

1 Distribution and associated determinants of high out-of-pocket healthcare expenditure in
2 Bangladesh: Evidence from Household Income and Expenditure Survey, 2010

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49 **Abstract**

50
51 **Introduction**

1 Like many low and middle income countries, out-of-pocket payments by patients or their
2 families are a key healthcare financing mechanism in Bangladesh that leads to economic
3 burden of household. The objective of the study was to focus whether and to what extent
4 socio-economic, demographic and behavioral factors of the population have impact on OOP
5 expenditure in Bangladesh.

6 **Methods**

8 A total of 12,400 patients who spent for receiving any type of healthcare services were
9 analyzed from Bangladesh Household Income and Expenditure Survey data, 2010. We
10 employed a regression analysis for find out the factors influencing OOP health expenditure
11 using ordinary least square method.

12 **Results**

14 The mean total out-of-pocket healthcare expenditure was US\$ 27.66; while cost of medicines
15 (US\$ 16.98) was the highest cost driver. In addition, the study identifies some significant
16 factors influencing higher out-of-pocket healthcare expenditure, namely, age, sex, marital
17 status, place of residence, rich families. In contrary, unemployed and with no social financial
18 safety were inversely associated.

19 **Conclusion**

21 Findings of the study can help the decision makers by stating the determinants of OOP,
22 discussing the mechanisms driving them and thus underscoring the need to develop policy
23 options for the building stronger financial protection mechanisms. The government should
24 consider devoting more resources to providing free or subsidized care. Parallel to government
25 action, the development of other prudential and sustainable risk pooling mechanism and so
26 may be most enthusiastic subscribers to community-based health insurance schemes.

27 **Key words:** Out-of-pocket, risk pooling mechanism, social financial safety, GDP per capita,
28 Bangladesh
29
30

31 **Introduction**

32
33

1 In many low and middle-income countries like Bangladesh, out-of-pocket (OOP) payments
2 by patients or their families is a key health care financing mechanism. The OOP share of
3 total health expenditure has increased from 55.9% in 1997 to 59.9% in 2005 to 63.3% in
4 2012 according to the latest national health accounts survey [1-3]. Reliance on out-of-pocket
5 expenditure for health services leads to a catastrophic burden for many households in Asia
6 including Bangladesh. Globally 100 million are pushed into poverty because of out-of-
7 pocket expenses [4,5] and millions more cannot utilize health services or suffer financial
8 hardship because the provision of healthcare is conditional on direct payments by the patient
9 at the point of service delivery [6]. Countless households find themselves in a position where
10 they have to borrow money, sell assets or divert resources from other needs to seek healthcare.
11 Indeed, high OOP payments, the absence of risk-pooling mechanisms and a high degree of
12 poverty can result in profound and catastrophic financial shocks to vulnerable households.
13 Some international studies also found that healthcare expenditure is closely linked to family
14 income and highly correlated with low-income status [7-11]. Higher public expenditures and
15 better risk pooling mechanisms have been identified as important financing mechanisms to
16 avert the financial hardship associated with paying for health care [12,13]. In this situation,
17 knowing the determinants of OOP payments may be important for developing an effective
18 health policy since it can help us understand the different characteristics of individuals and
19 households that influence barriers to utilization of health care due to the absence of financial
20 risk protection. A large number of factors such as availability of health services, financial
21 resources, community support, perceived an actual need for healthcare, patient satisfaction
22 etc. may contribute to healthcare utilization, which might be reflected in overall out of pocket
23 payments at individual or/and household level [1,11,14-15]. Household characteristics, such
24 being headed by an elderly or disabled person and having a member suffer from any chronic
25 diseases can influence the high out-of-pocket expenditure for healthcare [16]. For this reason,
26 out-of-pocket payment is considered as the most inequitable of all possible financing

1 mechanisms especially for the poor [17]. Therefore, policy makers may need to recognize the
2 characteristics which make individuals and households more vulnerable to high out-of-pocket
3 (OOP) payments. The objective of the study was to focus whether and to what extent socio-
4 economic, demographic and behavioral factors of the population have an impact on OOP
5 expenditure of households in Bangladesh.

