HOUSEHOLD COST OF ILLNESS: SUMMARY OF FINDINGS FROM FOUR COUNTRIES

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Executive Summary

Cost-of-illness studies are conducted to quantify the costs of a particular illness to society, government or the health system with the aim of influencing the way in which disease control strategies are prioritised. Although common in high-income countries, relatively little work has been done in low income countries to document costs at the household level. Illness can cost a family considerably: the cost of treatment and medications can force families with limited disposable income into debt, while time off work or school due to illness can affect a household's income or a child's educational attainment. It is therefore useful to capture information on the extent to which common illnesses such diarrhoea, respiratory infections and skin infections impact families.

A one-time questionnaire survey was administered to a married female respondent in around 200 households in multiple urban areas in India, Indonesia, Brazil & South Africa. Households with a child under-twelve years of age and where at least one household member had reportedly experienced an episode of diarrhoea, skin infections (rash, blisters, and prickly heat) or respiratory illness (influenza or cough & cold with fever) in the last two months were included. Respondents were questioned face-to-face on the direct costs (out-of-pocket medical costs; accommodation; transport costs) and indirect costs (lost working days of patient or carer; time spent travelling) for each episode of illness, as well as time off school as a result of illness. Data collection was conducted by a contracted data collection agency, IPSOS, and analysis carried out at LSHTM in London, UK, using STATA 12. Costs were calculated in International dollars so costs could be compared across countries.

In all countries, respiratory illness was the most prevalent type of illness, calculated to occur in almost half of households in the general population of included cities during the two-month recall period. In all four countries, episodes of diarrhoea, respiratory and skin infections rarely went untreated. The mean cost of treatment of an episode of illness was similar in India, Indonesia and South Africa (approximately International $8), but was substantially lower in Brazil (Int. $3.09). In Brazil, purchase of medicines comprised three-quarters of the out-of-pocket payments, far higher than in other countries where medicines were never more than half of the total costs. Transport costs represented a greater proportion of the direct costs in South Africa than in other countries at 17.1%, followed by Brazil (10.4%), Indonesia (5.0%) and then India (1.2%).The mean direct costs in Brazil for any episode of illness was Int. $ 14.56. This compares with Int. $ 12.91 in India, Int. $ 8.39 in Indonesia and Int. $ 16.23 in South Africa. Treatment and medicine purchase form the bulk of the total costs in all countries, although treatment costs were considerably lower in Brazil. In all countries except South Africa, treatment of skin infections carried the greatest cost.

Illness frequently required the patient to take time off work or to miss school. Even in Indonesia, where missing work or school as a result of illness was least common, it still occurred in a third of illness episodes. Patients in India who missed work took off the longest time (mean 3.47 days) as a

result of illness, more than a day longer than patients in the other countries. Similarly, school children who missed school in India were also absent for a longer period of time than those in other countries. In all countries, almost all illness episodes required a caretaker and this person was almost always a family member (slightly less common in South Africa, where neighbours and paid carers were also employed). Carers in Indonesia who had to take time off work or school took less time than carers in other countries. More school days were missed by carers in India than elsewhere, but Brazilian carers missed the most work days. Lost productivity - value of lost working time of the patient and any carers within the family - had the highest indirect cost in South Africa due to the high value of lost working days by a patient. In marked contrast, in Indonesia, where illness least frequently resulted in time off work or school, and the fewest number of days were taken when a patient or carer was absent from work or school, the total indirect cost of illness is very low.

The total cost (direct and indirect costs) per episode of illness in South Africa is almost eight times higher than the costs in Indonesia, almost double the costs in Brazil and a third higher than total costs in India. The high costs in South Africa are the result of the combined effect of high out-of-pocket payments and high indirect costs of adult illness (and patients taking time off work).

In Brazil, 63 respondents (30.1%) believed they can help prevent illness, similar to in South Africa n=76, 37.8%). This is in stark contrast to respondents in India and Indonesia, who were far more confident in their ability to protect their children from common illnesses: 190 (94.1%) of Indian respondents and 172 (84.3%) of Indonesian respondents.

Common infections such as diarrhoea, colds and influenza, and skin infections such as rashes impact family life considerably, both in terms of out-of-pocket payments and lost productivity as a result of absence from work or school. The type of treatment sought, mode of transport and extent of absence from work and school varied considerably between countries, as did the overall direct and indirect costs in each country. The lowest costs were in Indonesia, but as the mean monthly salary in surveyed households in Indonesia was far lower than the other countries (after conversion to International dollars), the low costs still corresponded to the highest expenditure as a proportion of monthly earnings. It is interesting to see the high level of care-seeking behaviour in all countries in response to these typically mild illnesses. It is difficult to assess whether this is a true indication of behaviour or whether recall bias has played a role: for example, respondents who sought treatment may have been more likely to remember having experienced an episode of illness in the last two months (and were therefore more frequently included in the survey than householders who did not seek treatment).

Background

Cost-of-illness studies inform public policy and disease control priorities and can be conducted from the perspective of society, the health care system, businesses, government or families. While considerable research has been done in high-income countries, there is relatively little evidence on the family-level, household cost of illness among resource-poor persons. This study aimed to fill this gap, by investigating the direct and indirect cost of common infectious diseases (diarrhoea, skin infections and respiratory infections) at the household level. Out-of-pocket payments may drain limited household funds, and lost productivity could have far-reaching consequences, together potentially pushing families deeper into poverty.

