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Coping with Catastrophic Health Shocks

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Abstract

Financial risks associated with ill-health can be an important factor affecting household welfare. The stylised lognormal density of medical care expenditures means that a minority of people actually experiences major financial risks in any given year. Design of effective policy interventions to cope with these risks is especially important to protect the poor from suffering financial catastrophe in obtaining appropriate medical care. Risk management options aim to reduce the net out-of-pocket price facing consumers of medical care, either through supply-side subsidies financed by the government budget and channeled to public providers, or through demand-side subsidies financed by mandatory social insurance. This paper analyses the income distribution of major medical care expenditures using household survey data from Indonesia, and simulates the effectiveness of alternative risk management instruments in reducing the frequency of catastrophic financial risks among different income groups.

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COPING WITH CATASTROPHIC HEALTH SHOCKS

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I. INTRODUCTION

Protecting the poor against financial hardship from major medical expenses that consume a large share of household income is an important yet neglected policy concern in the health sector. The cost of using medical care creates financial risks attributable to ill-health, additional to income losses due to impaired labor supply and productivity. These risks derive intrinsically from the uncertain distribution of illness, intermediated by the behavioral response of seeking medical care when sick.

The problem of coping with catastrophic out-of-pocket costs results from the skewed concentration of the underlying health care expenditures. In the United States, for example, the most expensive 10% of the population account for 70% of all health spending in a given year (Berk & Monheit). Their health spending is, on average, eight times the population-wide mean, and that of the top 1% is thirty times the national average expenditure.

This skewness in the costs associated with medical care is illustrated in Figure 1 where T(x) and HH(x) represent total and household or privately financed expenditures, respectively (Prescott & Nichols).1 Expenditures per household per year are measured along the horizontal axis. The vertical axis measures the percentage of households with particular health expenditure levels. The entire area under T(x) represents total national health spending. Household expenditures are the sum of out-of-pocket payments and private insurance payments for health services.

The wedge between total and household expenditure represents aggregate spending on health by the public sector. Different financing systems set these lines closer or farther apart, depending on the

[1] T(x) and HH(x) are drawn with the commonly observed, approximately log normal shape for health expenditure density functions.

importance of public subsidies. These subsidies manage financial risks by reducing the out-of-pocket prices facing medical care consumers. In Figure 1, public subsidies intervene so as to ensure that no household pays for health care beyond the catastrophic level X2. Intuitively, this means a level of out-of-pocket costs so high that families would have to significantly lower their standard of living. The catastrophic threshold is often set around 10 percent of household income.

Public spending commonly takes the form of supply-side subsidies financed by the government budget and paid to public providers. In some countries, it also comprises demand-side subsidies financed by mandatory social insurance contributions. Each or all of these components could be zero in any particular health financing system. The smaller the role of public subsidies, the larger the net financial risks confronting households in obtaining medical care. Whatever the total subsidy, policymakers must choose whether to target major risks and poorer income groups, or instead to spread subsidies thinly over all financial risks and income groups.

Keeping in mind this stylized framework of public and private expenditure distributions, this paper investigates the magnitude of catastrophic health shocks facing the poor, and explores the design of policy responses. The bulk of the paper uses household data collected by Indonesia's large-scale multipurpose National Socioeconomic Survey (SUSENAS) to answer three empirical questions. First, how concentrated is the distribution of out-of-pocket health spending observed in household survey data? Second, do poorer households with lower incomes suffer disproportionately from catastrophic shocks resulting from this concentration? Third, how well do public interventions such as price subsidies help the poor to cope with these shocks? Finally we turn to the design of catastrophic health insurance in practice, with reference to Singapore's unique Medishield model.

II. CONCENTRATION OF OUT-OF-POCKET HEALTH SPENDING

The SUSENAS Household Survey Data

The analysis uses Indonesia's multipurpose National Socieoconomic Survey (SUSENAS) of households carried out in 1995 and 1996. The SUSENAS has a core-module design that enables data collected in the complementary questionnaires to be cross-linked by merging the data sets. The Core questionnaire is administered to a large sample of around 200,000 households each year. The Core collects information on a set of basic social and economic welfare indicators, including provider-specific medical care utilisation and household consumption expenditures, including data on aggregated health expenditures. A specialised rotating Module questionnaire is administered to a subsample of 60,000 Core households. The 1995 Module collected additional information on the social sectors, including expenditures and sources of finance for inpatient and outpatient care. The 1996 Module comprised a detailed consumption questionnaire that includes a detailed disaggregation of medical care expenditures.

