



## Cost-comparison and determinants of out-of-pocket payments on child delivery care in Bangladesh

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**Title: Cost-comparison and determinants of out-of-pocket payments on child delivery care in Bangladesh**

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## Summary

**Objectives:** The objective of this study is to capture the relevant out-of-pocket costs, coping mechanisms, and associated factors that are related to child delivery in Bangladesh through the use of nation-wide household level data.

**Methods:** The study was conducted using a secondary data source of the latest Bangladesh Demographic and Health Survey (DHS) 2014. A cross-sectional survey was carried out for six months, from June to November 2014, where closed-ended questions regarding child delivery related expenditure were included. Log linear regression and descriptive analysis methods were used to analyse this data.

**Results:** Analysis indicated that the average self-reported out-of-pocket payment (OOPP) per child delivery was US\$ 79.23 (SD  $\pm$ 128.05). The highest OOP was observed for C-section (US\$ 249.89, SD  $\pm$ 153.54), followed by institutional normal delivery (US\$ 61.62, SD  $\pm$ 75.28). The average cost per normal home delivery was US\$ 15.89 (SD  $\pm$ 25.84). The richest quintile spent significantly more than the poorest quintile with regards to C-Section (US\$ 281 vs. US\$ 204), normal delivery at an institution (US\$ 80 vs. US\$ 65), and even normal delivery at home (US\$ 22 vs. US\$ 13).

**Conclusions:** The study showed that there was a huge variation of OOP which was dependent on the facility and socio-economic demographic status of the households. As such, policy efforts need to focus on lowest wealth quintiles to avoid economic burdens during child delivery related activities, and therefore, financial risk protection should be provided. Social health insurance might be an option for financing during child delivery, which is in line with the core objective of the Healthcare Financing Strategy of Bangladesh, which is to achieve Universal Health Coverage.

**Keywords:** Bangladesh, delivery care, service utilization, out-of-pocket expenditure, universal health coverage

## 1 | INTRODUCTION

Every day, approximately 830 mothers die globally due to pregnancy and childbirth-related complexities, with ninety-nine percent of all maternal deaths occurring in developing countries. However, one-third of these global maternal mortalities and morbidities occur in the Asian region.<sup>1,2</sup> The common causes that are responsible for these maternal deaths include haemorrhage, eclampsia and abortion-related complexities, most of which occur within 24 hours of the following delivery. As such, the quality of the care provided during pregnancy is crucial for the survival of mothers and their children.<sup>3</sup> In these circumstances, mothers are often advised to seek care from medically trained providers or from a recognized facility to avoid any complications during the pregnancy, at delivery, or in the postpartum period.<sup>4</sup> Bangladesh has achieved a remarkable improvement in both maternal- and child mortality-related health indicators. Despite the current focus on safe motherhood programs and better access to health facilities, maternal and neonatal mortality remains high, at 194/100,000 live births and 28/1000 live births, respectively. Furthermore, almost 62% of deliveries are performed at home.<sup>5</sup>

The health service delivery structure is well organized in Bangladesh. Services are organized through community clinics, health and family welfare centres, upazila health complexes (UHCs), district level hospitals, tertiary level medical college hospitals, and specialized hospitals. Private and Non-Government Organizations (NGOs) also play an active role in providing health services to its population. According to the latest Bangladesh Maternal and Child Health Expenditure report, Bangladesh spent approximately 21.1 billion Bangladeshi Taka (BDT) in the fiscal year of 2012 for reproductive health while almost 90% of this expenditure was spent for preventive care services.<sup>6</sup> However, the major expenditure during child delivery care relied on out-of-pocket spending by the household.<sup>7</sup> As such, maternal care-related financial and well-being costs might be devastating and could significantly impact the livelihoods of family members by causing economic disruption. Indeed, in the case of Bangladesh, many households experience catastrophic economic burden and fall into poverty due to these expenses.<sup>8-12</sup> Households often mitigate this excessive expenditure by borrowing, selling assets, or using savings, donation from relatives, bank loans, and relying on transfers<sup>13,14</sup>. In the order to avoid the financial consequences of maternal health shocks, the Sustainable Development Goals placed a high emphasis on financial sustainability and affordability for maternal care in order to reduce the cases of maternal, neonatal and under-five mortality. Numerous studies related to the cost of maternal, neonatal and child health program have been conducted in Bangladesh.<sup>15-18</sup> However, the pattern regarding out of pocket (OOP) expenditure and cost-comparison related to child delivery is still limited, although such analysis is vital for policy makers, as it allows them to adopt investment plans for improving the maternal healthcare delivery system despite being constrained by limited resources. OOP is the primary payment strategy for

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3 healthcare in Bangladesh, and OOP's share of total health expenditure has been increasing alarmingly,  
4 from 55.9% in 1997 to 67% in 2015.<sup>19</sup> The objective of this study is thus to capture the relevant out-  
5 of-pocket costs, coping mechanisms, and associated factors related to child delivery in Bangladesh  
6 using nation-wide household level data. The findings from the study show the extent of out-of-pocket  
7 expense during child delivery care, and can also have broad implication for improving the efficiency  
8 and equity of maternal child delivery care in Bangladesh.  
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## 14 **2| METHODS**

### 15 **2.1 | Study design and sampling**

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20 The study was conducted using secondary data sources from the latest Bangladesh Demographic and  
21 Health Survey (DHS) 2014. A cross-sectional survey was carried out for six months, from June to  
22 November 2014, with closed-ended questions that pertained to child delivery related expenditure. The  
23 two-stage stratified sampling design was adopted using a complete list of enumeration areas (EAs)  
24 and covering the whole country, which was prepared by the 2011 population census of the People's  
25 Republic of Bangladesh. The 2014 BDHS is the seventh Demographic Health Survey (DHS) in  
26 Bangladesh, which started in 1993-1994 and continued every four years since. The sampling method,  
27 survey design and instruments, and the measurement system, as well as quality control, have been de-  
28 scribed elsewhere.<sup>20,21</sup> The data on the delivery cost was collected from women who gave birth within  
29 the three years preceding the survey, and the most recent live birth cost was considered for the  
30 analysis. A total of 17,863 ever-married mothers were interviewed, whereas 4, 627 mothers delivered  
31 a baby. However, we have excluded 61 mothers from the analysis. This was either due to missing  
32 information or the respondent's inability to recall the mentioned cost history and outlier (Supplement  
33 1). In this context, the data of 4,566 mothers (98.68%) were analysed.  
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### 41 **2.2 | Data Analysis**

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Descriptive statistics were employed to analyse and summarise the data using different variables. Bi-  
variate and multivariable statistics were also employed. Log transformation was used for exhibiting  
linearity as out-of-pocket expenditure (the dependent variable), and was positively skewed, thus  
allowing the mean, median, and inter-quartile range (IQR) to be presented. However, such  
coefficients have been interpreted routinely regarding percentage changes using exponential  
functions.<sup>22-24</sup> The explanatory variables were age, education and working status of mothers,  
education and occupational status of spouse, birth order, ANC visits, household size, exposure of  
mass media, residence, socio-economic strata, as well as the administrative region. A log linear  
regression model was used to sort out the factors of OOP associated with home delivery, institutional

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3 normal delivery, C-section delivery, and the total cost of child delivery services. The variance  
4 inflation factor (VIF) test was used to detect for multicollinearity in the regression model.<sup>10,25</sup> All data  
5 cleaning, validation, and statistical analyses were performed using Stata/SE 13.0 (StataCorp. College  
6 Station, TX, USA).  
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## 10 11 12 **2.3 | Ethical Considerations**

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14 We analysed the publicly available DHS dataset by contacting the MEASURE DHS program office.  
15 DHS followed standardised data collection procedures. According to the DHS, written informed  
16 consent was obtained from mothers/caretakers who enrolled in the survey.  
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## 20 21 **3 | RESULTS**