6 **Methods**

7 **Data and Variables**

8 The present study uses data from the Household Income and Expenditure Survey (HIES)-
9 2010, conducted by the Bangladesh Bureau of Statistics (BBS), an apex organization of
10 Bangladesh's Ministry of Planning The HIES is a national-level survey with the various
11 districts of Bangladesh represented. The sampling technique, survey design, survey
12 instruments, measuring system and quality control have been described elsewhere [18]. The
13 data collection was done from 1 February 2010 to 31 January 2011. A total of 12,240
14 households were selected, with 7,840 from rural areas and 4,400 from urban areas. Among
15 the selected households, a total of 55,580 individuals were interviewed where 35,894 were
16 done from rural areas and the rest of urban areas. In brief, the survey provided socio-
17 economic data for a household level like as family earnings, consumptions, and expenditures,
18 assets, housing conditions, as well as individual level data on demographic structure (age, sex,
19 marital status), education, employment, health, disability and other. This analysis considered
20 both household and individual level data. The wealth quintile was constructed using
21 household characteristics from household level data and, then, values of wealth quintile were
22 allocated to all individuals based on household. However, 74 cases were dropped due to
23 missing values for the wealth index. Furthermore, 39,245 (70.61%) individuals who had
24 been suffering from any type of illness.

25

26

(Figure 1 will be inserted)

1
2 Finally, during estimating out-of-pocket payments (OOPP), data from 12,400 (31.60%)
3 individuals having any type of illness were considered based on any type of health care
4 utilization and associated expense in past 30 days preceding the survey. Total OOP
5 healthcare expenditure was derived by summing up direct medical cost and direct non-
6 medical cost. Direct medical costs included hospital outpatient fees, medicines, admission or
7 registration fees, physician fees, diagnostic test fees, and any other associated medical
8 supplies, whereas direct non-medical costs include transportation and conveyance, lodging,
9 tips and other associated costs [19]. In the current study, OOP health expenditure (natural
10 logged) was regressed onto explanatory variables such as demographic structure (gender,
11 age), marital status, educational background, employment status (yes or no), social financial
12 safety (i.e. receipt of governmental financial support due to age, poverty, veteran status,
13 widowhood or the like), first symptoms of illness (diarrhea, fever, dysentery, pain, injury,
14 blood pressure, weakness, others), as well as economic status (across asset quintiles). Age
15 was considered in five groups, in particular, childhood (≤ 19 years), young adulthood (20–39
16 years), middle-aged adulthood (40–64 years), and elderly (≥ 65 years). Marital status was
17 categorized into three groups: unmarried, married and others (widowed, divorced or
18 separated). Educational level was captured as no education, primary education, secondary
19 education, higher secondary and higher education.

20 *Estimation Strategy*

21 Descriptive statistics were employed to summarize the data about the different variables
22 (Table 1). OOPP for healthcare were considered the outcome variables. OOPP data is
23 characterized by a large cluster of data at zero, and the right skewed distribution of the
24 remaining observations, but the zeros have been deleted for the current analysis. The natural
25 log of OOPP healthcare expenditure was used to reduce the effects of the skewed nature of

1 the expenditure variable. Multiple linear regression models were used to find out influencing
2 factors of OOPP on explanatory variables. The multiple regression model considered is

$$y_i = \alpha + \sum_{i=1}^n \beta_i x_i + \varepsilon \quad (1)$$

3 where y_i was the dependent variable (natural log of out-of-pocket healthcare expenditure),
4 the x_i were a number of control explanatory study variables. β was the coefficient for any
5 independent variable, α represents the unknown intercept term and ε was the random error
6 term. In the adjusted model, all interest of variables was considered in model. The diagnostic
7 tests were employed in the analysis. The Breusch–Pagan/Cook-Weisberg test showed that
8 heteroscedasticity was present or not in the model. The Variance inflation factor (VIF) test
9 was employed for detect the multicollinearity problem in the regression model [20]. The
10 Ramsey (RESET) test was used to draw the evidence against the hypothesis of omitted
11 variable bias in the model. Data cleaning, validation and all statistical analyzed were
12 performed using the by Stata/SE 13.0.

13

14 **Ethical considerations**

15 The study has been conducted using secondary data from Bangladesh Bureau of Statistics,
16 where individuals and households are unidentifiable. Ethical approval is thus not applicable
17 for this study.

18

19 **Results**

20 **Background Characteristics**

21 A total sampled population of 12,400 reported illness and utilized healthcare during the last
22 30 days prior to the survey interview. Among the study samples, 63% of individuals were
23 female and 37% were male (table 1), whereas 59.20% of those surveyed were of participants
24 age (40-64 years). About more than half of the individuals those having a primary education

1 (56%) compared with those having a secondary education (21%) as well as 63% of
2 individuals were married. More than two-thirds of the individuals were unemployed while
3 only 22.73% of members were in paid employment. About 62% of individuals were living in
4 rural communities.

