International Journal of Business and Society, Vol. 26 No. 2, 2025, 490-510

DETERMINANTS OF OUT-OF-POCKET HEALTH EXPENDITURE FOR OUTPATIENT TREATMENT OF CHILDREN UNDER 5 IN BANGLADESH

Shahnaz Haque
Economics, School of Social Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
Faculty of Department of Economics, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

Saidatulakmal Mohd[♣]
Economics, School of Social Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
USM Initiatives on Ageing (USIA), Universiti Sains Malaysia, 11800 USM, Penang, Malaysia

ABSTRACT

The healthcare financing system in Bangladesh is predominantly characterized by out-of-pocket (OOP) health expenditure. However, despite the implementation of a strategy designed to alleviate this issue, OOP health expenditures continue to rise. This study aims to analyze the determinants of OOP health expenditure for ill children under 5, utilizing data from the Bangladesh Household Income and Expenditure Survey, 2016. The data indicate that 68.58% of the total OOP health expenditure is allocated to the purchase of medication. The ordinary least squares (OLS) method is employed to examine the factors influencing OOP health expenditure. The key findings indicate that OOP health expenditure for seeking outpatient care for female children is lower than that for male children, and children residing in urban areas are associated with higher OOP expenditure compared to those in rural areas. Additionally, the age of the child, types of illnesses, types of healthcare providers, delayed treatment, and sources of medicine significantly impact OOP health expenditure. Addressing these issues requires government intervention to reduce discrimination and regulate the price of medicine. It is also noteworthy that OOP health expenditure for children whose mothers have an income is lower, which warrants further investigation.

Keywords: Out-of-pocket health expenditure, children under 5, determinants of health expenditure, OOP health expenditure, Bangladesh.

Received: 22nd October 2024
Accepted: 17th May 2025
https://doi.org/10.33736/ijbs.8077.2025

♣Corresponding author: School of Social Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia; email: eieydda@usm.my; Tel: +60123463672

1. INTRODUCTION

Out-of-pocket (OOP) healthcare expenditure refers to the monetary contributions made directly by patients or users to cover their medical expenses. This form of healthcare financing is predominant in the majority of low- and middle-income countries. A report published on the East Asia Forum in 2022 stated that low- and middle-income countries had an average OOP healthcare expenditure of 35.25 percent in 2019. In contrast, advanced economies had an average OOP expenditure of 13.26 percent. It is worth noting that this percentage aligns with the World Health Organization's (WHO) recommended maximum of 20 percent (Prasetya & Afrina, 2022). However, in 2020, this percentage stood at 68.5% in Bangladesh (The Daily Star, 2021). Financial challenges can often result in individuals accumulating debt or selling their assets to pay for medical treatment. This not only worsens their financial difficulties but also has the potential to affect the educational opportunities available to their children. Essentially, the extensive dependence on OOP payments significantly impacts the overall standard of living in the household (Molla & Chi, 2017).

In the Malaysian context, extensive research has demonstrated that increasing OOP health expenditure has a deleterious effect on the health outcomes of children under 5 (Logarajan et al., 2022). Government health expenditure has the potential to mitigate the disparities in under-5 mortality rate indicators between rural and urban regions (Pertiwi & Sjaaf, 2022). As part of the Sustainable Development Goals (SDGs) related to children's health, a key objective is to eliminate avoidable infant and child mortality by 2030. It is highly recommended that all nations take decisive measures to reduce neonatal mortality rates to a level of 12 per 1,000 live births, as well as strive to attain a minimum under-5 mortality rate of 25 per 1,000 live births (United Nations, 2015). In this particular context, SDG 3.8, pertaining to the achievement of Universal Health Coverage (UHC), encompasses the aim of delivering financial risk protection and guaranteeing affordable access to essential medicines and vaccines for all individuals (United Nations, 2015).

Basic vaccination coverage among children has been nearly accomplished in Bangladesh (BDHS, 2020) and shows significant progress in reducing the under-5 mortality rate to 31.0 per 1,000 live births in 2020 (World Bank, 2023a). However, this rate is still relatively high compared to the SDG targets. Moreover, inadequate utilization of healthcare services remains a significant factor in predicting under-five mortality, which has the potential to hinder progress toward the SDG target of reducing the under-5 mortality rate (Khan et al., 2021). However, only approximately 28% and 25.6% of children under 5 suffering from diarrhea and fever/cough, respectively, sought formal treatment in Bangladesh (Ahmed & Yunus, 2020). In contrast, another study reported these figures to be 36% and 37%, respectively (Khanam & Hasan, 2020). Therefore, a larger proportion of children under 5 are not receiving formal treatment.

Health system financing (HSF) in Bangladesh is characterized by a significant dependence on OOP health expenditure by users (Molla & Chi, 2017), with no formal health insurance coverage. The healthcare finance system in Bangladesh involves four key parties: the government, service users, international development aid, and non-governmental organizations (NGOs). The majority of healthcare funding is sourced from out-of-pocket expenditures made by service users, constituting 67% of the total healthcare spending. The government contributes 23% of the funds

through tax revenue and development outlays, while 8% is derived from international development assistance and 2% from NGOs (BHFS, 2019).

It is noteworthy that the Health Care Financing Strategy 2012-2032, published by the Health Economics Unit (HEU) of the Ministry of Health and Family Welfare, aims to reduce OOP healthcare expenses to 32% by the year 2032 (MoHFW, 2012). Despite the implementation of this strategy, OOP expenses accounted for approximately 67% of the overall healthcare expenditure by households in 2015, as reported by the Bangladesh National Health Accounts (2017). This percentage increased to 68.5% in 2020 (The Daily Star, 2021). Furthermore, the World Bank (2023b) indicates that OOP expenditure constituted 74% of the current health expenditure in 2020. Another policy projected that the government's health budget would increase from 5% of the total public budget to 15% by the year 2032. However, as of 2020, this figure had not deviated from its 2012 level, remaining at 5%. Furthermore, the proportion of households facing catastrophic health expenditures increased from 15% in 2012 to 24.6% in 2016, contrary to the expectation that this figure would decrease to zero by 2023, as indicated in the review of the Health Care Financing Strategy 2012-2032 (HEU, 2023). This stagnation serves as further motivation for conducting this research.

Additionally, the percentage of individuals in rural areas who forgo any form of treatment due to high healthcare costs rose from 14.02% in 2010 (BBS, 2010) to 20% in 2016 (BBS, 2019), highlighting the adverse impact of healthcare costs on the rural population in Bangladesh. Moreover, individuals seeking treatment often engage in various financial strategies to manage their substantial expenses, including borrowing funds from external sources, utilizing family resources, receiving donations from relatives, liquidating assets, and obtaining bank loans, among other methods (Tahsina et al., 2018).

