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Original Article

Assessing the magnitude, distribution and determinants of catastrophic health expenditure in urban Lucknow, North India

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ABSTRACT

Introduction: To assess the magnitude, distribution, and determinants of catastrophic health expenditures (CHE) of households in urban Lucknow, North India.

Methods: A cohort of 400 households was selected by 2-step cluster sampling and baseline demographic survey was done followed by two six-monthly health surveys. CHE was defined as health expenditures $\geq 10\%$ of household's capacity to pay, measured by non-subsistence spending.

Results: From December 2011 to June 2012, 157/400 (39.25%) households reported ≥ 1 episodes of illness, with households suffering sickness in the first survey at increased risk for it in the second (Crude Odd's Ratio = 3.33, 95% CI: 2.02–5.45; p value < 0.0001). Mean sickness days without hospitalization were 13.13 ± 36 per household. In 24 (6%) households, there was ≥ 1 hospitalization. Health expenditure was entirely met through out of pocket payments (OOP). CHE occurred in 45 (11.25%) households, with statistically significant differences across per capita income quintiles ($p = 0.036$) and 60% falling in the lower two. On logistic regression model, adjusting for per capital income quintile, CHE was associated with hospitalization (Adjusted OR = 100, 95% CI: 25.00–333.33; $p < 0.0001$) and > 13 sickness days without hospitalization (Adjusted OR = 4.21, 95% CI: 1.862–9.524; $p = 0.001$).

Conclusions: Since not only hospitalization but also prolonged sickness days without hospitalization was associated with increased risk of CHE, and since almost half the households have sickness, steps should be taken to protect all households from financial hardship through tax based health financing, social health insurance or other forms of prepayment, as currently all health expenses were met through OOP payments.

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1. Introduction

Out of pocket payments (OOP) are the primary source through which health expenditure is met in many developing countries like India. Catastrophic health expenditure (CHE) occurs in both rich and poor economies, but over 90% of the affected people reside in low-income countries.¹ Any health expenditure that threatens a household's financial capacity to meet its subsistence needs is termed as catastrophic and does not merely imply high magnitude health expenditure.^{2,3} Hence the term catastrophic is used for any expenditure that risks impoverishing a household.^{1,4–6}

A study covering 5 districts in Rajasthan, India showed that medical expenses are an important factor pushing people into poverty.⁷ A nationally representative sample survey indicated that an additional 37 million Indians (3.7% of total population) were impoverished in the year 1999 because of health care costs; increasing poverty head counts by 12%.⁸ Still other studies show that 17–34% of hospitalized Indian patients are impoverished because of medical costs.⁹ Globally it is estimated that 150 million people suffer financial catastrophe each year on account of incurring health expenditure and about 100 million are pushed into poverty because of OOP payments for health.¹⁰

Hence, there is an urgent need to provide some form of financial protection to the population of developing countries, like India, with reference to health financing. While considering policy options to increase financial protection, policy makers need to understand whether any characteristics make people more vulnerable to catastrophic payments. Knowledge is also necessary of which households are more vulnerable for any set of system characteristics. Therefore, this study aims to fulfill this purpose. The objective of the current study was to determine the magnitude of CHE, its distribution and determinants among households in urban Lucknow, North India.

2. Methods

The study was conducted in Lucknow city. Lucknow is the capital city of Uttar Pradesh, a state in Northern India with a population of 4,588,455 in 2011.¹¹ There are public and private hospitals for inpatient and outpatient care as well as a wide network of private health care providers in the city.

2.1. Design

This was a prospective cohort study.

2.2. Sample size

In a study conducted in urban slums of Bijapur, Karnataka State in Southern India, almost all the households incurred CHE for childhood illnesses.¹² Since we were collecting data on any family illness, therefore we assumed that 50% of the households would have had CHE and to estimate this with a confidence level of 95%, precision level of 5%, and follow-up loss of 5%, 400 households were to be included on calculating

the sample size. This sample size would be adequate to assess with the same confidence level and precision CHE proportions below and above 50%.