Probability Density of Spending

The stylised lognormal density of household expenditures on medical care is readily seen in the 1996 Module data. Nearly one-half of all households (44%) reported zero expenditure on medical care during the reference month. Including zeros, per capita monthly health expenditures were widely dispersed around an average of Rp. 2,092 (standard deviation=15,469) and a median of Rp. 140. Meanwhile, nonzero per capita monthly medical care expenditures averaged Rp. 3,723 with a median value of Rp. 833.

These large differences between the mean and median figures highlight the heavily skewed nature of the out-of-pocket expenditure distribution. Figure 2 plots the probability density function for nonzero health expenditures. The largest probability density of financial risks is clustered far below the mean value of health expenditures, while the smallest density is distributed over a long tail of high expenditure values. In other words, despite various forms of public subsidy interventions in the medical care market, a minority of users continues to experience major medical expenditures.

Cumulative Distribution of Spending

The skewness of out-of-pocket health spending is the concentration curve showing the cumulative share of total health care expenditures incurred by cumulative shares of health spenders. Figure 3 shows that the top 10 percent of spenders account for 80 percent of all out-of-pocket expenditure on health recorded in the 1996 Module. Meanwhile 81% of the population spends only 10 percent of out-of-pocket outlays. Again the horizontal portion of the Lorenz curve shows that nearly one-half of the population spends nothing on health in a one-month interval. Not surprisingly, the Gini coefficient for health expenditures registers a high degree of concentration at 0.88.

Decomposition of Financial Risks

The observed concentration of overall health expenditures is clearly driven by very different patterns of underlying risk. Figure 4 gives a side-by-side comparison of the probability densities of log expenditure values for outpatient and inpatient events based on 1995 Module data. Obviously inpatient expenditures are the main cause of major financial risks confronting users. The density of inpatient expenditures is displaced well to the right of the outpatient spending distribution, while the probability values are orders of magnitude lower. Only 0.03% of the

population incurred nonzero inpatient expenditures in the reference month, while 8.9% incurred nonzero outpatient expenditures. Outpatient events entail minor financial risks but occur much more frequently.

III. INCOME DISTRIBUTION OF CATASTROPHIC HEALTH SHOCKS

So far we have looked at the concentration of health spending expressed only in absolute terms, instead of relative to the income levels of households that incur these expenditures. Now we turn to the implications of this concentration for the distribution of catastrophic shocks. For operational purposes, we define these in terms of a simple percentage of income threshold set at 10%. Given the inequality of incomes, we expect the poor to suffer disproportionately from catastrophic health shocks measured in this way.

Price-Income Ratios

Ex ante we investigate the affordability of discrete financial risks by computing price-income ratios that index the out-of-pocket cost of inpatient and outpatient care relative to per capita consumption expenditure (as a proxy for income). Provider-specific prices are extracted from the 1995 SUSENAS by estimating hedonic price regressions from individual data on out-of-pocket payments for inpatient and outpatient medical care, and the provider-specific utilisation data on inpatient days and outpatient visits. Separate regressions are estimated for inpatient and outpatient care.

We benchmark the ex ante risk of financial catastrophe at the private sector price of a hospital inpatient admission. This approximates the counterfactual magnitude for major financial risks in the absence of public intervention. The hedonic price of a private hospital inpatient day was Rp.

54,284, with inpatient users averaging 6.3 days length of stay. Meanwhile monthly per capita consumption expenditure ranged from Rp. 21,782 in the poorest quintile to Rp.120,660 in the richest quintile. The corresponding gradient of price-income ratios with annualised consumption expenditures is shown in Figure 5. At a ratio of 1.31, the cost of a private hospital admission far exceeds the annual income of the poorest quintile. Even the richest quintile faces, on average, a seemingly catastrophic ratio of 0.24.

