

Catastrophic Healthcare Expenditure and Poverty Related to Out-of-Pocket Payments for Healthcare in Bangladesh - An Estimation of Financial Risk Protection of Universal Health Coverage

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3 Title: Catastrophic Healthcare Expenditure and Poverty Related to Out-of-Pocket Payments for
4 Healthcare in Bangladesh – An Estimation of Financial Risk Protection of Universal Health
5 Coverage
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10 11 12 **SUMMARY**

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15 The Sustainable Development Goals target to achieve Universal Health Coverage (UHC),
16 including financial risk protection (FRP) among other dimensions. There are four indicators of
17 FRP, namely incidence of catastrophic health expenditure (CHE), mean positive catastrophic
18 overshoot, incidence of impoverishment and increase in the depth of poverty occur for high out-
19 of-pocket (OOP) healthcare spending. OOP spending is the major payment strategy for
20 healthcare in most low-and-middle-income countries, like Bangladesh. Large and unpredictable
21 health payments can expose households to substantial financial risk and, at their most extreme,
22 can result in poverty. The aim of this study was to estimate the impact of OOP spending on CHE
23 and poverty, i.e. status of FRP for UHC in Bangladesh. A nationally representative Household
24 Income and Expenditure Survey 2010 was used to determine household consumption
25 expenditure and health related spending in the last 30 days. Mean CHE headcount and its
26 concentration indices (CI) were calculated. The propensity of facing CHE for households was
27 predicted by demographic and socioeconomic characteristics. The poverty headcount was
28 estimated using ‘total household consumption expenditure’ and such expenditure without OOP
29 payments for health in comparison with the poverty-line measured by cost of basic need. In
30 absolute values, a pro-rich distribution of OOP payment for healthcare was found in urban and
31 rural Bangladesh. At the 10%-threshold level, in total 14.2% of households faced CHE with
32 1.9% overshoot. 16.5% of the poorest and 9.2% of the richest households faced CHE. An overall
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3 pro-poor distribution was found for CHE (CI=-0.064) in both urban and rural households, while
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5 the former had higher CHE incidences. The poverty headcount increased by 3.5 percent (5.1
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7 million individuals) due to OOP payments. Reliance on OOP payments for healthcare in
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9 Bangladesh should be reduced for poverty alleviation in urban and rural Bangladesh in order to
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11 secure FRP for UHC.
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INTRODUCTION

Target 3.8 of the Sustainable Development Goals, declared by the United Nations in 2015, deals with achieving Universal Health Coverage (UHC), including financial risk protection (FRP) among other dimensions like, access to quality essential health-care services and access to safe, effective as well as quality and affordable essential medicines and vaccines for all. There are four indicators of FRP, namely incidence of catastrophic health expenditure (CHE), mean positive catastrophic overshoot, incidence of impoverishment and increase in the depth of poverty occurring due to high out-of-pocket (OOP) healthcare spending (Saksena et al. 2014). It is estimated that out-of-pocket (OOP) payments for healthcare account for 150 million people globally suffering from catastrophic healthcare expenditure (CHE) each year and about 100 million individuals falling into poverty (Xu et al., 2007). Over 90% of all people who face CHE reside in low-income countries (Xu et al., 2003). In Bangladesh, almost 5 million people fall below the poverty line due to out-of-pocket (OOP) payments for healthcare. The corresponding figures for India and China are 37 million and 32 million respectively (Van Doorslaer et al., 2007). Healthcare financing systems are an important determinant of whether people are affected by CHE. Reliance on OOP payments for healthcare increases financial burden of households (Wagstaff and van Doorslaer, 2003; Xu et al., 2003; O'Donnell et al., 2005; Amaya Lara and Ruiz Gómez, 2011). OOP spending is the major payment strategy for healthcare in most low- and middle-income countries. It comprises 63% of total healthcare expenditure in Bangladesh (MoHFW, 2015). Large and unpredictable OOP health payments can expose households to substantial financial risk and, at their most extreme, may result in impoverishment. Therefore, protecting households from these payments and consequently, their impact on impoverishment are desirable objectives of health systems worldwide. The World Health Organization (WHO)