Furthermore, a prior investigation carried out in Bangladesh evidenced an upward trend in OOP health expenditures for children under 5 (Tahsina et al., 2017). There are very few scholarly studies that specifically examine the cost of healthcare for children under 5, particularly concerning the economic impact of hospitalizations due to rotavirus and diarrheal diseases and hardship financing (Ahmed et al., 2021; Sarker et al., 2019; Tahsina et al., 2017; Tahsina et al., 2018). In a study in rural Bangladesh, male children received a higher allocation of health expenditures compared to female children who suffer from diarrheal disease (Das et al., 2015). Conversely, another study found similar healthcare costs for both male and female children suffering from rotavirus (Ahmed et al., 2021). But what happens to health expenditure for children if they are suffering from any illnesses? Studies focusing on predictors of OOP health expenditure for children under 5 have been limited in recent years. It is essential to identify what the factors are and how they influence OOP health expenditures for children under 5, utilizing recent data.

Although substantial progress has been made in achieving basic vaccination coverage as a preventive measure, there remains a critical need for access to qualified healthcare at affordable prices to sustain the declining trend in the under-5 mortality rate and to attain UHC. Nevertheless, despite the implementation of national strategies aimed at reducing OOP health expenditures, there continues to be a concerning increase in OOP health spending. This trend imposes a significant financial burden on households. Accordingly, the purpose of this study is to examine the factors that impact OOP health expenditure for outpatient care for children under 5

in Bangladesh. The analysis will employ the latest nationally representative data from the Household Income and Expenditure Survey (HIES) of 2016. By identifying the determinants of OOP health spending, this study will contribute valuable insights to policymakers. These insights will help them determine whether adjustments to existing strategies are necessary to alleviate the burden of OOP health expenditures or if a financial protection mechanism should be established. In addition, this study can be generalized as it includes children under 5 suffering from various types of illnesses and utilizes the nationally representative HIES 2016 dataset, which encompasses samples from across the entire country.

This paper is organized as follows: Section 1 provides the introduction; Section 2 discusses the literature review; Section 3 delineates the research methodology; Section 4 presents the results and discussion, including the implications of the study; and Section 5 concludes the study.

2. LITERATURE REVIEW

Numerous factors contribute to healthcare spending, such as access to healthcare facilities, economic well-being, the type and severity of illnesses, and enrollment in health insurance programs (Aregbeshola & Khan, 2018). In the case of children, higher healthcare expenditure is associated with younger children in Bangladesh (Hasan et al., 2021; Sultana et al., 2021). Moreover, no notable variations in healthcare expenses were observed between male and female children in Northern India based on statistical analysis (Srivastava et al., 2009). In Bangladesh, healthcare expenditure is positively associated with males and the elderly (Mahumud et al., 2017; Sarker et al., 2014). In India, there is a notable disparity in healthcare expenditure between girl children and boy children (Mishra et al., 2017). Furthermore, the type of illness or having a chronic illness also affects OOP health expenditure. In India, the prevalence of diarrheal illness among children under 5 is associated with increased OOP health expenditures (Pradhan et al., 2020). In sub-Saharan African nations, the prevalence of malaria among children under 5 places a significant economic strain on households as a consequence of out-of-pocket health expenditures (El-Houderi et al., 2019).

The severity of illness and the type of healthcare provider have a substantial influence on the cost of treatment (Schreiber Pedersen et al., 2018; Srivastava et al., 2009). The selection of a healthcare provider directly affects healthcare expenditure (Njagi et al., 2018). Opting for private healthcare facilities increases OOP health expenditure for children under 5 in urban areas of Puducherry (Nair et al., 2015). Additionally, a study found that trained healthcare providers (both private and public) increase OOP expenditure. By utilizing cross-sectional data, determinants of OOP health expenditure were estimated using linear regression; however, that study was limited to rural areas in Bangladesh (Tahsina et al., 2017). Molla et al. (2017) investigated the predictors of OOP household healthcare expenditure by applying the ordinary least squares (OLS) estimation technique in Bangladesh and found increased OOP household health expenditure for families with children under 5. Mugisha et al. (2002) employed Tobit regression for the analysis, utilizing OOP health expenditure as the outcome variable. Several factors, such as the healthcare provider, the specific disease being treated, and the levels of poverty, have a significant impact on the burden of funding healthcare expenses (Aregbeshola & Khan, 2018; Tahsina et al., 2018).

Moreover, socioeconomic or household factors influence healthcare expenditure. Disparities in healthcare expenditure in Malawi can be attributed to factors including socioeconomic status, region of residence, household size, and the presence of children under 5 (Mulaga et al., 2022). Employed mothers in Australia, according to Hayes et al. (2016), allocated a greater amount of their financial resources toward early childhood healthcare compared to their unemployed counterparts. Children residing in urban areas incur higher OOP health expenditure (El-Houderi et al., 2019). However, having more children in a household increases OOP health expenditure (Ebaidalla & Ali, 2019).

Healthcare or community factors influence OOP health expenditure. A positive correlation between the distance to the healthcare facility and OOP health expenditure has been consistently observed in previous scholarly investigation (Ebaidalla & Ali, 2019; Rocque et al., 2019). Another study conducted by Nakovics et al. (2019), utilizing the two-part model, revealed that distance exhibits a negative correlation with the probability of incurring positive OOP expenses while simultaneously demonstrating a positive association with the magnitude of OOP health expenditures. Medication cost is the primary driver of high OOP health expenditure (Nair et al., 2015; Tahsina et al., 2017). Health expenditure is higher due to drug prices and hospital charges in India (Kumar et al., 2019).

In the existing literature, it has been found that most studies on parents' OOP health expenditure for children under 5 in Bangladesh were conducted for common childhood illnesses, specific diseases, or were limited to specific areas (Hasan et al., 2021; Sultana et al., 2021; Tahsina et al., 2017). While Tahsina et al. (2017) examined the determinants of OOP health expenditure for children under 5 residing only in rural areas, mothers' employment status was not included in that study, which could affect OOP health expenditure. However, Molla et al. (2017) only considered the presence of chronic illness and did not take into account the impact of other illnesses on OOP household health expenditure. Addressing these research gaps, this study attempts to examine the factors that influence OOP health expenditure for children under 5 suffering from any illnesses. Utilizing the recent nationally representative Bangladesh HIES 2016 data, the analysis provides a comprehensive understanding of these expenditures. Furthermore, the study adjusts the OOP health expenditure and household income variables for inflation, thereby presenting a more accurate representation of the economic landscape.