### 22 23 **3.1 | Background Characteristics of Study Participants**

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25 A total of 4,566 delivered mothers were considered for analysis (Table 1), whereas normal delivery at  
26 home, normal delivery at institutions, and C-section were 2,812 (62%), 660 (14%) and 1,094(24%),  
27 respectively. The mean age of mothers was 24.58 years (SD  $\pm$  5.75), and most of the mothers were  
28 not employed (76%), with only 31% of mothers completing the recommended (4 or more) ANC  
29 visits. Regarding education level, most of the mothers (76%) had completed primary and secondary  
30 school, whereas approximately 14% mothers had no formal education. A similar educational pattern  
31 was also observed in the case of their spouses. Around 48% (n=2,202) of households had more than  
32 five members in size, with most of the families (62%) exposed to mass media and lived in rural  
33 settings (74%). Dhaka division had the highest proportion (n=1,609, 35%) of mothers participating in  
34 the survey, while the lowest proportion of participants belonged to the Chittagong region (n=1,002,  
35 22%). Table 1 shows that approximately 62% of the mothers delivered at home, followed by private  
36 hospitals and clinics (23%). In addition, about 13% of mothers delivered at public facilities.  
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### 45 46 **3.2 | Distribution of child delivery cost**

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48 The distribution of OOP costs related to child delivery is shown in Table 2. The average self-reported  
49 OOP per child delivery was US\$79.23 (SD  $\pm$ 128.05), with the highest OOP observed for C-section  
50 (US\$ 249.89, SD  $\pm$ 153.54), and followed by institutional normal delivery (US\$ 61.62, SD  $\pm$ 75.28).  
51 The average cost per normal home delivery was US\$15.89 (SD  $\pm$ 25.84). As for the age of mothers,  
52 the older mothers (aged 35-49) spent significantly more (US\$ 91.16, SD $\pm$ 151.12) than younger ones  
53 (p<0.001). The OOP cost was significantly higher for mothers who had higher educational attainment  
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3 and who utilised the recommended ANC services. The average OOP of C-section (US\$ 261), normal  
4 delivery at institution (US\$73) and normal delivery at home (US\$ 19) was higher for mothers who  
5 utilised the recommended ANC visits when compared to those who did not. The average total cost for  
6 child delivery was higher in the urban areas (US\$ 113.89) when compared to rural areas (US\$ 62.90).  
7 The OOP due to C-section was significantly ( $p<0.001$ ) higher in big cities like Sylhet (US\$ 330),  
8 Chittagong (US\$ 312), and Dhaka (US\$ 280), than in Rangpur city (US\$ 187). The richest quintile  
9 spent significantly more than the poorest quintile, with regards to C-Section costs (US\$ 281 vs. US\$  
10 204), normal deliveries at an institution (US\$ 80 vs. US\$ 65), and even normal delivery at home (US\$  
11 22 vs. US\$ 13). Considering the institutionalised normal delivery, OOP was higher for those who  
12 delivered their child at private hospitals and clinics (US\$ 92.60) than public facilities (US\$ 52.14). The  
13 lower OOP was incurred for those who has delivered normally at NGO facilities (US\$ 31.81). A  
14 similar pattern was further observed for the C-section category (Table 2). Our result shows that  
15 approximately US\$ 271.24 was spent on those who chose C-section at private hospital and clinics.  
16 The cost of C-section was lower at public facilities (US\$ 176.71); indeed, even lower than those for  
17 NGO facilities (US\$ 203.74). However, if we include the outliers in the analysis, we find that the  
18 average OOP per child delivery was US\$ 83.35 (SD  $\pm$  171.72) and US\$ 265.85 for C-section.  
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27 (Table 2 will be inserted here)

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### 30 31 32 **3.3 | Coping mechanisms**

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34 The various coping strategies of households during child delivery, based on the place of residence of  
35 the household, is shown in figure 2. We observed that approximately 87% of urban and 85% of rural  
36 women met their expenditure through family funding; financial support from the family was another  
37 important coping strategy that was slightly higher for rural women (19%) than urban (17%). Other  
38 coping strategies included borrowing, support by friends, selling assets, voucher schemes, health  
39 insurance and others.  
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44 (Figure 2 will be inserted here)

### 45 46 47 **3.4 | Factors Associated with out-of-pocket expenditures during child delivery strategies**

48 Table 3 demonstrates the various factors associated with OOP. Our study shows that several factors,  
49 such as the age and education of the mothers, education of spouses, working status of mothers, birth  
50 order, recommended ANC utilization, wealth quintiles, and administrative regions were significantly  
51 associated with OOP. Overall, older mother spent significantly higher on delivery care. OOP was  
52 higher for older mothers (aged 35-49) for C-section (34%,  $p<0.01$ ) and institutional normal delivery  
53 (32%,  $p<0.01$ ) for mothers aged 20-24 than that of younger mothers. Overall, OOP was significantly  
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3 associated with the higher educational level of spouses. Regarding home delivery, we found  
4 significantly lower costs among the smallest families than the larger households (Table 3). The  
5 number of child deliveries was highly associated with the expenditure for delivery care overall. The  
6 cost was higher for mothers who experienced their first child delivery (97%,  $p < 0.001$ ). The working  
7 status of the mother was significantly associated negatively with OOP and working mothers spent less  
8 than unemployed mothers. Utilization of ANC was positively associated with delivery-related  
9 expenditure, and OOP was higher for those who utilized the recommended ANC care. With regards to  
10 the administrative regions, our results demonstrate that OOP was significantly lower in the Rangpur  
11 division than others. Overall, the richest wealth quintile spent significantly ( $p < 0.001$ ) more than the  
12 poorest quintile.  
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18 (Table 3 will be inserted here)  
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#### 20 21 **4 | Discussion** 22

23 Bangladesh has made tremendous improvements in the health sector through the reduction of  
24 maternal mortality and improvement of child health due to a well-structured health system which  
25 involves both the public and private sectors, along with non-government organizations. Furthermore,  
26 this is supported by the commitment of the “Bangladesh Maternal Health Strategy”, which  
27 encourages mothers to deliver under the care of medically trained birth attendants, and have the  
28 delivery performed by a skilled birth attendant, along with promoting safe motherhood through  
29 various activities.<sup>5,26</sup> Over the last two decades, the private sector engaged in healthcare delivery  
30 significantly, which contributed to the increase of institutional delivery and C-section delivery rates in  
31 Bangladesh. However, the C-section rate is unnecessarily high (23%), and is higher than global  
32 standard, often resulting in excessive cost.<sup>5,10,27,28</sup> Nevertheless, the household OOP spending was still  
33 the main (67%) payment strategy for healthcare, although the target of the Bangladesh healthcare  
34 financing strategy was to reduce the out-of-pocket expenditure from 67% to 32% in total health  
35 expenditure to assist in the achievement of Universal Health Coverage.<sup>29</sup> In this context, the target  
36 will be realistic when larger portions of the population are able to access the pre-payment and pooling  
37 mechanisms for all services, including the delivery care. However, this is not yet the case.<sup>30</sup> This  
38 study thus addresses the extent of households’ OOP variation and the associated factors related to  
39 child delivery for Bangladeshi mothers.  
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49 The lower cost in public facilities reflect that these public facilities are highly subsidised by the  
50 government of Bangladesh and occasionally receive national and international donations for the  
51 purchasing of goods.<sup>16,31</sup> Thus, the financial cost is often shared among the households and the  
52 hospitals, whereas in the cases of private facilities, all expenditure (including profits) have to be raised  
53 from the households. While, due to the nature of this survey, we were not able to separate the  
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3 components of OOP, earlier studies in this context have observed that along with direct medical cost,  
4 travel, food, lodging, hiring of an 'aya', and even tip-giving were all major components of child  
5 delivery costs.<sup>32-34</sup> A previous hospital-based study in Bangladesh reported that the cost of normal  
6 delivery and C-section at public facilities was approximately US\$ 44 and US\$ 90, at the price level of  
7 2007.<sup>16</sup> A couple of community-based studies in this context observed that, for a normal delivery,  
8 households spent anywhere from US\$ 24 up to US\$ 32, while in C-section, the OOP was raised from  
9 US\$ 118 to US\$ 230.<sup>14,32</sup> Our study observed that family funds, support from others, and borrowing  
10 were the main coping strategies during the child delivery. Generally, households attempts to mitigate  
11 the cost of normal delivery with regular income and savings. However, the coping strategies were  
12 often altered if a delivery-related complication arose, or C-section was required. Consequently,  
13 households often relied on loans, donations, the selling of assets (e.g., jewellery, land) with the extent  
14 of the health shock being larger for the poorest households.<sup>14,33,34</sup> However, many of the households  
15 still had no opportunities to access the appropriate facilities during the delivery care phase due to  
16 affordability issues.<sup>32,35</sup> Thus, it is necessary to strengthen the on-going pro-poor health intervention,  
17 along with enriching the demand-side financing strategies in Bangladesh, which could mitigate the  
18 financial barriers during the delivery.<sup>29,36</sup>