Individual reports for each country have previously been produced. This report aims to compare and contrast the findings across the four countries.

Methods

Study design and sampling strategy

A one-time cross-sectional survey was conducted in Brazil, India, Indonesia and South Africa. In each country, the survey was conducted in urban areas in one or two nuclear cities (Table 1). Households were selected using a stratified random sampling plan wherein each city was divided into zones/strata's and a random survey starting point was selected within each zone. Subsequent households in each zone were selected using the "right hand rule", whereby two households were skipped following every contact with an ineligible household and three households were skipped following every successful interview. If a selected household was locked or declined to participate the household immediately adjacent was selected instead.

Data collection

The questionnaire survey was administered face-to-face in a local language to one married female respondent in each household. Households with no children below 12 years of age were excluded. The questionnaire enquired into whether any family members had experienced diarrhoea, skin infections (defined as rash, blister or prickly heat) or respiratory illness (defined as 'flu or cough and cold / fever) in the last two months. Households with no illness were not questioned further. A two-month recall period was considered short enough to minimise potential recall bias and long enough to avoid having to sample a large number of households to find sufficient numbers that had experienced illness in the last two months. Respondents were asked detailed questions on the direct (out-of-pocket medical costs, transport and accommodation costs) and indirect costs (lost working days of patient or carer, time lost travelling) of each episode of illness. Additional data on school absenteeism were also collected. The survey included further questions whether and how the mother believed such illnesses could be prevented. Data collection was conducted by a contracted data collection agency in each country. In each country, the questionnaire was piloted before use and a local team reviewed the relevance of the survey questions and made adjustments based on experience with earlier surveys and to fit the local context (e.g. income categories).

Table 1: Overview of Survey Design, by country

	Brazil	**India**	**Indonesia**	**South Africa**
Survey Location(s)	São Paulo	Mumbai and Delhi	Jakarta and Surabaya	Gauteng; Kwazulu Natal; Limpopo and

				Free State Provinces
Survey Timing	June 2012	May 2012	March 2012	October 2012
Season	(Winter) Temp: 12-22°C Rainfall: 60mm	(Summer, pre-monsoon) • *Mumbai* Temp:26-33°C Rainfall: 13mm • *Delhi* Temp: 26-40°C Rainfall: 18mm	(Wet season) • *Jakarta* Temp:25-33°C Rainfall: 100mm • *Surabaya* Temp: 24-32°C Rainfall: 283mm	(Summer) • *Gauteng* Temp: 16-27°C Rainfall: 98mm • *Ranges from 12-28°C and from 58-108mm rainfall in other provinces*
Sampling strategy	Random selection of households stratified by city zone and income; face-to-face interview	Random selection of households stratified by city zone and income; face-to-face interview	Random selection of households stratified by city zone and income; face-to-face interview	Random selection of households stratified by city zone and income; face-to-face interview

Data on average temperature and rainfall are taken from the relevant Wikipedia sites.

Data analysis

Analysis was carried out at LSHTM using STATA 12. Data for each country were entered in a separate database and reorganised using the 'reshape' command before analysis could be performed due to the occurrence of multiple episodes of multiple illnesses among multiple individuals in the surveyed households.

Data analysis involved a number of calculations. As the survey was restricted to households with illness in the preceding two months, the denominator for prevalence calculations includes individuals in households where no illness occurred, assuming households were the same size as surveyed households. All out-of-pocket expenditure due to an episode of illness is referred to as "direct costs". Direct cost calculations take account of the fact that many illness episodes did not incur any costs (or were not reported to have incurred any cost). In a minority of cases, more than one treatment was sought for any one episode of illness: analysis was restricted to the cost of the first treatment sought only. Lost productivity in terms of missed school or work was assessed from the perspective of losses within the family only (i.e. lost productivity of a neighbour caring for an ill child was not recorded). Lost productivity as a result of missed work, as well as losses in terms of time spent travelling are referred to as "indirect" costs, assigned a monetary value determined by the amount of time lost and the cost of this time in line with the "human capital approach" to measurement. This time cost was calculated using the monthly household income by assuming that: i) the person who lost work was the sole breadwinner in the household and ii) this person works a standard five-day week. The indirect and direct costs together form the total cost of an episode of illness, as before, including the episodes that did not require treatment or did not incur any costs in the calculations. Costs per household (over a two month period) were calculated as the sum of the cost of all illness episodes in a household divided by the number of illness episodes, again, including in the denominator individuals from households with no illness by assuming families were the same size as surveyed households.

All costs are presented in US dollars using market exchange rates current at the time of the survey in each country: Brazil = 2.0318; India =55.53; Indonesia =9188; South Africa = 8.84767

(www.currencyconverter.com). Costs are also shown in International dollars (Int. $) using the most recent (2011) implied purchasing power parity (PPP) conversion factor for each country: Brazil =1.81; India =19.13; Indonesia =6603.91; South Africa =5.051 (http://www.econstats.com/weo/V013.htm). The International dollar provides a way of comparing costs across countries that can otherwise not be easily compared due to differences in income and cost of services and products in different countries. Nevertheless, the International dollar is still an imperfect measure, hence costs are reported in both units.