3. METHODOLOGY

3.1. Data Source

This study constitutes a cross-sectional investigation that draws upon secondary data sources obtained from the Bangladesh Household Income and Expenditure Survey (HIES) 2016. The survey was administered by the Bangladesh Bureau of Statistics (BBS) under the diligent oversight of the Statistics and Informatics Division (SID). The World Bank and World Food Programme provided financial and technical support for this survey (BBS, 2019). In the process of collecting data, a stratified, two-stage clustered sampling design was used, and to stratify the country, all eight divisions were classified into three primary localities: rural, urban, and city (BBS, 2019). The survey included a total sample size of 46,080 households and individuals, comprising approximately 186,055 participants. Among the participants, the total sample size of

ill children from 0 to 5 years of age who sought any form of treatment was included in this study, amounting to 6,474. In the survey, the household head or the parents of the children were responsible for completing the questionnaires pertaining to children under the age of five.

3.2. Method

The utilization of healthcare can be expressed through the cost of utilization. Therefore, the costs or expenditures of healthcare can be analyzed based on the theoretical framework of Grossman's (1972) model of demand for good health, which is also followed by Acton (1975) and used in a previous study (Masiye & Kaonga, 2016). This framework is similar to utility maximization and the household production of health, as described by Lindelow (2002). An individual's health stock depends on their individual attributes, healthcare, and household characteristics, which determine their investment in healthcare. It is assumed that individuals derive positive utility from their health stock.

This study initially employed univariate analysis to document the frequency distribution of all variables, as presented in the table. After applying filters, the ultimate sample size for the present study was 6,474. Here, the dependent variable is OOP health expenditure for outpatient treatment. The cost data are in nominal terms in the HIES 2016. To account for inflation, we converted the OOP health expenditure and household income to real values using the national consumer price index (CPI) (Gimenez & Jolliffe, 2014), with the base year set as 2005–2006 in Bangladesh.

Furthermore, we employed the OLS regression model for estimation, incorporating robust standard errors. We also conducted various diagnostic tests to validate the model. The OLS model has been widely utilized in previous studies to estimate cost variables (Molla et al., 2017; Tahsina et al., 2017). Since our sample contains very few observations with zero cost, the OLS method is suitable for estimating OOP health expenditure (Sun et al., 2021). Data analysis was conducted using STATA 17.0 software.

3.3. Variables

The dependent variable, real OOP health expenditure for children under 5, is defined as:
Real Out-of-Pocket (OOP) health expenditure = ln_BDT (Bangladeshi Taka) spent on outpatient treatment during the past 30 days of the survey. Such OOP health expenditure on outpatient treatment consists of consultation fees, the cost of medicine, the cost of tests or investigations, and transportation costs. The regression model can be expressed as:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} + \beta_{11} X_{11i} + \beta_{12} X_{12i} + \varepsilon_i \ldots\ldots (1)$$

Where Y is the dependent variable, β_0 is the intercept term, β_1, β_2, β_3, ... are parameters, X_1, X_2, X_3, …… are independent variables, and ε is a random disturbance term. The independent or explanatory variables are divided into three attributes following Lindelow's (2002) classification: individual, household, and healthcare or community attributes/characteristics, which are given and defined in the following Table 1.

Table 1: Dependent and Independent Variables

Variables		Definition
Dependent variable Real out-of-pocket (OOP) health expenditure for ill children under 5 years (Y)		ln_BDT (Bangladeshi Taka) spent on outpatient treatment during the past 30 days of the survey consists of consultation fees, the cost of medicine, the cost of tests or investigations, and transportation costs.
Independent Variables		
Individual characteristics	Age of the ill child (X_1)	= 1 if 0 to 2 years of age = 2 if 3 to 5 years of age
	Sex of child (X_2)	= 1 if a child is male = 2 if female
	Health status of a child (X_3)	= 1 if a child has been suffering from any chronic illness = 0 if there is no chronic illness
	Delayed treatment (X_4)	= 0, if no delay = 1, if delayed 1 to 2 days = 2, if delayed 3 to 4 days = 3, if delayed 5 or more days
	Types of illnesses (X_5)	= 1 if fever = 2 if diarrhea and dysentery = 3 if pain and injury = 4 if respiratory diseases = 5 if pneumonia = 6 if skin diseases = 7 if others
	Types of healthcare providers (X_6)	= 1 if treatment is sought from a qualified healthcare provider = 2 if treatment is sought from a non-qualified healthcare provider = 3 if treatment is sought from a pharmacy/traditional/self-care
Household characteristics	Earning status of mothers (X_7)	=1 if mothers have income =0 if mothers have no income
	Total number of children (X_8)	Total number of children (0–5 years) in a household
	Household real monthly income (X_9)	ln_BDT (Bangladeshi Taka)
	Place of residence (X_{10})	=1 if rural =2 if urban

Healthcare or community characteristics	Distance to healthcare providers (X_{11})	Time to reach a healthcare provider =1 if >0.4 hours or 24 minutes =0 if <0.4 hours
	Sources of medicine (X_{12})	= 1 if receiving medicine from the government or public healthcare facility = 2 if received from an NGO facility = 3 if received from a private health facility = 4 if received from a pharmacy/dispensary = 5 if received from other facilities

4. RESULTS AND DISCUSSION

This study aimed to investigate the determinants of OOP health expenditure for children under the age of five who sought outpatient treatment in Bangladesh. The descriptive statistics presented in Table 2 indicate that the average OOP health expenditure stands at 631 Bangladeshi Taka (BDT). The average monthly household income is approximately 20,720 BDT. The data reveal no statistically significant differences in health expenditure between the two age groups or between male and female children. Chronic illnesses are relatively uncommon within the sample, affecting only about 6% of the children. However, these conditions, which necessitate prolonged observation for accurate diagnosis, are not prevalent among the sample population. In terms of prevalent childhood illnesses, fever is reported most frequently, followed by diarrhea, which affects approximately 9.42% of the children in the sample. Approximately 60% of the population resides in rural areas of Bangladesh; however, in our sample, a substantial proportion of children (71%) live in rural areas, while 29% are located in urban areas. While basic vaccination coverage among children has nearly been achieved, over 60% of ailing children received treatment from non-qualified healthcare providers, pharmacies, or through self-care/traditional remedies.