3. Sampling strategy

The city of Lucknow is traversed by the river Gomti. The study was conducted by randomly selecting one zone on either side of Gomti River, according to the latest map. All the wards in each zone were alphabetically listed and given a serial number. Between 1 and the highest serial number, 4 numbers were randomly generated by MS-EXCEL and these 4 wards per zone were selected for the study. From each ward two colonies or “*mohallahs*” in local dialect, were then randomly selected. Total number of household in each “*mohallah*” was obtained, divided by 25 to get the sampling frequency (*n*) and then every *n*th household was included in the study. Thus a total of 400 households were included, 200 households from each zone. These 200 households from each zone, comprised 25 households from each of the four wards in a zone.

3.1. Data collection

Data was collected using a pre-structured, validated questionnaire in local language, Hindi. A pre-test was done in 12 households in 4 locations to validate cognitive suitability, and corrections were made as necessary after the pre-test.

A baseline demographic survey was done in which data was collected on household characteristics which includes household size, education of the head of household and all the members, occupation, total family income, fixed assets owned by the family, any type of health insurance coverage available for any family member, loans taken for health care or selling of fixed assets for health care in the last 3 months. Data was also collected on demographic variables for each member of the household and on food and non-food expenditure incurred by households. Food expenditure was calculated by summing expenditure on food items like ration/groceries, milk, special food items, poultry etc. Non-food expenditure was calculated by summing expenditure on rent, electricity, vehicle fuel expenditure, clothes etc.

Thereafter, two health surveys were done at an interval of six months. Questions were asked about illnesses episodes in the preceding 3 months in any family members, and whether the sick person/s availed out patient care or in patient care. For treated illness episodes, data was collected on expenditures incurred as.

(i) direct health expenditures, like doctors fees, medicines, diagnostics (investigations and procedures) and hospital charges; (ii) indirect health expenditures like transportation to seek care for the sick, special diets, hiring of special staff as care providers and (iii) direct non-medical expenditure like wages lost due to sickness either of the ill person or any family member. However for calculation of CHE, only direct health expenditure was included. Total household expenditure was calculated as a summation of health expenditure, food and non-food expenditure.

3.2. Data management and statistical analysis

Data was entered in MS-EXCEL. SPSS™ Software (version 16) was used for statistical analysis, after both the surveys. Unit of analysis was the household. Consistent with most of the literature, we define catastrophic payments as OOP direct medical expenditure on health care in excess of a given share of the total household non-subsistence expenditure.¹³ We concentrate on a 10% threshold, which is common in the literature¹⁴ and has been argued to approximate the burden at which a household is forced to sacrifice other basic needs, deplete productive assets, incur debt, or be impoverished.¹⁵

Monthly household consumption expenditure was ranked into quintiles after adjustment for standard household size. This adjustment allows any differences in health spending across countries to be attributed to factors other than the differential composition of their populations. The poverty line was defined by subsistence spending, i.e. the average monthly food expenditure of the household whose food expenditure as a share of total household consumption expenditure fell between the 45th and 55th percentiles of the entire sample.¹ The subsistence spending of each household was calculated as the poverty line multiplied by standard household size. If a household's total expenditure was less than this figure, the household was categorized as poor. Household non-subsistence spending was used as a proxy for capacity to pay. However, whenever food expenditure was less than subsistence spending, capacity to pay was defined as total expenditure minus food expenditure.¹

3.3. Definitions and measurements used

Out-of-pocket health expenditures were those made by households at the point of receiving health services and include cash payments reported in the surveys.⁶

CHE was defined in relation to a household's non-subsistence spending. Health spending was taken to be catastrophic when its ratio to total household non-subsistence spending exceeded 10%. Household non-subsistence spending was used as a proxy for capacity to pay. A household's capacity to pay (CTPi) was calculated using the following formula¹:

$$\begin{aligned} \text{CTPi} &= \text{TEXPi} - \text{SE}(45 - 55)i & \text{If } \text{FEXPi} \geq \text{SE}(45 - 55)i \\ \text{CTPi} &= \text{TEXPi} - \text{FEXPi} & \text{If } \text{FEXPi} < \text{SE}(45 - 55)i \end{aligned}$$

where *TEXP* denotes total expenditure, *FEXP* denotes food expenditure and *SE* denotes subsistence expenditure. *SE* was calculated by multiplying the poverty line with each household's household equivalent size. The poverty line by the average monthly food expenditure of the household whose food expenditure as a share of total household consumption expenditure fell between the 45th and 55th percentiles of the entire sample. Household non-subsistence spending was used as a proxy for capacity to pay. However, whenever food expenditure was less than subsistence spending, capacity to pay was defined as total expenditure minus food expenditure.

