Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data

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Summary

Background **Conventional estimates of poverty do not take account of out-of-pocket payments to finance health care. We aimed to reassess measures of poverty in 11 low-to-middle income countries in Asia by calculating total household resources both with and without out-of-pocket payments for health care.**

Methods **We obtained data on payments for health care from nationally representative surveys, and subtracted these payments from total household resources. We then calculated the number of individuals with less than the internationally accepted threshold of absolute poverty (US$1 per head per day) after making health payments. We also assessed the effect of health-care payments on the poverty gap—the amount by which household resources fell short of the $1 poverty line in these countries.**

Findings **Our estimate of the overall prevalence of absolute poverty in these countries was 14% higher than conventional estimates that do not take account of out-of-pocket payments for health care. We calculated that an additional 2·7% of the population under study (78 million people) ended up with less than $1 per day after they had paid for health care. In Bangladesh, China, India, Nepal, and Vietnam, where more than 60% of health-care costs are paid out-of-pocket by households, our estimates of poverty were much higher than conventional figures, ranging from an additional 1·2% of the population in Vietnam to 3·8% in Bangladesh.**

Interpretation **Out-of-pocket health payments exacerbate poverty. Policies to reduce the number of Asians living on less than $1 per day need to include measures to reduce such payments.**

Lancet 2006; 368: 1357–64

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Introduction

Out-of-pocket payments continue to be the most important means of financing health care in most developing countries. Large and unpredictable health payments can expose households to substantial financial risk and, at their most extreme, can result in impoverishment. But standard measures of poverty are not adjusted for these costs. On the contrary, households that sell assets or incur debt to pay for health care will not be counted as poor if high medical expenses raise their total expenditure above the accepted poverty threshold. Failure to recognise variation in out-of-pocket health payments could also result in misinterpretation of trends in poverty over time or of differences between countries. For example, a reform of health-financing policy that reduced reliance on out-of-pocket payments could produce an apparent rise in poverty. Failure to account for the impoverishing effect of out-of-pocket health payments could also hinder monitoring of progress toward the first Millennium Development Goal, which is to reduce by half the proportion of individuals living on less than $1 per day by 2015.

In the USA, a National Academy of Sciences panel[1] has recommended that poverty be assessed after deduction of health-care payments, as most of these payments cover essential needs that are not fully incorporated in the poverty threshold. (Alternative estimates of poverty in the USA are available.[2,3]) The variability and unpredictability of medical expenditures make it very difficult to establish a poverty threshold that incorporates them. Some have criticised the recommendations of the National Academy of Sciences panel on the basis that health-care expenditures vary (eg, according to incomes and prices), indicating that some health-care spending is discretionary.[4] Nonetheless, some households probably make great sacrifices to pay for vital health care. The high medical expenses of such households might raise their total spending above the poverty line, causing them to be classed as non-poor, even though their spending on food, clothing, and shelter might more accurately classify them as below the subsistence level.

The World Bank has developed two international absolute poverty lines—US$1·08 and $2·15 per head per day (adjusted to represent purchasing power parity in relation to the 1993 consumer prices of each country).[5–7] The lower of these thresholds was calculated as the median of the ten lowest poverty lines used in a sample of low-income countries,[8] and represents a very low living standard, often referred to as extreme poverty.[9] This threshold was calculated without any specific allowance for health-care needs. Of the 11 countries we examined, the World Bank assessed that Indonesia, Bangladesh, Nepal, and the Philippines had national poverty lines that were very close to this lower poverty threshold in 1993.[8]

Typically, poverty lines are calculated from estimates of the cost of nutritional requirements for each country plus

an allowance for non-food basic needs.[6] Although non-food basic needs might be expected to include health-care payments, they are never explicitly included, not least because of the complexity generated by the stochastic nature of these needs. At best, a poverty line might incorporate expected health-care costs when basic nutritional requirements are satisfied. But conventionally measured poverty lines do not incorporate the needs of sick people.

The World Bank calculated the higher poverty line ($2·15 per head per day) by doubling the lower one. This threshold was intended to correspond to the low standard of living at which someone would experience poverty in a middle-income country.[9] Although it is higher, this level of resources would probably still not be sufficient to pay for health-care needs.

We investigated the effect of out-of-pocket health payments on poverty estimates in 11 low to middle income countries that account for 79% of the total population of Asia—and 48% of the world's population. We estimated the additional number of individuals who would lie below the international poverty thresholds if such expenditures were subtracted from their total household resources, and the amount by which the resources would fall short of poverty thresholds.

Methods

We used the World Bank's absolute poverty thresholds, of $1·08 and $2·15 per head per day, to recalculate the poverty head count and the poverty gap for each of the 11 countries. The poverty head count denotes the proportion of individuals who fall below the poverty line, and the poverty gap is the average amount by which resources fall short of the poverty line as a percentage of that line (counting the shortfall as zero for those with resources in excess of the line).[7–9] We compared estimates of the poverty head count and poverty gap before and after out-of-pocket payments for health care were deducted from household resources.