Results

Characteristics of study population

Data collection took place over a two-three week period in each country. A comparable number of households were surveyed in each country (Table 2). Families in South Africa had on average one more inhabitant that those in Indonesia, while those in Brazil and India fell in between, with 4.9 and 4.6 members respectively. Household members ranged from 0-92 years old, although all households had at least one child below 12 years of age according to inclusion criteria.

In all countries, respiratory illness was the most prevalent type of illness, calculated to occur in almost half of households in the general population of included cities during the two-month recall period.

Table 2: Characteristics of surveyed population and point prevalence of illness, by country

		Brazil	**India**	**Indonesia**	**South Africa**
Number of households surveyed		207	202	204	200
Mean (SD) household size		4.88 (1.80)	4.63 (1.41)	4.32 (1.29)	5.20 (2.14)
*No. & (%) of household members per age group^*	*0-4*	140 (15.7%)	74 (7.9%)	129 (14.6%)	Not collected
	5-15	294 (32.9%)	293 (31.3%)	228 (25.9%)	
	16-55	435 (48.7%)	492 (52.6%)	501 (56.9%)	
	56 plus	25 (2.8%)	77 (8.2%)	23 (2.6%)	
No. of illness episodes		587	408	540	484
*Prevalence of illness in preceding 2 months**	*Any illness*	52.5%	31.8%	57.4%	43.0%
	Diarrhoea	11.8%	8.5%	11.2%	6.6%
	Skin infection	7.4%	7.3%	10.0%	7.3%
	Respiratory infection	33.3%	16.0%	36.2%	29.1%

^In Brazil, India, and Indonesia, the age of all household members was collected. In South Africa, age was collected in three categories (0-15, 16-55 and +55 years) and only for individuals who experienced an episode of illness. 76 percent of illness episodes (and hence recorded ages) are in the 0-15 category. Data not shown.
**Households where no family member had been ill with diarrhoea, skin infection or respiratory infection in the preceding two months were excluded (Brazil: 22; India: 75; Indonesia: 14; South Africa: 46). Assuming the same household size as surveyed household the denominator was inflated to calculate the prevalence in the general population e.g. in Brazil the denominator was increased by 22*4.88.*

Types of treatment

In all four countries, episodes of diarrhoea, respiratory and skin infections rarely went untreated. A wide range of traditional remedies and conventional medical services were sought (Figure 1). The profile of sources of treatment in Brazil is most different from the other countries. It shows a high reliance on traditional remedies and a preference for hospital visits over clinic visits, possibly a reflection of the structure of the health system in this country. Community health centres in Indonesia are the equivalent of small clinics, and can be considered to fall in the same category for the purpose of comparison as they provide a similar, albeit restricted service. Clinics were therefore the first port of call for treatment of almost half of all illness episodes in all countries except Brazil.

