IS THERE A MARKET FOR VOLUNTARY HEALTH INSURANCE IN DEVELOPING
COUNTRIES?

Mark Pauly
Fredric E. Blavin
Sudha Meghan

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ABSTRACT

In many developing countries the proportion of health care spending paid out of pocket is about half of all spending or more. This study examines the distribution of such spending by income and care type, and the variation in spending about its expected value, in order to see whether voluntary private health insurance that reduces variation in spending might be able to be supplied. Using data from the World Health Survey for 14 developing countries, we find that out of pocket spending varies by income but that most spending usually occurs in income quintiles below the topmost quintile. We use estimates of the variance of total spending, hospital spending, physician spending, and outpatient drug spending about their means to generate estimates of the risk premia risk averse consumers might pay for insurance coverage. For hospital spending and total spending, these risk premia as a percent of expenses are generally larger than reasonable estimates of private health insurer loading as a percent of expenses, suggesting that voluntary insurance might be feasible. However, the strong relationship between spending and income suggests that insurance markets may need to be segmented by income.

Mark Pauly
Health Care Systems Department
University of Pennsylvania
208 Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104-6218
and NBER
pauly@wharton.upenn.edu

Fredric E. Blavin
Health Care Systems Department
The Wharton School
University of Pennsylvania
Colonial Penn Center
3641 Locust Walk
fblavin@wharton.upenn.edu

Sudha Meghan
University of Pennsylvania
Colonial Penn Center, Room 204
3641 Locust Walk
Philadelphia, PA 19104-6218
sudham@wharton.upenn.edu

Introduction.

In almost all developing countries a sizeable proportion of total national health care expenditures are paid out of pocket. We have noted elsewhere that there are potential utility gains from making insurance available in such countries to risk averse consumers who might otherwise need to make large out of pocket payments (Pauly and Zweifel, 2006). The private gain to citizens from protecting themselves from a rare but very high medical expense might motivate voluntary insurance purchase if that insurance can be offered at attractive premiums. There might also be a widespread societal gain if some of those who can now obtain insurance were households whose poor health outcomes and catastrophic ruin from high medical bills are of highest concern.

This study looks at the potential for voluntary health insurance in a sample of truly "developing" countries, ones with low but growing per capita incomes. It looks at the potential demand for an all-inclusive insurance, for one that covers hospital care, and for one that covers outpatient drugs only. We show that potential demand for voluntary health insurance is not concentrated in the highest strata of the income distribution, but often extends to lower income levels as well. The demand for insurance exists for two reasons: first, for many households the possibility of a high out of pocket payment, though low, is real: there is a risk to be confronted. Second, the variance of potential out of pocket spending is quite large, so that (with plausible assumptions about risk aversion), the "risk premium" people would be willing to pay above the expected value of the benefits is fairly large, which in turn implies that an insurance plan should profitably be able to charge premiums that cover both its expected benefits costs and its administrative expenses, for plausible values of those administrative expenses.

This is so even for people not at the highest income levels. (We will usually define as "high income" those in the highest quintile of the distribution of household income). In almost all of the countries we examine, people with estimated incomes below the topmost quintile account for most of the out of pocket payments made. However, the mean or expected out of pocket expense varies with income. We will show that this implies segmenting the voluntary insurance market so that those with lower incomes are able to pay premiums based on their below-average spending; compared to charging premiums based on average expense across all income groups, a segmented policy will not cross-subsidize the rich and will be more attractive to lower income consumers.

Finally, we examine the likelihood a voluntary market might be feasible by estimating the amount of people in each developing country would be willing to pay for insurance above the expected value of benefits and comparing this "risk premium" (as part of the total premium) with likely values for the administrative expense share of insurance premiums. In particular, we use the variance of out of pocket spending combined with accepted risk aversion parameters to estimate the "risk premium." In most (though not all) the countries we study, this risk premium (expressed as percentage of expected benefits for full coverage insurance) is in the neighborhood of the kinds of administrative expense percentages that insurers in private markets can generate. This is especially so for insurance that would pay for hospital care; it is also true for comprehensive insurance that covered hospital, physician, and drug expenses.