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3 calls for universal health coverage, where financial affordability for accessing healthcare has
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5 important implications for reducing CHE from healthcare-related OOP (WHO, 2005).
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10 In recent years, a large literature on OOP payments and its impact on CHE and poverty has been
11 developed (Wagstaff and van Doorslaer, 2003; Xu *et al.*, 2003; van Doorslaer *et al.*, 2006; Van
12 Doorslaer *et al.*, 2007; Amaya Lara and Ruiz Gómez, 2011; Chuma and Maina, 2012; Tomini *et*
13 *al.*, 2012). From a study of 89 countries, incidence of CHE was estimated to 3.1%, 1.8% and
14 0.6% in low-, middle- and high-income countries respectively (Xu *et al.*, 2007). The incidence of
15 CHE in households of Bogota in Colombia was 4.9% and this incidence was higher in low-
16 income households without any affiliation to social security schemes (Amaya Lara and Ruiz
17 Gómez, 2011). Flores *et al.*, (2008) estimated CHE for inpatient care in India to 30%. Chuma
18 and Maina, (2012) observed that about 1.48 million Kenyans were pushed below the national
19 poverty line due to OOP payments and the burden was found to be highest among the poor
20 (Chuma and Maina, 2012). In Burkina Faso, about 6-15% of households experienced CHE when
21 using 40% of total non-food expenditure as a threshold. Household economic status was a key
22 determinants of CHE along with household health care utilization type, illness episodes and
23 presence of chronic illness (Su *et al.*, 2006). In Uganda, 2.9% of households incurred CHE in
24 2003 (Xu *et al.*, 2006). In Nigeria, 40.2% of households faced CHE when using a 10% threshold
25 level of total expenditure. This estimate was lower, 14.8%, when a 40% threshold level was used
26 (Onoka *et al.*, 2011). In a multi-country analysis, van Doorslaer *et al.*, (2006) observed that in 11
27 Asian countries 2.7% of the population under study (78 million people) fall below the poverty-
28 line due to OOP payments for healthcare (van Doorslaer *et al.*, 2006). In another multi-country
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3 study, Bangladesh appeared as the most affected country with the highest incidence (15.6%) of
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5 CHE (Van Doorslaer *et al.*, 2007).
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9 Two studies have been published in recent years which have analyzed the impact of OOP
10 payments for healthcare on economic impoverishment and poverty in Bangladesh (Rahman *et*
11 *al.*, 2013; Hamid *et al.*, 2014). Rahman *et al.*, (2013) using data from a metropolitan city
12 (Rajshahi) of Bangladesh investigated the determinants of high healthcare expenditure and
13 healthcare related financial catastrophe. This study found that the households spent on average
14 11% of their budget on health. Half of the residents spent 7% of the monthly per capita
15 consumption expenditure for one illness and approximately 9% of all households faced financial
16 catastrophe. The socioeconomic pattern of health expenditure showed that though the poorest
17 households spent less on health, they faced financial catastrophe more than four times than the
18 richest households. It was also observed that the risk of financial catastrophe and the level of
19 OOP payments were higher in relation to inpatient and outpatient care from both public and
20 private facilities, compared to self-medication and care from traditional-healers. The analysis
21 suggests that socioeconomic status, presence of chronic and childhood and adult illness appeared
22 as the determinants of OOP payments. Hamid *et al.*, (2014) employed data from rural households
23 of 14 districts (out of 64) which were members of a social business company, named Grameen
24 Kalyan, which had been operating a pre-paid card based micro health insurance scheme. This
25 study investigated the impact of OOP payments for healthcare on people falling into poverty
26 overall as well as in relation to particular diseases. It found that 3.4% of households annually fell
27 into poverty due OOP spending for healthcare and that non-communicable diseases (NCDs) were
28 the principal reason for the effect. While both studies contribute to the knowledge base of the
29 impact of OOP healthcare spending on economic impoverishment in Bangladesh, both reflect a
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3 partial picture of the country. Rahman *et al.*, (2013) investigated the issue in a metropolitan city
4 and focused on catastrophe related to OOP spending. It consequently missed the catastrophe in
5 rural areas and also poverty impact in both urban and rural areas separately. Hamid *et al.*, (2014),
6 on the contrary, missed the catastrophic impact estimation in total population and poverty impact
7 in urban population. That study included only the low-income population, who were members of
8 a rural micro-insurance scheme and as a result missed the general economic structure of the
9 country, which is important while studying poverty. It is important to study the impact of OOP
10 healthcare spending on economic impoverishment/poverty reflecting the national situation as
11 well as the urban and rural scenarios.
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25 In this current study, the authors investigated the impact of OOP payments on CHE and poverty
26 in Bangladesh using the latest national Household Income and Expenditure Survey (BBS, 2011).
27 The status of financial risk protection for Universal Health Coverage was estimated for
28 Bangladesh. This in-depth analysis may be useful for developing specific policy actions for
29 poverty alleviation related to healthcare financing mechanisms in Bangladesh.
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41 **METHODS**

42 **Data sources**

43 Data was obtained from the latest Household Income and Expenditure Survey 2010 (HIES) of
44 Bangladesh (BBS, 2011). HIES is periodically conducted in each five year by Bangladesh
45 Bureau of Statistics. This nationally representative survey provides information on all kind of
46 income and consumption of households, including healthcare expenditure. This current survey
47 employed a two-stage stratified random sampling technique and a total sample of 12,240
48 households were selected. In the first stage, 1,000 primary sampling units (PSUs) from 16 strata
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3 (6 rural, 6 urban and 4 SMAs) across the country were selected. Each PSU consists of 200
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5 households. In the second stage, 20 households were randomly selected from each PSU (BBS,
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7 2011). All analyses in this current study were conducted using STATA-13.0. Since two-stage
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9 stratified random sampling method was employed for data collection, the analyses accounted for
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11 probability sample weight.
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20 **Measuring incidence and intensity of CHE**