5 (Table 1 will be inserted)

6
7

8 **Distribution of out-of-pocket health care expenditure**

9 The mean total out-of-pocket health expenditure in last 30 days was US \$ 27.66 which is
10 20.26% of GDP per capita for a month during the fiscal year 2009-2010. Whereas the urban
11 patients had more spent money for healthcare (US \$ 38.29) than the patients of rural
12 (US\$ 21.21). The cost of medicines (US \$ 16.98) was the highest cost driver (61.38% of
13 total OOP health expenditure) followed by physician fee (US \$ 3.70) (Table 2). According to
14 the residence, those who lived in urban areas spent double money on medicine (US \$ 24.06)
15 than urban residents (US \$ 12.68). We found the upper 20% of the population had higher
16 average OOP healthcare expenditure (US\$ 32.46) that was only 4.34% of their monthly
17 household income. On the contrary, the lowest quintile of the individuals spent money for
18 receiving healthcare was US\$ 12.82, that was 16.27% of their monthly household income,
19 furthermore, lower socio-economic status of rural individuals had more burden of OOP
20 health expenditure (18.25% of their household income) compared to urban individuals
21 (14.28%) (Table 3).

22 (Table 2 and Table 3 will be inserted in here)

23

24 **Associated factors of out-of-pocket healthcare expenditure**

25 We considered all variables in the multiple linear regression models that were significant
26 predictors of OOP payments in the multivariate analysis (Table 4). The regression model

1 explains 28.80% of total variation ($R^2 = 0.288$). The following diagnostic tests were
2 employed. The Breusch–Pagan/Cook-Weisberg test showed that heteroscedasticity was not
3 present in the model ($P < 0.01$). The Variance inflation factor (VIF) test with its mean (max)
4 value of 2.34 (3.60) indicated that there was no evidence of multicollinearity problem in the
5 regression model. The Ramsey (RESET) test showed that there was sufficient evidence
6 against the hypothesis of omitted variable bias in the model ($P < 0.01$).

7 (Table 4 will be inserted in here)

8 Age group ($P < 0.01$), sex ($P < 0.01$), marital status ($P < 0.10$), urban status ($P < 0.05$), being in
9 the richest 20% of the population ($P < 0.01$), higher education status ($P < 0.01$), were
10 significantly associated with higher out-of-pocket health expenditures. On the other hand,
11 earning status ($P < 0.01$) and social financial safety ($P < 0.05$) were inversely associated with
12 out-of-pocket healthcare expenditure.

13

14 **Discussion**

15 The present study identified the determinants of out-of-pocket health expenditures incurred
16 by people in Bangladesh. Different factors like socioeconomic status, demographic
17 characteristics, urban community, unsafe water source and unhygienic toilet facilities were
18 significantly associated with higher out-of-pocket health expenditures. Our results showed
19 that age and sex of the individuals were significantly associated with OOP health
20 expenditures. Several studies observed that sex differences in reproductive biology and
21 mortality drive differences in the use of healthcare services which were reflected the total
22 OOP but it might also be that men are more likely to be in employment and their healthcare
23 cost might be covered by the insurance program associated their jobs [21,22]. Healthcare
24 expenditure was significantly associated with age and this effect was highest among the
25 elderly people, which were consistent with findings from earlier studies [19, 23-26]. The
26 lack of health sector resources for management of specific chronic diseases in the elderly

1 might be a possible explanation of the positive influence of old age on OOP health
2 expenditure, particularly as, there is in Bangladesh no special coverage for older citizens to
3 mitigate excess healthcare cost at an affordable price [15]. This study observed that
4 medicine and diagnostic test costs were the main cost drivers. This is consistent with other
5 findings for Bangladesh which indicated that a large amount of money was spent on
6 medicine [27]. It may be argued that when the OOP payment is large as a share of household
7 budgets, households are at risk of sacrificing current consumption of the necessities of life
8 to pay for these medical costs [28]. Our findings are consistent with the results of other
9 studies which highlighted that the risk of catastrophic health expenditures was strongly
10 associated with the type of hospitals which patients have access to utilization of healthcare
11 [29]. These results are consistent with similar findings from another study which showed
12 that the burden of out-of-pocket payments is highest among the poor [30], but which also
13 indicates the high incidence of catastrophic health expenditures among poor and middle-
14 income households [31]. This may reflect the severity of the disease in the poor (low-income)
15 groups and it is higher than that in the high-income groups. Usually, the poor person doesn't
16 utilize healthcare services when the severity of disease is low. However, the high-income
17 person utilizes healthcare services at early stage of the disease. Study has shown that OOP
18 health expenditure was more significantly associated with the urban communities which are
19 consistent with the argument that rural communities used installment payment and in-kind
20 payment mechanisms for their health care needs [32]. The present study also found that
21 OOP spending on health care services remains a significant determinant of financial
22 insecurity. Those most at risk are the poor as they have no proper financial security. Many
23 rural people continue to seek help from traditional healers. Culturally ingrained beliefs for
24 various illnesses and inconsistencies in health service access might be the reason seeking the
25 traditional practitioner who nevertheless can impose a high OOP burden on those seeking
26 care [33]. Improving the cultural competence of the primary care health professionals and