Household expenditure was adjusted for the number of household members in the following way¹:

3.3.1. Household expenditure

Household equivalent size β .

If $\beta = 1$, a household with four members would have to have four times the expenditure of a single member household to be on the same expenditure (consumption) level. If $\beta = 0$ no adjustment is made for household size. We have chosen $\beta = 0.56$, which is the coefficient used by Xu et al.¹ The value of the parameter β (0.56) has been estimated from previous studies based on household survey data from 59 countries.¹ The logic behind this approach is that health expenditure is compared to actual non-food expenditure for poorer households while for richer households – that may be expected to spend more on food than what represents necessities – health expenditure is compared to non-subsistence expenditure.

Baseline characteristics of the household have been reported earlier.¹⁶ A descriptive analysis was undertaken to describe food expenditure and non-food expenditure. Also, we report the number of households with at least one sick person, in the last three months, in each of the two health surveys. We report the crude odd's ratio for occurrence of sickness in the second health survey if there was an episode reported in the first one. We also report the health expenditure incurred by households, combining data from both the health surveys. To ensure consistency, while combining data from both the surveys, each household was assigned a unique ID. This prevented anomalies and ensured correctness of calculations. Per capita income was used to categorize households into 5 economic strata. We report the proportion (along with 95% CI) of households, which suffered from CHE. Univariate association was assessed between CHE and independent variables and reported only if the difference was statistically significant. We also report the comparison of family size, age and average age, monthly income and per capita income as well as number of sickness days without hospitalization between households with and without CHE. Thereafter, logistic regression analysis was used to predict determinants of CHE, using those independent variable which had a univariate association with it, with a *p* value of <0.1 .

For categorical variables Odd's ratio with 95% confidence interval (CI) was computed and chi square test statistics was used to compute the *p* value. For continuous variables, student's *t* test and analysis of variance (ANOVA) statistics was used. Using a 2-tailed distribution, a *p* value of <0.05 was taken as statistically significant.

We calculated Kappa statistics to compare households categorized by income and expenditure quintiles. We have also calculated and reported the correlation coefficient between household income and food as well as non-food expenditure.

We have also calculated Gini coefficients of health expenditure, food expenditure and non-food expenditure to determine the statistical dispersion in these variables.¹⁷ Gini Coefficient is a summary measure of the extent to which the actual distribution of income, consumption expenditure, or a related variable, differs from a hypothetical distribution in which each person receives an identical share.

4. Results

The study duration was from December 2011 to June 2012. The baseline characteristics of the households have been reported

Table 1 – Health expenditure, food expenditure and non-food expenditure distribution across expenditure quintiles (All values are in INR, 1\$ = 55 INR).

Quintile	Health expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)	Food expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)	Nonfood expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)
I	119.31 ($\pm$ 256.87) 0 (162.50)	1034.66 ($\pm$ 230.74) 1010 (275)	3670.92 ($\pm$ 905.68) 3910 (1327.50)
II	235.06 ($\pm$ 434.58) 0 (254.25)	1297.90 ($\pm$ 289.84) 1295 (190)	5175.96 ($\pm$ 498.09) 5190 (617.50)
III	249.16 ($\pm$ 535.71) 0 (139.59)	1448.28 ($\pm$ 272.73) 1445 (305)	7005.00 ($\pm$ 833.96) 6965.00 (1218.75)
IV	561.18 ($\pm$ 1167.04) 0 (529.17)	1737.98 ($\pm$ 476.11) 1640 (382.5)	24234.73 ($\pm$ 89992.86) 8977.50 (1671.25)
V	2452.22 ($\pm$ 6097.77) 170.84 (1137.51)	2321.56 ($\pm$ 1332.87) 1960 (947.50)	42089.24 ($\pm$ 92710.71) 15989.17 (22420.00)
P value of ANOVA	<0.0001	<0.0001	<0.0001

elsewhere.¹⁶ In the first health survey conducted in winter months, 115/400 (28.75%) households reported illness in at least one of the family members. The average sickness days (excluding hospitalization) were 10.39 ± 34.35 . In the second health survey conducted in summer months, none of the households were lost to follow-up. There were 84/400 (21.00%) households reporting illness in at least one of the family members in the second health survey with average sickness days (excluding hospitalization) being 2.74 ± 9.11 . By combining the data of both rounds, there were 157/400 (39.25%) unique households reporting at least one illness episode and the average sickness days (excluding hospitalization) at any point of time was 13.13 ± 36 . Household with a sickness reported in the first health survey was at a greater risk of having sickness reported in the second health survey also (Crude Odd's Ratio = 3.33; 95% CI 2.016: 5.496; p value < 0.0001).