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22 The incidence of CHE was estimated from the fraction of OOP payments for healthcare in
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24 relation with household consumption expenditure, which exceeds a certain threshold (Wagstaff
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26 and van Doorslaer, 2003). Two definitions are often used for such estimations. Firstly, OOP
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28 expenditure is compared with total household consumption expenditure (THCE) (Pradhan and
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30 Prescott, 2002; Wagstaff and van Doorslaer, 2003; Russell, 2004) and secondly, such
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32 expenditure is compared with the total non-food consumption expenditure (NFE) of households
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34 (Berki, 1986; Xu *et al.*, 2003, 2006). OOP healthcare expenses of all individuals in a household are
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36 summed up and compared with the same household's consumption expenditure for assessing if the
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38 household faced catastrophic health expenditure at different levels of thresholds. There is no single
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40 accepted threshold for estimating CHE. However, households that incur 10% of THCE and 25%
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42 of NFE have been used as the CHE thresholds in this study. For observing sensitivity, we have
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44 applied more threshold levels (5% and 15% of THCE and 15% and 40% of NFE). While
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46 applying the first threshold for CHE is generally recommended at 10% level and corresponding
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48 recommended threshold for the second definition lies at 40% level (Wagstaff and van Doorslaer,
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50 2003). The CHE incidence measure does not reflect the amount by which households exceed the
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3 threshold. The CHE overshoot is thus estimated, which presents by what percentage the
4 households, incurred CHE, and exceeds the threshold.
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11 12 13 **Asset Quintiles and Concentration Index**

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16 Information on land, durable goods, livestock, housing materials and access to basic facilities
17 such as water and sanitation were used for constructing asset index by employing data from
18 HIES (BBS, 2011). Categorical asset variables were recorded as binary variables. Principle
19 Component Analysis (PCA) was used to determine the linear weighted combination for asset
20 variables (Vyas and Kumaranayake, 2006). The first principal component was used as an
21 indicator of socio-economic status (O'Donnell *et al.*, 2008). The score associated with the first
22 principal component was divided into five quintiles, which were used as indicators of
23 socioeconomic condition of households in this study. Such socioeconomic categorization had
24 been used in earlier studies (Filmer and Pritchett, 2001; Gwatkin *et al.*, 2005). In PCA, frequency
25 weights of number of household members were used for adjusting the effect of household size on
26 asset (Deaton and Paxson, 1998).
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43 The concentration indices (CI) were estimated to show the magnitude and direction of the
44 incidence and intensity of CHE across socioeconomic groups of households. In calculating CI,
45 households were ranked according to their socio-economic condition (asset score), starting with
46 the least wealthy ones. CI was earlier estimated from micro data with a categorical welfare
47 variable or grouped data, which was followed in this current study (Kakwani *et al.*, 1997).
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Prediction model of CHE

In multilevel logistic regression model we predicted the likelihood of facing catastrophic health expenditure by households with explanatory variables containing the information about demographic and socioeconomic level. We used this analysis to account for the hierarchical structure of two level of data, namely, location (urban or rural) and household (Subramanian *et al.*, 2003). From this analysis, we estimated to what extent different explanatory variables influenced the household's probability for facing CHE. Dependent variable was constructed as a dichotomous variable where 0 and 1 denote the households that facing and not facing CHE respectively. Model 1 and 2 used total household consumption expenditure and non-food consumption expenditure based thresholds for estimating catastrophic health expenditure.

Estimating Poverty

The poverty headcount was estimated using 'total household consumption expenditure and such expenditure without OOP payments for healthcare separately. The difference between these two poverty headcount measurements captured the impact of OOP payments on poverty. The national level estimates for poverty line provided by Bangladesh Bureau of Statistics were employed in this study. The poverty line was estimated using Costs of Basic Need (CBN) approach, which implies that, poverty line represents the level of per capita expenditure at which the members of a household can be expected to meet their basic needs (comprised of food and non-food consumption items). Market price for eleven food items for meeting basic need (rice, wheat, pulses, milk, oil, meat, fish, potato, other vegetables, sugar and fruits) for getting 2,122 kcal per day per person was captured for estimating food poverty line (BBS, 2011). Then the non-food allowance for poverty line was estimated as the median amount spent for non-food

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3 items by the group of households which have per capita food expenditure close to food-poverty
4 line. Finally, the poverty line was the sum of food poverty line and non-food allowances for each
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6 geographical region. Our approach for estimating poverty impact of OOP health expenditure was that
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8 we first kept OOP health expenditure with consumption expenditure and then removed (OOP expenses)
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10 from consumption expenditure for observing what proportion of individuals go below the poverty line.
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17 RESULTS

18 OOP payments

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20 Table 1 shows the average household OOP spending on healthcare for 30 days, which accounted
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22 for 644.6 BDT. OOP healthcare spending of rural households (709.1 BDT) for their illness was
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24 significantly higher than that of the urban households (468.5 BDT). However, those who were in
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26 socioeconomically better-off positions had higher spending in both urban (CI=0.044) and rural
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28 (CI=0.198) areas.
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Table 1 to be inserted here