1 integrating traditional healers within the existing health services may reduce their out-of-
2 pocket health expenditure.

3 Our study captured the determinants and distribution of OOP health expenditures among
4 Bangladeshi people. Its strengths include a relatively large sample size and representative
5 sampling method. However, the study has some limitations. There may be some recall bias
6 as data were collected after receiving the health services. Furthermore, this survey data
7 (HIES-2010) mentions nothing about proxy interviews; in cases where children and elderly
8 people were unable to respond to the interviews, some proxy respondents may have been
9 interviewed. Of course, some people may not incur OOP not because they are not in need of
10 health services but because they are not able to afford them – describing this phenomenon is
11 not possible with the current dataset and is a task for future research.

12 13 **Conclusions and recommendations**

14 The study identified some significant factors influencing higher out-of-pocket health
15 expenditure, namely, age, sex, marital status, place of residence, rich families. However,
16 unemployed and with no social financial safety were inversely associated with out-of-pocket.
17 The present study can help the decision makers by stating the determinants of OOP,
18 discussing the mechanisms driving them and thus underscoring the need to develop policy
19 options for the building stronger financial protection mechanisms in Bangladesh. The
20 presence of significant levels of OOP shows that the population is sufficiently affluent to
21 afford healthcare: however, payment through OOP is not an equitable or efficient financing
22 mechanism. The government should consider devoting more resources to providing free or
23 subsidized care. Parallel to government action, the development of other prudential and
24 sustainable risk pooling mechanism – for example, community-based mechanisms - can help
25 in reducing the intensity of OOP payments. By showing where OOP is highest, our current
26 study may help the designers of such schemes identify which sections of the population are

1 most exposed to OOP and so may be most enthusiastic subscribers to community-based
2 health insurance schemes.

3

4 **Declaration of Conflicting Interests**

5 The author(s) declared no potential conflicts of interest with respect to the research,
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7

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15 **Authors' contributions**

16 RAM, ARS and MS designed and planned the study. The study was coordinated by RAM,
17 MS, ARS, ZI, JAMK and AM. RAM, MS and ARS assisted in the analysis. Interpretation
18 of the data was conducted by RAM, MS, ARS, ZI, JAMK and AM. The manuscript was
19 drafted by RAM, MS, and ARS. All authors critically reviewed and approved the final
20 manuscript.

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22 **References**

- 23 1. Saito E, Gilmour S, Rahman MM, Gautam GS, Shresth PK, Shibuya K. Catastrophic
24 household expenditure on health in Nepal: a cross-sectional survey. Bull World
25 Health Organ 2014; 92:760-767. doi: <http://dx.doi.org/10.2471/BLT.13.126615>
- 26 2. Majumder MAA. Economics of healthcare financing in WHO South East Asia Region.
27 South East Asia Journal of Public Health 2012;2(2):3-4.
- 28 3. Ministry of Health and Family Welfare. Bangladesh National Health Accounts 1997 –
29 2012. Research Paper No. 42a, Dhaka: Health Economics Unit, Ministry of Health and
30 Family Welfare, Government of the People's Republic of Bangladesh, 2015.