The mean (SD, Median) of food and non-food expenditure was INR 1517.46 ($\pm$ 808.29, 1407) and INR 16733.4 ($\pm$ 79388.94, 6640) respectively. Mean (SD, median) of household's capacity to pay was INR 17713.21 ($\pm$ 44398.82, 7437.70). The mean (SD, median) of total direct medical expenditure on illness was INR 610 ($\pm$ 2721.65, 0) and the entire amount was paid out of pocket. The

Gini coefficients to measure statistical dispersion were 0.393 for Health Expenditure, 0.224 for Food Expenditure and 0.654 for Non-Food Expenditure.

Table 1 shows the distribution of food expenditure and non-food expenditure across consumption expenditure quintiles of the sampled population from the data collected during the baseline demographic survey. Also given in Table 1 is the combined health expenditure of both the health surveys. All the three categories of expenditure show a significant difference across quintiles when one-way ANOVA was used to assess this parameter.

There was a significant positive correlation between monthly household income with food ($r = 0.34$; $p < 0.0001$) and non-food expenditures ($r = 0.13$; $p = 0.01$). Table 2 shows the distribution of health expenditure, food expenditure and non-food expenditure across per capita household income quintiles of the sampled population. Health and food categories of expenditure are significantly different across quintiles.

The Kappa statistic, which determines the degree of concordance between categorical variables, between the Per capita income method and the household consumption expenditure method of dividing the sampled population into quintiles was 0.097, indicating a poor concordance.

Table 2 – Health expenditure, food expenditure and non-food expenditure distribution across per capita income quintiles (All values are in INR, 1\$ = 55 INR).

Quintile	Health expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)	Food expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)	Non-food expenditure Mean ($\pm$ S.D) Median (IQR) (n = 80 for each quintile)
I	1412.678 ($\pm$ 4037.379) 0 (341.6725)	1531.45 ($\pm$ 604.1292) 1370 (497.5)	13804.15 ($\pm$ 27512.33) 6090 (5483.75)
II	311.3286 ($\pm$ 637.5257) 0 (432.71)	1422.55 ($\pm$ 552.8014) 1320 (417.5)	6425.475 ($\pm$ 3120.275) 5752.5 (2621.25)
III	455.0199 ($\pm$ 1649.013) 0 (300)	1390.75 ($\pm$ 352.7451) 1350 (287.5)	8105.138 ($\pm$ 6102.632) 6425 (3722.5)
IV	235.4991 ($\pm$ 681.7562) 0 (177.085)	1622.875 ($\pm$ 603.1084) 1525 (555)	24234.73 ($\pm$ 89992.86) 7607.5 (5555)
V	640.0634 ($\pm$ 4075.666) 0 (183.34)	1916.063 ($\pm$ 1400.393) 1590 (838.75)	31097.53 ($\pm$ 149906.4) 8705 (7046.25)
P value of ANOVA	0.05	0.0002	0.22

Table 3 – Comparison of expenditure incurred by households in the catastrophic health expenditure and the non-catastrophic health expenditure segments.

	Catastrophic (n = 45)	Non-catastrophic (n = 355)	P value
Family size	5.96 ± 1.89	5.88 ± 2.19	0.81
Mean (±SD)	6 (3)	5 (2)	
Family age (cumulative all ages of family members in years)	154.03 ± 54.61	152.50 ± 61.99	0.93
Mean (±SD)	159 (86.02)	145.5 (77)	
Average family age (cumulative all ages in years/number of family members)	27.06 ± 9.76	26.76 ± 8.30	0.84
Mean (±SD), Median (IQR)	25.88 (16.55)	25.75 (10)	
Family income (INR)	7780 ± 5922.97	9844.50 ± 10403.37	0.05
Mean (±SD), Median (IQR)	5500 (6000)	7500 (6500)	
Per capita income (INR)	1452.91 ± 1214.32	1915.72 ± 2088.48	0.03
Mean (±SD), Median (IQR)	1000 (1047.62)	1333.33 (1226.19)	
Food Expenditure	1458.667 (±685.0036)	1591.704 (±822.2343)	0.24
Mean (±SD), Median (IQR)	1340 (510)	1430 (480)	
Non-food expenditure	7446.667 (±9484.258)	17910.6 (±84144.22)	0.03
Mean (±SD), Median (IQR)	5180 (3285)	6950 (4855)	
Sickness without hospitalization	46.88 ± 47.83	8.95 ± 32.31	0.000005
Mean (±SD), Median (IQR)	36 (80.7)	0 (0.37)	
Health expenditure	4912.081 (±7407.776)	192.11 (±507.46)	0.001
Mean (±SD), Median (IQR)	1766.67 (3841.67)	0 (175)	