We used data from nationally representative surveys of household expenditure or socioeconomic status that recorded both out-of-pocket payments for health care and total household consumption in detail (table 1). With the exceptions of Malaysia, the Philippines, and Sri Lanka, these were the same surveys as those used by the World Bank to estimate poverty rates in each country. For China, we analysed the same urban and rural household surveys that were used for national and World Bank estimates of poverty. However, we used data from ten of the provinces covered by these surveys, and applied sample weights to maintain national representativeness.

We defined out-of-pocket payments for health care to include medical fees, user charges for public care, purchases of medicines (whether prescribed or not), insurance copayments, and payments for appliances, diagnostic tests, and so on. All the surveys analysed covered at least medical fees, inpatient and outpatient charges for hospitals or clinics, and medicines (table 2). The surveys for Malaysia, Nepal, Sri Lanka, Thailand, and Vietnam also explicitly referred to expenditures on traditional medicine. (Traditional medicine and home care represented about

	Year	Survey	Survey institution	Survey design	Response rate	Sample size (households)
Bangladesh[10]	1999–2000	Household income expenditure survey	Bangladesh Bureau of Statistics	Stratified, cluster sample. Weights applied.	100%	7440
China[11]	2000	Urban/rural household survey*	National Bureau of Statistics	Stratified. Weights applied.	100%	9700
India[12]	1999–2000	National sample survey, 55th round	National Sample Survey Organisation	Stratified. Weights applied.	100%	120 039
Indonesia[13]	2001	Socioeconomic survey (SUSENAS)	National Board of Statistics	Stratified, cluster sample. Self-weighted.	98%	218 568
Kyrgyz Republic[14]	2000–01	Household budget survey	National Statistical Committee	Stratified. Weights applied.	>90%	3000
Malaysia[15]	1998–99	Household expenditure survey	Government Department of Statistics	Stratified. Weights applied.	82%	9198
Nepal[16]	1995–96	Living standards survey	Central Bureau of Statistics	Stratified, cluster sample. Weights applied.	99.6%	3388
Philippines[17]	1999	Poverty indicator survey	National Statistics Office	Stratified. Self-weighted.	100%	37 454
Sri Lanka[18]	1996–1997	Consumer finance survey	Central Bank of Sri Lanka	Stratified. Weights applied.	98%	8880
Thailand[19]	2002	Socioeconomic survey	National Statistical Office	Stratified. Weights applied.	93%	17 489
Vietnam[20]	1998	Living Standards Survey	Govt of Vietnam and World Bank	Stratified, cluster sample. Weights applied.	99%	5999

*Random sample of 9700 households from 10 of the provinces covered by the full survey. Weights applied to maintain national representativeness.

Table 1: **Description of surveys by country**

5–12% of total out-of-pocket health payments in India, Malaysia, Sri Lanka, and Vietnam.[21]) The remainder of the surveys did not refer to this type of expenditure, and so inclusion of these payments was dependent on reporting by individual households.

We measured total household resources, as in the World Bank poverty estimates, by the value of total consumption, including that from home production (table 2). Total consumption and out-of-pocket health-care payments were measured by household on a per head basis, and poverty estimates represented numbers of individuals.

Role of funding source

The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The authors had full access to all the data in the study and the corresponding author had final responsibility for the decision to submit for publication.

Results

Table 3 shows cross-country variation in the magnitude and the variability of out-of-pocket payments for health as a share of total expenditures. On average, the burden of out-of-pocket payments was highest in Vietnam, Bangladesh, India, and China, and lowest in Malaysia, Thailand, and Indonesia. For all these distributions the mean substantially exceeded the median, and the coefficients of variation were large. Both features are typical of health-expenditure distributions, indicating that many people incurred little or no expenditures, but a few sick individuals had high expenditures for health care.

Table 4 shows the poverty head count ratios based on household consumption relative to each of the two poverty lines. Before we subtracted out-of-pocket payments from gross household consumption, we calculated that poverty was highest in Nepal, where almost 40% of individuals had less than the equivalent of $1·08 per day. India had the next highest rate of poverty (about 30%), followed by Bangladesh (about 20%), the Philippines, and China (both about 15%). Relative to the higher poverty standard of $2·15 a day, more than two-thirds of the populations of Nepal, India, and Bangladesh lived in poverty, and at least a quarter of people in every country other than Malaysia and (marginally) Thailand were poor.

At the $1·08 poverty line, subtraction of out-of-pocket payments from total resources increased the poverty head count by almost four percentage points in Bangladesh (equivalent to almost 5 million people), by a similar proportion in India (over 37 million people), and by nearly three percentage points in China (more than 32 million people) (table 4). Only in Malaysia, which has very low poverty rates, did subtracting out-of-pocket health payments from total household consumption not cause a significant rise in poverty rate. The total estimated increase in the poverty head count was 78·16 million people, which is almost 3% of the population of these 11 low-income to middle-income Asian countries.