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27 Our study observed a number of factors (such as age, education, working status of the mother, birth  
28 order, utilization of ANC, regional variation and wealth status) were significantly associated with a  
29 high OOP. Older mothers spent significantly more than younger mothers, as advanced maternal age  
30 was associated with various maternal complexities. Thus, older mothers tended to require  
31 hospitalization and even C-sections, which reflected a rise in out-of-pocket expenditure in relation to  
32 child-birth.<sup>37-39</sup> Furthermore, the adverse maternal outcome was closely linked with the duration of  
33 hospitalisation, which also increased the out-of-pocket expenditure.<sup>34</sup> It is well established that a  
34 positive association is often visible amongst the level of education and health awareness, which leads  
35 to a greater utilisation of maternal care service and thus expenditure.<sup>40-42</sup> In line with this statement,  
36 we observed a positive link with higher education and OOP for all child delivery care. However,  
37 higher education was often linked with higher income, which might be an another reason for high  
38 spending during the child delivery care.<sup>43</sup> Birth order appeared as a significant factor of high out-of-  
39 pocket expenditure. Furthermore, we observed those who experienced first delivery had spent relative  
40 to others. Younger mothers tended to give greater attention to their first delivery as they have no  
41 previously experience of pregnancy, and would end up spending more to utilise better care.<sup>44</sup> We also  
42 observed that the working status of mothers is significantly negatively associated with OOP and  
43 mothers who had engaged a regular job spent less than unemployed mothers. This seems counter-  
44 intuitive, and might be due to working women having a better knowledge about pregnancy and  
45 childbirth, a greater freedom of movement, and therefore, better access to pregnancy-related  
46 information and even healthcare, thus avoiding adverse events.<sup>42,44,45</sup> Various studies showed that  
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3 unemployment often acted as a barrier against optimal, timely utilisations of health service, which  
4 could lead to delivery-related complexities and a negative impact on resources.<sup>46,47</sup> Our results  
5 indicated that recommended of ANC drives higher the out-of-pocket cost for child delivery. The  
6 average out-of-pocket expenditure for C-sections and normal deliveries at institution and normal  
7 delivery at home was significantly higher for those mothers who had utilised the recommended ANC  
8 visits than those who did not. ANC recommendations acted as a powerful determinant of institutional  
9 delivery, since with the help of ANC services, mothers were often informed about the adverse events  
10 linked with pregnancy-related complications and thus developed better communication with  
11 healthcare, which encouraged them to access health facilities during delivery and spent spend more  
12 for safe delivery care.<sup>48,49</sup> A study of similar countries observed that recommended ANC increased C-  
13 section utilisation by a factor of two compared to those who did not utilise the recommended care.<sup>50</sup>  
14 According to the administrative region of the country, OOP was highest for the Dhaka division, as  
15 Dhaka is the capital of Bangladesh and the living cost was higher than those of other regions in the  
16 country. The study showed that the richest wealth quintile spent significantly more than poorest  
17 quintile, although higher cost does not always guarantee the better birth outcome.<sup>51</sup> However, it was  
18 well reported that the wealthiest households always utilised more maternal care services than those in  
19 the poorest households, in the Bangladeshi context.<sup>42,52</sup> Recent studies indicated that the utilisation of  
20 C-section was highly concentrated among mothers from the richest wealth quintiles, and even the  
21 poorest mother often had difficulties accessing this life-saving procedure.<sup>50,53</sup> Affordability might be  
22 an important issue, as the financial burden was greater for poorer households, irrespective of the  
23 institutional normal delivery or C-section delivery.<sup>14</sup> Again, many studies explored the unofficial fees  
24 associated with the child delivery care in Bangladesh,<sup>32-34</sup> and thus effective supervision is also  
25 necessary for the reduction of OOP. Although the wealthiest households mitigated the excessive  
26 delivery cost from their income and saving, the poor suffered catastrophically and often borrow from  
27 local money-lenders with a high-interest rate due to the lack of social protection.<sup>12,14</sup> Thus, strong  
28 policy initiatives are necessary to ensure the accessibility and affordability of delivery care services.  
29 However, an affordable social health insurance would be able to finance households during child  
30 delivery care, which would be in a similar line with that of the national healthcare financing strategy  
31 in Bangladesh.<sup>29</sup>

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Our study has several limitations. We used secondary data sources of Bangladesh Demographic and Health Survey, which was based on self-reported information provided by respondents. Therefore, recall bias and reporting errors might be associated particularly with the out-of-pocket expenditure, including other associated variables, such as age, ANC utilization, and education level of spouses. Furthermore, due to the cross-sectional nature of this survey, we were not able to provide the evidence of a causal relationship. We used asset-based wealth index as a proxy of household SES, as BDHS 2014 did not collect information on household income and expenditure. Therefore, we were not able

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3 to show whether household expenditure was “catastrophic”. Again, there might have been numerous  
4 households who were not able to utilise the institutional delivery care and/or C-section due to un-  
5 affordability, but this study was unable to capture such scenarios. Further investigation was necessary  
6 to observe underlying mechanisms of the out-of-pocket variation, which will help to promote value  
7 and efficiency in child delivery care in the long run. Despite these limitations, the study’s findings can  
8 be generalized to the national level as the study gathered data from a nationally representative  
9 demographic and health survey of Bangladesh.  
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## 13 14 **5 | Conclusion**

15  
16 The present study highlights the distribution and comparison of out-of-pocket expenditure on child  
17 delivery in Bangladesh. Our study has shown that there is a huge variation of OOP, according to the  
18 facility used and the socio-demographic status. Several factors, such as age, education, working status  
19 of the mother, birth order, utilization of ANC, regional variation and wealth status were significantly  
20 associated with high OOP. Women belonging to wealthier households tended to receive better care  
21 and spend more, and so policy efforts would need to focus on the lowest wealth quintiles in order to  
22 avoid economic burden during child delivery-related activities. As such, financial risk protection  
23 should be provided. Social and private health insurance might be another alternative for financing  
24 during child deliveries, and this is in line with the core objective of the Healthcare Financing Strategy  
25 of Bangladesh, which is to achieve Universal Health Coverage.<sup>29</sup>  
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## 36 **References**