However, the risk premium for stand alone drug insurance is relatively low, while at the same time drug spending constitutes a large share of total out of pocket spending. These findings suggest that a comprehensive insurance (rather than a hospitalization-only

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or drugs-only policy) might be the most feasible way to achieve good financial protection.

Conceptual framework.

The theory of insurance demand predicts that risk averse households will voluntarily purchase insurance if it can be offered to them at a premium whose excess over expected expenses is smaller than the "risk premium" they would be willing to pay. That risk premium in turn depends on the variance of the losses the insurance will cover and on the household's extent of risk aversion (Phelps, 2003, p. 323). There will be little demand for insurance if the variance of the losses is small or the administrative "loading" in excess of the fair premium is high. The value of risk aversion and the loading that would be charged in insurance markets should they come into existence is obviously not known precisely at present. But by computing a risk premium based on actual variance of expenses and plausible values for the risk aversion coefficient, we can estimate the maximum value of the loading at which a market can exist. If this maximum acceptable loading is higher than plausible conjectures about insurer administrative costs (and normal profit) for a market in voluntary insurance without subsidies, we will conclude that even an unsubsidized voluntary market appears possible. By extension, modest subsidies can substantially improve the functioning of voluntary private insurance markets.

The implication is that a voluntary health insurance market is most likely to emerge when three conditions hold: (1) there is a risk of out of pocket payments which are high relative to households' income or wealth; (2) insurance firms can offer premiums to

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different households that are close to the different households' expected value of out of pocket medical spending; and (3) loadings for administrative costs and profits are moderate. Of course, some of these quantitative terms, like "close" and "moderate," remain to be determined.

The sample of countries.

We selected a sample of convenience of fourteen developing countries with moderately large populations, per capita incomes that are low compared to developed countries but above subsistence levels, and generally high values for real economic growth. Table 1 shows these countries, their per capita incomes and income growth rates, and the proportion of medical spending made out of pocket. We intentionally chose the sample to include countries from Africa, East Asia, and the former Soviet Union. Though the sample is obviously not random, it should illustrate whether the key parameters of insurance demand tend to vary across countries, and offer some evidence on the generalizeability of conclusions (recognizing that there are rarely enough observations of different countries in cross-country studies to support a guarantee that something will probably work everywhere). The most notable finding in Table 1 is the high percentage of out of pocket payment at the point of use (for example, in the US the comparable figure would be about 12%). In most of these countries the proportion of people with formal insurance is low, but high out of pocket proportions even occur in countries like Kazakhstan and Georgia where the proportion of the population nominally with health insurance is large.

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The World Health Survey.

We primarily rely on data from the 2002 World Health Survey (WHS) which was implemented in 71 countries by the World Health Organization. The WHS contains individual and household-level data on the health of populations and outcomes associated with health systems (World Health Organization, 2003). Approximately 4,000 to 6,000 households are surveyed in each country using a multistage stratified random cluster sample. The most knowledgeable household member (household informant) answers the household survey. Our final household-level dataset combines information on household survey, which includes health expenditures, permanent income measures, and insurance status, with demographic information on the household informant from the individual survey. The survey does not gather data on individual health expenses.

Definition of income.

Measures of annual money income were not obtained in the World Health Survey. It is likely that any measures would have been imprecise, because of imperfect recall and the importance of income in kind (e.g., consuming home agricultural production). We wish only to divide households in each country into income quintiles; great precision in the income measure is not required for this task. We show average out of pocket medical expense per household by income stratum with the strata based on two measures: (1) a "permanent income" measure suggested by the WHO based on a regression of consumption spending on some indicators of wealth, such as whether the household owns a bicycle, etc. (Ferguson et al. 2003); (2) Because this measure is likely to be unbiased but contain substantial measurement error, we also developed an alternative measure

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based on actual consumption spending less actual medical care spending for each household, plus an estimate of expected medical expenses based the WHO permanent income regression variables.

Measuring out of pocket expenses.

The World Health Survey asks for household medical expenses, in total and separately for inpatient care, drugs, and outpatient physician care, in the month prior to the survey. It only asks for an annual estimate for inpatient hospital expenditures and use (as well as monthly hospitalization expenditures), presumably because the larger size and rarer frequency of typical inpatient hospital use makes recall less of a problem and monthly measures much more noisy. As we discuss in more detail below, empirical measures of risk aversion in the literature are almost all based on annual or lifetime income and wealth; fluctuations and mismatches of spending and income over short time periods in a year are assumed to be of little or no consequence (but see below on the possible "time smoothing" benefits of insurance).