- 1 4. Xu K, Evans DB, Carrin G, Aguilar-Rivera AM, Musgrove P, Evans T. Protecting
2 households from catastrophic health spending. *Health Aff* 2007; 26 (4):972-83. DOI:
3 10.1377/hlthaff.26.4.972
- 4 5. Doorslaer EV, O'Donnell O, Rannan-Eliya RP, Somanathan A, Adhikari SR, Garg CC,
5 Harbianto D, Herrin AN, Huq MN, et al. Catastrophic payments for health care in
6 Asia. *Health Econ* 2007;16(11):1159–84. DOI: 10.1002/hec.1209
- 7 6. World Health Organization (WHO). *The World Health Report: Health Systems Financing:
8 The Path to Universal Health Coverage Plan of Action*. World Health Organization,
9 2010. Geneva, Switzerland.
- 10 7. da Silva MT, Barros AJD, Bertoldi AD, Jacinto PDA, Matijasevich A5, Santos IS,
11 Tejada CAO. Determinants of out-of-pocket health expenditure on children: an
12 analysis of the 2004 Pelotas Birth Cohort. *Int J Equity Health* 2015;14(53):1-9. DOI:
13 10.1186/s12939-015-0180-0.
- 14 8. Garg CC, Karan AK. Reducing out-of-pocket expenditures to reduce poverty: a
15 disaggregated analysis at rural-urban and state level in India. *Health Policy Plan* 2009;
16 24(2):116-28. DOI: 10.1093/heapol/czn046. Epub 2008 Dec 17.
- 17 9. Chu TB, Liu TC, Chen CS, Tsai YW, Chiu WT. Household out-of-pocket medical
18 expenditures and National Health Insurance in Taiwan: income and regional inequality.
19 *BMC Health Serv Res* 2005; 5(60):1-9. DOI: 10.1186/1472-6963-5-60
- 20 10. Rous JJ, Hotchkiss DR. Estimation of the determinants of household health care
21 expenditures in Nepal with controls for endogenous illness and provider choice. *Health
22 Econ* 2003;12(6):431–51.
- 23 11. Malik AM, Syed SIA. Socio-economic determinants of household out-of-pocket
24 payments on healthcare in Pakistan. *Int J Equity Health* 2012;11(51):1-7 **DOI:**
25 10.1186/1475-9276-11-51
- 26 12. Kawabata K, Xu K, Carrin G. Preventing impoverishment through protection against
27 catastrophic health expenditure. *Bull World Health Organ* 2002;80(8):612.
- 28 13. Xu K, Evans DB, Kawabata K, Zeramndini R et al. Household catastrophic health
29 expenditure: a multicounty analysis. *Lancet* 2003;362:111–7. DOI:10.1016/S0140-
30 6736(03)13861-5
- 31 14. Kien VD, Minh HV, Giang KB, Dao A, Tuan LT et al. Socioeconomic inequalities in
32 catastrophic health expenditure and impoverishment associated with non-
33 communicable diseases in urban Hanoi, Vietnam. *Int J Equity Health* 2016; 15(169):1-
34 12. DOI: 10.1186/s12939-016-0460-3
- 35 15. Lee W-Y, Shaw I. The Impact of Out-of-Pocket Payments on Health Care Inequity:
36 The Case of National Health Insurance in South Korea. *Int J Environ Res Public
37 Health* 2014;11(7):7304–18. DOI: 10.3390/ijerph110707304
- 38 16. Waters HR, Anderson GF, Mays J. Measuring financial protection in health in the
39 United States. *Health Policy* 2004; 69(3):339-49. DOI:10.1016/j.healthpol.2004.01.003