- 37  
38 1. World Health Organization. Fact sheet : Maternal mortality. Media Centre.  
39 <http://www.who.int/mediacentre/factsheets/fs348/en/>. Published 2016. Accessed January 29,  
40 2018.  
41  
42 2. Patton GC, Coffey C, Sawyer SM, et al. Global patterns of mortality in young people: a  
43 systematic analysis of population health data. *The Lancet*. 2009;374(9693):881-892.  
44 doi:10.1016/S0140-6736(09)60741-8.  
45  
46 3. Sultana M, Mahumud RA, Ali N, et al. Cost of introducing group prenatal care (GPC) in  
47 Bangladesh: a supply-side perspective. *Safety in Health*. 2017;3(1):8. doi:10.1186/s40886-017-  
48 0059-4.  
49  
50 4. Sultana M, Mahumud RA, Ali N, et al. The effectiveness of introducing Group Prenatal Care  
51 (GPC) in selected health facilities in a district of Bangladesh: study protocol. *BMC Pregnancy*  
52 *and Childbirth*. 2017;17(1):48. doi:10.1186/s12884-017-1227-6.  
53  
54 5. NIPORT. *Bangladesh Demographic and Health Survey 2014*. Dhaka, Bangladesh, and  
55 Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International; 2016.  
56  
57 6. World Bank. *Reproductive, Maternal, Newborn, and Child Health (RMNCH) Expenditure*

- Bangladesh. Bethesda, Maryland; 2016. <https://www.hfgproject.org/?download=17274>.
7. Chandrasiri J, C. Anuranga, R. Wickramasinghe and RPR-E. The Impact of Out-of-Pocket Expenditures on Poverty and Inequalities in Use of Maternal and Child Health Services in Bangladesh: Evidence from the Household Income and Expenditure Surveys 2000– 2010 RETA–6515 Country Brief. Manila: Asian Development Bank. 2012:1-8.
  8. WHO. *A Price Too High to Bear: Summary of Research Finding*. Geneva Switzerland; 2014. [http://www.who.int/pmnch/media/news/2014/technical\\_brief.pdf](http://www.who.int/pmnch/media/news/2014/technical_brief.pdf).
  9. Khan JAM, Ahmed S, MacLennan M, Sarker AR, Sultana M, Rahman H. Benefit incidence analysis of healthcare in Bangladesh – equity matters for universal health coverage. 2016:1-7. doi:10.1093/heapol/czw131.
  10. Mahumud RA, Sarker AR, Sultana M, Islam Z, Khan J, Morton A. Distribution and determinants of out-of-pocket healthcare expenditures in Bangladesh. *Journal of Preventive Medicine and Public Health*. 2017;50(2):91-99. doi:10.3961/jpmph.16.089.
  11. Van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Catastrophic payments for health care in Asia. *Health Economics*. 2007;16(11):1159-1184.
  12. Khan JAM, Ahmed S, Evans TG. Catastrophic healthcare expenditure and poverty related to out-of-pocket payments for healthcare in Bangladesh- A n estimation of financial risk protection of universal health coverage. *Health Policy and Planning*. 2017;32(8):1102-1110. doi:10.1093/heapol/czx048.
  13. Flores G, Krishnakumar J, O'donnell O, Doorslaer E Van. Coping with health-care costs: implications for the measurement of catastrophic expenditures and poverty. *Health economics*. 2008;17(February):1393-1412. doi:10.1002/hec.
  14. Hoque ME, Dasgupta SK, Naznin E, Al Mamun A. Household coping strategies for delivery and related healthcare cost: findings from rural Bangladesh. *Tropical Medicine & International Health*. 2015;20(10):1368-1375. doi:10.1111/tmi.12546.
  15. Sarker BK, Ahmed S, Islam N, Khan JA. Cost of behavior change communication channels of Manoshi -a maternal, neonatal and child health (MNCH) program in urban slums of Dhaka, Bangladesh. *Cost effectiveness and resource allocation : C/E*. 2013;11(1):28. doi:10.1186/1478-7547-11-28.
  16. Sarowar MG, Medin E, Gazi R, et al. Calculation of costs of pregnancy- and puerperium-related care: Experience from a hospital in a low-income country. *Journal of Health, Population and Nutrition*. 2010;28(3):264-272.
  17. Borghi J, Sabina N, Blum LS, Hoque ME, Ronsmans C. Household costs of healthcare during pregnancy, delivery, and the postpartum period: a case study from Matlab, Bangladesh. *Journal of health, population, and nutrition*. 2006;24(4):446-455.
  18. Levin A, Amin A, Rahman A, Saifi R, Khuda B-E, Mozumder K. Cost-effectiveness of family planning and maternal health service delivery strategies in rural Bangladesh. *The International Journal of Health Planning and Management*. 1999;14(3):219-233. doi:10.1002/(SICI)1099-1751(199907/09)14:3<219::AID-HPM549>3.0.CO;2-N.
  19. MOHFW. *Bangladesh National Health Accounts 1997–2015: Preliminary Results*. Dhaka, Bangladesh; 2015. <http://www.thedailystar.net/backpage/people-fork-out-most-1465246>.
  20. National Institute of Population Research and Training (NIPORT), Mitra and Associates and II 2016. *Bangladesh Demographic and Health Survey 2014*. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International.; 2014.



21. Bangladesh Bureau of Statistics (BBS). Report of the household income & expenditure survey 2010. Dhaka, Bangladesh: New Panama Printing Press, BBS, Statistics division, Ministry of Planning, The Government of the People's Republic of Bangladesh. 2011:1-583.
22. Molla AA, Chi C, Mondaca ALN. Predictors of high out-of-pocket healthcare expenditure: an analysis using Bangladesh household income and expenditure survey, 2010. *BMC Health Services Research*. 2017;17(1):94. doi:10.1186/s12913-017-2047-0.
23. Sidney K, Salazar M, Marrone G, Diwan V, DeCosta A, Lindholm L. Out-of-pocket expenditures for childbirth in the context of the Janani Suraksha Yojana (JSY) cash transfer program to promote facility births: who pays and how much? Studies from Madhya Pradesh, India. *International Journal for Equity in Health*. 2016;15(1):71. doi:10.1186/s12939-016-0362-4.
24. Yang J. Interpreting coefficients in regression with log-transformed variables. *Cornell University: Cornell Statistical Consulting Unit*. 2012;(June):4.
25. Hossain MG, Saw A, Alam R, Ohtsuki F, Kamarul T. Multiple regression analysis of anthropometric measurements influencing the cephalic index of male Japanese university students. *Singapore Medical Journal*. 2013;54(9):516-520. doi:10.11622/smedj.2013175.
26. MOHFW. *Bangladesh Health Bulletin 2015*. Dhaka, Bangladesh; 2015. doi:10.1017/CBO9781107415324.004.
27. UNFPA/UNICEF/ WHO. *Guidelines for Monitoring the Availability and Use of Obstetric Services*. Second Edi. (Maine D, Wardlaw TM, Ward VM, et al., eds.). New York, USA: United Nations Children's Fund; 1997. doi:10.1016/j.ijgo.2011.05.004.
28. Chowdhury OH, Osmani SR. Towards achieving the right to health: The case of Bangladesh. *The Bangladesh Development Studies*. 2010;33(1/2):205-273.
29. MOHFW. *Expanding Social Protection for Health: Towards Universal Coverage, Health Care Financing Strategy 2012-2032*. Dhaka, Bangladesh; 2012.
30. WHO. *Health Systems Financing: The Path to Universal Health Coverage. World Health Report 2010*. Geneva, Switzerland; 2010.
31. Andaleeb SS. Public and private hospitals in Bangladesh: service quality and predictors of hospital choice. *Health policy and planning*. 2000;15(1):95-102. doi:10.1093/heapol/15.1.95.
32. Nahar S, Costello A. Research report. The hidden cost of "free" maternity care in Dhaka, Bangladesh. *Health Policy and Planning*. 1998;13(4):417. doi:10.1093/heapol/13.4.417.
33. Afsana K. The tremendous cost of seeking hospital obstetric care in Bangladesh. *Reproductive Health Matters*. 2004;12(24):171-180. doi:10.1016/S0968-8080(04)24142-8.
34. Khan SH. Free does not mean affordable: Maternity patient expenditures in a public hospital in Bangladesh. *Cost Effectiveness and Resource Allocation*. 2005;3:1-7. doi:10.1186/1478-7547-3-1.
35. Killingsworth JR, Hossain N, Hedrick-Wong Y, Thomas SD, Rahman A, Begum T. Unofficial fees in Bangladesh: Price, equity and institutional issues. *Health Policy and Planning*. 1999;14(2):152-163. doi:10.1093/heapol/14.2.152.
36. Ahmed S, Khan MM. Is demand-side financing equity enhancing? Lessons from a maternal health voucher scheme in Bangladesh. *Social Science and Medicine*. 2011;72(10):1704-1710. doi:10.1016/j.socscimed.2011.03.031.