Using a threshold of 10%, 45 (11.25%; 95% CI: 8.51–14.72) of the sampled households faced CHE. The percentage of households with healthcare expenditures greater than 10%, 20%, 30% and 40% of their capacity to pay were 11.25%, 4%, 3% and 2.75%, respectively. There were 14/80 (17.5%; 95% CI: 10.7–27.3) households in the first quintile that faced CHE, 13/80 (16.25%; 95% CI: 9.8–25.8) in the second, 4/80 (5%; 95% CI: 1.96–12.2) in the third, 9/80 (11.25%; 95% CI: 6.0–20.0) in the fourth and 8/80 (10%; 95% CI: 5.2–18.5) in the fifth quintile. This distribution was significant across quintiles, with $p = 0.036$.

We have compared certain baseline characteristics, food and non-food expenditure, health expenditure and sickness days between households with and without CHE and reported them in Table 3. Households with sickness days without hospitalization >13 days were at statistically significantly increased risk of CHE (Crude OR = 4.27, 95% CI: 2.243–8.121; $p < 0.0001$).

Combining data of both health surveys, there were 24/400 (6%, 95% CI: 4.03–8.81) households wherein there was one or more episode of hospitalization in the last 3 months. The occurrence of hospitalization in the household statistically significantly increased the risk of incurring CHE (Crude O.R: 102.67, 95% CI: 28.59:368.69; $p < 0.0001$). Among those hospitalized, 62.5% (15/24) households were in the first and second quintile and 37.5% (9/24) were in the remaining quintiles.

On logistic regression analysis, CHE was associated with ≥13 Sickness days without hospitalization (Adjusted OR = 4.21, 95% CI: 1.86–9.52; $p = 0.001$), occurrence of any hospitalization in the household (Adjusted OR = 100, 95% CI: 25.00–333.33, $p < 0.0001$), controlling for per capital income quintiles, viz. 1st (Adjusted OR = 3.68, 95% CI: 0.801–16.861, $p = 0.094$), 2nd (Adjusted OR = 4.40, 95% CI: 0.959–20.163; $p = 0.057$), 3rd (Adjusted OR = 1.557, 95% CI: 0.272–8.92; $p = 0.619$), 4th (Adjusted OR = 2.913, 95% CI: 0.622–13.645; $p = 0.175$) with the 5th being the reference.

5. Discussion

In the present cohort study conducted on 400 households, over a 12-month period in the years 2011–12 in urban Lucknow, North India, 11.25%(45/400) households faced CHE. Since 39.25% (157/400) households reported a sickness episode, 28.66% (45/157) of households with sickness had CHE. This was when a 10% threshold limit of health expenditure to capacity to pay was used.

There is no consensus on where this threshold limit of health expenditure to capacity to pay should lie. In different studies, health expenditure has been labeled catastrophic if a household's financial contributions to the health system exceed 10%–40% of capacity to pay.^{1,14,18,19}

We found that of 11.25% (45/400) households facing CHE, which was similar to the findings of a study conducted in Georgia between 2000 and 2007, which reported an increase in the proportion of households facing CHE from 2.8% in 1999 to 11.7% in 2007.²⁰ Georgia is a lower-middle-income country, according to the World Bank classification with Gross National Income (GNI) per capita \$1560 in 2006.²¹ In Georgia, 70.9% of the total health expenditure is Out of Pocket.²²

The poorest quintile, when classifying the sampled households into socioeconomic status classes using per capita household income, demonstrated the highest mean out of pocket health expenditure in our study. This indicates the relatively high out of pocket health expenditure incurred by economically weaker households. The average of the ratio of health expenditure to total consumption expenditure was the highest in the poorest quintile and was 15%, the lowest being 2% in the 4th quintile. Hence if a phased social health insurance scheme is to be started, the poorest quintile must be targeted first.

