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Post COVID-19 Socioeconomic Impacts on Slum Dwellers in Bangladesh: Evidence from a Logistic Regression Analysis

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Abstract

Since 2015, Bangladesh has transitioned from a low-income to a lower-middle-income economy. Despite this advancement, a significant portion of the population continues to live below the poverty line in substandard and unhealthy conditions. This study aims to examine the impact of the global COVID-19 pandemic on urban settlements in Bangladesh, with a specific focus on the Rajshahi Division. Data were collected from 484 slum-dwelling households, and the Cost of Basic Needs (CBN) method was used to assess poverty levels. To identify key determinants of household poverty, a logistic regression analysis was conducted. Findings indicate that households whose head was infected with COVID-19 experienced greater financial hardship than those whose head remained uninfected. The probability of a household being poor also increased with the number of infected members within the household. Furthermore, limited access to healthcare services was linked to higher poverty rates. The study also revealed that urban households were generally poorer than their rural counterparts. These outcomes highlight the pressing issue of inadequate healthcare infrastructure in urban slums, which exacerbates vulnerability to COVID-19 and other infectious diseases while also perpetuating poverty through reduced household income.

Keywords: COVID-19; rural-urban; poverty

JEL Codes: C5; D1; I11; I13

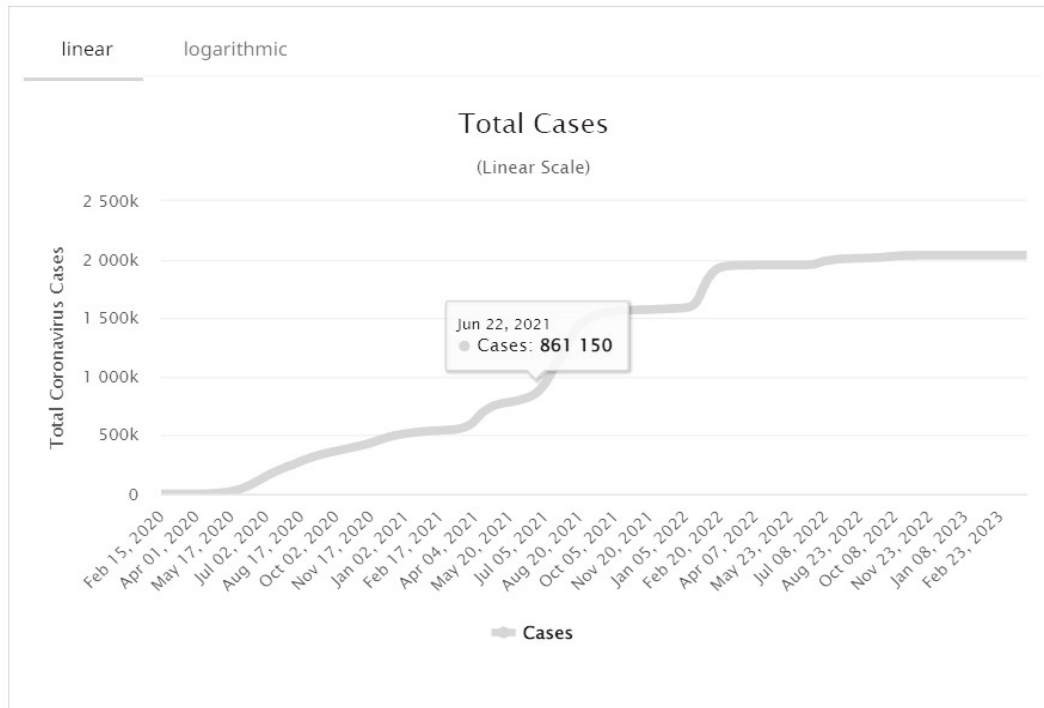
1.0 Study Background

Health is human beings' greatest asset, the true value of which is often only realized during illness ^[1]. Developed countries around the world have established systems in place to provide healthcare to their citizens, allowing individuals to focus less on this sector personally ^[2]. However, in the case of low-income countries, such as Bangladesh, it becomes challenging to deal with any known epidemic or pandemic, even with a limited government service system ^[3]. Arguably, Bangladesh managed the global COVID-19 pandemic with relative success, even as many developed nations struggled. In the case of the COVID-19 pandemic, statistically, it shows that the number and rate of people infected and the death toll in Bangladesh are much lower than those of many developed countries. However, the measures implemented over nearly two years had long-term negative impacts on almost all socio-economic sectors of the country.

Poverty is a multidimensional concept which cannot be easily measured ^[4]. This includes various factors, such as inadequate health services, unhygienic sanitation systems, high levels of illiteracy, low income, a scarcity of fundamental rights, and a lack of social security ^[5]. The basis of measurement for all these variables depends on the country's socio-economic, geographical, and climatic conditions ^[6]. A purely financial measure indicates that a family in a country with a hostile climate can lead a decent life for significantly less money than in a country with a typical environment ^[7]. Bangladesh is a country with six distinct seasons, and the temperature remains at a normal and tolerable level throughout the year. So, living is not too expensive. However, due to high population density, urban lifestyles lead to various health risks, including air pollution, which are most pronounced among low-income slum dwellers in every significant city ^[8].

According to Worldometer statistics, as of February 23, 2023, the total number of COVID-19 cases in Bangladesh is 2,037,978 (Figure 1.1). However, there is currently no comprehensive analysis detailing how these initial cases were distributed across different social classes. However, some studies show that many of the city's slum dwellers were infected with COVID-19 but never got tested ^[9]. Again, some studies show that many people in the low-income category of Bangladesh had no symptoms, but most of their family members were found to be COVID-19 positive ^[10]. It should be noted that in the case of Bangladesh, the mandatory COVID-19 test was only for foreign travellers and some government institutions. Still, there was no obligation for the general population. Moreover, because common COVID-19 symptoms frequently occur during seasonal changes in Bangladesh, the general public often overlooked them. Therefore, they were not aware of the COVID-19 test. Hence, the above number of victims cannot be considered the actual number of victims.