43 Incidence and intensity of CHE

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45 Table 2 shows the incidence and intensity of household CHE at 5%, 10% and 15% of total
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47 expenditure. Incidence and intensity of CHE dropped as the threshold level increased from 5% to
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49 15% of total expenditure in both urban and rural areas and also in all socioeconomic quintiles.
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51 We observed a pro-poor incidence of CHE in all threshold levels (5%, 10% & 15% of total
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53 expenditure) in the urban area. At 5% and 10% threshold level, CHE in rural area was pro-poor.
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55 On the contrary, it found to be pro-rich (CI=0.014) at 15% threshold level. The higher intensity
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3 (overshoot) of CHE was observed in the socioeconomically better-off households in the total
4 sample. However, this intensity was in opposite direction in urban and rural areas, being pro-
5 poor and pro-rich in urban and rural areas respectively. The mean positive overshoot shows that
6 on an average, OOP expenditure for all households was 13.7% higher than 10% of total
7 expenditure. At the same threshold level, rural area (13.9%) had a higher mean positive
8 overshoot than urban (12.8%).
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24 Table 3 showed incidence and intensity of CHE considering threshold in respect to household
25 non-food expenditure with a threshold level of 25%. CHE incidence was 17.5% in the whole
26 sample, but higher incidence was observed in rural (20.7%) than urban (9.0%) areas. CHE
27 overshoot was 4.7% in rural and 1.7% in urban areas. We further observed a pro-poor headcount
28 and overshoot of CHE in both urban and rural areas with negative values of the concentration
29 indices. Difference between urban and rural areas was observed considering the size of
30 concentration indices, which implies that CHE headcount and overshoot were more pro-poor in
31 urban areas. The mean positive overshoot (MPO) was estimated to 22.1% in total sample. The
32 corresponding value was higher in rural (22.6%) than urban (19.2%) areas.
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53 Figures 1 (a-c) illustrates OOP healthcare payment budget share against cumulative percentage
54 of households ranked by decreasing budget share of total and non-food household consumption
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3 expenditure in rural, urban and all areas of Bangladesh respectively. These figures show that the
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5 CHE headcount was higher when it was defined with respect to OOP healthcare payment relative
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7 to non-food expenditure. Comparing figure 1a and 1b, we observed that rural areas had higher
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9 OOP payment budget share than urban areas.
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Figure 1(a-c) to be inserted here

Descriptive statistics shows that, households with female and elderly head faced more CHE incidences at both 10% and 25% threshold levels. Further, household heads with higher educational levels had lower CHE incidences. While 14.6% households with 1-10 years of schooling faced CHE, only 9.9% households faced the same with 10+ years schooling at threshold level of 10%. The pattern remained same when CHE estimated at 25% threshold level. Presence of old-age people (65 years and above) in household increased the CHE incidence from 13.2% to 18.1%, while it increased from 13.6% to 14.4% in presence of children (under 15 years). Presence of reproductive age women in the households increased CHE incidence rate from 12.9% to 17.0 at 10% threshold level. Further, households with 5 members or more faced higher rate of CHE incidence than those households with 1-2 or 3-4 members. Similar patterns found when CHE incidence rates were estimated at 25% threshold level of non-food expenditure as well.

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3 Table 5 shows the results from multivariate analysis for predicting the effect of demographic and
4 socioeconomic characteristics on CHE. It was observed in model 1 (CHE with threshold level at
5 10% health expenditure of total consumption expenditure) that the likelihood of CHE was higher
6 among the households with female, lower number of schooling years of household heads and
7 presence of reproductive age women. Urban households and those in richest socioeconomic
8 quintile had significantly lower rate of CHE.
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24 Estimation model 2 (CHE with threshold level at 25% health expenditure of total non-food
25 consumption expenditure) in table 5 suggested that higher number of schooling years of
26 household heads and higher socioeconomic status reduced CHE significantly. On the contrary,
27 presence of elderly members (65 and above) and children (under 15 years) and female members
28 at reproductive age (15-49 years) resulted in higher CHE rate.
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39 **Impact of poverty**

40 A graphical presentation of impact of OOP payments on poverty is presented in figure 2.
41 Households were ranked from poorest to richest along using total consumption expenditure in
42 the y-axis. Poverty-line was used for capturing the impact.
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3 We observed that a number of individuals, which were above the poverty-line, fall later below
4 after subtracting the OOP payments from their total household consumption expenditure. Most
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6 such falls occurred in marginal populations, i.e. those who were just above the poverty-line.
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11 The change in poverty headcount due to OOP expenditure is presented in table 6. The poverty
12 headcount was 37.8% considering total household consumption expenditure with gross OOP
13 spending. It increased to 41.3% when total expenditure was calculated without OOP payments.
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25 This 3.5% increase in the poverty headcount corresponds to 5.1 million individuals. The
26 normalized poverty gap indicated the average amount by which the resources fall short of the
27 poverty line as a percentage of that line. The normalized poverty gap increased from 10.9% to
28 12.3% if OOP payments were deducted from total expenditure.
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37 **DISCUSSION AND CONCLUSIONS**