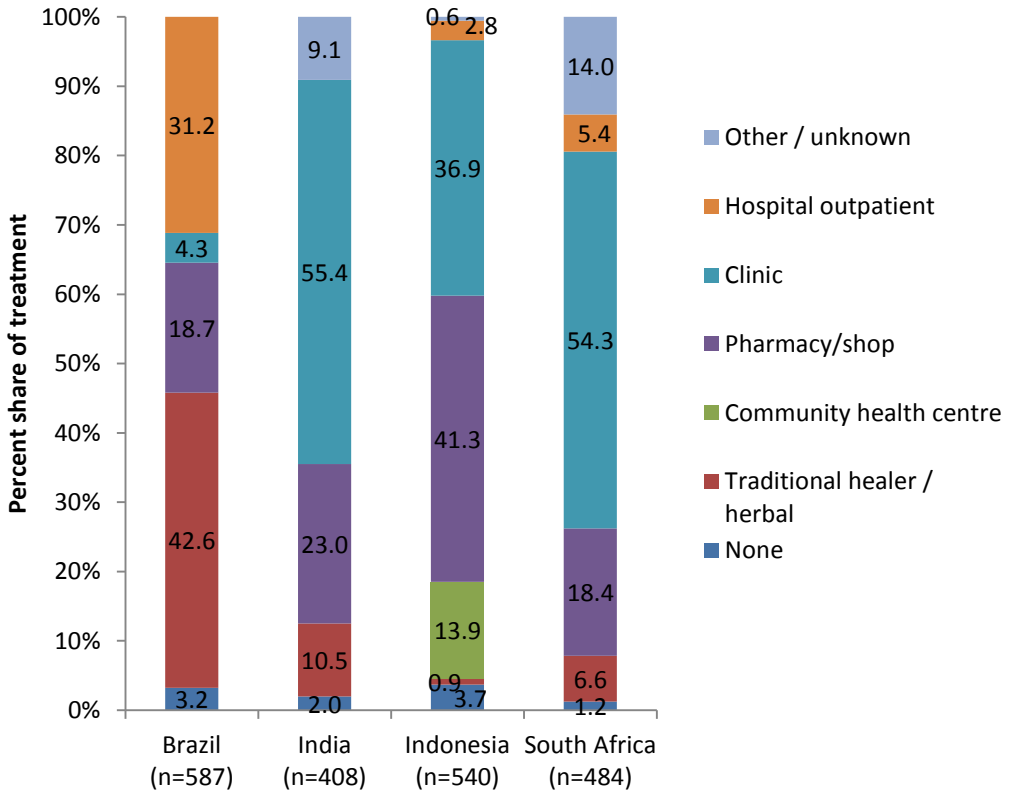


Figure 1: Type of treatment sought for each illness episode, by country

Treatment costs

The mean cost of treatment of an episode of illness was similar in India, Indonesia and South Africa (approximately International $8), but was substantially lower in Brazil (Int. $3.09) (Table 3). In Brazil, only 49 of the 568 episodes of illness requiring treatment (9.1%) were associated with a cost. Even hospital outpatient visits had low average cost (Int. $3.21), similarly lacking payment in all but 16 of 183 instances. In South Africa, we see a similar story, just 22.4% of treated episodes required payment. In contrast, treatment was associated with a cost in 293 (73.3%) treated episodes of illness in India and 501 (96.3%) of treated episodes in Indonesia. Excluding unknown origin costs, clinic

visits were the most expensive in all countries except South Africa, where only 12 of 263 clinic visits reportedly required payment.

A greater number of Brazilian households reported having a health insurance policy (n=65, 31%) than those in India (n=36, 18%) and South Africa (n=35, 18%). However, coverage varied, with only 1 Brazilian household reporting being able to claim 75-100% of health expenses, compared with 12 in India and two in South Africa. Data on health insurance were not collected in Indonesia.

Table 3: Breakdown of expenditure on treatment per episode of illness by country and type of treatment in US dollars and International dollars

	Brazil		**India**		**Indonesia**		**South Africa**	
	US $	**Int $**	**US $**	**Int $**	**US $**	**Int $**	**US $**	**Int $**
Traditional healer / herbal	0.89	1.33	0.05	0.20	0.20	0.46	3.28	7.49
Pharmacy / shop	2.06	3.08	0.90	3.41	2.08	4.87	5.54	12.66
Clinic	14.82	22.15	2.92	11.04	7.79	18.18	0.57	1.29
Hospital outpatient	2.15	3.21	0	0	6.99	16.31	5.65	12.92
Other / unknown	0	0	5.13	19.43	4.35	10.17	16.28	37.21
Total cost of treatment per episode	**2.07**	**3.09**	**2.18**	**8.25**	**3.65**	**8.54**	**3.84**	**8.79**

Reported treatment costs are for any illness episode (diarrhoea, respiratory infection of skin infection).Mean values include episodes with no reported treatment costs. Episodes of illness that were not treated and incurred no cost for this reason are included in the calculation of the total cost of treatment per episode. Clinic costs in Indonesia have been combined with cost of treatment at a community health centre.

Direct costs breakdown

Other than treatment costs, costs associated with purchase of medicines (where separate from treatment), travel, accommodation and any other expenses were also recorded as direct costs (Figure 2, Table 4). Figure 2 shows the contribution of each type of cost to the total direct costs. In Brazil, purchase of medicines comprised three-quarters of the out-of-pocket payments, far higher than in other countries where medicines were never more than half of the total costs. Transport costs represented a greater proportion of the direct costs in South Africa than the other countries at 17.1%, followed by Brazil (10.4%), Indonesia (5.0%)and then India (1.2%). The mode of transport also varied by country: in India most people accessed treatment on foot, in Indonesia a two-wheeler (moped) was often used, while in Brazil and South Africa public transport, moped and cars were all used.