The average non-food expenditure was highest in the fifth quintile, thereby confirming that non-subsistence spending is highest in the richest 20% of the sampled population and

significantly increases as we move up the quintiles, from the lowest to the highest economic status. The average food expenditure was also highest in the richest quintile. This pattern is similar to a study done in Nairobi, also a developing city.²³

Food and non-food expenditure was significantly positively correlated with household income. With the increase in household income the households spend more on food and this fact is similar to the food expenditure pattern in a low-income township of South Africa.²⁴

While comparing households facing CHE and those not facing it, health and non-food expenditure was found to be significantly different. Health expenditure in the households facing CHE was nearly 26 times more than the same in those households not facing it. This shows the depth of financial catastrophe being faced by a certain section of the households. Food expenditure remained more or less uniform between the two segments. Non-food expenditure was 2.5 times more in the households not afflicted by CHE when compared to those facing it. This signifies the depletion in the quality of life of the households facing the flak, as the non-food expenditure like that on travel and education is reduced to meet health expenditure needs.

We found that in the logistic regression model the predictors of CHE were per capita income quintile, sickness days not including hospitalization and the occurrence of hospitalization. This is similar to a study carried out in a low-income economy of Nouna District, Burkina Faso which concluded that economic status was one of the significant predictors of CHE, with the poorest members being the hardest hit lot.²⁵

The occurrence of hospitalization in households increased the risk of facing a financial catastrophe by about 100 times. One solution to this could be that subsidized hospital care may offload to the afflicted households but in India subsidized care in government hospitals is not availed due to community perceptions about the quality of care provided there.²⁶

As our survey was a rolling one, so that the sampled households were interviewed at two different time periods, addressed the issue of seasonality. In collecting data on household expenditure on health, food and non-food items we used different recall periods because expenditures on several items are incurred at different frequencies and may not be captured accurately in a one-month period even if the expenditures are annualized.

6. Conclusions

Since not only hospitalization but also prolonged sickness days without hospitalization was associated with increased risk of CHE, and since almost half the households have sickness, steps should be taken to protect all households from financial hardship through tax based health financing, social health insurance or other forms of prepayment, as currently all health expenses were met through OOP payments.

Authors' contributions

SM involved with design, data collection, data management and analysis interpretation and manuscript writing and is the

guarantor. SA, MA, VK, JVS involved with design, study supervision, interpretation and manuscript writing. SA supervised data analysis.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. Xu K, Evans DB, Kawabata K, Zeramardini R, Klavus J, Murray CJ. Household catastrophic health expenditure: a multicounty analysis. *Lancet*. 2003;362(9378):111–117.
2. Xu K, Evans DB, Carrin G, Aguilar-Rivera AM, Musgrove P, Evans T. Protecting households from catastrophic health spending. *Health Aff (Millwood)*. 2007;26:972–983.
3. Su TT, Kouyate B, Flessa S. Catastrophic household expenditure for health care in a low income society: a study from Nouna District, Burkina Faso. *Bull World Health Organ*. 2006;84:21–27.
4. World Health Organization. *The World Health Report 2000; Health Systems: Improving Performance*, Geneva; 2000. http://www.who.int/whr/2000/en/whr00_en.pdf. Accessed 07.07.13.
5. Garg CC, Karan AK. Reducing out-of-pocket expenditures to reduce poverty: a disaggregated analysis at rural-urban and state level in India. *Health Policy Plan*. 2009;24(2):116–128.
6. Xu K, Evans DB, Kadama PJN, Ogwal P, Nabukhonzo P, Aguilar A. Understanding the impact of eliminating user fees: utilization and catastrophic health expenditures in Uganda. *Soc Sci Med*. 2006;62(4):866–876.
7. Krishna A. Escaping poverty and becoming poor: who gains, who loses and why? *World Dev*. 2004;32:121–136.
8. van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Effect of payments for health care on poverty estimates in 11 countries in Asia: an analysis of household survey data. *Lancet*. 2006;368(9544):1357–1364.
9. Peters DH, Yazbeck AS, Sharma RS, Ramana GNV, Pritchett LH, Wagstaff A. *ACCORD Community Health Insurance. Better Health Systems for India's Poor*. Washington: World Bank; 2002. <http://www.srtt.org/downloads/accordcommunity.pdf>. Accessed 21.07.13.
10. Binnendijk E, Koren R, Dror DM. Hardship financing of healthcare among rural poor in Orissa, India. *BMC Health Serv Res*. 2012;12(23). <http://www.biomedcentral.com/1472-6963/12/23>. Accessed 21.07.13.
11. Lucknow district: census 2011 data. <http://www.census2011.co.in/census/district/528-lucknow.html>; Accessed 21.07.13.
12. Patil SS, Berad AS, Angadi MM. A study to assess catastrophic household expenditure on childhood illness in an urban slum of Bijapur. *Indian J Community Med*. 2009;34:335–337.
13. Xu K. Distribution of health payments and catastrophic expenditures methodology World Health Organization: Department Health System Financing. http://www.who.int/health_financing/documents/dp_e_05_2-distribution_of_health_payments; Accessed 07.07.13.
14. Ranson MK. Reduction of catastrophic health care expenditures by a community-based health insurance scheme in Gujarat, India: current experiences and challenges. *Bull World Health Organ*. 2002;80(8):613–621.
15. Wagstaff A, van Doorslaer E. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993-1998. *Health Econ*. 2003;11:921–934.
16. Misra S, Awasthi S, Singh JV, Agarwal M, Kumar V. Estimation of out of pocket direct and indirect medical expenditure and