This data will allow estimates of annual risk premia for inpatient care based on data on the variance in annual out-of-pocket spending relative to its mean, by income stratum. It is less than clear how the distribution of annual total medical spending across households (or, for that matter, the distribution of lifetime spending) should be related to the monthly numbers for the other two categories of spending. Here the best that we can do is to estimate bounds on annual spending and the variance or standard deviation of annual spending. At one extreme, we could assume that almost all illness is chronic, and so generate an estimate of annual spending for each household by multiplying its monthly

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spending by twelve. (The annual frequency of positive spending in this model would then be the same as the monthly frequency.) The standard deviation of spending relative to the mean in this model would be identical at monthly and annual observation periods. This would be interpreted as the risk faced by a person contemplating the possibility of a future chronic condition which would last at least a year if it occurs, and which occurs at the observed frequency of positive spending in the monthly data.

At the other extreme, we could assume that all illnesses are acute and independent, and are short enough that they almost all begin and end within a month. Then we could estimate annual lifetime expenses for each household based on that assumption that monthly spending levels were independently and randomly distributed. Here the average annual spending level would still be twelve times the monthly level, but the standard deviation of annual spending would in this case be close to the monthly standard deviation, and the coefficient of variation would be approximately the monthly standard deviation divided by the annual mean spending, a much smaller number than in the chronic case.

In-between cases which we will simulate will assume that the typical length of an episode of spending is greater than a month but less than a year. We will provide estimates of the risk premium based on the assumptions that on average spending episodes are three months or six months in duration.

The survey did contain a question asking whether any family member had a chronic illness or condition which required help from others with activities of daily living. This measures the prevalence of chronic illnesses that lead to frailty, a subset of all chronic illnesses. Only about 6% answered affirmatively. We have deleted from our sample of

potential insurance purchasers this six percent of households who already have strong

evidence of being high risk at insurance purchase, since the premium they would need to

be charged in a private market would be high; up to a point they would have a greater

willingness to pay for a given nominal policy than lower risk households, but high premia

may run into a budget constraint on insurance.[1] We might imagine that any voluntary

insurance system would have a subsidized high risk pool to deal with such matters.

Variation in out of pocket spending with income.

We first want to determine how out of pocket medical expenses were distributed

across income strata in these countries. Table 2 provides the main results, displayed for

both measures of income. In most countries the uppermost quintile spends considerably

less than half of total out of pocket expenses, although there are a few countries (Laos,

Senegal) where expenses are much more concentrated among the rich. The distribution

of expenses by income does seem to vary across these countries, but in all of them there

is enough spending among people with incomes below the top quintile to suggest that a

market for insurance could benefit more than just the rich.

The distribution by income is somewhat more skewed using the consumption

definition of income than using the WHO wealth-related distribution. This is to be

expected, and reflects a tradeoff between a wealth based measure that is probably more

influenced by permanent income and a consumption measure that will be affected by

fluctuations over time. We do not think it is possible to establish a preference a priori,

especially if imperfect capital markets mean that consumption cannot easily be smoothed

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[1] For all countries, except for Georgia and Kazakhstan, we also deleted units where the household
informant reports having health insurance. Nearly all households in Georgia and Kazakhstan report having
health insurance and are included in the final sample.

over time. The qualitative pattern of out of pocket spending being related to income, and being common in income strata below the topmost, is displayed using either income measure.

The spending data show, in Table 3, that at every income level drug spending has the largest single share of total spending. Probably hospital and doctor care, largely produced with local labor, have a much lower relative price than do pharmaceuticals where the local price is closer to the world price, and can often be obtained for low or zero cost in whatever public health or safety net system the country offers.