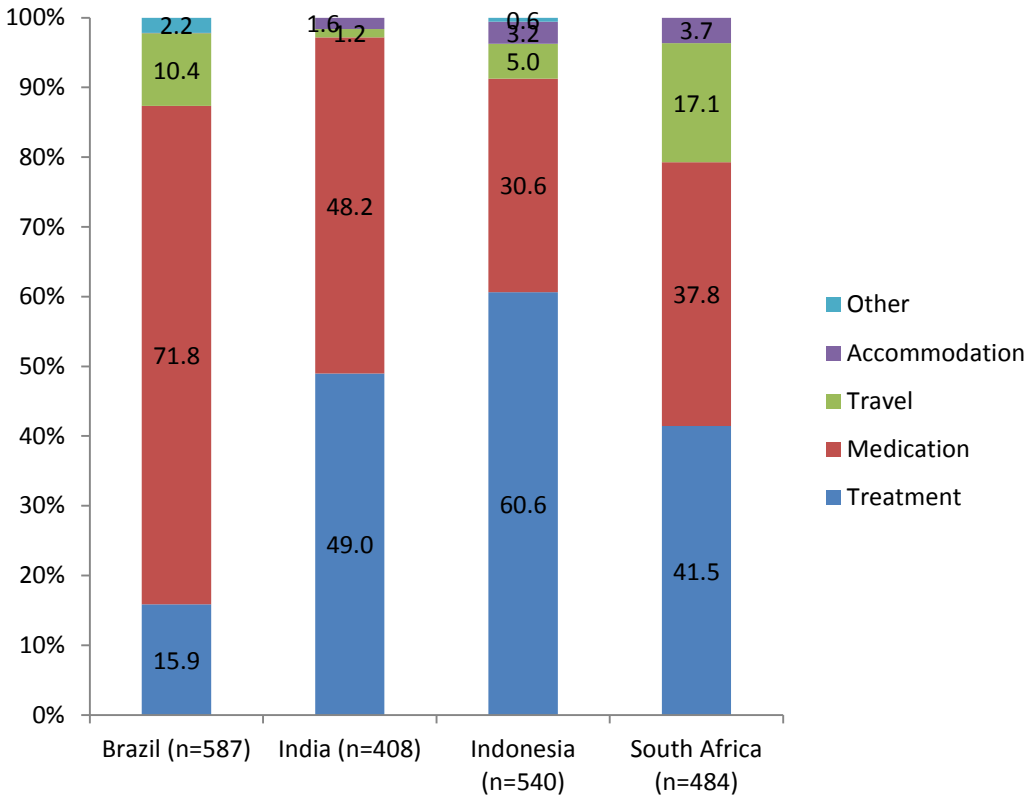


Figure 2: Breakdown of expenditure per episode of illness as a proportion of the direct costs, by country

Direct costs per episode of illness

Table 4 gives a breakdown of all out-of-pocket payments made to treat an episode of illness (any illness episode and broken down by illness type). The mean cost is shown in US dollars and International dollars. For simplicity's sake, standard deviations are omitted. As a small number of episodes resulted in large payments, standard deviations are hugely variable and often greater than the mean. The mean amount expended in Brazil for any episode of illness was Int. $ 14.56. This compares with Int. $ 12.91 in India, Int. $ 8.39 in Indonesia and Int. $ 16.23 in South Africa. As seen in Figure 2, the contribution of treatment costs, purchase of medicines, travel costs and accommodation to these mean amounts was different in each country. Treatment and medicine purchase form the bulk of the total costs in all countries, although treatment costs were considerably lower in Brazil. In all countries except South Africa, treatment of skin infections carried the greatest cost.

Table 4: Breakdown of mean direct costs per episode of illness by country and illness type in US dollars and International dollars

	Total direct costs		Treatment		Medication		Travel		Accommodation		Other	
	US $	Int $	US $	Int $	US $	Int $	US $	Int $	US $	Int $	US $	Int $
Brazil												

Diarrhoea	13.28	14.91	1.61	1.81	9.33	10.47	1.57	1.77	0.02	0.01	0.82	0.92
Skin infection	19.43	21.81	4.55	5.11	13.15	14.76	1.60	1.80	-	-	0.30	0.33
Respiratory infection	11.42	12.82	1.67	1.88	8.44	9.48	1.23	1.38	0.02	0.01	0.09	0.10
Any infection	12.97	14.56	2.07	2.32	9.31	10.45	1.35	1.52	0.01	0.01	0.29	0.32
India												
Diarrhoea	3.58	10.40	1.64	4.76	2.47	7.16	0.02	0.05	0.13	0.37	-	-
Skin infection	5.49	15.94	2.85	8.26	1.78	5.18	0.05	0.16	0.11	0.31	-	-
Respiratory infection	4.43	12.86	2.16	6.27	2.20	6.38	0.07	0.21	0.02	0.05	-	-
Any infection	4.45	12.91	2.18	6.33	2.14	6.22	0.05	0.16	0.07	0.21	-	-
Indonesia												
Diarrhoea	2.15	7.17	3.56	4.95	1.08	1.51	0.39	0.54	0.11	0.15	0.02	0.02
Skin infection	7.22	10.04	4.10	5.71	2.40	3.34	0.25	0.35	0.41	0.57	0.05	0.08
Respiratory infection	5.97	8.30	3.56	4.95	1.93	2.68	0.29	0.40	0.16	0.22	0.03	0.05
Any infection	6.03	8.39	3.65	5.09	1.85	2.57	0.30	0.42	0.19	0.27	0.03	0.05
South Africa												
Diarrhoea	5.76	10.10	1.47	2.57	1.47	2.57	1.13	1.98	1.70	2.97	-	-
Skin infection	4.52	7.92	1.92	3.37	1.70	2.97	1.24	2.18	-	-	-	-
Respiratory infection	11.30	19.80	4.86	8.51	4.41	7.72	1.81	3.17	0.11	0.20	-	-
Any infection	9.27	16.23	3.84	6.73	3.50	6.14	1.58	2.77	0.34	0.59	-	-

Cost calculations do not include the instances where more than one treatment was sought. All mean costs include episodes that did not incur a cost or where no cost was reported. If costs were incurred but not reported total expenditure on these items would be greater than shown here. Transport and accommodation costs include costs for other family members travelling with the patient as relevant.

Lost productivity: indirect costs of illness per episode

Illness frequently required the patient to take time off work or to miss school (Table 5). Even in Indonesia, where missing work or school as a result of illness was least common, it still occurred in a third of illness episodes. Patients in India who missed work took off the longest time (mean 3.47 days) as a result of illness, more than a day longer than patients in the other countries. Similarly, school children who missed school in India were also absent for a longer period of time than those in other countries.