- 1  
2  
3 37. Ecker JL, Chen KT, Cohen AP, Riley LE, Lieberman ES. Increased risk of cesarean delivery  
4 with advancing maternal age: Indications and associated factors in nulliparous women.  
5 *American Journal of Obstetrics and Gynecology*. 2001;185(4):883-887.  
6 doi:10.1067/mob.2001.117364.
- 7  
8 38. Lin HC, Sheen TC, Tang CH, Kao S. Association between maternal age and the likelihood of a  
9 cesarean section: A population-based multivariate logistic regression analysis. *Acta Obstetrica  
10 et Gynecologica Scandinavica*. 2004;83(12):1178-1183. doi:10.1111/j.0001-  
11 6349.2004.00506.x.
- 12  
13 39. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a  
14 systematic review. *Birth (Berkeley, Calif)*. 2010;37(3):219-226. doi:10.1111/j.1523-  
15 536X.2010.00409.x.
- 16  
17 40. Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic Status, Education and  
18 Empowerment: Implications for Maternal Health Service Utilization in Developing Countries.  
19 Shea BJ, ed. *PLoS ONE*. 2010;5(6):e11190. doi:10.1371/journal.pone.0011190.
- 20  
21 41. Ronsmans C, Chowdhury ME, Koblinsky M, Ahmed A. Recours aux soins au moment de  
22 l'accouchement et mortalité maternelle et périnatale à Matlab, au Bangladesh. *Bulletin of the  
23 World Health Organization*. 2010;88(4):289-296. doi:10.2471/BLT.09.069385.
- 24  
25 42. Sarker AR, Sheikh N, Mahumud RA, Sultana M. Determinants of adolescent maternal  
26 healthcare utilization in Bangladesh. *Public Health*. 2018;157:94-103.  
27 doi:10.1016/j.puhe.2018.01.010.
- 28  
29 43. Gregorio J De, Lee J-W. Education and Income Inequality: New Evidence From Cross-  
30 Country Data. *Review of Income and Wealth*. 2002;48(3):395-416. doi:10.1111/1475-  
31 4991.00060.
- 32  
33 44. Navaneetham K, Dharmalingam A. Utilization of maternal health care services in Southern  
34 India. *Social Science & Medicine*. 2002;55:1849-1869. doi:10.1016/S0277-9536(01)00313-6.
- 35  
36 45. Desai S, Jain D. Maternal Employment and Changes in Family Dynamics : The Social Context  
37 of Women ' s Work in Rural South India. *Population and Development Review*.  
38 2009;20(1):115-136.
- 39  
40 46. Johnson AA, Hatcher BJ, El-Khorazaty MN, et al. Determinants of Inadequate Prenatal Care  
41 Utilization by African American Women. *Journal of Health Care for the Poor and  
42 Underserved*. 2007;18(3):620-636.
- 43  
44 47. Beeckman K, Louckx F, Putman K. Predisposing, enabling and pregnancy-related  
45 determinants of late initiation of prenatal care. *Maternal and Child Health Journal*.  
46 2011;15(7):1067-1075. doi:10.1007/s10995-010-0652-1.
- 47  
48 48. Agha S, Williams E. Quality of antenatal care and household wealth as determinants of  
49 institutional delivery in Pakistan: Results of a cross-sectional household survey. *Reproductive  
50 Health*. 2016;13(1):1-8. doi:10.1186/s12978-016-0201-5.
- 51  
52 49. Acharya DR, Bell JS, Simkhada P, van Teijlingen ER, Regmi PR. Women's autonomy in  
53 household decision-making: a demographic study in Nepal. *Reproductive health*. 2010;7(1):15.  
54 doi:10.1186/1742-4755-7-15.
- 55  
56 50. Begum T, Rahman A, Nababan H, et al. Indications and determinants of caesarean section  
57 delivery: Evidence from a population-based study in Matlab, Bangladesh. *PLoS ONE*.  
58 2017;12(11):1-16. doi:10.1371/journal.pone.0188074.
- 59  
60 51. Xu X, Lee HC, Lin H, et al. Hospital Variation in Cost of Childbirth and Contributing Factors:

1  
2  
3 A Cross-Sectional Study. *BJOG: An International Journal of Obstetrics and Gynaecology*.  
4 2017;12(10):3218-3221. doi:10.1111/ijlh.12426.

- 5  
6 52. Rahman MM, Rahman MM, Tareque MI, Ferdos J, Jesmin SS. Maternal pregnancy intention  
7 and professional antenatal care utilization in Bangladesh: A nationwide population-based  
8 survey. *PLoS ONE*. 2016;11(6):1-15. doi:10.1371/journal.pone.0157760.
- 9  
10 53. Khan MN, Islam MM, Rahman MM. Inequality in utilization of cesarean delivery in  
11 Bangladesh: a decomposition analysis using nationally representative data. *Public Health*.  
12 2018;157:111-120. doi:10.1016/j.puhe.2018.01.015.

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17 Table 1: Background characteristic of delivered mother, (N=4,566)

18 Table 2: Distribution of child delivery cost in Bangladesh, US\$

19 Table 3: Factor association with child delivery cost

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24 Figure 1. Out of pocket expenditure during child delivery across divisions

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26 Figure 2. Coping strategies during child delivery

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29 Supplement 1. Study flow chart



