent to 20 percent of total income—or 12.5–50 percent of nonsubsistence income for poor families spending 60 percent of their income on food. The rank-order correlation coefficient of the proportion of households with catastrophic spending ranges from 0.95 to 0.99 across countries, using thresholds set at 30 percent, 40 percent, and 50 percent of household capacity to pay. S.E. Berki, “A Look at Catastrophic Medical Expenses and the Poor,” Health Affairs 5, no. 4 (1986): 138–145; L. Wyzwaniowski, “Financially Catastrophic and High Cost Cases: Definitions, Distinctions, and Their Implication for Policy Formulation,” Inquiry 23, no. 4 (1986): 382–394; and Wagstaff and van Doorslaer, “Catastrophe and Impoverishment.”

7. Xu et al., “Household Catastrophic Health Expenditure.”

8. While permanent income might be reflected in the assets a household owns, many surveys did not provide enough information to develop an asset index and value assets in money terms—needed for the denomina-

9. Xu et al., “Household Health System Contributions.”

11. The Gini coefficient is a summary measure of inequality, usually applied to the distribution of income or spending across households or individuals. It ranges from 0 to 1, with 0 representing total equality and 1 representing the other extreme. For the list of countries, type of survey, and survey years, see online Appendix 1 at http://content.healthaffairs.org/cgi/content/full/26/4/972/DC1.

12. For the regression analysis, all continuous variables were transformed into natural logarithms for estimation. For most countries, only one household expenditure survey was available. However, the database included four surveys for one country, three surveys for six countries, and two surveys for twelve countries. Accordingly, not all data points can be assumed to be independent, so the robust cluster option in STATA was used to account for clustering. The regressions reported in Exhibit 4 had a good statistical fit. The variance inflation indicators (VIF) indicate that there are no problems with multicollinearity (VIF < 2.6 for all covariates).


14. General government spending is the denominator because social health insurance spending is included in government health expenditures reported in the WHO National Health Accounts, the source of our data.

15. Xu et al., “Household Catastrophic Health Expenditure.”

16. The proportion of the population living in poverty could have been used as an alternative to the Gini coefficient. It would be more appropriate for identifying the determinants of impoverishment rather than financial catastrophe, which can occur to people at all income levels.


18. Details are provided in online Appendix 1, as in Note 11.