In all countries, almost all illness episodes required a caretaker and this person was almost always a family member (slightly less common in South Africa, where neighbours and paid carers were also employed). Caring for a sick family member occasionally resulted in the carer taking time off work or school, in South Africa this occurred in 1 in 3 episodes. Carers in Indonesia who had to take time off work or school took less time than carers in other countries. More school days were missed by carers in India than elsewhere, but Brazilian carers missed the most work days.

Table 5: Lost productivity (work or school days) of patient and familial carer per episode of illness, by country

	Brazil	India	Indonesia	South Africa
Patient				
No. (%) of episodes resulting in absence of 1 or more days of work or school	205 (45.5%)	265 (65.0%)	208 (35.4%)	286 (62.3%)
Mean number (SD) work days lost by patient	2.18 (1.90)	3.47 (2.70)	2.15 (1.24)	2.44 (1.39)
Mean number (SD) school days missed by patient	3.26 (2.24)	3.34 (3.06)	2.19 (1.47)	2.45 (1.24)
Carer				
No. (%) of illness episodes that required a carer	544 (92.7%)	379 (92.9%)	465 (86.1%)	396 (81.8%)
No. (%) of illness episodes cared for where the carer was a family member	526 (96.7%)	358 (94.5%)	457 (98.5%)	354 (89.4%)
No. (%) of episodes cared for by family member resulting in absence of 1 or more days of work or school	55 (10.5%)	68 (19.0%)	59 (12.9%)	109 (30.8%)
Mean number (SD) work days lost by familial carer	3.00 (2.75)	2.16 (2.29)	1.40 (0.82)	2.19 (0.87)
Mean number (SD) school days missed by familial carer	2.10 (1.70)	2.52 (2.06)	1.30 (1.17)	1.93 (0.59)

The percentage of episodes resulting in time off work or school is calculated based on the number of episodes where information was available on whether time was taken off work or school, not always equal to the total number of illness episodes. The denominator for calculations of the percentage of illness episodes cared for by a family member is the total number of illness episodes that required a carer.

*Mean number of days absent is among **only** those episodes associated with a day off work or school and therefore do not reflect the mean number of days off for an episode of illness (the value of which would be much lower as would include all the episodes for which no days of work or school were lost).*

In order to quantify the cost of an episode of illness for a family it is also important to consider lost productivity of these family members as a monetary value of lost working time of the patient and any carers within the family. Lost productivity of any family members travelling for treatment was also assigned a monetary value as described earlier. The mean value of lost working time of the patient and their carer and time spent travelling by the family is shown in US dollars and International dollars in Table 6. Lost productivity had the highest costs in South Africa due to the high value of lost working days by a patient. In marked contrast, in Indonesia, where illness least

frequently resulted in time off work or school, and the fewest number of days were taken when a patient or carer was absent from work or school, the total indirect cost of illness is very low.

Table 6: Breakdown of indirect costs per episode of illness by country and illness type in US dollars and International dollars

	Total costs		Estimated value of loss work days (patient)		Estimated value of loss work days (carer)		Estimated value of travel time	
	US $	Int $	US $	Int $	US $	Int $	US $	Int $
Brazil								
Diarrhoea	24.37	27.35	13.64	15.31	9.96	11.18	0.76	0.85
Skin infection	37.59	42.19	1.92	2.15	34.37	38.58	1.28	1.44
Respiratory infection	21.02	23.59	9.25	10.39	10.91	12.25	0.85	0.95
Any infection	24.10	27.05	9.20	10.33	14.00	15.71	0.89	1.00
India								
Diarrhoea	16.80	48.77	9.92	28.80	5.98	17.35	0.88	2.56
Skin infection	16.57	48.09	13.16	38.21	2.47	7.16	0.94	2.72
Respiratory infection	10.35	30.06	6.97	20.23	2.40	6.95	0.99	2.88
Any infection	13.51	39.21	9.18	26.66	3.37	9.78	0.95	2.77
Indonesia								
Diarrhoea	1.44	2.00	0.46	0.64	0.40	0.56	0.57	0.79
Skin infection	3.12	4.34	1.67	2.32	0.77	1.07	0.64	0.89
Respiratory infection	2.25	3.13	1.09	1.52	0.48	0.67	0.67	0.93
Any infection	2.24	3.11	1.06	1.48	0.52	0.72	0.64	0.89
South Africa								
Diarrhoea	23.40	40.98	41.25	72.26	24.07	42.17	3.39	5.94
Skin infection	23.40	40.98	46.68	81.77	30.06	52.66	1.92	3.37
Respiratory infection	42.72	74.84	82.85	145.12	29.84	52.27	4.63	8.12
Any infection	36.51	63.95	75.95	133.04	29.16	51.08	3.96	6.93

Total cost of illness per episode

Given the assumptions made in assigning a monetary value to lost productivity it is appropriate to view the total household cost of an episode of illness including *and* excluding the indirect costs, as displayed in Table 7 below. In International dollars, the total direct costs of any episode of illness is lowest in Indonesia in terms of indirect costs. The total out-of-pocket cost of an illness episode is highest in South Africa. Including the large indirect costs in South Africa, which result from a large number of episodes resulting in a patient taking time off work (for an average of 2.44 days), the total sum of direct and indirect costs in South Africa is almost eight times higher than the costs in Indonesia, almost double the costs in Brazil and a third higher than total costs in India (Table 7).

