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Original Article

Estimation of out of pocket direct and indirect medical expenditure and spending burden ratio across income quintiles in urban Lucknow, India

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ABSTRACT

Background: Health insurance in India is almost non-existent. Therefore all expenses incurred during illnesses are borne directly by the family and accurate estimates are not available. The primary objective of the study was to assess the proportion of households who incur out of pocket medical expenditure due to sickness of family members in an urban area in India. Secondary objectives were to quantify the direct and indirect medical expenditure incurred by families in the last 3 months and to assess the spending burden ratio (ratio of total medical expenditure to family income) among income quintiles.

Methods: This was a community based cross sectional study conducted in randomly selected administrative wards in Lucknow city, northern India.

Results: From December 2011 to March 2012, 400 families, having 2343 members were recruited from 16 wards. Mean family size was 5.86 members (SD = 2.13 members) and mean family income was INR 9622.25 (SD = 11,323.01) (US \$1 = INR 50 approximately in mid-2012). In last 3 months, 115 households (28.75 percent) sought medical care for illness in one or more family members. Mean direct medical expenditure was INR 3406 (SD = 4657), mean indirect medical expenditure was INR 1449 (SD = 2685) and mean total medical expenditure was INR 6590 (SD = 13,333). The spending burden ratio in the lowest and highest income quintile was 0.57 ± 0.82 and 0.15 ± 0.30 respectively (p value = 0.024). **Conclusions:** Since more than one-fourth of households incur medical expenditure which are paid out of pocket from family income, and since the spending burden ratio is statistically significantly higher in the lowest income quintile when compared to highest, there is a need for introduction of health insurance of some sort for the urban population. This is especially needed for the poorer sections, with provision to absorb the indirect medical expenses if possible.

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1. Introduction

Health care finance in developing nations is mainly characterized by out of pocket (OOP) payments for health, and the lack of health insurance. Borrowing money is a common source of funds to pay off healthcare costs. The impact of borrowing on households can be severe, leading to indebtedness. In the absence of insurance, the expenditure incurred on illness not only impacts the overall welfare but also increases the risk of not being able to recover them from existing resources and thereby slipping deeper into poverty. It is now widely acknowledged that health care expenditures can impoverish individuals and households. Medical expenditure is regarded as catastrophic in nature if it exceeds a pre-determined share of household income or total expenditure in a given period. Financial protection mechanism like health insurance schemes will greatly help in mitigating such a burden, however, unfortunately, in developing nations such as India, such insurance schemes are almost completely absent.

India holds the third rank in the south-east Asia region in the latest list of countries with highest out of pocket (OOP) expenditure on health as per the WHO's World Health Statistics 2012.¹ According to the same source nearly 60 percent of the total health expenditure in India was out of pocket in the year 2009. In south-east Asia region Myanmar has the top OOP expenditure of 82 percent. Bangladesh comes second with 65 percent.

At a global level Afghanistan along with Myanmar had the highest OOP health expenditure with 82 percent. The countries that spent less on their OOP health expenditure were the developed nations including Netherlands at 6 percent, France at 7 percent and UK at 10 percent.

The World Bank study named 'Government-sponsored Health Insurance in India: Are You Covered?' carried out for the Ministry of Health and Family Welfare has recommended increasing health insurance coverage for both outpatient and inpatient care to include all poor and near-poor patients.² The country's public financing for health care is less than 1 percent of the world's total health expenditure, although it is home to over 16 percent of the world's population. The study suggests a balanced approach, building upon existing health related infrastructure and adding to it accessible private capacity and utilizing the lessons learned from the existing government-sponsored health schemes.

OOP spending burden ratio is the ratio of average out of pocket spending to household equivalent income and is estimated as the mean of the ratios between the two numbers for each individual and this can be a measure of equity when assessed across income quintiles.³ A high OOP spending burden is likely to result in financial catastrophe and impoverishment.^{4–7} A study for 89 countries suggested that the more a country relies on OOP, the more of its households face financial catastrophe.⁸

Hence, the primary objective of the study was to assess the proportion of households who incur OOP medical expenditure due to sickness of family members in an urban area. Secondary objectives were to quantify the direct and indirect medical expenditure incurred by families in the last 3 months and to assess the OOP spending burden ratio in and across income quintiles.