Table 2: Descriptive Statistics for all Variables

Variables	Obs	Mean	Std. Dev.	Min	Max
OOP health expenditure (nominal BDT)	6,474	631.1443	1,304.254	0	39,060
OOP health expenditure (real BDT)	6,474	272.2562	562.6151	0	16,849.28
Monthly Household income (nominal BDT)	6,474	20,719.77	43,533.13	0.25	913,750
Monthly Household income (real BDT)	6,474	8,937.868	18,778.85	0.107842	394,163.6
Total number of children (0–5 years)	6,474	1.344918	0.5540182	1	5

Variables	Frequency	Percentage (%)
Age of the ill child		
0-2 years	3,513	54.26
3-5 years	2,961	45.74
Total	6,474	100
Sex of child		
Male	3,383	52.26
Female	3,091	47.74
Total	6,474	100
Health status		
No chronic illness	6,088	94.04
Have chronic illness	386	5.96
Total	6,474	100
Types of illnesses		
Fever	4,726	73.00
Diarrhea	610	9.42
Pain/injury	148	2.29
Respiratory diseases	201	3.10
Pneumonia	225	3.48
Skin diseases	107	1.65
Others	457	7.06
Total	6,474	100
Delayed treatment		
No delay	2,177	33.63
Delayed 1/2 days	3,429	52.97
Delayed 3/4 days	542	8.37
Delayed 5 or more days	326	5.04
Total	6,474	100

Types of healthcare providers		
Qualified healthcare	2,380	36.76
Non-qualified healthcare	1,615	24.95
Pharmacy/traditional/self-care	2,479	38.29
Total	6,474	100
Earning status of mothers		
Mothers have no income	5,955	91.98
Mothers have income	519	8.02
Total	6,474	100
Place of residence		
Rural	4,578	70.71
Urban	1,896	29.29
Total	6,474	100
Distance to healthcare providers		
Distance <0.4 hours	4,179	64.55
Distance >0.4 hours	2,295	35.45
Total	6,474	100
Sources of medicine		
Govt health facility	187	2.89
NGO health facility	19	0.29
Private health facility	19	0.29
Pharmacy/dispensary	6,007	92.79
Others	242	3.74
Total	6,474	100

Source: Bangladesh HIES, 2016; calculated by the author

A significant portion of healthcare expenditure is allocated to the purchase of medications; however, pharmacies and dispensaries serve as the primary sources of medication, with only about 3% of children receiving medicines from government healthcare facilities, despite these facilities offering free medications in Bangladesh. Therefore, the cost of medicine is one of the major components of OOP health expenditure.

This study further provides an account of the distribution of OOP health expenditures for children under 5. This information is presented in Table 3, which delineates the diverse constituents of OOP healthcare expenditure for outpatient treatments, including consultation fees, medication costs, investigation expenses, and transportation costs. Notably, approximately 69% of the overall OOP health expenditure is allocated toward the purchase of medicines. It is evident in Bangladesh that the expenditure on pharmaceuticals constitutes nearly two-thirds of the total expenditure (Mannan, 2013; Tahsina et al., 2017). That finding is also in line with a study conducted in India (Mishra et al., 2017).

Table 3: Distribution of OOP Health Expenditure

Components	Average BDT. (n)	% of total OOP healthcare expenditure
Consultation fees	96.74 (5,214)	15.33
Costs of medicine	432.83 (6,080)	68.58
Costs of investigation	71.72 (4,952)	11.36
Transportation costs	64.03 (5,409)	10.14
Total	631.14 (6,474)	100

Source: Bangladesh HIES, 2016

The findings of the ordinary least squares (OLS) regression with robust standard errors are displayed in Table 4. The third column of Table 4 shows the value of Exp(β) - 1, which explains the changes in the dependent variable concerning the independent variables.

Table 4: Results of OLS Regression regarding OOP Health Expenditure for Children under 5

Variables	Coefficient	Exp(β) - 1	P>t
Sex of child (ref. male)			
Female	-0.065***		
	(0.025)	-0.0629	0.009
Age of child (ref. 0-2 years)			
3-5 years	-0.140***		
	(0.025)	-0.1306	0.000
Health status (ref. there is no chronic illness)			
Chronic illness	0.157**		
	(0.071)	0.1699	0.027
Types of illnesses (ref. fever)			
	0.190***		
Diarrhea	(0.044)	0.2092	0.000
	0.493***		
Pain/injury	(0.095)	0.6372	0.000
	0.406***		
Respiratory diseases	(0.082)	0.5008	0.000
	0.878***		
Pneumonia	(0.072)	1.4060	0.000
	-0.163		
Skin diseases	(0.112)	-0.1504	0.145
	0.140**		
Others	(0.058)	0.1503	0.015
Delayed treatment (ref. no delay)			
	-0.050*		
Delayed 1/2 days	(0.027)	-0.0487	0.059

Delayed 3/4 days	0.131*** (0.049)	0.1399	0.007
Delayed 5/more days	0.255*** (0.074)	0.2904	0.001
Types of healthcare providers (ref. Qualified healthcare)			
Non-qualified healthcare	-0.679*** (0.034)	-0.4928	0.000
Pharmacy/traditional/self-care	-0.910*** (0.030)	-0.5974	0.000
Earning status of mothers (ref. have no income) Have income	-0.097** (0.045)	-0.0924	0.031
Log (Household monthly real income)	-0.003 (0.012)		0.781
Total number of children (0–5 years)	-0.049** (0.024)	-0.0478	0.038
Place of residence (ref. rural) Urban	0.166*** (0.028)	0.1805	0.000
Distance to healthcare providers (ref. <0.4 hours) >0.4 hours	0.550*** (0.029)	0.7332	0.000
Sources of medicine (ref. public health facility)			
NGO health facility	0.456 (0.443)	0.5777	0.303
Private health facility	1.325*** (0.377)	2.7621	0.000
Pharmacy/dispensary	1.497*** (0.153)	3.4682	0.000
Others	1.243*** (0.167)	2.4659	0.000
_Cons	3.726*** (0.201)		0.000

Notes: Number of observation = 6474, Prob > F = 0.0000, R-squared= 0.3166; ***, **, and * indicates significant at 1%, 5%, 10% respectively; standard errors in parenthsis; ref.: reference group; Exp: exponential

It is important to note that the dependent variable is log-transformed. Moreover, for the regression analysis, we utilized inflation-adjusted or real out-of-pocket health expenditures and

real household income. The results of the regression analysis provide evidence that female children are associated with lower OOP healthcare expenditure compared to male children. This outcome aligns with similar findings observed in India (Mishra et al., 2017). This may be due to Bangladeshi cultural norms, where it is customary for sons to assume the responsibility of providing sustenance and shelter to their elderly parents (Begum, 2018). Nevertheless, the preference for sons over daughters among Bangladeshi parents, while gradually diminishing, continues to exist (Asadullah et al., 2021). On the contrary, no significant disparity in the expenses associated with treating male and female children under 5 hospitalized for rotavirus is observed in Bangladesh (Ahmed et al., 2021). This may be due to inpatient treatment; however, our study included a sample of children who sought outpatient treatment. Moreover, children, whether male or female, are more vulnerable during early childhood or infancy compared to later stages of childhood and require greater healthcare expenditures. This finding aligns with previous research conducted in this field (Hasan et al., 2021; Sultana et al., 2021).