Table 7: Total direct and indirect costs per episode of any illness, by country

	Mean DIRECT cost of illness per episode		Mean INDIRECT cost of illness per episode		Mean TOTAL cost of illness per episode	
	US $	**Int $**	**US $**	**Int $**	**US $**	**Int $**
Brazil	12.97	14.56	24.10	27.05	37.11	41.65
India	4.45	12.91	13.51	39.21	17.95	52.12
Indonesia	6.03	8.39	2.24	3.11	8.25	11.47
South Africa	9.27	16.23	36.51	63.95	46.11	80.78

Household cost of illness

The impact of out-of-pocket expenditure and lost productivity at the level of the household depends on the number of illness episodes that a household experiences. The mean total cost of illness per household during the two-month recall period is presented in Table 8. These costs are also given as a proportion of the household income during this period. In Indonesia, although the total cost of illness is very low (Int. $ 27), this reflects almost 10% of the household income (Table 8).

Table 8: Total cost of illness per household and corresponding mean family expenditure as percent of income, by country

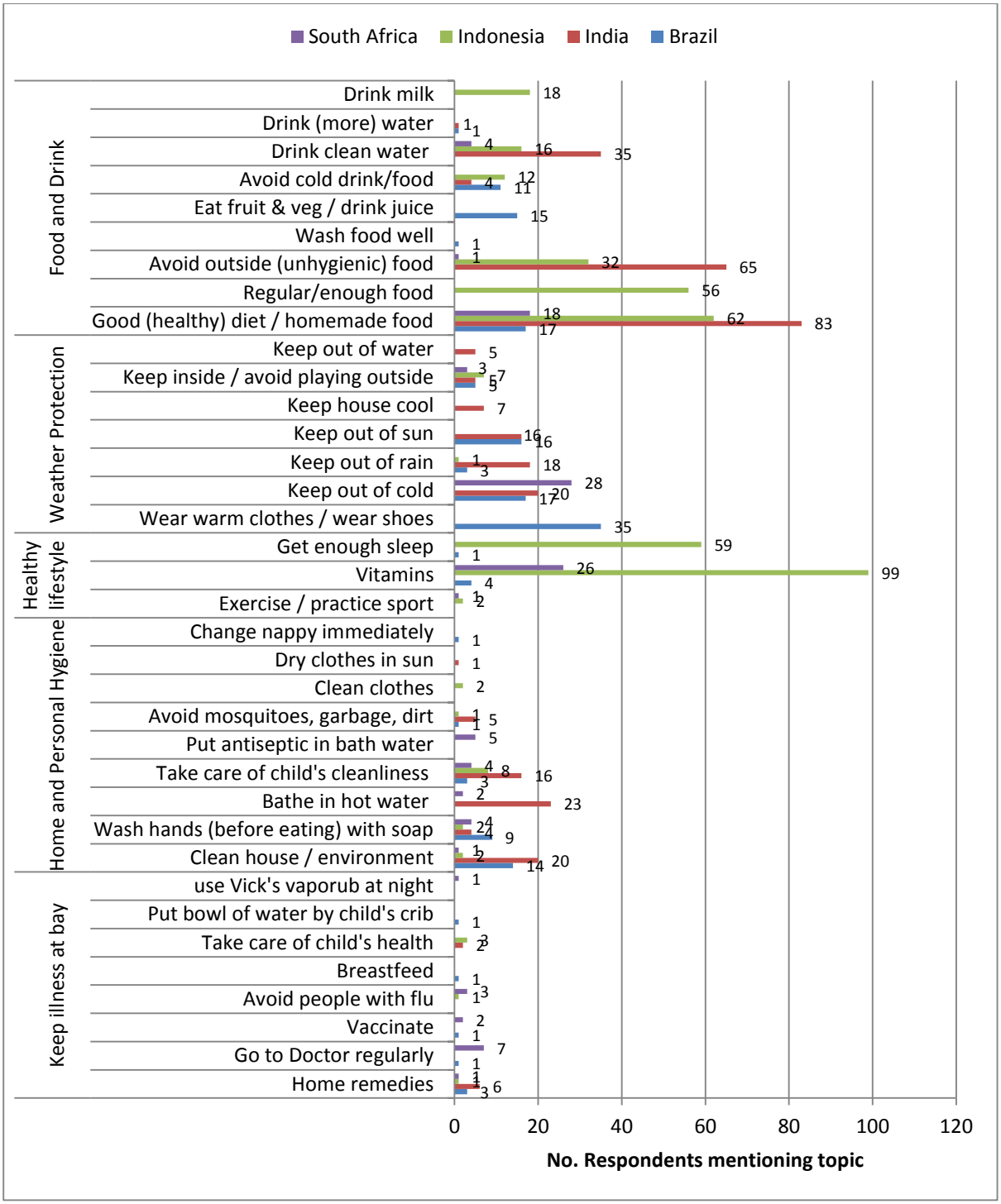
	Mean TOTAL Cost of illness per household in preceding two months		Monthly income per household		% expended per household as % of household income during this period (total costs)
	US $	**Int $**	**US $**	**Int $**	**%**
Brazil	94.46	106.03	1035.61	1162.51	4.6
India	26.45	76.79	354.07	1027.79	3.7
Indonesia	19.37	26.95	104.04	144.74	9.3
South Africa	101.27	177.39	1164.88	2040.49	4.3

Calculation of percent of total household income expended per household is based on income over two months as the total costs are for illnesses occurring within a two month period. In South Africa households that did not provide information on their monthly income (n=44, 21%) were assigned a monthly income based on the mean income of other surveyed households.