2. Material and methods

2.1. Setting

The study was conducted in Lucknow city. Lucknow is the capital city of Uttar Pradesh, a state in Northern India. As reported in the Census of India 2011 Lucknow had a population of 4,588,455.⁹ The population in the city is rapidly increasing with a change of 25.79 percent when compared to 2001. As per the information collected from the public health departments in Lucknow, there are two district hospitals, one each for male and female patients, providing secondary level health care, three government academic medical institutions providing tertiary level care, eight Maternity and Child Health Centers and fourteen urban health posts manned by MBBS doctors providing primary health care. In addition there is a wide network of private health care providers.

2.2. Design

This was a cross sectional community based survey.

2.3. Sample size

Assuming that 50 percent of the households had at least one member who fell ill in the last 3 months. Then to estimate this with a confidence level of 95 percent, precision level of 5 percent, and follow up loss of 5 percent, 400 households were to be surveyed. The following formula was used for sample size calculation:

$$n = \frac{(z^2 * p * (1 - p))}{d^2}$$

where n = sample size, p = estimated proportion of the population that presents the characteristic (when unknown we use $p = 0.5$), z = Z statistic for a level of confidence, p = expected prevalence or proportion and d = precision.

2.4. 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.

2.5. Data collection

The cross sectional data were obtained by using a pre-structured questionnaire that was validated and finalized after including the suggestions made by experts in the area of study. The questionnaire was then translated from English

into Hindi, and back-translated into English. Both the questionnaires were used, depending upon the suitability of the occasion. 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.

Data was collected by the first author (SM) under the supervision of co-authors. Data analysis was done after the collection was completed by SM under supervision of co-author, Dr Shally Awasthi (SA). 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.

Questions were asked about illnesses episodes in the preceding 3 months in any family members, and whether the sick person/s availed health care on outdoor basis or was hospitalized. For treated illness episodes, data was collected on expenditures incurred as (i) direct medical variables, like doctors fees, medicines, investigations, procedures, hospital charges; (ii) indirect medical expenditures like transportation to seek care for the sick, special diets, hiring of special staff as care providers and (iii) direct non-medical costs like wages lost due to sickness either of the ill person or any family member.

2.6. Data management and statistical analysis

Data was entered in MS-EXCEL. SPSS™ Software (version 16) was used for statistical analysis. Unit of analysis was the household. A descriptive analysis was done to assess the baseline characteristics of the enrolled households, prevalence of any morbidity in the last 3 months, health care seeking behavior and expenditure on illness. Modified Kuppuswamy scale was applied to categorize households into 5 socio-economic strata.¹⁰ Demographic and socio-economic characteristics, including gender of the head of household, of houses with and without illness in the last 3 months were compared. For categorical variables odd's ratio with 95 percent confidence interval (CI) was computed and chi square test statistics was used to compute the *p* value. For continuous variables, Students' *t* test statistics was used. Using a 2-tailed distribution, a *p* value of <0.05 was taken as statistically significant.

Based on reported duration of sickness, acute morbidity (AM) was defined when duration was less than 90 days and chronic morbidity (CM) when duration was greater than or equal to 90 days.¹¹ We have reported the proportion of AM and CM in our study population.

Total medical expenditure was computed by summing direct as well as indirect medical cost associated with outpatient care as well as hospitalization of sick persons. We reported the mean along with standard deviation (SD) as well as the median expenditures along with inter-quartile range (IQR). Total medical expenditure was compared between households with AM, CM or both in the preceding 3 months. Spearman's correlation was done to find association of total medical expenditure with family income. Households were divided into income quintiles and OOP total medical

expenditure as well as spending burden ratio across income quintiles was compared using analysis of variance (ANOVA).