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40 This current study observed that catastrophic health expenditure had been incurred by 14.2% of
41 households nationally, but it was more concentrated in rural (16.3%) than urban (8.6%)
42 populations and also more concentrated in households with lower socioeconomic status. It was
43 further found that several demographic and socioeconomic characteristics contributed to CHE. It
44 was further found that 3.5% of total population fell into poverty annually due to out-of-pocket
45 spending for healthcare, which corresponds to economic impoverishment of 5 million people in
46 Bangladesh.
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3 Findings from this study were in the same line as some previous studies in Bangladesh (van
4 Doorslaer *et al.*, 2007; Rahman *et al.*, 2013; Hamid *et al.*, 2014). Rahman *et al.*, (2013) found by
5 analyzing urban people from a metropolitan city of Bangladesh that 9% of households face
6 financial catastrophe due to health spending and such catastrophe is four times higher in poorest
7 households than the richest ones. Our findings in this regard are similar, implying that 8.6% of
8 urban population face financial catastrophe and it is 1.2 times higher among poorest households
9 than the richest ones at the national level. Hamid *et al.*, (2014), using data from rural people of
10 low income group found that 3.4% people get into poverty due to OOP spending for healthcare.
11 Our current study also suggested the similar findings while investigating poverty at the national
12 level. Hamid *et al.*, (2014) and Rahman *et al.*, (2013) used data from year 2009 and 2011
13 respectively, which is almost the same period, i.e. 2010 of the data used by this current study.
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32 Van Doorslaer *et al.*, (2007), using data from 2000, found that 15.6% and 7.1% of households in
33 Bangladesh faced CHE considering 10% of THCE and 40% of NFE respectively as thresholds
34 (Van Doorslaer *et al.*, 2007). The authors observed that richer households experienced CHE
35 more often. However, the current study using data from 2010 found that poor households
36 experienced more CHE. Some other countries, for instance, China, Nepal, Vietnam, Kenya,
37 Georgia with negative or approximately zero value of concentration index showed the results in
38 the same line as this study (Van Doorslaer *et al.*, 2007).
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51 It should also be noted that estimation techniques of measurements are different in different
52 studies. For instance, households were placed into socioeconomics classes using alternative
53 measurements, like, household consumption expenditure or asset index. Choosing asset quintiles
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3 for classifying households into socioeconomic groups in this study could be supported by
4 arguments from O'Donnell *et al.*, (2005), who pointed out in estimating CHE that using
5 consumption expenditure as one of the explanatory variables in an economic model can lead to
6 endogeneity problems (O'Donnell *et al.*, 2005). The usage of asset quintiles for socioeconomic
7 classification, as was done in the current study, could avoid such a problem (Joglekar, 2008). In
8 an earlier study, poverty was measured using US\$ 1.08 as a threshold (van Doorslaer *et al.*,
9 2006), and CBN in our study. The CBN method, which was used in Bangladesh for estimating
10 the poverty line, was more appropriate since the local price level of household consumptions are
11 considered (BBS, 2011).
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27 Unlike previous studies in Bangladesh, we analyzed the data at national level and also for urban
28 and rural areas separately. In addition to the studies of Hamid *et al.*, (2014), Rahman *et al.*,
29 (2013) and van Doorslaer *et al.*, (2007), this current study provided a more complete
30 understanding of the impact of OOP for healthcare on CHE and poverty by disaggregating the
31 analyses into urban and rural areas. The major limitation of this study is that it is based on cross-
32 sectional data. Ideally, longitudinal data would be used to estimate the causal effect of
33 impoverishment resulting from OOP for healthcare. This would allow one to identify how
34 spending on non-medical goods and services changes following a health shock (Sauerborn *et al.*,
35 1996).
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50 We found socio-demographic and economic gradients in CHE rates though it varied to some extent when
51 we applied two different definitions (10% health expenditure of total household consumption expenditure
52 and 25% health expenditure of total non-food consumption expenditure as CHE thresholds). The effects
53 of demographic and socioeconomic variables that were found in the analyses were mostly expected.
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6 Bangladesh has made significant progress between 2005 and 2010 by reducing the poverty rate
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8 from 40.0% to 31.5% (BBS, 2007, 2011). The study of van Doorslaer *et al.*, (2006) found that
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10 OOP contributed to poverty by 3.8% in 2000, and this study observed a corresponding rate of
11
12 3.5% in 2010 (van Doorslaer *et al.*, 2006). This implies that while poverty in general reduced by
13
14 a higher rate (from 40.0% to 31.5%), we observed just a slight reduction in poverty attributed to
15
16 OOP for healthcare. Healthcare financing methods of Bangladesh should concentrate on finding
17
18 alternative financing methods than OOP for reducing the probability of CHE and consequently
19
20 poverty. Pre-payment mechanisms, like social health insurance, which are often recommended
21
22 by international organizations, e.g., the WHO and the World Bank, should be applied in
23
24 Bangladesh as a remedy for reducing financial risk and poverty attributed to OOP healthcare
25
26 spending (WHO, 2010). The Government of Bangladesh developed the healthcare financing
27
28 strategy for addressing social protection in order to achieve universal health coverage (MoHFW,
29
30 2012). The strategy recognized the impact of OOP healthcare financing mechanism on financial
31
32 risk and poverty and consequently recommended reduction of OOP as a share of total health
33
34 expenditure from 64% to 32% in 20 year period (2012-2032) and applying prepayment
35
36 mechanisms, like social health insurance, tax funding, community-based health insurance, more.
37
38 Findings from this study would be supportive to the healthcare financing strategy of the
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40 Government for monitoring the progression towards universal health coverage in Bangladesh.
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TABLES