Additionally, children with chronic illnesses require regular check-ups and medication, which tend to increase OOP health expenditures (Walter et al., 2019). Not only do chronic illnesses, but the type of illness has also been recognized as a significant determinant of OOP healthcare expenditure. Specifically, children with pneumonia and diarrhea are associated with higher OOP health expenditure compared to those with fever (Tahsina et al., 2017). It has been observed that diarrhea among children under 5 results in increased OOP health expenditure, as highlighted in a study in India (Pradhan et al., 2020). Similarly, in sub-Saharan African countries, malaria among children under 5 imposes an economic burden on families in terms of OOP health expenditure (El-Houderi et al., 2019).

OOP health expenditures vary across different illness types. However, regardless of the illness type, delayed treatment significantly exacerbates the severity of illnesses, thereby leading to an increase in OOP healthcare expenses for children, as evidenced by our study (Mohanty et al., 2021). As anticipated, this study indicates that the pursuit of treatment from a qualified healthcare provider is correlated with an increase in OOP healthcare expenses (Tahsina et al., 2017). Consequently, the decision to seek qualified healthcare for children is influenced by the financial capabilities of parents. In this context, it is often assumed that mothers with income possess the financial capacity to allocate greater resources toward healthcare expenses for their children. However, our research findings demonstrate a negative correlation between mothers with income and OOP healthcare spending for their children (Berman et al., 1997). Conversely, employed mothers exhibited higher expenditure on early childhood healthcare in comparison to their unemployed counterparts in a previous study (Hayes et al., 2016). Additionally, the occupation of mothers has been positively linked to seeking treatment in private healthcare facilities (Sarker et al., 2016), which generally involve higher healthcare expenses. Our research findings indicate a negative correlation, which may be attributed to the limited availability of mothers with incomes to spend time on childcare (Shepherd-Banigan et al., 2017). To fully understand the relationship between mothers with income and healthcare expenditure for their children, further investigation and research are necessary.

An increase in the overall number of children residing within a household is linked to a reduction in OOP healthcare expenses for an individual child. This phenomenon can be attributed to limited available resources or the fact that parents may have acquired knowledge on treating

illnesses and are, therefore, less inclined to allocate funds toward the healthcare needs of children under 5. Similar findings were explored in a study, although they were insignificant (Mishra et al., 2017). However, in Ethiopia, individuals from smaller household sizes exhibited a greater propensity to incur out-of-pocket health expenditures compared to those from larger household sizes (Bedado et al., 2022). Children residing in urban areas are generally associated with higher OOP expenses compared to their rural counterparts (Hasan et al., 2021; Sultana et al., 2021). This difference may be due to the concentration of advanced and tertiary healthcare facilities primarily in urban regions. As anticipated, this study has observed a positive correlation between the distance to the healthcare facility (measured in time to reach it) and OOP health expenditure (Ebaidalla & Ali, 2019). However, Nakovics et al. (2019), in their study, measured the distance in kilometers to reach a healthcare facility and found that distance is negatively associated with the amount of OOP health expenditure, although this association is insignificant.

As expected, this study provides evidence that obtaining medicine from private pharmacies and dispensaries results in higher OOP health expenditures (Amiresmaili & Emrani, 2019). The retail prices of medicine have a substantial and significant impact on the burden of OOP payments (Conti et al., 2021). Despite having the opportunity to receive free medicine at public healthcare facilities in Bangladesh, only a small percentage of patients opt to obtain their medication from these facilities. This can be attributed to the inadequate supply of medicine in public health facilities (Mannan, 2013). Furthermore, a study indicates that the availability of medicine in the public sector is generally insufficient, which compels patients to bear the cost of purchasing medication from the private sector in Bangladesh (Kasonde et al., 2019). Thus, both individual and household attributes, as well as healthcare characteristics, serve as determinants of OOP health expenditures for children under 5 in Bangladesh. Nonetheless, although healthcare costs may change over time, the fundamental determinants of OOP health expenditure, including gender disparity and rural-urban differences, persist consistently.

To ensure a normal distribution and address the issue of heteroskedasticity, we utilized a log-transformed dependent variable and employed robust standard errors. To assess multicollinearity, we conducted a variable inflation factor (VIF) test, which yielded an average VIF of 1.22, indicating the absence of problematic multicollinearity. The R-squared value of 0.3166 indicates that the model is well-fitted, with approximately 32% of the variation in the response variable being explained by the predictors. Furthermore, we performed the likelihood-ratio test to assess the adequacy of the model's fit. The results [LR $chi^2(1) = 8.59$; Prob> $chi^2 = 0.0034$] indicate that our fitted model is statistically significant.

In addition, a significant advantage of OLS regression is its provision of the Best Linear Unbiased Estimators (BLUE) under specific assumptions, including the absence of multicollinearity and heteroskedasticity and the independence of errors. These conditions ensure that, on average, the estimated coefficients remain unbiased, thereby enhancing the reliability and generalizability of the results. OLS is a robust methodology for identifying and quantifying relationships between variables, making it a critical component in formulating generalizable conclusions in economic research (Verbeek, 2017). Moreover, linear regression can achieve maximum accuracy in forecasting overall healthcare costs, highlighting its effectiveness in estimating economic relationships, especially within stable contexts of healthcare costs and expenditure patterns over short to medium time frames (Taloba et al., 2022).

The findings of this study are based on data from the Bangladesh HIES 2016, which ran from April 1, 2016, to March 31, 2017. While this study is limited to a single year of data, 2016, and acknowledges the potential for recall bias due to self-reported illnesses, it benefits from a substantial sample size, consistent data collection methods, and the robustness of our fitted model. These factors collectively enhance the validity and reliability of the findings, allowing for broader generalizability.

This study did not attempt to modify or add anything new to the theory; however, there are no theoretical implications. Some policy implications are provided here following the key findings. Addressing gender and rural-urban disparity issues would necessitate government investment as well as awareness programs through the organization of workshops or seminars that can mitigate the disparities, thereby contributing to equitable access to healthcare services, which constitute one of the key components of SDG 3. The government should facilitate free medication for chronic illnesses among children under 5 across the country. It is essential to take the initiative to monitor the management and mechanisms by which treatment from qualified healthcare providers contributes to increased OOP health expenditures and to implement strategies aimed at mitigating these costs. The government needs to improve the supply of medications in public health facilities and implement effective monitoring of the management systems employed in their distribution.

5. CONCLUSION

The current study employed the OLS regression method to identify the determinants of OOP health expenditure for children under 5 in Bangladesh. The study used data from the Household Income and Expenditure Survey (HIES) conducted in 2016. The data analysis revealed that the majority of OOP health expenditure is allocated to the purchase of medicine (68.58%). Key findings indicate that individual, household, and community characteristics significantly influence OOP health expenditure. These factors include the age of a child, the types of illnesses, the presence of chronic illness, the types of healthcare providers, delayed treatment, distance to healthcare providers, and sources of medicine. The findings suggest that both sex discrimination and rural-urban discrimination persist in relation to OOP health expenditure in Bangladesh. Notably, mothers who have an income tend to have lower OOP health expenditures for their children. The government ought to implement measures to reduce the cost of accessing qualified healthcare providers, ensure proper management of medicine supply in public healthcare facilities, and regulate the price of medicine. Furthermore, the government must support the widespread availability of cost-free medication for children afflicted with chronic illnesses and implement healthcare financing reforms through the introduction of health insurance. These endeavors would not only prove advantageous for children but also have a positive impact on the overall population. Further research can be conducted to investigate the underlying reasons for the association between children of earning mothers and lower OOP health expenditure, with the aim of informing specific policy implications.