**Table 1:** Background characteristic of delivered mother, (N=4,566)

Variables	n (%)	95% CI
<b>Age, years (mean ± SD)</b>	24.58 ± 5.75	
<b>Age group</b>		
15 - 19	957 (20.95)	(19.80-22.16)
20 - 24	1,531 (33.53)	(32.17-34.91)
25 - 34	1,804 (39.51)	(38.10-40.94)
35 - 49	274 (06.01)	(05.36-06.74)
<b>Women's education</b>		
No education	647 (14.18)	(13.19-15.22)
Primary	1,277 (27.97)	(26.69-29.29)
Secondary	2,187 (47.90)	(46.46-49.35)
Higher	454 (09.95)	(09.11-10.85)
<b>Husband education</b>		
No education	1,093 (23.94)	(22.72-25.20)
Primary	1,371 (30.03)	(28.72-31.38)
Secondary	1,459 (31.96)	(30.62-33.32)
Higher	643 (14.08)	(13.10-15.12)
<b>Husband occupation</b>		
Farmer	1,172 (25.66)	(24.42-26.95)
Day labor	490 (10.73)	(09.86-11.66)
Factory worker	405 (08.87)	(08.08-09.73)
Driver	1,100 (24.08)	(22.86-25.34)
Service holder	267 (05.86)	(05.21-06.58)
Business	992 (21.72)	(20.55-22.94)
Other	141 (03.08)	(02.61-03.62)
<b>Mode of delivery</b>		
Home delivery	2,812 (61.59)	(60.16-62.99)
Institutional normal delivery	660 (14.45)	(13.46-15.50)
Caesarean section	1,094 (23.96)	(22.75-25.22)
<b>Household size</b>		
<4	569 (12.47)	(11.54-13.46)
4 - 5	1,795 (39.32)	(37.91-40.74)
>5	2,202 (48.22)	(46.77-49.67)
<b>Birth order</b>		
1	1,809 (39.62)	(38.21-41.05)
2 - 3	2,121 (46.45)	(45.00-47.90)
≥ 4	636 (13.93)	(12.96-14.97)
<b>Working status</b>		
Not working	3,478 (76.17)	(74.91-77.38)
Working	1088 (23.83)	(22.62-25.09)
<b>Mass media exposure (TV/Radio)</b>		
No exposure	1756 (38.46)	(37.06-39.88)
Exposure	2,810 (61.54)	(60.12-62.94)
<b>ANC visit</b>		
No ANC	984 (21.55)	(20.38-22.77)
1 - 3	2,160 (47.31)	(45.86-48.76)
≥ 4	1,422 (31.14)	(29.81-32.50)
<b>Place of residence</b>		
Urban	1,178 (25.81)	(24.56-27.10)
Rural	3,388 (74.19)	(72.90-75.44)
<b>Division</b>		
Rangpur	449 (09.83)	(09-10.73)
Sylhet	421 (09.22)	(08.42-10.10)
Barisal	262 (05.74)	(05.10-06.45)
Rajshahi	458 (10.04)	(09.20-10.95)
Khulna	365 (7.99)	(07.24-08.82)
Chittagong	1,002 (21.93)	(20.76-23.16)
Dhaka	1,609 (35.24)	(33.87-36.64)
<b>Wealth index</b>		
Poorest	992 (21.73)	(20.55-22.95)
Poorer	866 (18.97)	(17.86-20.13)
Middle	877 (19.21)	(18.10-20.38)
Richer	945 (20.70)	(19.54-21.90)
Richest	886 (19.40)	(18.28-20.57)
<b>Place of delivery</b>		
Home delivery	2,812 (61.59)	(60.16-62.99)
Public facilities	595 (13.03)	(12.08-14.03)

Private hospitals/clinic	1,039 (22.75)	(21.55-23.99)
Non-Government Organization (NGO)	115 (02.53)	(02.11-03.02)
Others	05 (0.11)	(0.05-0.27.00)

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For Peer Review

**Table 2: Distribution of child delivery cost in Bangladesh, US\$**

Variables	Home Delivery, (n=2,812)		Institutional Normal Delivery, (n=660)		Cesarean Section, (n=1,094)		Overall , (n=4,566)	
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)
<b>Age group</b>								
15 - 19	17.85 (28.24)	09.01 (24.46)	56.67 (57.91)	38.63 (51.50)	226.92 (133.40)	193.13 (128.75)	68.58 (108.16)	20.60 (70.82)
20 - 24	15.40 (22.71)	06.44 (18.03)	65.61 (81.01)	38.63 (51.50)	237.03 (137.93)	218.88 (193.13)	76.08 (119.05)	25.75 (83.69)
25 - 34	15.98 (28.00)	06.44 (18.35)	61.29 (80.13)	38.63 (57.94)	262.74 (168.77)	231.76 (167.38)	85.84 (140.54)	19.31 (110.73)
35 - 49	11.14 (16.57)	06.44 (12.88)	56.54 (65.90)	25.75 (51.50)	297.91 (163.99)	257.51 (193.13)	91.16 (151.12)	12.88 (139.06)
P-value	0.027		0.665		0.001		0.003	
<b>Women's education</b>								
No education	12.13 (21.73)	06.44 (12.88)	46.59 (44.72)	25.75 (49.57)	200.01 (120.27)	186.69 (128.75)	29.58 (63.64)	06.44 (25.11)
Primary	13.62 (24.27)	06.44 (14.81)	53.30 (62.02)	38.63 (50.86)	238.88 (140.54)	218.88 (193.13)	47.09 (93.77)	12.88 (36.05)
Secondary	18.43 (27.94)	10.30 (23.18)	60.99 (75.04)	38.63 (51.50)	248.71 (146.62)	231.76 (186.69)	88.75 (130.87)	25.75 (122.32)
Higher	23.79 (27.51)	12.88 (32.19)	88.87 (103.18)	64.38 (61.16)	265.37 (174.72)	257.51 (180.26)	175.72 (176.80)	128.75 (225.32)
P-value	<0.001		0.001		0.038		<0.001	
<b>Husband education</b>								
No education	12.96 (26.16)	06.44 (12.88)	45.56 (59.34)	25.75 (38.63)	215.88 (140.99)	193.13 (128.75)	35.31 (78.51)	06.44 (24.46)
Primary	15.63 (25.83)	06.44 (18.03)	52.18 (49.08)	38.63 (45.06)	238.25 (136.54)	193.13 (193.13)	54.78 (98.78)	12.88 (46.35)
Secondary	17.85 (24.49)	10.30 (23.18)	66.45 (88.25)	38.63 (57.94)	240.14 (142.3)	206.01 (193.13)	91.37 (130.38)	25.75 (122.32)
Higher	22.04 (27.96)	12.88 (21.89)	83.42 (89.63)	64.38 (56.65)	276.32 (173.38)	257.51 (167.38)	169.60 (177.40)	128.75 (231.76)
P-value	<0.001		<0.001		<0.001		<0.001	
<b>Husband occupation</b>								
Farmer	13.03 (22.67)	06.44 (12.62)	50.08 (52.89)	38.63 (47.64)	212.74 (129.06)	193.13 (128.75)	42.41 (83.90)	11.59 (37.34)
Day labor	13.41 (23.58)	06.44 (12.75)	48.79 (65.91)	25.75 (51.50)	210.38 (122.43)	206.01 (128.75)	38.47 (78.11)	07.73 (24.46)
Factory worker	15.78 (25.24)	06.44 (16.74)	59.93 (92.4)	38.63 (51.50)	268.36 (150.18)	257.51 (148.07)	71.64 (124.30)	15.13 (57.94)
Driver	18.31 (23.54)	12.88 (23.18)	68.52 (84.23)	38.63 (51.50)	237.93 (144.51)	193.13 (193.13)	84.08 (125.09)	25.75 (109.44)
Service holder	25.98 (27.67)	19.31 (32.19)	92.94 (113.43)	64.38 (55.36)	287.95 (185.63)	257.51 (167.38)	186.46 (189.93)	128.75 (221.46)
Business	17.65 (31.19)	07.73 (17.77)	56.33 (56.59)	38.63 (54.08)	255.36 (157.25)	244.63 (180.26)	101.70 (143.42)	25.75 (147.89)
Other	17.50 (40.06)	06.44 (24.46)	90.83 (88.38)	64.38 (70.82)	275.78 (103.40)	257.51 (141.63)	103.88 (132.87)	32.19 (186.69)
P-value	<0.001		0.003		<0.001		<0.001	
<b>Household size</b>								
<4	13.20 (19.58)	06.44 (12.39)	66.02 (91.05)	38.63 (45.06)	236.32 (143.03)	206.01 (167.38)	80.93 (126.49)	19.31 (97.85)
4 - 5	16.88 (30.35)	06.44 (18.03)	51.78 (59.05)	38.63 (48.28)	247.60 (153.81)	231.76 (193.13)	80.40 (128.82)	20.60 (96.57)
>5	15.75 (23.21)	06.63 (18.03)	68.16 (81.18)	38.63 (51.5)	255.90 (156.25)	231.76 (167.38)	77.88 (127.87)	19.31 (83.69)
P-value	0.087		0.024		0.376		0.786	
<b>Birth order</b>								
1	18.76 (27.85)	11.59 (21.89)	70.73 (83.03)	51.50 (51.50)	243.36 (141.99)	218.88 (193.13)	98.13 (133.43)	32.19 (145.49)
2 - 3	15.06 (25.99)	06.44 (18.54)	52.77 (65.15)	38.63 (47.64)	255.89 (165.39)	231.76 (193.13)	74.85 (129.88)	19.31 (73.39)
≥ 4	12.78 (20.68)	06.44 (12.49)	57.36 (74.26)	38.63 (50.54)	267.41 (164.50)	257.51 (238.20)	38.99 (90.19)	07.73 (24.46)
P-value	<0.001		0.010		0.305		<0.001	
<b>Working status</b>								
Not working	16.50 (26.88)	06.44 (19.31)	65.78 (79.61)	38.63 (51.50)	252.37 (155.22)	231.76 (193.13)	84.39 (132.16)	25.75 (109.44)
Working	14.00 (22.24)	06.44 (14.16)	44.33 (50.30)	25.75 (51.50)	238.20 (145.20)	206.01 (167.38)	60.95 (110.42)	12.88 (60.51)
P-value	0.032		0.003		0.253		<0.001	