	Household living standards		Out-of-pocket health payments	
	Measurement*	Period†	Expenditures included	Recall period‡
Bangladesh	Consumption	1 year	Fees, hospital or clinic charges, medicines, tests or investigations, transport, tips and other health-service charges	1 month
China	Consumption	1 year	Fees, inpatient and outpatient charges for hospitals or clinics, medicines	1 year
India	Consumption	1 month	Fees, inpatient and outpatient charges for hospitals or clinics, medicines, tests, abortions, ambulance charge.	Inpatient 1 year; others 1 month
Indonesia	Consumption	1 month	Fees, inpatient and outpatient charges for hospitals or clinics, medicines	Inpatient 1 year; others 1 month
Kyrgyz Republic	Expenditure	1 year	Fees, inpatient and outpatient charges for hospitals or clinics, medicines	Inpatient 1 year; others 1 month
Malaysia	Consumption	1 year	Fees, inpatient and outpatient charges for hospitals or clinics (western and traditional), medicines, dental, medical supplies or equipment, tests	1 month
Nepal	Consumption	1 year	Fees (western and traditional), inpatient and outpatient charges for hospitals or clinics, medicines, tests.	1 month
Philippines	Consumption	1 year	Fees, inpatient and outpatient charges for hospitals or clinics, medicines, dental charges, other medical goods and supplies.	6 months
Sri Lanka	Consumption	1 year	Fees, inpatient and outpatient charges for hospitals or clinics, medicines, tests, spectacles, dental care, homoeopathy and acupuncture, traditional medicine	1 month
Thailand	Consumption	1 month	Fees, inpatient and outpatient charges for hospitals or clinics, medicines, traditional medicine	Inpatient 1 year; others 1 month
Vietnam	Consumption	1 year	Inpatient care costs plus total other amount paid in money and in-kind for diagnosing and treating illness and injury, traditional medicine.	1 year

*Consumption includes value of goods consumed from household production and, where feasible, use value of durables and implicit rental value of housing. Expenditure is value of goods purchased for consumption. †Expenditures on different items reported for different recall periods. Total consumption or expenditure computed for period shown. ‡We scaled all out-of-pocket payments to the same period as for total consumption/expenditure.

Table 2: **Variable definitions: living standards and out-of-pocket health payments by country**

Figure 1 shows that the poverty adjustment was greatest in the countries with the highest reliance on out-of-pocket health financing. The remaining variation was largely attributable to differences in the initial rates of poverty. When we controlled for the share of health-care finance from out-of-pocket payments and the initial poverty rate, neither national income per head nor the distribution of health payments in relation to total household consumption were significant. Relative to the initial rate of poverty, the increase in poverty was greatest, by far, in Vietnam, where the poverty rate rose by a third. The initial poverty head counts in Sri Lanka and Vietnam were similar, but the adjustment due to health-care payments in Vietnam was almost four times that in Sri Lanka. Similarly, despite the fact that the initial head count was higher in the Philippines than it was in China, the poverty adjustment was more than four times greater in China.

	Bangladesh	China	India	Indonesia	Kyrgyz Republic	Malaysia	Nepal	Philippines	Sri Lanka	Thailand	Vietnam
Mean	5·10%	4·11%	4·84%	1·83%	2·40%	1·37%	2·77%	1·94%	2·11%	1·71%	5·49%
Coefficient of variation†	1·92	1·98	1·59	2·93	1·81	2·47	2·28	2·66	1·95	2·46	1·32
Median	1·15%	2·33%	2·17%	0·00%	0·60%	0·18%	1·15%	0·41%	0·91%	0·40%	2·94%

*We applied sample weights to produce population estimates. †Coefficient of variation was equal to the standard deviation divided by mean.

Table 3: **Out-of-pocket payments for health care as percentage of total household resources by country***

	Poverty line of $1·08 per day					Poverty line of $2·15 per day				
			Change in poverty head count					Change in poverty head count		
	Prepayment head count*	Postpayment head count	Percentage point change†	Number of individuals‡	Percentage change§	Prepayment head count*	Postpayment head count	Percentage point change†	Number of individuals‡	Percentage change§
Bangladesh	22·5%	26·3%	3·8%	4 940 585	16·8%	73·0%	76·5%	3·6%	4 653 875	4·9%
China	13·7%	16·2%	2·6%	32 431 209	18·8%	44·6%	46·4%	1·8%	23 198 460	4·1%
India	31·1%	34·8%	3·7%	37 358 760	11·9%	80·3%	82·4%	2·1%	20 638 361	2·6%
Indonesia	7·9%	8·6%	0·7%	1 440 395	8·7%	58·2%	59·9%	1·7%	3 493 767	2·9%
Kyrgyz Rep·	2·6%	2·7%	0·1%	5989	4·7%	32·2%	34·1%	1·9%	94 793	6·0%
Malaysia	1·0%	1·1%	0·1%	10 562	4·4%	11·8%	12·1%	0·3%	58 626	2·1%
Nepal	39·3%	41·6%	2·2%	515 933	5·7%	80·4%	81·7%	1·3%	290 280	1·6%
Philippines	15·8%	16·4%	0·6%	445 680	3·7%	50·2%	51·2%	1·1%	790 333	2·1%
Sri Lanka	3·8%	4·1%	0·3%	60 116	8·3%	39·1%	40·8%	1·7%	325 783	4·3%
Thailand	2·1%	2·3%	0·2%	100 201	7·91%	24·2%	24·9%	0·7%	417 626	2·8%
Vietnam	3·6%	4·7%	1·1%	848 870	30·1%	36·9%	41·4%	4·5%	3 492 321	12·1%
TOTAL	19·3%	22·0%	2·7%	78 158 299	14·0%	58·8%	60·8%	2·0%	57 454 225	3·4%