Even more relevant to insurance markets, we note in Table 3 that there is substantial variation across income strata in the level of expected expenses, with average expenses falling in absolute value (though not as a proportion of income) as income falls. This means that insurance that charged the same premium for a given level of coverage to consumers at all income levels may have problems of adverse selection by upper income people; they would be eager to buy insurance whose premium did not reflect their higher demand. Lower income people might decline insurance not just because they are lower income or cannot" afford" the premium but also because the premium is high relative to what they would expect to receive as benefits. A market with uniform premiums may therefore be limited or, in the extreme, even fail to exist. Varying the premium (and potentially the generosity of coverage) positively with income may permit markets for lower income households to survive; segmented markets may have value. Compared to no insurance, which is undesirable, and generous coverage for all, which is infeasible, making a lower cost basic insurance available to lower income households may make economic sense.

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Variance of hospital spending and theoretical risk premium.

Insurance is useful and is demanded voluntarily only when there is variation in actual medical expenses about their predicted or expected (average) value; there is no point in paying for insurance to cover a sure thing, even a valuable sure thing. The greater the variance in spending for a given expected value, the higher the risk premium (in excess of the actuarially fair premium) a risk averse household will be willing to pay. To illustrate the method of estimating risk premia, consider the data on annual hospitalization expenses. We first regressed hospital spending within consumption-based income strata on household characteristics such as income and family size. We then calculate the variance of actual spending from its regression predicted expected value. The means and coefficients of variation are shown in the first two columns in Table 4.

According to Phelps (2003, p. 323), the risk premium is approximately $.5*[r(I)/I]*\sigma^2$, where $r(I)$ is the relative risk-aversion coefficient, I is income, and σ^2 is the variance of the residual for the risky distribution. Using a constant risk aversion coefficient of 2.0, we find as shown in the third column of Table 4 that the risk premium for hospitalization insurance is generally in the range of 40 to 60 percent of its expected value. (Garber and Phelps [1997] indicate that a risk aversion coefficent of 2.0 represents the central tendency of estimates in this area.) As we will discuss in more detail below, it seems likely that insurance could be profitably offered at premiums with loadings smaller than this proportion.

Total spending, other categories of spending, and risk premia.

As noted above, we do not have annual spending data for the other components of medical spending or for total spending. To approximate measures of spending and risk premia on an annual basis, as discussed above we simulate spending based on the assumption that the average spell of spending is three or six months in duration. We show the national average coefficients of variation (from regression-predicted spending) for total spending, physician spending, and drug spending only implied by the assumption that spells of spending average both three months and six months in Table 5. Note that the total expenditure figure includes any temporal correlation across the expenditure types. (The expense prediction model was estimated separately for each income stratum.)

The table shows that, for total spending, in most countries, the implied risk premia are quite high relative to mean expenses. The risk premia are lower for drug only coverage, as might be expected, but even these values may sometimes be attainable by state of the art insurance firms. (As one might expect, the overall risk premia tend to be smaller in countries like Kazakhstan where the drug share is high.) The results indicate that bundling drug and physician coverage with other coverage yields a higher proportional risk premium than for stand-alone drug insurance. If insurers could be required to offer only comprehensive insurance (rather than permitting drug expenditure to be carved out), the emergence of an otherwise voluntary insurance market that covers drug spending becomes more likely.

Which income and which spending matters?

The theory of the demand for insurance makes the risk premium a buyer would be willing to pay for insurance against a single loss in excess of the insurance's actuarial

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value a function of the buyer's taste for (or against) risk, and the variance of losses around the mean for buyers facing identical risks. That preference as well may be influenced by the buyer's level of wealth. It is usually specified in an empirical context by the coefficient of relative risk aversion (CRRA), which divides the coefficient of absolute risk aversion by wealth or income.

In the prospective application to data on medical spending in developing countries, both the form of the data and the plausibility of assumptions about buyer behavior take us quickly away from the stylized example of a single potential risk to lifetime wealth. If capital markets were perfect, so that people could shift consumption over their lifetimes, then the proper measure of what is threatened by an unexpected loss would be the present discounted value of lifetime wealth. Even losses that were high relative to any single period's income could be quite low relative to lifetime wealth, and therefore could carry low risk premia. Borrowing or saving would be a substitute for insurance. However, in developing countries capital markets are surely not perfect. What then in theory would be the ideal measure of what is threatened by an unexpected loss?

If we went to the other extreme and assumed that borrowing or saving were impossible over more than a brief period of time, then income in that brief period would be the proper measure, and it would be matched with potential losses in the same period. The correct model surely is something in between, probably involving current period income and gross or net assets. Thus our use of a CRRA from developed country studies may actually understate risk aversion for these developing countries, where capital markets are limited. Interfamily borrowing is a common substitute, but is surely not universally available or easy to arrange.