1	<b>Mass media exposure</b>								
2	<b>(TV/Radio)</b>								
3	No exposure	13.91 (26.02)	06.44 (12.49)	64.43 (78.86)	38.63 (70.82)	217.54 (129.63)	193.13 (128.75)	41.16 (83.54)	09.01 (25.75)
4	Exposure	17.86 (25.51)	10.30 (23.18)	60.66 (74.07)	38.63 (45.06)	256.57 (157.27)	244.63 (180.26)	102.69 (144.08)	32.19 (146.78)
5	P-value	<0.001		0.564		0.002		<0.001	
6	<b>ANC visit</b>								
7	No ANC	11.9 (24.97)	06.44 (12.75)	56.22 (60.07)	25.75 (77.25)	261.16 (146.62)	257.51 (193.13)	24.49 (63.12)	06.44 (18.67)
8	1 - 3	17.20 (26.22)	09.01 (23.18)	52.71 (51.66)	38.63 (45.06)	234.83 (132.07)	193.13 (193.13)	71.18 (111.66)	25.75 (70.82)
9	≥ 4	19.06 (25.57)	10.43 (23.82)	73.20 (97.04)	38.63 (51.50)	261.15 (168.40)	257.51 (180.26)	127.85 (161.30)	64.38 (180.26)
10	P-value	<0.001		0.002		0.022		<0.001	
11	<b>Place of residence</b>								
12	Urban	17.76 (27.41)	06.73 (23.18)	52.74 (71.93)	38.63 (51.5)	258.12 (163.49)	257.51 (193.13)	113.89 (153.86)	38.63 (185.41)
13	Rural	15.34 (25.34)	06.44 (18.03)	67.81 (77.01)	38.63 (64.38)	241.83 (142.83)	206.01 (191.84)	62.90 (110.19)	12.88 (60.51)
14	P-value	0.043		0.009		0.084		<0.001	
15	<b>Division</b>								
16	Rangpur	11.21 (16.81)	06.44 (12.62)	53.55 (77.46)	25.75 (51.50)	187.47 (97.94)	167.38 (128.75)	54.46 (88.78)	12.88 (58.58)
17	Sylhet	13.76 (27.24)	06.44 (15.45)	87.14 (93.43)	48.28 (103.0)	329.78 (179.18)	321.89 (193.13)	64.66 (130.36)	12.88 (37.34)
18	Barisal	19.03 (29.18)	07.73 (21.89)	67.36 (69.88)	38.63 (69.53)	247.57 (130.57)	257.51 (167.38)	69.3 (111.50)	17.38 (70.82)
19	Rajshahi	13.11 (25.41)	06.44 (12.23)	38.24 (35.73)	25.75 (38.63)	197.62 (106.82)	186.69 (128.75)	69.48 (101.57)	19.31 (109.44)
20	Khulna	13.73 (23.00)	08.05 (10.30)	32.90 (22.83)	25.75 (31.54)	193.73 (118.76)	167.38 (128.75)	81.64 (110.59)	25.75 (119.74)
21	Chittagong	24.28 (29.75)	12.88 (19.31)	88.97 (100.75)	64.38 (64.38)	311.59 (162.56)	270.39 (193.13)	92.72 (141.83)	25.75 (80.47)
22	Dhaka	11.77 (20.07)	06.44 (12.88)	61.04 (62.12)	38.63 (51.50)	280.31 (175.00)	257.51 (154.51)	106.19 (160.95)	25.75 (177.68)
23	P-value	<0.001		<0.001		<0.001		<0.001	
24	<b>Wealth index</b>								
25	Poorest	12.63 (25.47)	06.44 (12.88)	65.21 (69.24)	38.63 (69.53)	204.25 (119.20)	193.13 (154.51)	28.90 (63.17)	06.44 (25.11)
26	Poorer	14.46 (23.63)	06.44 (14.16)	44.19 (41.55)	25.75 (36.05)	225.91 (153.34)	193.13 (128.75)	43.17 (88.99)	12.88 (36.05)
27	Middle	17.01 (26.65)	08.37 (18.03)	54.13 (70.7)	38.63 (45.06)	223.35 (140.02)	193.13 (141.63)	63.76 (107.3)	19.31 (57.94)
28	Richer	18.82 (24.01)	12.88 (21.89)	58.70 (80.82)	38.63 (45.06)	231.77 (123.59)	206.01 (160.94)	90.39 (122.11)	25.75 (119.74)
29	Richest	22.20 (31.96)	12.88 (19.31)	80.05 (88.15)	64.38 (64.38)	281.03 (171.89)	257.51 (167.38)	170.84 (177.50)	128.75 (231.76)
30	P-value	<0.001		0.001		<0.001		<0.001	
31	<b>Palace of delivery</b>								
32	Home delivery	15.89 (25.84)	06.44 (18.03)	-	-	-	-	15.89 (25.84)	06.44 (18.03)
33	Public facilities	-	-	52.14 (64.66)	32.83 (45.06)	176.71 (128.80)	154.51 (167.38)	96.14 (109.98)	64.38 (103.00)
34	Private hospitals/clinic	-	-	92.60 (95.11)	64.38 (64.38)	271.24 (153.57)	257.51 (167.38)	234.95 (160.59)	193.13 (193.13)
35	Non-Government	-	-	31.81 (34.07)	20.60 (32.19)	203.74 (147.30)	154.51 (180.26)	79.49 (112.73)	38.63 (77.25)
36	Organization (NGO)	-	-	108.93 (87.43)	90.13 (16.74)	-	-	108.93 (87.43)	90.13 (16.74)
37	Others	-	-	108.93 (87.43)	90.13 (16.74)	-	-	108.93 (87.43)	90.13 (16.74)
38	P-value			<0.001		<0.001		<0.001	
39	<b>Total</b>	15.89 (25.84)	06.44 (18.03)	61.62 (75.28)	38.63 (57.94)	249.89 (153.54)	225.32 (193.13)	79.23 (128.05)	19.31 (83.69)

Note: 1 US\$=77.667 BDT at the end of month July, 2014; SD: Standard Deviation; IQR: Inter-Quartile range