*World Bank estimates of poverty rates can be obtained using Povcal (http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp). Their estimates of $1·08 per day poverty head counts are as follows (any differences in survey and year indicated): Bangladesh 26·8%; China (2001) 16·6%; India 34·8%; Indonesia (2002) 7·51%; Kyrgyz Republic 2·0%; Malaysia (different survey, 1997) 0·17%; Nepal 39·1%; the Philippines (different survey, 2000) 15·5%; Sri Lanka (different survey, 1995–6) 6·6%; Thailand (2000) 1·9%; and Vietnam 3·8%. †This change is the difference in poverty head count before and after health-care payments are subtracted. All results are significantly different from zero at the 5% significance level, except for that of Malaysia at $1·08. ‡Percentage point change multiplied by the total population. §Percentage point change as a proportion of the prepayment head count.

Table 4: **Poverty head counts: effect of accounting for out-of-pocket payments for health care**

The proportion of the population at risk of falling below the extreme poverty threshold, defined as people whose total expenditure lay between the $1 and $2 thresholds, was positively but not significantly correlated with the degree of adjustment in measures of poverty due to incorporation of out-of-pocket payments. This absence of significance suggests that there was substantial cross-country variation in the magnitude of out-of-pocket health payments and in the extent to which people at risk of poverty are protected from such costs by fee waivers. For example, figure 2 shows that, in Bangladesh, India, and Indonesia, roughly half the population was estimated to live on between $1 and $2 per day without accounting for health-care payments. However, when we subtracted health-care payments, nearly 4% of the population in Bangladesh and India fell below the $1 threshold, but only 0·7% of Indonesians did so. The greater poverty adjustment in Bangladesh and India probably resulted from differences in the magnitude of out-of-pocket payments (table 3) rather than differences in the reliance on out-of-pocket financing as a share of total health expenditure (figure 1). A similar pattern was recorded for China, Nepal, and Vietnam, where high out-of-pocket payments caused a larger increase in poverty head count than in the Philippines and Sri Lanka.

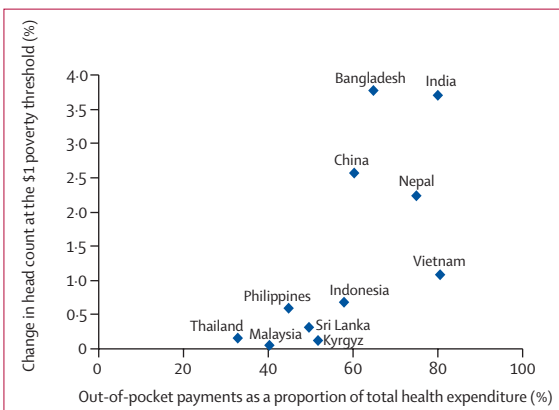

Figure 1: **Change in poverty head count at the $1 poverty line compared with out-of-pocket payments as a share of total health finance**
Note: A least-squares regression of the change in the poverty head count on the out-of-pocket financing share and the initial poverty rate (at the $1 threshold) resulted in a coefficient for the out-of-pocket financing share of 0·0333 (p=0·1787) and for the initial poverty rate of 0·0591 (p=0·0678); R^2=0·68.)

At the higher poverty line of $2·15 per day, our adjustment for health-care payments caused the poverty rate across all countries to rise from 58·8% to 60·8%, which was

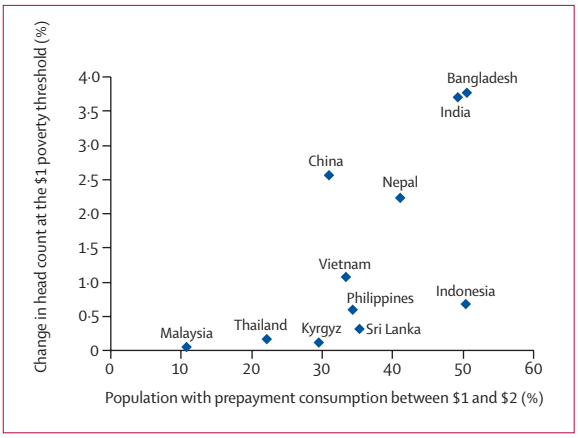

Figure 2: **Change in poverty head count at the $1 poverty line compared with the percentage of population at risk of impoverishment**
Note: In a least-squares regression of the change in the poverty head count on the out-of-pocket financing share, the initial poverty rate, and the proportion of the population between the two thresholds, the p value on this proportion at risk of impoverishment is 0·5887.

equivalent to an additional 56·7 million individuals counted as poor. As at the more extreme poverty line of $1 per day, accounting for health-care payments caused the greatest increase in poverty in Vietnam. However, differences between countries were less pronounced than for the effect of out-of-pocket health-care payments on extreme poverty.

Poverty was most severe in Nepal where, on average, the deficit of total household consumption was more than 10% below the $1·08 threshold (table 5). This deficit rose by almost a percentage point when out-of-pocket payments for health care were subtracted from total resources. The gaps between resources and needs were also great in India, Bangladesh, and China; and adjustment for out-of-pocket payments caused the greatest changes, in absolute terms, in the poverty gaps of these three countries and Nepal. The Philippines also had a large poverty gap, but deduction of out-of-pocket payments had less effect than it did in other countries, suggesting that the poor were better protected from health-care costs. All changes in the poverty gap due to accounting for health-care payments were significantly different from zero at the 5% level.