Table 1. The average out of pocket payments in BDT (Standard error) per household per month across socioeconomic quintiles and rural urban areas

	Rural	Urban	Total
Poorest	421.1 (38.8)	244.7 (75.4)	416.7 (37.9)
2nd	539.9 (39.0)	272.5 (41.4)	518.7 (36.2)
3rd	690 (54.0)	419.9 (85.8)	648.7 (47.7)
4th	872.3 (81.0)	505.5 (85.9)	728.2 (60.0)
Richest	2437.8 (768.1)	491.6 (55.4)	966.3 (195.4)
Total	709.1 (60.8)	468.5 (42.2)	644.6 (45.9)
CI	0.198	0.044	0.113
SE(CI)	(0.019)	(0.030)	(0.016)

Table 2. The incidence and intensity of household CHE in different socioeconomic condition of urban and rural areas

Threshold	Rural			Urban			Total		
	5%	10%	15%	5%	10%	15%	5%	10%	15%
Head count (HC)									
Poorest	29.1%	16.6%	10.7%	19.3%	10.6%	6.4%	28.9%	16.5%	10.6%
2nd	28.1%	16.3%	10.1%	21.0%	10.9%	6.2%	27.5%	15.9%	9.8%
3rd	27.7%	15.9%	10.0%	22.0%	10.2%	7.5%	26.8%	15.0%	9.6%
4th	26.6%	15.8%	11.3%	18.0%	10.7%	6.6%	23.3%	13.8%	9.4%
Richest	27.3%	16.6%	11.4%	14.3%	6.8%	4.5%	17.5%	9.2%	6.2%
Total	28.0%	16.3%	10.5%	16.7%	8.6%	5.5%	25.0%	14.2%	9.2%
CI	-0.013	-0.003	0.014	-0.059	-0.057	-0.048	-0.066	-0.064	-0.050
SE(CI)	(0.010)	(0.014)	(0.019)	(0.016)	(0.023)	(0.029)	(0.009)	(0.012)	(0.016)
Rich-poor ratio	0.936	0.995	1.069	0.744	0.644	0.694	0.606	0.557	0.582
Rich-poor difference	-0.018	-0.001	0.007	-0.049	-0.038	-0.020	-0.114	-0.073	-0.044
Overshoot									
Poorest	3.3%	2.2%	1.5%	2.1%	1.3%	0.8%	3.3%	2.2%	1.5%
2 nd	3.3%	2.2%	1.5%	2.1%	1.4%	1.0%	3.2%	2.1%	1.5%
3 rd	3.3%	2.2%	1.6%	2.3%	1.5%	1.1%	3.1%	2.1%	1.5%
4 th	3.3%	2.3%	1.6%	2.2%	1.5%	1.0%	2.9%	2.0%	1.4%
Richest	3.9%	2.9%	2.2%	1.3%	0.8%	0.5%	1.9%	1.3%	0.9%
Total overshoot	3.3%	2.3%	1.6%	1.7%	1.1%	0.7%	2.9%	1.9%	1.4%
Mean Positive Overshoot	11.9%	13.9%	15.2%	10.2%	12.8%	13.5%	11.6%	13.7%	14.9%
CI	0.016	0.026	0.035	-0.071	-0.078	-0.091	-0.058	-0.053	-0.052
SE(CI)	(0.018)	(0.023)	(0.027)	(0.025)	(0.032)	(0.038)	(0.014)	(0.018)	(0.022)
Rich-poor ratio	1.180	1.290	1.405	0.625	0.608	0.616	0.588	0.592	0.603
Rich-poor difference	0.006	0.006	0.006	-0.008	-0.005	-0.003	-0.013	-0.009	-0.006

Table 3. Proportion of household observing CHE on health at different threshold level across asset quintiles