- 1 17. Wagstaff A, Doorslaer EV. Equity in healthcare financing and delivery. In: Handbook
2 of Health Economics, A. J. Culyer and J.P. Newhouse, 1803-62. Amsterdam: North-
3 Holland 2000:1-62
- 4 18. Bangladesh Bureau of Statistics (BBS). Bangladesh household income & expenditure
5 survey 2010. Statistics Division, Ministry of Planning, Government of the People's
6 Republic of Bangladesh, New Panama Printing Press, Dhaka, Bangladesh, 2011.
- 7 19. Sarker AR, Mahumud RA, Sultana M, Ahmed S, Ahmed W, Khan JAK. The impact of
8 age and sex on healthcare expenditure of households in Bangladesh. SpringerPlus 2014;
9 3(435):1-5.
- 10 20. Hossain MG, Saw A, Mahumud RA, Ohtsuki F, Kamarul T. Multiple regression
11 analysis of anthropometric measurements influencing the cephalic index of male
12 Japanese university students. Singapore Med J 2013;54:516–20.
- 13 21. Mustard CA, Kaufert P, Kozyrskyj A, Kozyrskyi A, Mayer T. Sex Differences in the
14 Use of Health Care Services. N Engl J Med 1998;338:1678–83.
- 15 22. Bekelman JE, Halpern SD, Blankar CR, Bynum JP, Cohen J, Fowler R, et al.
16 Comparison of Site of Death, Health Care Utilization, and Hospital Expenditures for
17 Patients Dying With Cancer in 7 Developed Countries. JAMA 2016; 315(3):272-283.
18 DOI:10.1001/jama.2015.18603
- 19 23. Ye Li , Qunhong Wu, Ling Xu, David Legge, Yanhua Hao, Lijun Gao, Ning Ning,
20 Gang Wan. Factors affecting catastrophic health expenditure and
21 impoverishment from medical expenses in china: policy implications of universal
22 health insurance. Bull World Health Organ 2012; 90: 664–671.
23
- 24 24. Jiang C, Ma J, Zhang X, Luo W. Measuring financial protection for health in families
25 with chronic conditions in rural china. BMC Public Health 2012; 12(988):1-7
26
- 27 25. Shi W, Chongsuvivatwong V, Geater A, Zhang J, Zhang H, Brombal D. Effect of
28 household and village characteristics on financial catastrophe and impoverishment due
29 to health care spending in western and central rural China: a multilevel analysis.
30 Health Res Policy Syst 2011; 9:21.
31
- 32 26. Alemayehu B, Warner KE. The Lifetime Distribution of Health Care Costs. Health Serv
33 Res 2004; 39 (3): 627-642. DOI: 10.1111/j.1475-6773.2004.00248.x
- 34 27. Sarker AR, Islam Z, Khan IA, Saha A, Chowdhury F, et al. Cost of illness for cholera
35 in a high risk urban area in Bangladesh: an analysis from household perspective. BMC
36 Infect Dis 2013; 13 (518):1-6. DOI: 10.1186/1471-2334-13-518
- 37 28. Hoque ME, Dasgupta SK, Naznin E, Al-Mamun A. Household coping strategies for
38 delivery and related healthcare cost: findings from rural Bangladesh. Trop Med Int
39 Heal 2015;20 (10):1368–75. DOI: 10.1111/tmi.12546. Epub 2015 Jun 1.
- 40 29. Say L, Raine R. A systematic review of inequalities in the use of maternal health care
41 in developing countries: examining the scale of the problem and the importance of
42 context. Bull World Heal Organ 2007;85(10):812–819.

- 1 30. Daga S, Mhatre S, Dsouza E. Out-of-pocket nonmedical expenses associated with out-
2 patient treatment of common childhood illnesses. *J Trop Pediatr* 2015;61(3):226–8.
3 DOI:<https://doi.org/10.1093/tropej/fmv014>
- 4 31. Ilunga-Ilunga F, Levêque A, Laokri S, Dramaix M. Incidence of catastrophic health
5 expenditures for households: An example of medical attention for the treatment of
6 severe childhood malaria in Kinshasa reference hospitals, Democratic Republic of
7 Congo. *J Infect Public Health* 2015;8(2):136–44. DOI:10.1016/j.jiph.2014.08.008.Epub
8 2014 Sep 26.
- 9 32. Onwujekwe OE, Uzochukwu BSC, Obikeze EN, Okoronkwo I, Onoka CA, Madubuko
10 G, Okoli C. Investigating determinants of out-of-pocket spending and strategies for
11 coping with payments for healthcare in southeast Nigeria. *BMC Health Serv Res* 2010;
12 10:67. DOI: 10.1186/1472-6963-10-67
- 13 33. Verhagen LM, Kapinga R, van Rosmalen-Nooijens KAWL. Factors underlying
14 diagnostic delay in tuberculosis patients in a rural area in Tanzania: a qualitative
15 approach. *Infection* 2010;38 (6):433–46. DOI: 10.1007/s15010-010-0051-y

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Table 1: Background characteristics of the study population (N=12,400)