The relative change in the poverty gap after adjustment for out-of-pocket payments was greatest in Vietnam, followed by China, Bangladesh, and India. The same pattern was recorded for the poverty head count at both the $1 and $2 per day poverty lines (table 4). The aggregate percentage point increase in the population-weighted average poverty gap increase was 0·75 at $1 per day and 1·5 at $2 per day. These aggregate increases translated into substantial relative changes in the poverty gaps of 18% and 7%, respectively. Changes in the poverty gap after accounting for out-of-pocket payments were typically larger than adjustments to the poverty head count. Thus health-care payments not only raise the prevalence of poverty, but also its intensity. The increase in the poverty gap is partly due to more individuals falling below the poverty line, but also due to poor individuals sinking even further below the poverty line once health-care payments are subtracted from their resources.

Figure 3 shows the poverty-increasing effect of health-care payments, for Bangladesh as an example.[22] Many individuals already below the $1 per head per day threshold on the basis of total household expenditure before health-care payments ended up even further below after medical expenses were deducted. Moreover, many individuals in the middle and top end of the distribution

	Poverty line of $1·08 per day				Poverty line of $2·15 per day			
			Change in normalised poverty gap				Change in normalised poverty gap	
	Prepayment normalised gap*	Postpayment normalised gap	Percentage point change†	Percentage change‡	Prepayment normalised gap*	Postpayment normalised gap	Percentage point change†	Percentage change‡
Bangladesh	4·5%	5·3%	0·9%	18·6%	27·8%	30·5%	2·6%	9·4%
China	3·4%	4·2%	0·8%	23·3%	17·0%	18·2%	1·2%	7·1%
India	6·7%	7·7%	1·0%	14·8%	33·9%	35·9%	2·0%	6·0%
Indonesia	1·2%	1·3%	0·1%	10·3%	17·3%	18·1%	0·8%	4·7%
Kyrgyz Republic	0·4%	0·4%	0·1%	13·5%	7·4%	8·0%	0·6%	8·0%
Malaysia	0·2%	0·2%	0·0%	5·9%	2·8%	2·9%	0·1%	3·0%
Nepal	10·8%	11·7%	0·9%	8·4%	37·4%	38·7%	1·3%	3·4%
Philippines	3·9%	4·0%	0·2%	4·4%	19·3%	19·8%	0·5%	2·8%
Sri Lanka	0·7%	0·7%	0·1%	7·5%	10·1%	10·6%	0·5%	5·3%
Thailand	0·4%	0·4%	0·0%	3·5%	6·1%	6·4%	0·3%	4·2%
Vietnam	0·6%	0·8%	0·2%	30·0%	9·3%	11·0%	1·7%	18·3%
TOTAL§	4·3%	5·1%	0·8%	18·1%	23·0%	24·5%	1·5%	6·7%

*The poverty gap is the average amount by which resources fall short of the poverty line as a percentage of that line (counting the shortfall as zero for those with resources in excess of the line). †This change is the difference in poverty head count before and after health care payments are subtracted. All results are significantly different from zero at the 5% significance level. ‡Percentage point change as a proportion of the prepayment poverty gap. §Totals are population-weighted averages.

Table 5: **Poverty gaps: effect of accounting for out-of-pocket payments for health care**