Threshold	Rural			Urban			Total		
	15%	25%	40%	15%	25%	40%	15%	25%	40%
Head count (HC)									
Poorest	35.8%	25.6%	14.7%	26.0%	18.3%	9.8%	35.5%	25.4%	14.5%
2 nd	31.3%	20.9%	11.4%	26.5%	16.1%	8.0%	30.9%	20.5%	11.1%
3 rd	26.8%	18.4%	10.8%	22.6%	13.6%	7.4%	26.1%	17.7%	10.3%
4 th	24.3%	16.2%	8.6%	17.8%	11.1%	6.0%	21.8%	14.2%	7.5%
Richest	22.9%	14.8%	8.1%	10.5%	5.9%	2.3%	13.5%	8.1%	3.7%
Total	30.0%	20.7%	11.6%	15.1%	9.0%	4.4%	26.0%	17.5%	9.7%
CI	-0.080	-0.092	-0.098	-0.156	-0.184	-0.198	-0.149	-0.173	-0.189
SE(CI)	(0.010)	(0.012)	(0.017)	(0.017)	(0.22)	(0.032)	(0.008)	(0.011)	(0.015)
Rich-poor ratio	0.640	0.579	0.555	0.404	0.321	0.234	0.381	0.317	0.256
Rich-poor difference	-0.129	-0.108	-0.065	-0.155	-0.124	-0.075	-0.220	-0.174	-0.108
Overshoot									
Poorest	8.9%	5.8%	2.9%	6.1%	4.0%	1.8%	8.8%	5.8%	2.9%
2 nd	7.4%	4.8%	2.4%	5.3%	3.2%	1.5%	7.2%	4.7%	2.3%
3 rd	6.4%	4.1%	2.0%	4.5%	2.8%	1.4%	6.1%	3.9%	1.9%
4 th	5.4%	3.4%	1.6%	3.8%	2.4%	1.1%	4.8%	3.0%	1.4%
Richest	5.3%	3.5%	1.7%	1.7%	0.9%	0.3%	2.6%	1.5%	0.7%
Total overshoot	7.2%	4.7%	2.3%	2.9%	1.7%	0.7%	6.0%	3.9%	1.9%
Mean Positive Overshoot	23.9%	22.6%	19.7%	19.3%	19.2%	17.2%	23.2%	22.1%	19.4%
CI	-0.095	-0.099	-0.106	-0.193	-0.211	-0.250	-0.182	-0.194	-0.214
SE(CI)	(0.013)	(0.016)	(0.022)	(0.023)	(0.028)	(0.038)	(0.011)	(0.014)	(0.018)
Rich-poor ratio	0.598	0.592	0.601	0.286	0.232	0.189	0.296	0.266	0.238
Rich-poor difference	0.971	0.974	0.972	0.551	0.548	0.503	0.835	0.832	0.820

Table 4. Incidence of catastrophic health expenditure by household characteristics, types of illness or symptoms and healthcare seeking behavior

Characteristics	Incidence of catastrophic health expenditure	
	10% of total expenditure (95% Confidence Interval)	25% of non-food expenditure (95% Confidence Interval)
<i>Gender of household head</i>		
Male	13.8% (12.8%-14.8%)	17.4% (16.3%-18.5%)
Female	16.7% (14.6%-18.9%)	18.9% (16.7%-21.2%)
<i>Age of household head</i>		
Under 60 years	13.8% (12.8%-14.9%)	17.0% (16.0%-18.1%)
60+	16.3% (14.3%-18.4%)	20.8% (18.6%-23.1%)
<i>Years of schooling of household head</i>		
0 year	14.6% (13.3%-15.9%)	19.9% (18.5%-21.4%)
1-10 year	14.7% (13.5%-16.1%)	16.3% (15.0%-17.6%)
10+	9.9% (7.8%-12.4%)	9.6% (7.6%-12.0%)
<i>Household member's characteristics</i>		
<i>Presence of old age (65 years and above)</i>		
No	13.2% (12.3%-14.3%)	16.4% (15.4%-17.6%)
Yes	18.1% (16.3%-20.1%)	22.3% (20.3%-24.5%)
<i>Presence of child (under 15 years)</i>		
No	13.6% (12.1%-15.3%)	16.0% (14.5%-17.8%)
Yes	14.4% (13.3%-15.4%)	18.0% (16.9%-19.2%)
<i>Presence of reproductive age women</i>		
No	12.9% (11.9%-13.9%)	16.1% (15.0%-17.2%)
Yes	17.0% (15.4%-18.8%)	20.9% (19.1%-22.8%)
<i>Household size</i>		
1-2 persons	14.5% (12.5%-16.8%)	18.3% (16.0%-20.9%)
3-4 persons	13.1% (12.0%-14.3%)	15.9% (14.7%-17.1%)
5 persons or more	15.2% (13.9%-16.6%)	19.1% (17.7%-20.6%)