ACKNOWLEDGEMENT

We are thankful to the authorities of the Bangladesh Bureau of Statistics (BBS) for providing us with the Bangladesh Household Income and Expenditure Survey (HIES) 2016 data to conduct this study.

REFERENCES

Acton, J. P. (1975). Nonmonetary factors in the demand for medical services: some empirical evidence. *Journal of Political Economy*, *83*(3), 595-614. doi: 10.1086/260342

Ahmed, M. S., & Yunus, F. M. (2020). Healthcare seeking behavior for common illness among Bangladeshi under-five children: A nationwide cross-sectional survey. *Children and Youth Services Review, 119,* 105644. https://doi.org/10.1016/j.childyouth.2020.105644

Ahmed, S., Dorin, F., Satter, S. M., Sarker, A. R., Sultana, M., Gastanaduy, P. A., Parashar, U., Tate, J. E., Heffelfinger, J. D., Gurley, E. S., & Khan, J. A. M. (2021). The economic burden of rotavirus hospitalization among children < 5 years of age in selected hospitals in Bangladesh. *Vaccine*, *39*(48), 7082–7090. https://doi.org/10.1016/j.vaccine.2021.10.003

Amiresmaili, M., & Emrani, Z. (2019). Investigating the exposure of Iranian households to catastrophic health expenditure due to the need to purchase medicines. *PLOS ONE*, *14*(4), e0214783. https://doi.org/10.1371/journal.pone.0214783

Aregbeshola, B. S., & Khan, S. M. (2018). Determinants of catastrophic health expenditure in Nigeria. *The European Journal of Health Economics*, *19*(4), 521–532. https://doi.org/10.1007/s10198-017-0899-1

Asadullah, M. N., Mansoor, N., Randazzo, T., & Wahhaj, Z. (2021). Is son preference disappearing from Bangladesh? *World Development*, *140*, 105353. https://doi.org/10.1016/j.worlddev.2020.105353

BDHS. (2020). *Bangladesh Demographic and Health Survey 2017-18*. National Institute of Population Research and Training (NIPORT), and ICF. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT and ICF.

BHFS. (2019). *Bangladesh Health Facility Survey 2017*. National Institute of Population Research and Training (NIPORT) and ICF. https://dhsprogram.com/pubs/pdf/SPA28/SPA28.pdf

Bangladesh National Health Accounts. (2017). *Bangladesh National Health Accounts, an overview on the public and private expenditures in health sector*. https://www.who.int/bangladesh/news/detail/05-10-2017-bangladesh-national-health-accounts-an-overview-on-the-public-and-private-expenditures-in-health-sector

BBS. (2010). *REPORT ON HOUSEHOLD INCOME AND EXPENDITURE SURVEY 2010.* Bangladesh Bureau of Statistics (BBS), Statistics and Informatics Division (SID), Ministry of Planning, Government of the People's Republic of Bangladesh. www.bbs.gov.bd.

BBS. (2019). *FINAL REPORT ON HOUSEHOLD INCOME AND EXPENDITURE SURVEY 2016*. Bangladesh Bureau of Statistics (BBS), Statistics and Informatics Division (SID), Ministry of Planning, Government of the People's Republic of Bangladesh. https://drive.usercontent.google.com/download?id=1TmUmC-0M3wC5IN6_tUxZUvTW2rmUxMce&export=download&authuser=0

Bedado, D., Kaso, A. W., & Hailu, A. (2022). Magnitude and determinants of out of pocket health expenditure among patients visiting outpatients in public hospitals in East Shoa Zone, Ethiopia. *Clinical Epidemiology and Global Health*, *15*, 101066. https://doi.org/10.1016/j.cegh.2022.101066

Begum, A. (2018). An Inclusive Approach to Care of the Elderly in Bangladesh. *Annals of Reviews & Research*, *2*(5). https://doi.org/10.19080/ARR.2018.02.555600

Berman, P., Zeitlin, J., Roy, P., & Khumtakar, S. (1997). Does maternal employment augment spending for children's health care? A test from Haryana, India. *Health Transition Review*, 187-204. doi: 10.1086/260342

Conti, R. M., Turner, A., & Hughes-Cromwick, P. (2021). Projections of US Prescription Drug Spending and Key Policy Implications. *JAMA Health Forum*, *2*(1), e201613. https://doi.org/10.1001/jamahealthforum.2020.1613

Das, J., Das, S. K., Ahmed, S., Ferdous, F., Farzana, F. D., Sarker, M. H. R., ... & Mamun, A. A. (2015). Determinants of percent expenditure of household income due to childhood diarrhoea in rural Bangladesh. *Epidemiology & Infection, 143*(13), 2700-2706. doi:10.1017/S0950268814003781

Ebaidalla, E. M., & Ali, M. E. M. (2019). Determinants and impact of household's out-of-pocket healthcare expenditure in Sudan: Evidence from urban and rural population. *Middle East Development Journal*, *11*(2), 181–198. https://doi.org/10.1080/17938120.2019.1668163

El-Houderi, A., Constantin, J., Castelnuovo, E., & Sauboin, C. (2019). Economic and Resource Use Associated With Management of Malaria in Children Aged <5 Years in Sub-Saharan Africa: A Systematic Literature Review. *MDM Policy & Practice*, *4*(2), 2381468319893986. https://doi.org/10.1177/2381468319893986

Giménez, L., & Jolliffe, D. (2014). Inflation for the Poor in Bangladesh: A Comparison of CPI and Household Survey Data. *The Bangladesh Development Studies, 37*(1 & 2), 57–81. https://www.researchgate.net/publication/274973184_Inflation_for_the_Poor_in_Bangladesh_A_Comparison_of_CPI_and_Household_Survey_Data

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy, 80*(2), 223–255. http://www.jstor.org/stable/1830580.