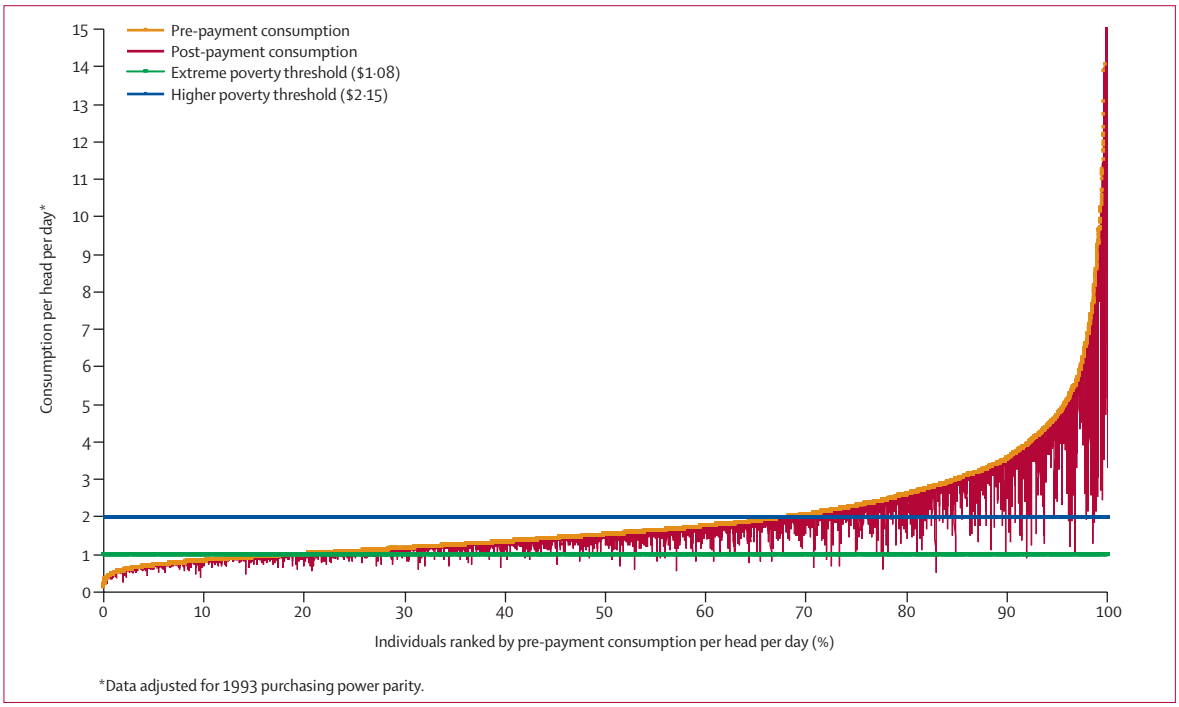

Figure 3: **Distribution of total consumption before and after subtracting health-care payments–Bangladesh (2000)**
*Data adjusted for 1993 purchasing power parity. The chart plots household consumption per head per day against the cumulative percentage of individuals ranked by the same variable (the S-shaped curve). Where this curve intersects with the poverty line the x-coordinate is the poverty head count—which is 22·5% in Bangladesh at the $1·08 poverty line. The area below the poverty line and above the curve showing consumption before health-care payments indicates the poverty gap. The vertical lines below the prepayment curve indicate the drop in household resources due to the subtraction of health payments, and identify individuals who are pulled below the poverty line by such payments.

were pulled below the $1 per day threshold by such payments. Individuals located as high as the 90th percentile of this distribution actually had less than $1 per day to spend after making health-care payments. The gross consumption of some of these people had most probably been driven up by urgent medical needs.[23] Thus the conventional approach to the measurement of poverty has provided a misleading picture of their actual living standards.[23]

Discussion

We have provided cross-country comparable evidence that out-of-pocket payments for health care exacerbate the prevalence and depth of poverty in Asia. Our findings indicate that over 78 million people, representing about 2·7% of the total population in the 11 low-income to middle-income countries that we assessed, fell below the extreme poverty threshold of $1 per day when payments for health care were subtracted from their resources. Moreover, our analysis emphasises the depth of poverty of many more millions of people throughout Asia.

Our estimates of poverty head count before deducting health payments were generally consistent with those of the World Bank.[9] The fact that our estimate of the poverty rate in India was four percentage points lower at the $1 line than that of the World Bank was attributable to the World Bank's adoption of the Deaton correction[24] to make their estimates comparable over time. Without this correction, the World Bank's estimate (32%) would be closer to our own (31%). Other discrepancies can be explained by the use of different data sources. The one substantial discrepancy that we were unable to explain was for Bangladesh, where our estimate, from the same data, was four percentage points lower than that of the World Bank.

Although the existing evidence on the impoverishing effect of out-of-pocket payments for health care in Asia is scarce, our estimates were broadly consistent with the relevant large-scale surveys.[22,25–27] In India, a study based on the 1995–96 national sample survey showed that deduction of out-of-pocket payments from household resources raised the poverty rate by 2·2% at the national poverty line, and that a quarter of hospital patients in India were impoverished by the resulting cost.[25] A study in rural China in 1995 estimated[27] that accounting for payments for health care would raise the percentage of the population below the $1 per day threshold from 17·6% to 20·1%; another 3 years later[26] estimated that out-of-pocket payments added 3·26% to the poverty head count of 7·22% at the official poverty line. In the same year in Vietnam, researchers reported that out-of-pocket payments would raise the poverty rate, at the food poverty line, from 15% to 18·4%.[22]

Our findings also lend support to qualitative studies suggesting that health-care payments cause impoverishment. The World Bank Voices of the Poor study[28] showed

that, after illiteracy and unemployment, health costs were the most important precursor to poverty. A retrospective study in rural India[29] identified the cost of ill-health and health expenses as one of three main factors responsible for 85% of all cases of impoverishment, and as a contributing cause in half to two-thirds of such cases. Such impoverishment is of even greater concern because another detailed study from the same region[30] showed that the health care purchased was often of poor quality, and could even be harmful.

The difference between poverty estimates derived from gross household resources and those based on net resources (minus out-of-pocket payments for health care) can be interpreted as a rough approximation to the impoverishing effect of such payments.[22] If out-of-pocket payments for health care were completely non-discretionary and total household resources were fixed, the difference between the two estimates would correspond to poverty due to health payments. Neither of these two conditions holds perfectly. A household that chooses to spend excessively on health care is not pushed into poverty by such payments. Equally, if a household borrows to cover health-care expenses, its total expenditure will be greater than its available resources on average over the long term. For such reasons, our comparison of poverty estimates cannot be interpreted as the change in poverty that would arise from any policy reform that eliminated out-of-pocket payments for health care in the countries under study. Nonetheless, our comparison is indicative of the scale of the impoverishing effect of health payments, and has shown the extent to which poverty is currently underestimated (or hidden) by ignoring the amount of household resources that are exhausted by payments for health care. Our method has also corrected for variations between countries in the magnitudes of health-care costs, which are obscured by existing methods for calculating poverty rates.