Table 5. Determinants of catastrophic health expenditure in Bangladesh

Variables	Description	Model 1	Model 2
		(Dependent= 10% of total expenditure)	(Dependent= 25% of non-food expenditure)
		OR (95% Confidence Interval)	OR (95% Confidence Interval)
<i>Gender of household head</i>	Female (Ref=Male)	1.216*(1.046,1.414)	1.057(0.914,1.222)
<i>Age of household head</i>	60+ (Ref= Under 60 years)	0.941(0.794,1.114)	0.973(0.830,1.141)
<i>Years of schooling of household head</i>	1-10 year (Ref= 0 year)	1.171**(1.044,1.313)	1.013(0.910,1.128)
	10+ (Ref= 0 year)	0.915(0.731,1.145)	0.756* (0.600,0.951)
<i>Household with old age member (65 years and above)</i>	Old age (Ref= Household without old age member)	1.242**(1.056,1.461)	1.268** (1.088,1.479)
<i>Household with child member (under 15 years)</i>	Child (Ref= Household without child member)	1.114(0.950,1.307)	1.260** (1.080,1.471)
<i>Household with reproductive age women (15-49 years)</i>	Reproductive age women (Ref= Household without reproductive age women member)	1.261**(1.098,1.449)	1.287***(1.129,1.467)
<i>Household size</i>	3-4 persons (Ref= 1-2 persons)	0.877(0.712,1.081)	0.871(0.714,1.063)
	5 persons or more (Ref= 1-2 persons)	1.031(0.822,1.293)	1.048(0.844,1.300)
<i>Area</i>	Urban (Ref=Rural)	0.705***(0.618,0.804)	0.725***(0.640,0.822)
<i>SES quintile</i>	2nd (Ref=Poorest)	0.973(0.832,1.136)	0.789***(0.689,0.905)
	3rd (Ref=Poorest)	0.942(0.802,1.106)	0.678***(0.587,0.783)
	4th (Ref=Poorest)	0.961(0.809,1.142)	0.581***(0.494,0.682)
	Richest (Ref=Poorest)	0.775*(0.627,0.958)	0.389***(0.316,0.478)
<i>Constant</i>		0.130***(0.0980,0.174)	0.247***(0.188,0.324)
<i>N</i>		12,219	12,219
<i>Log likelihood</i>		-4972.1	-5466.9
<i>LR chi2(14)</i>		151.1	394.6
<i>Prob > chi2</i>		0.000	0.000

***, ** and * denote the significance levels at 0.1%, 1%, 5% and respectively

Table 6. Measures of poverty based on consumption gross and net spending on health care

	Head count with gross OOP payments	Head count without OOP payments	Difference	
			Absolute	Relative
Poverty headcount	37.8%	41.3%	3.5%	9.1%
Standard error	0.008	0.008	0.002	
Poverty gap	819.4	922.5	103.1	12.6%
Standard error	21.5	22.6	4.2	
Normalized poverty gap	10.9%	12.3%	1.4%	12.6%
Standard error	0.003	0.003	0.001	

For Peer Review

FIGURES

Figure 1(a-c). Health payment budget share against cumulative percentage of Households Ranked by decreasing budget share in rural, urban and all areas of Bangladesh, year 2010.

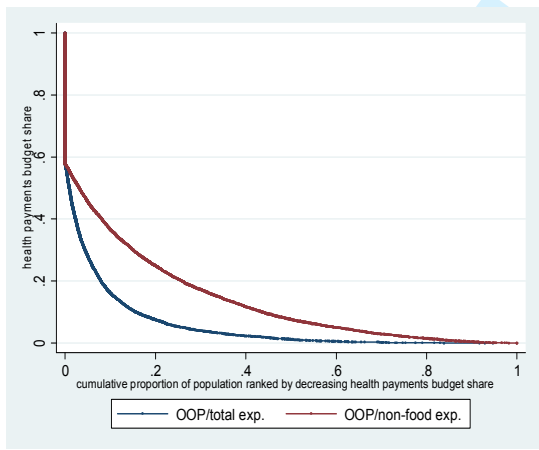


Figure (a)

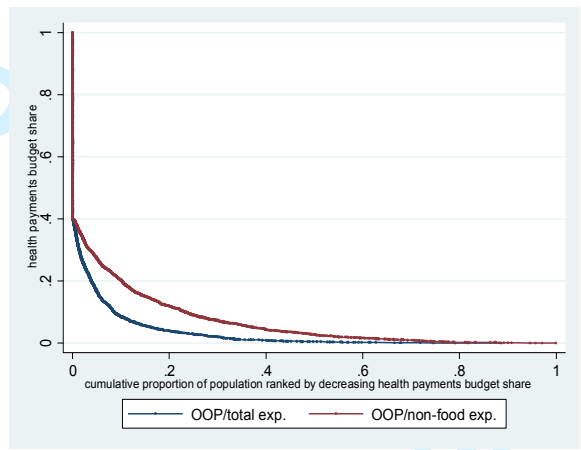


Figure (b)

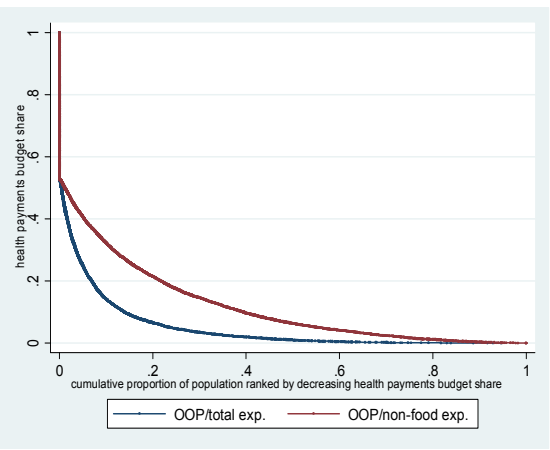


Figure (c)

Figure 2. Poverty impact on Pen's Parade non-health per capita expenditure using national poverty line