Hasan, Md. Z., Mehdi, G. G., De Broucker, G., Ahmed, S., Ali, Md. W., Martin Del Campo, J., Constenla, D., Patenaude, B., & Uddin, Md. J. (2021). The economic burden of diarrhea in children under 5 years in Bangladesh. *International Journal of Infectious Diseases*, *107*, 37–46. https://doi.org/10.1016/j.ijid.2021.04.038

Hayes, A., Chevalier, A., D'Souza, M., Baur, L., Wen, L. M., & Simpson, J. (2016). Early childhood obesity: Association with healthcare expenditure in Australia. *Obesity*, *24*(8), 1752-1758. https://doi.org/10.1002/oby.21544

HEU. (2023). *REVIEW OF BANGLADESH'S HEALTH CARE FINANCING STRATEGY 2012-2032*. Health Economics Unit (HEU). https://heu.portal.gov.bd/sites/default/files/files/heu.portal.gov.bd/page/c1d65061_f61c_4df2_bd96_cd2e06a4d7f9/2024-04-22-09-54-6a997da367a434169e7da35af5dc7d4b.pdf

Kasonde, L., Tordrup, D., Naheed, A., Zeng, W., Ahmed, S., & Babar, Z.-U.-D. (2019). Evaluating medicine prices, availability and affordability in Bangladesh using World Health Organisation and Health Action International methodology. *BMC Health Services Research*, *19*, 383. https://doi.org/10.1186/s12913-019-4221-z

Khan, M. A., Khan, N., Rahman, O., Mustagir, G., Hossain, K., Islam, R., & Khan, H. T. A. (2021). Trends and projections of under-5 mortality in Bangladesh including the effects

of maternal high-risk fertility behaviours and use of healthcare services. *PLOS ONE, 16*(2), e0246210. https://doi.org/10.1371/journal.pone.0246210

Khanam, M., & Hasan, E. (2020). Inequalities in health care utilization for common illnesses among under five children in Bangladesh. *BMC Pediatrics, 20*, 1-11. https://doi.org/10.1186/s12887-020-02109-6

Kumar, H., Misra, S., & Awasthi, S. (2019). Estimation of medical expenditure of initial various treatment regimes in hospitalized cases of severe community acquired pneumonia in children under 5 years of age in North India. *Clinical Epidemiology and Global Health*, *7*(1), 41–45. https://doi.org/10.1016/j.cegh.2017.12.007

Lindelow, M. (2002). *HEALTH CARE DEMAND IN RURAL MOZAMBIQUE: EVIDENCE FROM THE 1996/97 HOUSEHOLD SURVEY*. FCND DP NO.126. International Food Policy Research Institute, Washington, D.C. 20006 U.S.A. file:///C:/Users/ASUS/Downloads/Health_care_demand_in_rural_Mozambique_Evidence_fr.pdf

Logarajan, R. D., Nor, N. M., Sirag, A., Said, R., & Ibrahim, S. (2022). The Impact of Public, Private, and Out-of-Pocket Health Expenditures on Under-Five Mortality in Malaysia. *Healthcare, 10*(3), 589. https://doi.org/10.3390/healthcare10030589

Mahumud, R. A., Sarker, A. R., Sultana, M., Islam, Z., Khan, J., & Morton, A. (2017). Distribution and Determinants of Out-of-pocket Healthcare Expenditures in Bangladesh. *Journal of Preventive Medicine and Public Health*, *50*(2), 91–99. https://doi.org/10.3961/jpmph.16.089

Mannan, M. A. (2013). Access to Public Health Facilities in Bangladesh: A Study on Facility Utilisation and Burden of Treatment. *The Bangladesh Development Studies, 36*(4), 25–80. http://www.jstor.org/stable/44730025

Masiye, F., & Kaonga, O. (2016). Determinants of Healthcare Utilisation and Out-of-Pocket Payments in the Context of Free Public Primary Healthcare in Zambia. *International Journal of Health Policy and Management*, *5*(12), 693–703. https://doi.org/10.15171/ijhpm.2016.65

Mishra, S., Kusuma, Y. S., & Babu, B. V. (2017). Treatment-seeking and out-of-pocket expenditure on childhood illness in a migrant tribal community in Bhubaneswar, Odisha State, India. *Paediatrics and International Child Health*, *37*(3), 181–187. https://doi.org/10.1080/20469047.2016.1245031

Mohanty, P., Satpathy, S. K., Patnaik, S., & Patnaik, L. (2021). Out-of-pocket expenditure and its predictors for illness of under-five children: A cross-sectional study in urban slums of Eastern India. *Journal of Family Medicine and Primary Care*, *10*(10), 3892–3898. https://doi.org/10.4103/jfmpc.jfmpc_2337_20

MoHFW. (2012). *Expanding Social Protection for Health: Towards Universal Coverage Health Care Financing Strategy 2012-2032*. Health Economics Unit, Ministry of Health and Family Welfare, Dhaka. Government of the People's Republic of Bangladesh. https://socialprotection.gov.bd/wp-content/uploads/2017/03/HCF-Strategy-Bd-2012-2032.pdf

Molla, A. A., & Chi, C. (2017). Who pays for healthcare in Bangladesh? An analysis of progressivity in health systems financing. *International Journal for Equity in Health*, *16*(1), 167. https://doi.org/10.1186/s12939-017-0654-3

Molla, A. A., Chi, C., & Mondaca, A. L. N. (2017). Predictors of high out-of-pocket healthcare expenditure: An analysis using Bangladesh household income and expenditure survey,

2010. *BMC Health Services Research*, *17*(1), 94. https://doi.org/10.1186/s12913-017-2047-0

Mugisha, F., Kouyate, B., Gbangou, A., & Sauerborn, R. (2002). Examining out-of-pocket expenditure on health care in Nouna, Burkina Faso: Implications for health policy. *Tropical Medicine and International Health, 7*(2), 187–196. https://doi.org/10.1046/j.1365-3156.2002.00835.x

Mulaga, A. N., Kamndaya, M. S., & Masangwi, S. J. (2022). Decomposing socio-economic inequality in catastrophic out-of-pocket health expenditures in Malawi. *PLOS Global Public Health*, *2*(2), e0000182. https://doi.org/10.1371/journal.pgph.0000182

Nair, D., Kar, S. S., Selvaraj, K., & Ramalingam, A. (2015). Morbidity profile and out of pocket health care expenditure among under five children of an urban area of Puducherry. *Journal of Natural Science, Biology, and Medicine*, *6*(Suppl 1), S139–S142. https://doi.org/10.4103/0976-9668.166122

Nakovics, M. I., Brenner, S., Robyn, P. J., Tapsoba, L. D. G., & De Allegri, M. (2019). Determinants of individual healthcare expenditure: a cross ‐ sectional analysis in rural Burkina Faso. *The International Journal of Health Planning and Management, 34*(4), e1478-e1494. https://doi.org/10.1002/hpm.2812

Njagi, P., Arsenijevic, J., & Groot, W. (2018). Understanding variations in catastrophic health expenditure, its underlying determinants and impoverishment in Sub-Saharan African countries: A scoping review. *Systematic Reviews*, *7*(1), 136. https://doi.org/10.1186/s13643-018-0799-1

Pertiwi, A. S., & Sjaaf, A. C. (2022). REDUCING INFANT AND UNDER-5 MORTALITY RATE THROUGH GOVERNMENT HEALTH EXPENDITURE: A SYSTEMATIC REVIEW. *Jurnal Administrasi Kesehatan Indonesia*, *10*(1), 122–132. https://doi.org/10.20473/jaki.v10i1.2022.122-132

Pradhan, H., Mohakud, N., Kavitha, A., Nayak, M., & Satpathy, S. (2020). Out-of-pocket health expenditure on diarrheal illness among under-five children in a teaching hospital ins Odisha, India. *Indian Journal of Public Health*, *64*(3), 252. https://doi.org/10.4103/ijph.IJPH_258_19

Prasetya, D, & Afrina, E. (2022, August 17). Healthcare costs leave Indonesians out-of-pocket. *East Asia Forum*. https://eastasiaforum.org/2022/08/17/healthcare-costs-leave-indonesians-out-of-pocket.html.