The adjustment to poverty for health payments was significant in all these 11 countries, but it was greatest in Bangladesh, China, India, Nepal, and Vietnam, where out-of-pocket payments represent the greatest share of health financing. In that these countries are also among the poorest suggests that heavy reliance on out-of-pocket payments and consequent impoverishment due to these payments are linked to the low level of economic development. Development would allow establishment of prepayment mechanisms for public funding of health care, which would certainly reduce the impoverishing effects of out-of-pocket payments for health care.

But in some countries experience shows that the threat of impoverishment can be mitigated even in the absence of long-term economic development. For example, in Sri Lanka, a low-income country, out-of-pocket payments have been contained at just below 50% of health financing. This policy results in a fairly modest adjustment in measures of poverty when health payments are subtracted (figures 1 and 2). The state's ability to raise sufficient revenue from taxation, and its public spending priorities, has enabled charges for health care in the public sector to be kept to a minimum. Moreover, Sri Lanka's public-health services are accessible though wide geographic distribution, and good governance has ensured that informal charges do not fill the vacuum left by the absence of official charges.[31,32]

Other policies could ameliorate the impoverishing effects of a heavy reliance on out-of-pocket payments for health-care financing. For example, Indonesia relies on out-of-pocket financing only slightly less than does China, but our findings show that health payments have a much smaller effect on rates of poverty in Indonesia. Furthermore, although the proportion of the population at risk of extreme poverty in Indonesia was of a similar size to that in Bangladesh and India, the proportion counted below the extreme poverty threshold after taking account of health payments in Indonesia was much lower. One possible explanation for Indonesia's apparent success in shielding poor families from high payments for health care is its policy of targeted exemptions, implemented through a health card.[33] The absence of exemptions for China's poor means that the burden of out-of-pocket payments on low-income households is greater, with a resulting exacerbation of poverty. In Bangladesh and India, unlike in Indonesia, charge exemptions for the poor are not implemented through a health card system, and do not provide relief from informal charges.

An alternative, and more sobering, interpretation of the apparently low number of people pushed below the poverty line by health payments in Indonesia is that those threatened by poverty merely forgo health care because of unaffordable charges. Indeed, Indonesians spent a smaller share of their household budgets on health care than that spent by people in other countries in this study. Similarly, the poorest 20% of the population in Indonesia accounted for only 3·7% of all inpatient admissions to public hospitals, in comparison with 12% in Bangladesh and 9% in India.[32] Thus the changes in estimates of poverty caused by deduction of health-care payments could be constrained by charges on the use of health care. If poor people forgo health care because of unaffordable costs, the resulting effect on their health and subsequent earnings could have longer-term implications for poverty rates that are substantially greater than the short-term effects we examined.

The experiences of Indonesia, Malaysia, Sri Lanka, and Thailand suggest that policies such as limitation of user charges for public-sector health care and the implementation of effective exemption schemes for the poor can help to mitigate impoverishment through health-care payments. But the overall contribution of public-sector charges should not be overestimated. Of the study countries, only in Nepal do charges for public-sector care account for more than 40% of total out-of-pocket payments.[21] In most of the other countries, the public sector share was 23–37% and in Bangladesh, Malaysia, and Sri Lanka, it was less than 10%.

By comparison with public-sector health-care charges, expenditures on drugs typically account for a greater share of out-of-pocket payments, falling in the range of 18–55% in most countries and reaching over 70% in Bangladesh and India.[21] Clearly, payments for medicines make a substantial contribution to any impoverishment arising from health payments. In most countries, exemptions from public-sector charges do not include prescribed medicines. In any case, exemptions are seldom effective because shortages mean that medicines have to be purchased. Another concern is the widespread practice of self-medication in south Asia and east Asia,[34] exacerbated by the limited access to health services in poor and rural societies that are constrained by income and distance.[35] Impoverishment is all the more disturbing when it arises from spending on self-prescribed medicines that have little or no positive effect.

By adjusting poverty estimates to incorporate out-of-pocket health-care payments we have provided new estimates to inform policy decisions. We have also suggested some broad areas of policy that should be relevant to combating impoverishment, such as limitation of user charges for public-sector health care and the implementation of effective exemption schemes for the poor. But careful and well-controlled evaluations are needed to find out how specific reforms in health financing could reduce impoverishment due to payments for health care.

Contributors

All authors have participated in the data analysis and reporting stage of this manuscript, and seen and approved the final version.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

The European Commission, INCO-DEV programme (ICA4-CT-2001-10015), has funded the EQUITAP project (www.equitap.org) from which this paper derives. We have also benefited from comments received from seminar participants at an EQUITAP meeting in Kandalama, Sri Lanka, the Harvard Global Health Initiative in Boston, and four reviewers.