- spending burden ratio across income quintiles in urban Lucknow, India. *Clin Epidemiol Glob Health*. April 2013;1(1):12. <http://download.journals.elsevierhealth.com/pdfs/journals/2213-3984/PIIS2213398413000134.pdf>. Accessed 07.07.13.
17. Food and Agriculture Organization of the United Nations. Inequality analysis: the Gini Index. http://www.fao.org/docs/up/easypol/329/gini_index_040en.pdf; Accessed 07.07.13.
 18. Pradhan M, Prescott N. Social risk management options for medical care in Indonesia. *Health Econ*. 2002;11(5):431–446.
 19. Nguyen Thi Bich Thuan, Lofgren Curt, Nguyen Thi Kim Chuc, Lindholm Lars. Are the estimates of catastrophic health expenditure among rural population too high? A comparison of studies in Vietnam. *Open Public Health J*. 2008;1:25–31. <http://www.benthamscience.com/open/tophj/articles/V001/25TOPHJ.pdf>. Accessed 07.07.13.
 20. Gotsadze G, Zoidze A, Rukhadze N. Household catastrophic health expenditure: evidence from Georgia and its policy implications. *BMC Health Serv Res*. 2009;9:69. <http://dx.doi.org/10.1186/1472-6963-9-69>. <http://www.biomedcentral.com/1472-6963/9/69/#B15>. Accessed 07.07.13.
 21. The World Bank. Data catalog. <http://datacatalog.worldbank.org/>; Accessed 07.07.13.
 22. Chanturidze T, Ugulava T, Duran A, Ensor T, Richardson E. Georgia health system review. *Health Syst Transit*. 2009;11(8):1–116.
 23. Kamau M, Olwande J, Githuku J. Consumption and expenditures on key food commodities in urban households: the case of Nairobi. <http://www.tegemeo.org/documents/work/WP41a-Consumption-and-Expenditures-on-Key-Food-Commodities-in-Urban-Households-The-Case-of-Nairobi.pdf>; Accessed 07.07.13.
 24. Sekhampu TJ. Socio-economic determinants of household food expenditure in a low income township in South Africa. *Mediterr J Soc Sci*. September 2012;3(3). <http://dx.doi.org/10.5901/mjss.2012.v3n3p449>. http://www.mcser.org/images/stories/2_journal/mjss_september_2012/tshedisopercent20josephpercent20sekhampupercent202percent20paper.pdf. Accessed 07.07.13.
 25. Su TT, Kouyaté B, Fless S. Catastrophic household expenditure for health care in a low- income society: a study from Nouna district, Burkina Faso. *Bull World Health Organ*. 2006;84:21–27.
 26. Raman VA, Björkman JW. Public/Private Partnership in Health Care Services in India. <http://www.pppinharyana.gov.in/ppp/sector/health/report-healthcare.pdf>; Accessed 07.07.13.