Catastrophic Shocks

Now we turn to the ex post distribution of catastrophic expenditures revealed in the household survey data. The cumulative distribution of household budget shares for health spending from the 1996 Core is plotted in Figure 6. The cumulative distribution of budget shares for the richest quintile dominates -- lies everywhere interior to -- the distribution for the poorest, implying that a higher proportion of the richest households attain any given budget share. In fact, only 2.7 percent of households in the poorest quintile spend more than 10 percent on medical care, while as many as 9.6 percent of households in the richest quintile exceeded the catastrophic threshold (Figure 7).

At first sight, the simple 10%-of-income definition yields the surprising result that poorer households are actually less likely to suffer catastrophic financial risks than the rich. Of course, this finding does not necessarily mean that poorer households truly face a lower likelihood of catastrophic risks. Indeed, medical expenses that appeared catastrophic ex ante may simply be unobserved ex post if they precluded access to treatment, especially among poorer households..

This income-dependence of utilisation patterns is clearly shown in Figure 7 using the 1996 Core data. The poorest quintile averaged only 38 inpatient days per 1,000 per year, an order of

magnitude less than the 675 inpatient days per 1,000 averaged over the richest quintile. The annualised outpatient visit rate averages 3.2 per capita among the richest quintile, double the utilisation rate of 1.6 among the poorest. Thus, the actual distribution of health expenditure is not a purely random exogenous variable.

Insofar as quantities of medical care utilisation are discretionary, the true financial risks confronting the sick when choosing a medical care provider are unobservable. Those who cannot afford the costs because they are poor or lack insurance will not seek treatment or will substitute lower quality treatment providers. This means that we cannot observe directly from the household survey data whether the poor suffer disproportionately from catastrophic health shocks.

IV. RISK MANAGEMENT SIMULATIONS

To get around the problem of unobserved financial shocks, we turn to stochastic simulation methods to purge the confounding behavioral effects of household income variation on prices and utilisation. This helps us to simulate the "true" medical care costs facing households of unequal incomes by imposing a standardised reference income level (e.g. the sample median).

Simulation models were estimated separately for the distributions of utilisation and prices, each for inpatient days and outpatient visits. Flexible distribution functions were used to capture the stochastic elements of the risk. Negative binomial distributions were fitted to the utilisation variables, and lognormal distributions to the different price regimes. Parameters of the distribution functions include observed characteristics such as age, sex, consumption expenditure and insurance status. The simulations assign medical expenditures to households using the estimated parameters of the models. The stochastic element of risk is taken into account by

assigning a single random draw from the estimated error distribution function to each individual or household.

Using the simulation approach we can evaluate the effectiveness of different pricing policies for managing the financial risks. Thus, we establish a benchmark where the simulated distribution of utilisation at the reference income level is subject to the distribution of private sector prices. This suggests what the income distribution of catastrophic health shocks would have been in the absence of any public intervention. Then we simulate what the income distributions of catastrophic shocks would look like if all utilisation was subjected to the distributions of either: (a) publicly subsidised prices; or (b) insured prices prevailing under the health insurance scheme for civil servant families (ASKES) covering 11% of the population.

The simulation results are summarised in Table 1. To begin with, consider the scenario generated by the unstandardised income distribution. Under private prices, 13.3 percent of the households experience a catastrophic shock. Publicly subsidised prices reduce the frequency of catastrophes to 6.3 percent. Insured prices achieve the lowest probability of a catastrophic risk, at 3.1 percent. Still, the poorest quintile appears to enjoy the lowest frequency of catastrophic risks simply because it has lower income-induced utilisation.

This picture reverses if a demand pattern standardised on consumption is used. Standardising on median incomes as the reference point, the average probability of a catastrophic risk is almost identical to the base case. However, the poorer quintiles now face a much higher probability of a catastrophic risk because they have higher income-induced utilisation. Under the purely private sector price baseline, the poorest quintile now has a 18 percent probability of a catastrophic risk. This reduces to 10 percent under the public subsidy scenario, and.falls further to 6% under insured prices.