References

1 Cirto C, Michael R. Measuring poverty: A new approach. Washington DC: National Academy Press, 1995.
2 Short K, Garner T, Johnson D, Doyle P. Experimental Poverty Measures: 1990 to 1997. U.S. Census Bureau, Current Population Reports, Consumer Income, 60–205. Washington DC: U.S. Government Printing Office, 1999.
3 Short K, Garner T. Experimental poverty measures: Accounting for medical expenditures. *Monthly Labor Review* 2002; **125:** 3–13.
4 Cogan J. Dissent. In Cirto C, Michael R, eds. Measuring Poverty: An alternative approach. Washington DC: National Academy Press, 1995: 385–90.
5 Ravallion M, Chen S. What can new survey data tell us about recent changes in distribution and poverty? World Bank Policy Research Working Paper No. 1694.Washington, DC: Poverty and Human Resources Division, World Bank 1996.
6 Ravallion M. Poverty lines in theory and practice. LSMS working paper no. 133. Washington, DC: World Bank, 1998.
7 Chen S, Ravallion M. How did the world's poorest fare in the 1990s? *Rev Income Wealth* 2001; **47:** 283–300.
8 Ravallion M, Datt G, van de Walle D. Quantifying absolute poverty in the developing world. *Rev Income Wealth* 1991; **37:** 345–61.
9 Chen S, Ravallion M. How have the world's poorest fared since the early 1980s? *World Bank Research Observer* 2004; **19:** 141–69.
10 Bangladesh Bureau of Statistics. Report on household income expenditure survey, 2000. Dhaka: Statistics Division, Ministry of Planning, 2003.
11 China National Bureau of Statistics. Rural household survey and Urban household survey. Beijing: China Statistics Press, 2002.
12 India National Sample Survey Organisation. Consumer expenditure survey, 55th round, 1999–2000. New Delhi: Ministry of Statistics, Government of India, 2001.
13 Indonesia National Board of Statistics. National social and economic survey (SUSENAS). Jakarta: Statistics Indonesia, 2001.
14 Kyrgyz Republic National Statistical Committee. Household budget survey 2000–01. Bishkek City: National Statistical Committee, 2002.
15 Malaysia Department of Statistics. Report on household expenditure Survey: Malaysia 1998/99. Kuala Lumpur: Department of Statistics, 2000.
16 Central Bureau of Statistics, National Planning Commission. Nepal living standards survey 1995–96. Kathmandu: Central Bureau of Statistics,1996.
17 National Statistics Office. Annual poverty indicator survey 1999. Manila: National Statistics Office, 2000.
18 Central Bank of Sri Lanka. Report on consumer finances and socioeconomic survey 1996/97. Colombo: Central Bank of Sri Lanka, 1999.
19 Thailand National Statistical Office. The 2002 socio-economic survey. Bangkok: Office of Prime Minister, National Statistical Office, 2002.
20 World Bank. Vietnam Living Standards Survey 1997–98: Basic Information. Washington: Poverty and Human Resources Division. World Bank, 2001.
21 Van Doorslaer E, O'Donnell O, Rannan-Elaja RP, et al. Paying out-of-pocket for health care in Asia: Catastrophic and poverty impact. EQUITAP Working Paper #2. Colombo: Erasmus University, Rotterdam and IPS, 2005.
22 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.
23 O'Donnell O, van Doorslaer E, Rannan-Elija RP, et al. Explaining the incidence of catastrophic expenditures on health care: Comparative evidence from Asia. EQUITAP Working Paper #5. Colombo: Erasmus University, Rotterdam and IPS, 2005.
24 Deaton A. Adjusted Indian Poverty Estimates for 1999–00. *Econ Pol Weekly* 2003; **38:** 322–26.
25 Peters D, Yazbeck A, Sharma R, et al. Better health systems for India's poor. Findings, analysis and options. Washington DC: World Bank, 2001.
26 Lui Y, Rao K, Hsiao W. Medical expenditure and rural impoverishment in China. *J Health Popul Nutr* 2003; **21:** 216–22.
27 Gustaffson B, Li S. Expenditures on education and health care and poverty in rural China. *China Economic Review* 2004; **15:** 292–301.
28 Narayan D, ed. Voices of the Poor. Can anyone hear us? Vol. 1. 2000, New York: Oxford University Press for the World Bank, 2000.
29 Krishna A. Escaping Poverty and Becoming Poor: Who Gains, Who Loses, and Why? *World Development* 2004; **32:** 121–36.
30 Banerjee A, Deaton A, Duflo E. Health care delivery in rural Rajasthan. *Econ Pol Weekly* 2004; **39:** 944–49.
31 McNay K, Keith R, Penrose A. Bucking the Trend—How Sri Lanka has achieved good health at low cost: challenges and policy lessons for the 21st century. London: Save the Children, 2004.
32 O'Donnell O, van Doorslaer E, Rannan-Elija RP, et al. Who benefits from public spending on health care in Asia? EQUITAP Working Paper #3. Colombo: Erasmus University, Rotterdam and IPS, 2005.
33 Pradhan M, Prescott N. Social risk management options for medical care in Indonesia. *Health Econ* 2002; **11:** 431–46.
34 Mudur G. Abuse of OTC drugs rising in South Asia. *BMJ* 1999; **318:** 556.
35 Chang FR, Trivedi PK. Economics of self-medication: Theory and evidence. *Health Econ* 2003; **12:** 721–39.