3. Results

The study was conducted from December 2011 to March 2012 after obtaining institutional ethical clearance. From 8 wards and 16 "mohallas", 400 families were enrolled. There were 2343 family members of which 53.1 percent (*n* = 1244) were males. The baseline characteristics of the enrolled families are given in Table 1. Out of the sampled households, 75 (18.75 percent) households had the head of the household holding a graduation degree. Mean monthly family income was INR 9622.25 (SD: 11,323.01, median: 7500, IQR: 6000) and mean annual per capita income was INR 20,886.67 (SD: 22,597.3, median: 15,000, IQR: 12,000).

In 115 (28.75 percent) households there was at least one sick family member and in 12 (10.34 percent) households these was one additional sick family member in the preceding 3 months. In these 115 households the mean number of family members per room in the house was 3.23(SD: 1.27) and amongst those households where none of the family members reported illness (*n* = 285) the mean number of family members per room in the house was 3.12 (SD: 1.29). Majority of illnesses were treated on outdoor basis and only 10 (8.7 percent) households with a sick family member reportedly hospitalized him or her. Mean number of sickness days per family was 36.83 days (SD: 56.59, range 0.05–360). None of the categorical family or household characteristic had univariate association with occurrence of illness (data not given). Family size and cumulative age of family members were found to be significantly associated with the occurrence of illness in the household in the preceding 3 months (Table 2).

Univariate OOP direct medical expenses incurred as total cost of outpatient care, as well as its components like expenditure on doctor's fees, purchase of medicines and payment for diagnostic tests is reported in Table 3. A doctor prescribed medicines purchased as a part of outpatient care in 101 (88.6 percent) households. Also reported in Table 3 are direct medical expenses incurred due to hospitalization of patients, inclusive of hospital charges, payment for medicines, diagnostic tests and procedures. We have also reported indirect medical expenses incurred because of transportation for medical care, payment for hiring special help at home for the care of sick, special diet for sick patient, purchase of equipment for home management of sick patient and loss of wages due to sickness in Table 4. All above mentioned OOP direct as well as indirect medical expenses have been added up and reported as OOP total medical expenditure. Mean OOP total medical expenditure was INR 6592.90 (SD = 13,335.18) and the median was INR 2650 (IQR: 4452). There was a weak positive correlation (Spearman's rank correlation coefficient = 0.1) between the family income and the total medical expenditure for all the households having at least one sick member. The rank (Spearman) correlation is considerably higher than the Pearson's correlation (Pearson's coefficient = −0.02) suggesting that the relationship between the family income and the total medical expenditure is somewhat non-linear.

Table 1 – Baseline characteristics of enrolled families and households.

Family characteristics		N, %
<i>Age distribution within families (n = 2343):</i>		
Child (0–9 years)		511 (21.8%; 54% males)
Adolescents (10–17 years)		519 (22.2%; 55.1% males)
Adults (18–59 years)		1171 (50.0%; 50.7% males)
Elderly (≥ 60 years)		142 (6.1%; 50.7% males)
<i>Marital status of family members ≥ 15 years (n = 1646):</i>		
Unmarried		514 (31.2)
Married		1027 (62.4)
Separated		6 (0.4)
Divorced		2 (0.1)
Widowed		97 (5.9)
<i>Occupation of family members</i>		
	<i><15 years (n = 697)</i>	<i>≥ 15 years (n = 1646)</i>
Professional	0	22 (1.3)
Semi-professional	0	107 (6.5)
Clerical, shop-owner, farmer	1 (0.1)	84 (5.1)
Skilled worker	0	209 (12.7)
Semi-skilled worker	0	109 (6.6)
Unskilled worker	3 (0.4)	140 (8.5)
Unemployed	215 (30.8)	730 (44.3)
Student	478 (68.6)	245 (14.9)
Household characteristics (n = 400)		N, %
<i>Modified Kuppuswamy scale for SE status</i>		
Upper class		2 (0.5)
Upper middle		9 (2.3)
Lower middle		99 (24.8)
Upper lower		252 (63.0)
Lower		38 (9.5)
<i>Ownership</i>		
Own		370 (92.5)
Rented		30 (7.5)
<i>Land area (sq ft) of house</i>		
<500		138 (34.5)
500–999		213 (53.3)
1000–1999		48 (12.0)
>2000		1 (0.3)
<i>Construction type</i>		
Brick & mortar		320 (80.0)
Mud-brick and mortar		80 (20.0)
<i>Rooms in the house</i>		
1		61 (15.3)
2–4		293 (73.3)
≥ 5		46 (11.5)
Separate kitchen		325 (81.3)
Separate toilet		334 (83.5)
<i>Water supply</i>		
Piped		249 (62.3)
Hand pump inside		41 (10.3)
Brought from outside		110 (27.5)
<i>Fuel for cooking</i>		
LPG		333 (83.3)
Wood/kerosene		67 (16.7)
<i>Electricity in home</i>		
		354 (88.5)
<i>Household assets</i>		
Agricultural land		27 (68.0)
Scooter/motorcycle		149 (37.3)
Car		8 (2.0)
Refrigerator		88 (22.0)
Washing machine		19 (4.8)