Table 1: Simulated probability of catastrophic health expenditures under different pricing regimes (percentages)

		Quintile (based on actual per capita consumption)				
	Total	1(poor)	2	3	4	5(rich)
Unstandardised consumption						
Private prices	13.3	12.5	12.2	12.6	14.2	15.2
Subsidised prices	6.3	6.3	5.8	5.7	6.4	7.5
Insured prices	3.1	2.9	2.6	2.9	3.1	4.1
Standardized consumption						
25th percentile (per capita consumption)						
Private prices	8.8	13.2	11.0	8.9	7.2	3.9
Subsidised prices	3.8	6.9	4.7	3.4	2.6	1.4
Insured prices	1.6	3.0	1.8	1.6	1.1	0.6
50th percentile (per capita consumption)						
Private prices	13.0	18.2	15.6	13.8	10.9	6.7
Subsidised prices	6.3	10.2	7.7	6.4	4.6	2.5
Insured prices	3.1	5.5	3.8	3.2	2.1	1.1
75th percentile (per capita consumption)						
Private prices	18.5	22.8	21.3	19.5	17.6	11.1
Subsidised prices	10.1	14.3	12.3	10.2	8.7	4.9
Insured public prices	5.7	9.0	7.1	5.5	4.5	2.5

As expected, these simulations suggest that "true" catastrophic shocks facing the poor are actually higher than observed, not only because of the income effect due to standardisation, but also

because none of the price intervention regimes – budget subsidies or ASKES insurance -- actually reduce prices enough to eliminate major financial risks. Further price reductions appear warranted, provided that they can be effectively targeted to poorer users. Obviously this demands careful attention to the design of catastrophic risk management measures.

V. CATASTROPHIC HEALTH INSURANCE IN PRACTICE

Risk-Pooling Options

The skewed distribution of health spending means that some kind of pooling or insurance mechanism is necessary to guarantee access to high cost but necessary health care. There are two alternative bases for pooling health risks: cross-sectional, across individuals and families during a given year; and intertemporal, over many years through medical savings accounts (MSA) for a single individual or family (Prescott & Nichols,1998). MSAs and high deductible backup insurance together create a combination that could deal effectively with both risk pooling problems. An MSA alone is a weak intertemporal risk pooling device for each individual or family, for while it can accumulate and soften the blow of the high deductible, it could never finance the contingency of being in the top 1% or even 10% of those needing health care. In contrast, a cross-sectional insurance backup, by pooling health risks across many individuals and families in a given year, could easily finance the large health care needs of the few who will need them with per person premiums or tax payments that are relatively modest.

Singapore's unique health financing structure embeds individual medical savings accounts in a multipillar framework of interlocking instruments. Medisave, launched in 1984, is backed up by a cross-sectional catastrophic risk-pooling scheme – Medishield, introduced in 1990 and later augmented by Medishield Plus in 1994. This cross-sectional insurance backup is reinforced by a

means-tested safety net for the poor – Medifund, introduced in 1993. This three-tier package of the 3Ms – Medisave. Medishield and Medifund – is in turn supported by an extensive role of government budget subsidies aimed at lowering the net price of medical care to users of public services.

The Singapore Model

Intertemporal Savings. The financial operations of Medisave are an integral part of the compulsory public sector social security system managed by the Central Provident Fund. The mandatory payroll deduction is equivalent to 40% of the wage bill shared equally between employers and employees. Out of this 40% contribution rate, between 6 and 8 percentage points are allocated to the member's Medisave account depending on age. Withdrawals from individual Medisave accounts are discretionary. They can be used to pay medical bills incurred not only by the account holder but also by their immediate family members, with public or private providers. But the withdrawal rules impose two important exclusions governing entry and exit. Since Medisave is designed to pay for high-cost but low-probability hospitalisation expenses, the entry rules exclude ambulatory care from eligibility for payment by Medisave (except for certain high-cost procedures such as renal dialysis and cancer therapy). Exit rules place a cap on eligible hospitalization expenses at a fixed limit of SGD300 per day for daily hospital charges, plus defined limits per surgical operation. Consequently, the average hospital bill requires a significant copayment on top of the fraction reimbursable by Medisave. These exit rules apply to the elderly and the nonelderly alike, and there are no explicit stop-loss provisions.