Rocque, G. B., Williams, C. P., Miller, H. D., Azuero, A., Wheeler, S. B., Pisu, M., Hull, O., Rocconi, R. P., & Kenzik, K. M. (2019). Impact of Travel Time on Health Care Costs and Resource Use by Phase of Care for Older Patients With Cancer. *Journal of Clinical Oncology*, *37*(22), 1935–1945. https://doi.org/10.1200/JCO.19.00175

Sarker, A. R., Mahumud, R. A., Sultana, M., Ahmed, S., Ahmed, W., & Khan, J. A. (2014). The impact of age and sex on healthcare expenditure of households in Bangladesh. *SpringerPlus*, *3*(1), 435. https://doi.org/10.1186/2193-1801-3-435

Sarker, A. R., Sultana, M., Ali, N., Akram, R., Alam, K., Khan, J. A. M., & Morton, A. (2019). Cost of Caregivers for Treating Hospitalized Diarrheal Patients in Bangladesh. *Tropical Medicine and Infectious Disease*, *4*(1), Article 1. https://doi.org/10.3390/tropicalmed4010005

Sarker, A. R., Sultana, M., Mahumud, R. A., Sheikh, N., Van Der Meer, R., & Morton, A. (2016). Prevalence and Health Care–Seeking Behavior for Childhood Diarrheal Disease in Bangladesh. *Global Pediatric Health*, *3*, 2333794X1668090. https://doi.org/10.1177/2333794X16680901

Schreiber Pedersen, L., Lose, G., Høybye, M. T., Jürgensen, M., Waldmann, A., & Rudnicki, M. (2018). Predictors and reasons for help-seeking behavior among women with urinary incontinence. *International Urogynecology Journal*, *29*(4), 521–530. https://doi.org/10.1007/s00192-017-3434-0

Shepherd-Banigan, M., Bell, J. F., Basu, A., Booth-LaForce, C., & Harris, J. R. (2017). Mothers' Employment Attributes and Use of Preventive Child Health Services. *Medical Care Research and Review*, *74*(2), 208–226. https://doi.org/10.1177/1077558716634555

Srivastava, N. M., Awasthi, S., & Agarwal, G. G. (2009). Care-seeking behavior and out-of-pocket expenditure for sick newborns among urban poor in Lucknow, northern India: A prospective follow-up study. *BMC Health Services Research*, *9*(1), 61. https://doi.org/10.1186/1472-6963-9-61

Sultana, M., Alam, N. H., Ali, N., Faruque, A. S. G., Fuchs, G. J., Gyr, N., Chisti, M. J., Ahmed, T., & Gold, L. (2021). Household economic burden of childhood severe pneumonia in Bangladesh: A cost-of-illness study. *Archives of Disease in Childhood*, *106*(6), 539–546. https://doi.org/10.1136/archdischild-2020-320834

Sun, C., Shi, J., Fu, W., Zhang, X., Liu, G., Chen, W., & He, J. (2021). Catastrophic Health Expenditure and Its Determinants Among Households With Breast Cancer Patients in China: A Multicentre, Cross-Sectional Survey. *Frontiers in Public Health*, *9*, 704700. https://doi.org/10.3389/fpubh.2021.704700

Tahsina, T., Ali, N. B., Hoque, D. M. E., Huda, T. M., Salam, S. S., Hasan, M. M., Hossain, M. A., Matin, Z., Kuppen, L., Garnett, S. P., & Arifeen, S. E. (2017). Out-of-pocket expenditure for seeking health care for sick children younger than 5 years of age in Bangladesh: Findings from cross-sectional surveys, 2009 and 2012. *Journal of Health, Population and Nutrition*, *36*(1), 33. https://doi.org/10.1186/s41043-017-0110-4

Tahsina, T., Ali, N. B., Siddique, M. A. B., Ahmed, S., Rahman, M., Islam, S., Rahman, M. M., Amena, B., Hoque, D. M. E., Huda, T. M., & Arifeen, S. E. (2018). Determinants of hardship financing in coping with out of pocket payment for care seeking of under five children in selected rural areas of Bangladesh. *PLOS ONE*, *13*(5), e0196237. https://doi.org/10.1371/journal.pone.0196237

Taloba, A. I., Abd El-Aziz, R. M., Alshanbari, H. M., & El-Bagoury, A. A. H. (2022). Estimation and prediction of hospitalization and medical care costs using regression in machine learning. *Journal of Healthcare Engineering, 2022*(1), 7969220. https://doi.org/10.1155/2022/7969220

The Daily Star. (2021, November 22). *Health Expenses: People dig deeper into their pockets | The Daily Star*. https://www.thedailystar.net/news/bangladesh/news/health-expenses-people-dig-deeper-their-pockets-2235411

United Nations. (2015). *Sustainable Development Goals | United Nations Development Programme*. Retrieved June 13, 2023, from https://www.undp.org/sustainable-development-goals?gclid=CjwKCAjwp6CkBhB_EiwAlQVyxU4pR2mmZLXjO4YF2_TF_Sslhcw-0AVUtNwc1QbhJtP6VCfMww-bxRoC0XAQAvD_BwE

Verbeek, M. (2017). Using linear regression to establish empirical relationships. *IZA World of Labor,* 336. doi: 10.15185/izawol.336

Walter, A. W., Ellis, R. P., & Yuan, Y. (2019). Health care utilization and spending among privately insured children with medical complexity. *Journal of child health care*, *23*(2), 213-231. doi:10.1177/1367493518785778. Epub 2018 Jul 19. PMID: 30025469.

World Bank. (2023a). *World Development Indicators | DataBank.* Retrieved July 10, 2023, from https://databank.worldbank.org/source/world-development-indicators#

World Bank. (2023b). *Out-of-pocket expenditure (% of current health expenditure)—Bangladesh |Data*. Retrieved July 22, 2023, from https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=BD