Abbreviations: LPG: liquefied petroleum gas, SE: socioeconomic.

Table 2 – Comparison of certain household characteristics of households with and without illnesses in last 3 months.

Variables (continuous)	Household with illness (n = 115) mean ± SD	Household without illness (n = 285) mean ± SD	P value
Family size	6.24 ± 2.31	5.70 ± 2.04	0.02
Family income (INR)	10,171.30 ± 15,071.76	9101.32 ± 5788.97	0.49
Per capita income (INR)	19,997.67 ± 23,529.16	21,245.40 ± 22,242.36	0.62
Family age (cumulative all ages of family members in years)	166.23 ± 59.24	146.26 ± 60.72	0.003
Average family age (cumulative all ages in years/number of family members)	28.02 ± 9.07	26.298 ± 8.20	0.08

As a percentage of OOP total medical expenditure, direct medical expenditure was 78 percent and indirect medical expenditure was 22 percent. In the direct medical expenditure, 65.8 percent was on outpatient care and 33.7 percent was on inpatient care and 0.5 percent was for provision of healthcare services at home. Various contributions to the total medical expenditure are shown in Table 3. Household earnings and personal savings were the most common sources of payment for illness in our study and none of the households settled health expenses through insurance.

The morbidity rate was 5.42 percent (127/2343). There were 62.9 percent (87/127) cases of CM and the mean (SD) total medical expenditure was INR 8377.00 (SD = 15,392.38), which was significantly higher than mean (SD) total medical expenditure on 37.1 percent (40/127) cases of AM, which was INR 2152.18 (SD = 272.11; $p = 0.00058$).

Distribution of total medical expenditure and OOP spending burden, across income quintiles of 400 enrolled households is given in Table 4. There was a statistically significant difference in the inter-quintile OOP spending burden ratio between the 1st and 4th quintile ($p = 0.018$) and the 1st and 5th quintile ($p = 0.024$).

4. Discussion

This study was done in Lucknow city, in northern India, in randomly selected localities. It was found that 115 (28.8

percent) households incurred OOP medical expenditure due to sickness episodes in family members and of those ill, 8.7 percent (10/127) were hospitalized. Households with OOP medical expenditure had significantly bigger family size as well as lower annual per capita income as compared to those who incurred no medical expense in the last 3 months. Mean total medical expenditure on illness was INR 6590.72 (SD = 13,333.76) in last 3 months. Assuming that these costs do not vary much, the mean annual total medical expenditure would be 1.32 times the annual per capita income of households, and thus must be considered catastrophic for affected households.