Cross-sectional Backup Insurance. Coverage by the Medishield backup insurance pool is quasi-compulsory. Medisave accountholders are presumptively covered on an opt-out basis, with the annual premium payments deducted from their Medisave account. Overall coverage is high because

most Medisave account holders (88%) do not opt out. But opt-out rates are highest among the elderly, reaching about 25% among Singaporeans aged 61 to 70, raising the possibility of adverse selection.

Claims against the Medishield backup for catastrophic expenses are subject to high annual deductibles ranging from SGD500 for the lowest-quality Class C wards to SGD1,000 for Class B2. Higher deductibles are imposed by Medishield Plus, targeted at users of the higher quality Class B1/A wards, ranging from SGD2,500 under Plan B to SGD4,000 under Plan A. All Medishield plans are subject to a coinsurance rate of 20% which can be financed by drawing down Medisave. In addition, Medishield imposes claim limits per policy year of SGD20,000 for basic coverage, SGD50,000 for Medishield Plus A, and SGD70,000 for Medishield Plan B. Corresponding limits per lifetime are SGD80,000, SGD150,000 and SGD200,000. These limits are stop-loss provisions for the insurance fund itself, not for the households on which the event-based deductibles impose financial liabilities. Coverage expires at age 75 under all Medishield plans, but coverage up to 80 is now available through the Incomeshield catastrophic medical plan offered by NTUC.

Budget Subsidies. Medishield itself is backed up by the important role played by government subsidies in Singapore's health financing structure. Budget subsidies play an important backup role in financing hospital inpatient care. These subsidies greatly augment the cross-sectional risk pool and are purposefully designed to be self-targeting to poorer users. About 50% of public sector inpatient costs are subsidized. These subsidies are channeled through the supply side from the Ministry of Health to public hospitals, and passed on to users through a multi-tier pricing structure.

The explicit policy of price discrimination is based on the four different classes of hospital ward in public sector hospitals – ranging in ascending order of comfort from Classes C, through B2

and B1 to A. Data for 1995 indicate that the subsidy ratios are highly differentiated across ward classes – averaging up to 74% of hospital costs in the lowest Class C, and declining to 67% in Class B2, 26% in Class B1 and 8% in upper Class A. Given the differential utilization patterns, the hospital inpatient subsidy is very efficiently targeted toward the lower quality wards. About 59% and 25% of the subsidy is targeted to the lower Classes B2 and C, while only 15% and 2% of the subsidy leaks to Classes B1 and A respectively.

These differential subsidy ratios are intended to help equalize the affordability of the class-specific prices relative to the income levels (and corresponding Medisave balances) of the patients who self-select them. Public hospitals provide financial counseling to prospective inpatients to facilitate selection of an affordable ward class based on the expected hospital bill size and the individual's Medisave balance. The effect of the price discrimination policy on affordability can be illustrated by the distribution of price-income ratios (PIRs), assuming a certain income distribution of utilization (which is not directly observable). Suppose the distribution of utilization is such that the poorest quintile uses Class C, the next poorest Class B2 and so on, with the richest quintile using private hospitals. Given the average cost of a hospital admission in each service category, the PIR gradient would be regressive without the price subsidy. The poorest quintile would face a catastrophic price equivalent to 55% of annual per capita expenditure, while the richest quintile faces a price-income ratio of only 21%. With the subsidies, the PIR gradient becomes progressive – lowest at 14% for users of Class C wards, and increasing to 31% for Class A wards.

Social Safety Net. As a last resort, patients who are unable to pay all their bills at government hospitals, after Medisave and Medishield, can apply for a means-tested grant from their Hospital Medifund Committee. This safety net is targeted at households with two adults and three children earning less than SGD1,400 per month -- roughly the lower one-third of the income distribution (Ministry of Trade and Industry, 1996). Medifund is an autonomous endowment fund

financed by periodic allocations from the government's budget surplus. Only the Medifund investment income is available to finance these demand-side subsidies targeted at the poor. However, significant numbers have obtained assistance. Those assisted amount to an increasing number of hospital inpatient admissions at the lower Class B2/C levels – 3.3% in 1993, 4.2% in 1994 and 5.8% in 1995 .