Perceived ability to prevent illness

The female survey respondent in each household was asked whether they believe that they can do anything to prevent their children from falling ill with diarrhoea, respiratory infections and skin infections, and if yes, what they think they can do. In Brazil, 63 respondents (30.1%) believed they can help prevent illness, similar to in South Africa n=76, 37.8%). This is in stark contrast to respondents in India and Indonesia, who were far more confident in their ability to protect their children from common illnesses: 190 (94.1%) of Indian respondents and 172 (84.3%) of Indonesian respondents.

The suggested ways in which illness could be prevented were categorised and grouped into common themes: food and drink; protection from the elements; healthy lifestyle; home and personal hygiene; and keeping illness at bay. Figure 3 shows all responses given, stratified by country.



Respondents often volunteered multiple ways in which they can prevent their children from falling ill. Responses were coded into themes. Occasional, unclear responses were not coded. The figure shows a simple summary of the frequency with which different items were mentioned. Drink clean water: refers to boiling (n=27) and filtering (n=8) water in India, drinking mineral water in Indonesia and drinking "clean" water in South Africa. Specific home remedies were mentioned in India (Ayurvedic, n=2 and "Kada", n=4) and in South Africa (lemon and syrup). "Take care of child's health" may well fit into many of the other categories as it is less specific than other responses.

Figure 3: Ways in which respondents in each country believe that illness can be prevented

Discussion

Common infections such as diarrhoea, colds and influenza, and skin infections such as rashes impact family life considerably, both in terms of out-of-pocket payments and lost productivity as a result of absence from work or school. The type of treatment sought, mode of transport and extent of absence from work and school varied considerably between countries, as did the overall direct and indirect costs in each country. School absenteeism has been linked with poor performance and higher rates of drop out, which may determine future earning potential. The lowest costs were in Indonesia, but as the mean monthly salary in surveyed households in Indonesia was far lower than the other countries (after conversion to International dollars), the low costs still corresponded to the highest expenditure as a proportion of monthly earnings. Presentation of costs as a proportion of a household's income is a useful way of comparing costs. However, the mean monthly income is only an approximation (as household income was collected in income brackets and not as a single figure) and total costs have been converted into international dollars. Since survey respondents do not represent the general population with regard to socio-economic status results should not be generalised to the population. However, since study populations were recruited from similar (large urban) settings, comparison across countries appears justifiable.

Direct cost calculations are affected by the lack of cost data for many episodes of infection. It is unknown whether different types of treatment or consultation are free of charge in some countries, (for example, hardly any clinic episodes in South Africa were paid for), or whether treatment costs have been inaccurately recalled or incompletely recorded. As calculations of the cost per episode of infection include when nothing was expended to treat an episode of illness the direct costs may in fact be higher than calculated. The daily wage rate used to calculate the indirect costs assumes that one salary contributes the entire household's income i.e. this is the salary of the person who has taken time off work to care for the ill person. As details were not collected on the relative contributions of different individuals to total household income, and as the respondent who provided the details of a household income was female and may not have been privy to salary details of other family members, this was considered a reasonable assumption. Assuming that there is only one earner could mean that the daily wage rate - and resulting indirect cost estimates - are overestimated. However, it is also possible that household earnings are higher than stated in countries with large informal sectors, which would have the opposite effect on indirect cost calculations. It is important to view direct and indirect cost calculations as estimations and not to take them as literal, absolute values. Furthermore, as the survey was restricted to households with at least one child under twelve, the prevalence of illness and resulting household costs of illness may be higher in our studies than in the general population.

Cost-of-illness studies usually assess prevalence and estimate total cost of a disease incurred in a given year. How much can we generalise from cross-sectional surveys collected at one point in time? Disease burden generally varies throughout the year which could impact the household cost of infection estimates. If the amount of disposable income a household has also varies with the seasons then this could influence decisions about treatment and care seeking, thereby affecting cost calculations. A two month recall period could have introduced systematic recall bias. If funding had allowed, this survey would have been replicated at several different time points throughout the year

using a one-month recall period. It is interesting to see the high level of care-seeking behaviour in all countries in response to these typically mild illnesses. It is difficult to assess whether this is a true indication of behaviour or whether recall bias has played a role: for example, respondents who sought treatment may have been more likely to remember having experienced an episode of illness in the last two months (and were therefore more frequently included in the survey than householders who did not seek treatment). It would be worth investigating this further.

The qualitative findings regarding the ways in which individuals in the different countries believe illness can be prevented revealed major differences between countries that may also reflect varying degrees of urbanisation and “modern lifestyle” aspirations as most strongly indicated by the high belief in vitamin supplementation in Indonesia.