Variables	n (%)	95% CI
Gender		
<i>Male</i>	4,589 (37.01)	(36.16 , 37.86)
<i>Female</i>	7,811 (62.99)	(62.14 , 63.84)
Age group		
<20	274 (2.21)	(1.97 , 2.48)
20-39	1,605 (12.94)	(12.36 , 13.55)
40-64	7,341 (59.20)	(58.33 , 60.06)
≥ 65	3,180 (25.65)	(24.78 , 26.56)
Marital status		
<i>Unmarried</i>	4,225 (34.07)	(33.24 , 34.91)
<i>Married</i>	7,861 (63.40)	(62.54 , 64.24)
<i>Others</i>	314 (2.53)	(2.27 , 2.82)
Education level		
<i>No education</i>	1,749 (14.10)	(49.28 , 51.18)
<i>Primary education</i>	6,908 (55.71)	(19.19 , 20.70)
<i>Secondary education</i>	2,561 (20.65)	(23.41 , 25.03)
<i>Higher</i>	1,182 (9.53)	(4.22 , 5.02)
Earner status		
<i>Yes</i>	2,818 (22.73)	(22.00 , 23.47)
<i>No</i>	9,582 (77.27)	(76.53 , 78.00)
Social financial safety		
<i>Yes</i>	940 (7.58)	(7.13 , 8.06)
<i>No</i>	11,460 (92.42)	(91.94 , 92.87)
First symptoms of illness		
<i>Diarrhea</i>	117 (0.94)	(0.79 , 1.13)
<i>Fever</i>	5,562 (44.85)	(43.98 , 45.73)
<i>Dysentery</i>	72 (0.58)	(0.46 , 0.73)
<i>Pain</i>	519 (4.19)	(3.85 , 4.55)
<i>Injury</i>	55 (0.44)	(0.34 , 0.58)
<i>Blood pressure</i>	2,508 (20.23)	(19.53 , 20.94)
<i>Weakness</i>	112 (0.90)	(0.75 , 1.09)
<i>Others</i>	3,455 (27.86)	(27.08 , 28.66)
Residence		
<i>Rural</i>	7,726 (62.31)	(61.45 , 63.16)
<i>Urban</i>	4,674 (37.69)	(36.84 , 38.55)
Wealth quintile		
<i>Lowest 20%</i>	1263 (10.19)	(9.67 , 10.73)
<i>2nd</i>	3435 (27.70)	(26.92 , 28.5)
<i>3rd</i>	2104 (16.97)	(16.32 , 17.64)
<i>4th</i>	1676 (13.52)	(12.93 , 14.13)
<i>Upper 20%</i>	3922 (31.63)	(30.82 , 32.45)

Table 2: Distribution of out-of-pocket (OOP) healthcare expenditure in US\$ last 30 days by cost parameters

Cost parameters	Rural (n = 7,726)			Urban (n = 4,674)			Total (n = 12,400)		
	Mean	Median (IQR ¹)	% of total OOP healthcare expenditure	Mean	Median (IQR ¹)	% of total OOP healthcare expenditure	Mean	Median (IQR ¹)	% of total OOP healthcare expenditure
<i>Physician fee</i>	2.50	2.90 (4.35)	11.78	5.68	4.35 (14.49)	14.84	3.70	2.90 (4.35)	13.38
<i>Hospital/clinic bed fee</i>	0.45	0.00 (0.00)	2.13	0.71	0.52 (1.45)	1.86	0.55	0.00 (0.00)	1.99
<i>Medicine cost</i>	12.68	7.25 (8.88)	59.80	24.06	10.87 (56.52)	62.83	16.98	7.25 (15.94)	61.38
<i>Diagnostic test</i>	1.11	0.00 (0.00)	5.23	2.71	1.20 (7.25)	7.08	1.71	0.00 (0.00)	6.20
<i>Conveyance cost</i>	3.28	1.98 (4.25)	15.46	4.15	2.90 (5.94)	10.83	3.61	0.58 (7.25)	13.04
<i>Tips cost</i>	0.18	0.00 (0.00)	0.86	0.03	0.00 (0.00)	0.07	0.12	0.00 (0.00)	0.45
<i>Other costs</i>	1.00	0.00 (0.00)	4.74	0.95	0.08 (0.43)	2.48	0.98	0.08 (0.43)	3.56
<i>Total</i>	21.21	10.14 (25.36)	100.00	38.29	20.29 (85.22)	100.00	27.66	10.14 (27.25)	100.00

Note: ¹IQR: Inter-quartile range, ²Out-of-Pocket

Table 3: Distribution of ²OOP healthcare expenditure in US\$ last 30 days by wealth quintile

Wealth quintile	Rural (n = 7,726)			Urban (n = 4,674)			Total (n = 12,400)		
	Mean	Median (IQR ¹)	² OOP healthcare expenditure (% household income)	Mean	Median (IQR ¹)	² OOP healthcare expenditure (% household income)	Mean	Median (IQR ¹)	² OOP healthcare expenditure (% household income)
<i>Lowest 20%</i>	12.49	10.14 (9.13)	18.25%	14.52	7.86 (14.06)	14.28%	12.82	9.42 (8.70)	16.27%
<i>2nd</i>	10.28	10.14 (11.23)	16.10%	13.17	3.99 (9.20)	10.98%	10.40	10.14 (11.23)	13.54%
<i>3rd</i>	25.84	28.26 (27.10)	8.64%	18.96	20.29 (8.50)	6.52%	23.55	20.29 (23.91)	7.58%
<i>4th</i>	40.59	7.25 (14.28)	6.42%	75.11	18.41 (4.86)	4.68%	24.99	88.41 (70.58)	5.55%
<i>Upper 20%</i>	40.83	62.32 (55.80)	4.82%	26.56	3.19 (59.13)	3.86%	32.46	8.41 (59.13)	4.34%
<i>Overall</i>	21.21	10.14 (25.36)	8.24%	38.29	20.29 (85.22)	7.82%	27.66	10.14 (27.25)	8.03%