**Table 3: Factor association with child delivery cost**

Parameters	Standard coefficient (S.E)			
	Model I	Model II	Model III	Model IV
	Home delivery	Institutional Normal Delivery	C- section delivery	Overall
<b>Age group</b>				
15 - 19 (ref)				
20 - 24	-0.06 (0.08)	0.28** (0.10)	-0.01 (0.06)	0.12 (0.07)
25 - 34	0.07 (0.10)	0.25 (0.13)	0.07 (0.07)	0.40*** (0.09)
35 - 49	-0.12 (0.16)	0.40 (0.22)	0.29** (0.11)	0.62*** (0.14)
<b>Women's education</b>				
No education (ref)				
Primary	-0.03 (0.09)	-0.10 (0.14)	0.12 (0.12)	0.05 (0.09)
Secondary	0.12 (0.09)	0.00 (0.14)	0.11 (0.11)	0.24** (0.09)
Higher	0.29 (0.17)	0.04 (0.19)	0.03 (0.12)	0.50*** (0.13)
<b>Husband education</b>				
No education (ref)				
Primary	0.08 (0.07)	0.15 (0.12)	0.10 (0.09)	0.14 (0.07)
Secondary	0.00 (0.08)	0.17 (0.12)	0.07 (0.09)	0.18* (0.08)
Higher	0.14 (0.14)	0.40** (0.16)	0.11 (0.10)	0.45*** (0.11)
<b>Husband occupation</b>				
Farmer (ref)				
Day labor	0.06 (0.09)	-0.22 (0.14)	-0.03 (0.11)	-0.02 (0.09)
Factory worker	-0.03 (0.11)	-0.12 (0.15)	0.14 (0.10)	-0.06 (0.10)
Driver	0.04 (0.08)	0.00 (0.12)	0.03 (0.08)	0.00 (0.08)
Service holder	0.15 (0.19)	0.06 (0.19)	0.17 (0.09)	0.24 (0.13)
Business	0.01 (0.08)	-0.07 (0.12)	0.07 (0.08)	0.17* (0.08)
Other	0.14 (0.18)	0.18 (0.21)	0.14 (0.13)	0.31* (0.15)
<b>Household size</b>				
<4	-0.29*** (0.09)	-0.04 (0.11)	-0.02 (0.07)	-0.11 (0.08)
4 - 5	0.00 (0.06)	-0.15 (0.08)	-0.01 (0.05)	0.05 (0.05)
>5 (ref)				
<b>Birth order</b>				
1	0.21 (0.12)	0.34* (0.17)	0.06 (0.11)	0.68*** (0.11)
2 - 3	-0.05 (0.09)	0.07 (0.14)	0.09 (0.1)	0.21* (0.09)
≥ 4 (ref)				
<b>Working status</b>				
Not working (ref)				
Working	-0.10 (0.06)	-0.20* (0.09)	0.00 (0.06)	-0.27*** (0.06)
<b>Mass media</b>				
Not exposure (ref)				
Exposure	0.07 (0.07)	-0.19* (0.10)	0.06 (0.06)	0.05 (0.06)
<b>ANC visit</b>				
No ANC (ref)				
1 - 3	0.38*** (0.07)	0.08 (0.13)	-0.15 (0.11)	0.66*** (0.07)
≥ 4	0.47*** (0.08)	0.27 (0.14)	-0.12 (0.11)	0.99*** (0.08)
<b>Place of residence</b>				
Urban	0.00 (0.07)	-0.40*** (0.08)	-0.09 (0.05)	0.00 (0.06)
Rural (ref)				
<b>Division</b>				
Rangpur (ref)				
Sylhet	0.29** (0.11)	0.68*** (0.14)	0.48*** (0.10)	0.21* (0.10)
Barisal	0.36*** (0.11)	0.33* (0.15)	0.24** (0.09)	0.21* (0.10)
Rajshahi	0.11 (0.11)	0.02 (0.13)	0.04 (0.08)	0.24** (0.10)
Khulna	0.12 (0.12)	-0.03 (0.13)	-0.02 (0.08)	0.33*** (0.10)
Chittagong	0.74*** (0.10)	0.64*** (0.13)	0.47*** (0.08)	0.47*** (0.09)
Dhaka	0.20 (0.11)	0.43*** (0.14)	0.30*** (0.08)	0.45*** (0.09)
<b>Wealth quintile</b>				
Poorest (ref)				
Poorer	-0.04 (0.08)	-0.35** (0.13)	-0.02 (0.11)	0.02 (0.08)
Middle	-0.07 (0.09)	-0.35** (0.14)	-0.05 (0.11)	0.15 (0.09)
Richer	0.05 (0.10)	-0.25 (0.14)	-0.02 (0.11)	0.36*** (0.09)
Richest	0.14 (0.13)	-0.03 (0.16)	0.09 (0.12)	0.78*** (0.11)
Intercept	5.87	7.65	9.22	5.46
N	2,812	660	1,094	4,566
Adjusted R-square	0.08	0.21	0.10	0.25
Mean VIF	1.90	2.49	3.67	2.19
F-value, (Prob > F)	6.66***	6.38***	4.56***	40.12***

S.E: Standard Error; VIF: Variance Inflation Factor; ref: Reference; \*P<0.05; \*\*P<0.01; \*\*\*P<0.001

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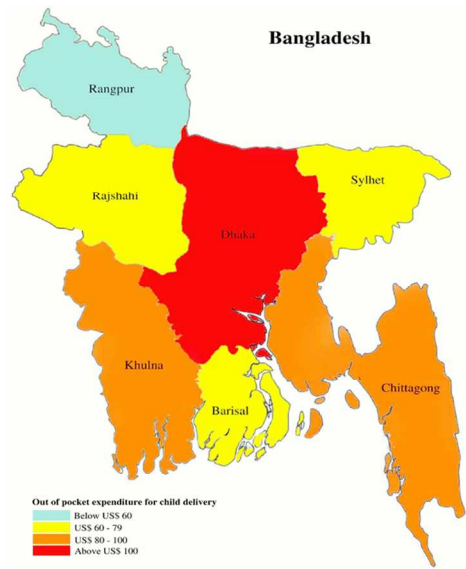


Figure 1 Out of pocket expenditure during child delivery across divisions

108x60mm (300 x 300 DPI)

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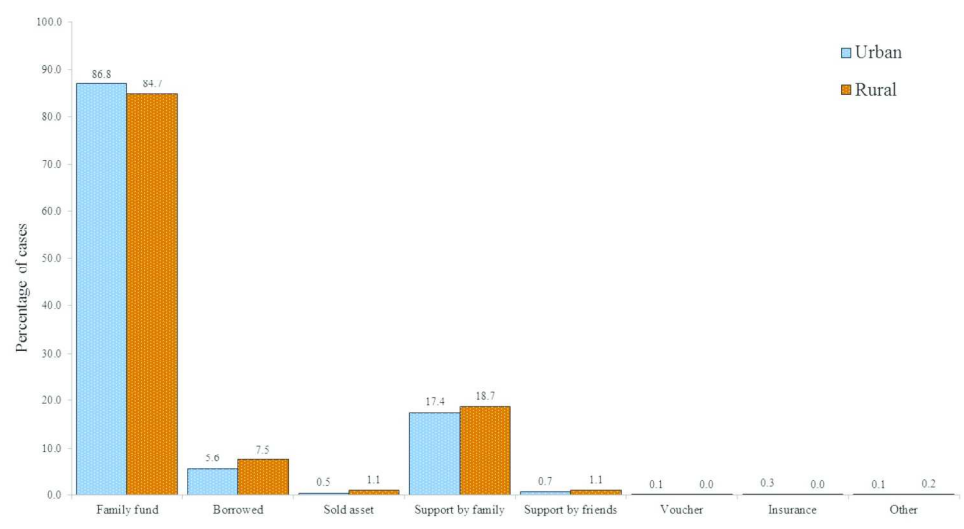


Figure 2. Coping strategies during child delivery

338x190mm (300 x 300 DPI)