We found that hospitalization was not common, occurring in 2.5 percent (10/400) households but was expensive. The mean medical expenditure on inpatient care was INR 19,975 (SD = 23,436.22) and this was statistically significantly higher than that occurring on outpatient care, which was INR 3382 (SD = 4642) ($p = 0.026$). Direct medical expenditure in outpatient care incurred on physician fees as well as purchase of medicines.

We found that in the last three months 28.75 percent of the households had one or more than one sick family member. Our findings are comparable to a study conducted in urban slums of Ahmedabad,¹² which reported a morbidity rate of 30.88 percent in preceding 15 days as well as another study conducted in rural as well as urban Kerala¹³ reported a morbidity rate of 25 percent for last six months. The morbidity rate in our study was 5.42 percent which is similar to the morbidity

Table 3 – Total medical expenditure on illnesses occurring in any member of the family in last 3 months.

Variable	N, mean (SD)	Median (IQR)
Direct medical expenditure (in INR)		
(A) Health expenditure on doctor's fee (outpatient care)	111, 97.27 (89.70)	100 (120)
(B) Health expenditure on medicines (outpatient care)	114, 2976.62 (4234.31)	2000 (2000)
(C) Health expenditure on diagnostics (outpatient care)	38, 1057.68 (1045.16)	850 (1420)
(D) (A + B + C) Total outpatient care expenditure	115, 3382 (46)	2050 (2750)
(E) Health expenditure on inpatient care	10, 19,975 (23436.22)	9500 (27000)
(F) Health expenditure on health care equipments for home use	4, 715 (1191.37)	145 (2430)
Indirect medical expenditure (in INR)		
(G) Expenditure on transport	88, 396.61 (285.72)	300 (0)
(H) Expenditure on special diet	40, 807.5 (316.54)	1000 (700)
(I) Expenditure on loss of wages	50, 1449.02 (1827.00)	1000 (1950)
(J) Expenditure on special help for care of sick	4, 6750 (2598.08)	6750 (4500)
Total (Direct + Indirect) medical expenditure (in INR)		
INR 758183	115, 6592.90 (13335.18)	2650 (4450)

Table 4 – Distribution of total expenditure on any illness across income quintiles of 400 enrolled households (80 households/quintile).

Variables	1st Quintile MI = 4000 INR	2nd Quintile MI = 5000 INR	3rd Quintile MI = 7500 INR	4th Quintile MI = 10,000 INR	5th Quintile MI = 16,000 INR
Total medical expenditure on illness in (INR) N, mean ($\pm$ std. dev)*	24, 6606 $\pm$ 10,245	19, 7646 $\pm$ 18,749	25, 7141 $\pm$ 16,116	24, 4260 $\pm$ 3158	23, 7537 $\pm$ 14,900
OOP spending burden ratio (total medical expenditure/total family income in 3 months) (INR) mean $\pm$ std. dev** (median)	0.57 $\pm$ 0.82 (0.24)	0.51 $\pm$ 1.25 (0.17)	0.31 $\pm$ 0.67 (0.14)	0.14 $\pm$ 0.11 (0.12)	0.15 $\pm$ 0.30 (0.05)
p Value of ANOVA: *0.91; **0.14. Abbreviations: MI: median income, INR: Indian rupees; ANOVA: analysis of variance.					

rate reported by a study conducted by Indian Institute of population studies in urban India in the year 2004.¹⁴

In this study the total medical expenditure was met entirely through OOP payments as none of the sampled households had any medical insurance cover. The World Bank data reports that the ratio of out of pocket medical expenditure to the total private medical expenditure in the year 2009 was 86.4 percent in the case of India and 25.1 percent in the case of United States, 29.6 percent in the case of South Africa.² We have also reported indirect medical expenditure on transport, incurred by 76.5 percent (88/115), on special diet, by 34.7 percent (40/115), as lost wages, by 43.5 percent (50/115) and on special help for the care of sick, by 3.5 percent (4/115). We could not find comparable Indian data in the available literature.