Note: ¹IQR: Inter-quartile range, ²Out-of-Pocket

Table 4: Factors influencing OOP¹ healthcare expenditure (Natural log)

Variables	Unadjusted		Adjusted	
	Coefficient	95 % CI	Coefficient	95 % CI
Constant	-	-	1.29***	(1.06 , 1.48)
Gender				
<i>Male (Ref)</i>	-	-	-	-
<i>Female</i>	0.35***	(0.06 , 1.52)	0.16***	(0.10 , 0.22)
Age group				
<20	0.44***	(0.38 , 0.56)	0.23***	(-0.35 , 0.69)
20-39(<i>Ref</i>)	-	-	-	-
40-64	0.60***	(0.54 , 0.78)	0.12**	(0.05 , 0.39)
65+	1.02***	(0.70 , 1.65)	0.38***	(0.10 , 0.67)
Marital status				
<i>Unmarried (Ref)</i>	-	-	-	-
<i>Married</i>	0.54***	(0.48 , 0.59)	0.11*	(-0.01 , 0.24)
<i>Others</i>	0.50***	(0.38 , 0.61)	0.04	(-0.13 , 0.20)
Education level				
<i>No education (Ref)</i>	-	-	-	-
<i>Primary education</i>	0.46	(0.10 , 0.84)	-0.01	(-0.08 , 0.05)
<i>Secondary education</i>	0.03	(-0.04 , 0.1)	-0.05	(-0.11 , 0.01)
<i>Higher secondary</i>	-0.02	(-0.16 , 0.11)	0.14**	(-0.25 , 0.52)
<i>Higher</i>	-0.02	(-0.30 , 0.26)	0.53**	(0.17 , 1.39)
Earner status				
<i>Yes (Ref)</i>	-	-	-	-
<i>No</i>	-0.12***	(-0.19 , -0.06)	-0.23***	(-0.55 , 0.30)
Social financial safety				
<i>Yes (Ref)</i>	-	-	-	-
<i>No</i>	-0.24***	(-0.17 , 0.51)	-0.16**	(-0.23 , 0.98)
First symptoms of illness				
<i>Fever (Ref)</i>	-	-	-	-
<i>Diarrhoea</i>	-0.49***	(-0.62 , -0.37)	0.38***	(0.27 , 0.49)
<i>Dysentery</i>	-0.47***	(-0.68 , -0.26)	-0.01	(-0.17 , 0.16)
<i>Pain</i>	0.39**	(0.25 , 0.53)	0.61***	(0.52 , 0.69)
<i>Injury</i>	0.67***	(0.64 , 0.89)	1.26***	(1.01 , 1.89)
<i>Blood pressure</i>	0.43***	(0.22 , 0.64)	0.57***	(0.41 , 0.73)
<i>Weakness</i>	0.52***	(0.32 , 0.72)	0.7***	(0.54 , 0.85)
<i>Others</i>	0.69***	(0.56 , 0.83)	0.91***	(0.85 , 0.97)
Residence				
<i>Rural (Ref)</i>	-	-	-	-
<i>Urban</i>	0.05*	(-0.05 , 0.07)	0.54***	(0.24 , 0.86)
Wealth quintile				
<i>Lowest 20% (Ref)</i>	-	-	-	-
2nd	0.28*	(0.12 , 0.47)	0.15	(0.13 , 2.82)
3rd	0.15	(0.10 , 0.43)	1.01	(1.05 , 3.01)
4th	0.06**	(-0.03 , 0.15)	1.21**	(1.01 , 2.14)
Upper 20%	0.01	(-0.08 , 0.1)	2.53***	(1.03 , 4.13)
<i>N</i>			12,310	
<i>R-square</i>			0.288	
<i>F-value</i>			155.56***	
<i>Root MSE</i>			1.25	
<i>Mean (Max of VIF value)</i>			2.34(3.60)	
<i>BP/ Cook-Weisberg test</i>			240.51***	
<i>Ramsey RESET</i>			23.12 ***	

NB: ***P<0.001, **P<0.01 and *P<0.05, ¹Out-of-Pocket

Figure 1. Distribution of study sample