There are thus two influences on what time period to use for spending and income measures in constructing estimates of the risk premium. One is the length of a spell of spending, and the other is the efficiency of the capital market. We could simulate the former in our analysis, but we do not have data on the latter. Since large medical expenses will almost always be associated with a potential need to borrow, the interest rate people in different income strata pay might be a useful indicator for future research.

Conclusion: What can we expect and what can we conclude?

The last piece of the puzzle is a determination of the kind of expense loadings insurers in developing countries might be able to achieve. The very low (5-15%) loadings in private insurance in the US apply only to heavily tax-subsidized group insurance, and such insurance is likely to be the exception rather than the rule in developing countries. A benchmark for a well managed individually purchased insurance in the US and other developed countries would be a loading as percentage of benefits of about 30%. If developing countries could achieve this rate, our results suggest that many households at many income levels would find voluntary insurance attractive, compared to facing similar expenses out of pocket.

Data on administrative expenses for private insurance in developing countries is available, though fragmentary and not strictly comparable across countries. One benchmark is private insurance in Chile, which is almost all individual (non-group) insurance, and which has an administrative loading of about 18% (Mahal, 2002, p. 434; Asociación de Isapres A.G. 1998). However, while taking private insurance in Chile is voluntary, taking some insurance is mandated on the working population by imposition

of a wage tax to fund either public or private insurance. Private individual insurance in South Africa appears to be as efficiently administered as in the US (perhaps because the bulk of customers are higher income households employed in the formal sector of the economy. The loading for the private General Insurance Company of India has been set at 20-32% (Mahal, 2002, p. 434). Additional measures of this type would be useful.

Nevertheless, even with the knowledge we now have, it does seem possible to conclude that there are bright prospects for voluntary insurance in many developing countries. If the insurer can segment markets by income, even low income households might be attracted. If consumers or decisionmakers are wary of for-profit insurers, the initial source of voluntary health insurance could largely be private nonprofit firms (as it was in the US for decades).

We want to be realistic. The argument is not that voluntary insurance is perfect—it will leave out the poorest households and offer limited coverage to middle income households—but that it is better than out of pocket payment, and is more feasible than heavily subsidized public insurance.

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TABLE 1
Per Capita Income, Income Growth Rates, Proportion of Medical Spending Made Out-of-Pocket, and Sample Sizes
Sample of Developing Countries

	GDP Per Capita (PPP)[a]	*Real GDP Growth Rates[a]*	*% Medical Expenditures Made OOP[b]*	*Final Sample Size (Households)*
Bangladesh	1980	5.3	64	5195
Ecuador	3780	3.8	57	754
Georgia	3160	7.0	80	2444
Ghana	2340	5.2	59	2806
India	3108	6.8	78	6282
Kazakhstan	7680	9.1	47	4173
Kenya	1084	3.1	45	3344
Laos	1860	6.3	39	3666
Pakistan	2280	5.9	65	5421
Paraguay	4640	1.7	55	3926
Philippines	4780	5.1	47	7491
Senegal	1680	4.7	53	1384
Vietnam	2670	7.4	62	2412

Data Sources:
a: Average of 2002-2006 estimates, CIA World Factbook (2003-2007).
b: World Health Organization, *The World Health Report 2005: Make Every Mother and Child Count*

TABLE 2
Percentage of Total Out-of-Pocket Payments
Accounted for by Lower Income Households
Sample of Developing Countries

	Spending Based Definition of Income		WHO Wealth Based Imputed Income	
	Bottom 80% of Households	*Bottom 40% of Households*	*Bottom 80% of Households*	*Bottom 40% of Households*
Bangladesh	63%	24%	69%	30%
Ecuador	61%	24%	63%	28%
Georgia	64%	21%	70%	24%
Ghana	68%	28%	73%	35%
India	70%	29%	77%	29%
Kazakhstan	77%	33%	73%	35%
Kenya	61%	17%	76%	29%
Laos	51%	18%	69%	27%
Pakistan	60%	21%	71%	36%
Paraguay	70%	32%	77%	34%
Philippines	72%	26%	72%	30%
Senegal	45%	17%	56%	20%
Vietnam	73%	34%	79%	42%