In our study, CM was reported in 62.9 percent (87/127) persons who reported sickness. Unlike our findings, in a study conducted in Canada, which used the same definition for CM as done by us (illness lasting for greater than 90 days), CM was found in 33 percent of those ill.¹⁵ This may be attributed to the advanced living standards in Canada. The GDP per capita in India is \$1489 and the same in Canada is \$50,345 in 2011 as per statistics published by World Bank.¹⁶ In another study in British Columbia the CM was 36 percent.¹⁷ Further community-based research is needed to find the proportion of CM as well as causes associated with it. While analyzing acute morbidity a classification between infective and non-infective was not made in this study and future studies can incorporate the same as well.

We found that OOP medical expenditure was regressive, imposing a greater burden on poor families than better-off families. Although the poor in general spend less on treatment than other income groups, possibly due to lack of access, lack of monetary resources, low self-health awareness levels etc., the spending is a higher proportion of income. We also computed the OOP spending burden ratio to assess equity among the income quintiles of the population. In this study there was a statistically significant difference in the inter-quintile ratio of total medical expenditure for illness and family income for 3 months, with the lowest two quintiles having approximately greater than 3.5 times higher ratio than the upper two quintiles. We found that the spending burden ratio was reducing as we moved up the income quintiles, the maximum being 57 percent for the 1st quintile and 14 percent and 15 percent for the 4th and 5th quintiles, respectively, thereby reducing the economic burden of illness related expenditure. Among cost of illness studies, regressive cost

burdens were identified in India,¹⁸ China¹⁹ and Vietnam.²⁰ In Vietnam, for example, mean household health expenditure over the whole sample was 7.1 percent of income, but 19.4 percent for the poorest quartile compared with only 3.9 percent for the richest.²⁰

Direct medical expenditure on illness was distributed unevenly across households and a minority incurred very high costs that raised the mean above the median. Median figures therefore usually reflect more accurately the costs being faced by the majority of the households and we have reported mean as well as median. In Sri Lanka for example, the mean direct cost burden for all illnesses was 6.5 percent of monthly income but the median was only 1.3 percent.²¹ In our study the median values of this ratio ranged from 24.3 percent in the 1st quintile to 5.4 percent in the 5th quintile, while the mean value of this ratio ranged from 57 percent in the 1st quintile to 14.5 percent in the 5th quintile. Hence, to portray a more accurate picture both median as well as mean expenditure on health must be reported.

This was a cross sectional study conducted in randomly selected population in urban Lucknow. The distribution of households across socio-economic classes as measured by modified Kuppuswamy scale revealed that the maximum number of households (63 percent) belonged to the upper lower class and least (0.5 percent) belonged to the upper class.¹⁰ We collected information on direct as well as indirect medical expenditure on illness and report the mean as well as median medical expenditures.

Based on days of illness we classified sick persons as having AM or CM and such reports are not readily available from other studies conducted in India. However, we did not collect information on type of illness. This can be done as future research work and disaggregated illness cost data by socio-economic group could be the focus of such a study. In addition, there could have been a recall bias in reporting expenditure on illness in this study, which had cross sectional study design, due to financial constraints. To avoid recall bias, a prospective cohort study design would have been an ideal one but this is expensive.

5. Conclusions

We conclude that since more than one-fourth of households incur medical expenditure which are paid OOP, and in about 1 in 11 households there is hospitalization, and since the

spending burden ratio is significantly higher in the lowest quintile when compared to upper most two, there is a need for introduction of health insurance of some sort for the urban population. This is especially for those in the lowest income quintile, with provision to absorb the indirect medical expenses if possible.

Out of the existing health insurance schemes, one of the main challenges of these insurance schemes is that these are focussed on inpatient, often surgical care. So, besides, working toward deepening their benefit packages, the government schemes also need to address several issues like minimizing healthcare costs, quality enhancement, consumer information and monitoring and evaluation. Health policy research and debates need to be broadened in scope because even if health services are improved they have to be designed in such way that they protect households from all illness costs, in particular expenditure on non-medical items and indirect costs. This will require the introduction of payment reforms.

Conflicts of interest

All authors have none to declare.

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