Source: WHO World Health Survey

TABLE 3
Mean Total Monthly Out-of-Pocket Spending (in PPP $) and Overall Percentage
of Spending for Prescription Drugs
By Country and Income Quintile (Spending-Based Definition)

		Income Quintile Group					% of Total Spending Attributable to Drugs
Country	*Overall*	*1*	*2*	*3*	*4*	*5*	
Bangladesh	48	24	33	40	51	92	84.1%
Ecuador	54	31	43	39	46	108	68.7%
Georgia	32	10	23	33	36	56	69.1%
Ghana	49	28	36	42	58	86	48.3%
India	50	31	40	39	66	79	54.9%
Kazakhstan	28	20	26	27	35	32	88.8%
Kenya	18	5	8	21	19	42	39.1%
Laos	34	13	22	26	28	72	52.9%
Pakistan	49	21	32	35	58	99	58.9%
Paraguay	45	28	33	35	50	111	73.1%
Philippines	39	21	25	38	52	67	61.4%
Senegal	36	18	11	22	29	104	46.4%
Vietnam	30	21	25	35	26	50	44.4%

Source: WHO World Health Survey

TABLE 4
Reported Annual Out-of-Pocket Hospital Spending
Mean Spending, Coefficient of Variation, and Risk Premium
as a Percent of the Mean by Country

	Overall		
	Mean	*CV*	*Risk Premium as % of Mean*
Bangladesh	103	5.1	39%
Ecuador	110	5.2	51%
Georgia	62	6.1	73%
Ghana	62	3.6	11%
India	166	4.5	68%
Kazakhstan	21	4.9	12%
Kenya	34	7.8	62%
Lao	86	5.3	101%
Pakistan	99	4.9	50%
Paraguay	167	5.2	42%
Philippines	98	6.1	82%
Senegal	44	5.1	16%
VietNam	58	6.2	60%

Source: WHO World Health Survey

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TABLE 5A
Simulated Annual Out-of-Pocket Spending Assuming 6-Month Spell
Mean Spending and Average Risk Premium as a Percent of the Mean by Country

	Drug Spending Only		Physician Spending Only		Total Spending (Drug, Physician, and Hospital)	
	Mean	*Risk Premium as % of Mean*	*Mean*	*Risk Premium as % of Mean*	*Mean*	*Risk Premium as % of Mean*
Bangladesh	485	10%	50	5%	576	15%
Ecuador	439	29%	88	23%	634	60%
Georgia	269	21%	42	24%	394	62%
Ghana	280	13%	136	16%	578	24%
India	354	41%	123	22%	585	83%
Kazakhstan	300	10%	12	117%	346	18%
Kenya	90	18%	57	13%	210	57%
Laos	220	34%	60	29%	414	78%
Pakistan	379	20%	102	8%	606	48%
Paraguay	391	23%	45	10%	552	57%
Philippines	287	28%	56	25%	472	81%
Senegal	205	16%	84	18%	413	44%
Vietnam	164	13%	87	20%	357	78%

Source: WHO World Health Survey

TABLE 5B
Simulated Annual Out-of-Pocket Spending Assuming 3-Month Spell
Mean Spending and Average Risk Premium as a Percent of the Mean by Country

	Drug Spending Only		Physician Spending Only		Total Spending (Drug, Physician, and Hospital)	
	Mean	*Risk Premium as % of Mean*	*Mean*	*Risk Premium as % of Mean*	*Mean*	*Risk Premium as % of Mean*
Bangladesh	487	5%	52	3%	579	8%
Ecuador	410	14%	117	15%	580	40%
Georgia	282	10%	46	13%	401	36%
Ghana	278	7%	136	9%	575	12%
India	356	22%	108	10%	597	40%
Kazakhstan	299	5%	7	49%	337	10%
Kenya	86	8%	56	7%	212	27%
Laos	221	17%	60	15%	415	38%
Pakistan	411	10%	100	4%	641	30%
Paraguay	389	11%	47	5%	536	29%
Philippines	292	15%	56	12%	479	42%
Senegal	200	8%	81	10%	407	24%
Vietnam	167	7%	84	9%	365	34%

Source: WHO World Health Survey