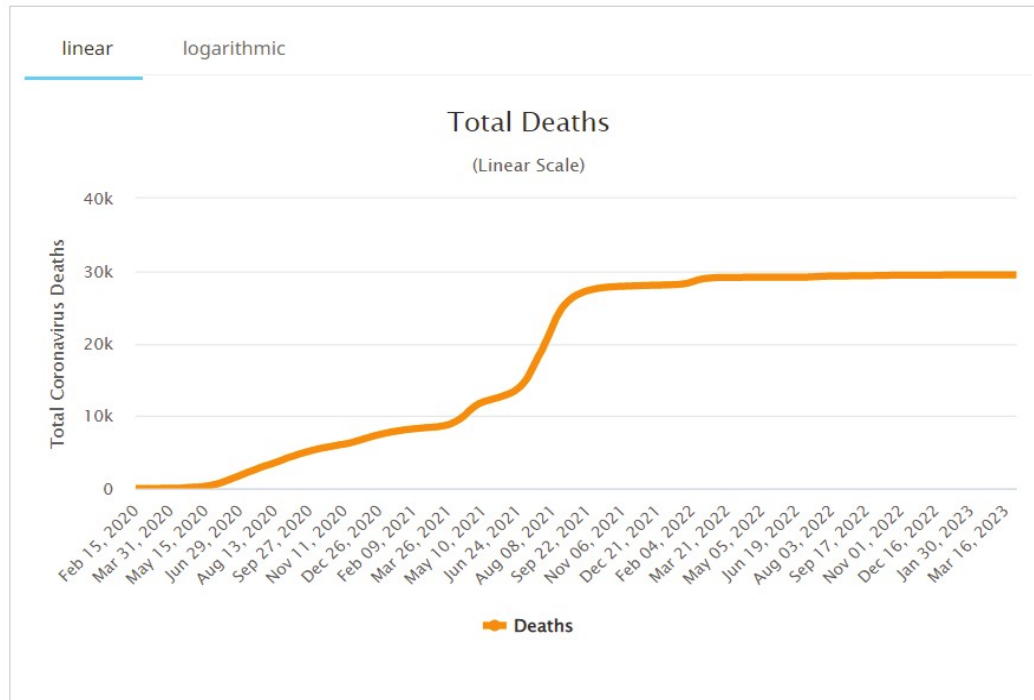
Figure 1.1: Total Coronavirus Cases in Bangladesh



Source: <https://www.worldometers.info/coronavirus/country/bangladesh/>

Again, from the same source, it can be seen that until 16 March 2023, the total number of deaths due to COVID-19 is 29,446 people in Bangladesh (Figure 1.2). Bangladesh government authorities have provided some geographical analysis of cases and deaths, but no social stratification data is available. Moreover, in many cases, the time it took to get the results of the COVID-19 test, showed that the deceased was found to be infected with COVID-19 days after burial^[11]. Furthermore, in the case of those who died in places other than hospitals, the deceased person was not tested for COVID-19^[12]. It is mentioned here that in Bangladesh, the burial of a dead person is still carried out by his family members. In this case, no permission or registration is required from any authority. Therefore, in the case of Bangladesh, it would not be accurate to consider the actual number of deaths due to COVID-19 solely based on this data.

Figure 1.2: Total Coronavirus Deaths in Bangladesh



Source: <https://www.worldometers.info/coronavirus/country/bangladesh/>

Due to Bangladesh's socio-economic conditions and organizational constraints, government data—particularly regarding public health—often exhibits significant inconsistencies. On the one hand, with pandemics like COVID-19, and on the other, with low-income unplanned urban slum dwellers in the city, it is challenging to find accurate data and sources of origin. As the pandemic progressed, even the affluent society struggled to get proper medical care, while the poor, especially in the urban slums, were undoubtedly deprived of medical care ^[13]. There were numerous instances of patients being denied admission across multiple hospitals, occasionally resulting in fatalities during transit. Media reports frequently highlighted cases in which families could not afford ICU care and were unable to retrieve the bodies of deceased relatives ^[14]. Consequently, the true extent of the challenges faced by the poor in accessing healthcare during the pandemic remains largely undocumented.

Various studies indicate that the primary source of income for urban slum dwellers in Bangladesh is primarily derived from daily work ^[15]. They are not dependent on any government jobs or financial assistance. Since the onset of COVID-19, as a result

of social and state restrictions (lockdown, social distancing) introduced, these groups of people, on the one hand, have lost their source of income. On the other hand, the cost of living has increased manifold due to market volatility, including commodity price hikes ^[16]. Not only has the poor class been affected, but many middle-class households, especially those not employed by the government, have also faced economic difficulties, leading to the relocation of many families to rural villages, with some or all household members ^[17].

It is challenging for Bangladesh's economy to cope with the global COVID-19 pandemic. However, the government has not adopted as strict a policy as developed countries, which is understandable, especially considering the prevalence of low-income jobs and professions. For example, the government has not closed or locked down the country's largest export sector, which includes ready-made garment factories and other small and large industries associated with it. However, due to the massive impact of COVID-19 on the international market, the country's export sector has also suffered a significant decline, thereby affecting the normal income of low-income individuals. Therefore, the objective of this study is to investigate the impact of COVID-19 and socioeconomic factors on the urban poverty status of households in Bangladesh.

2.0 Theoretical Background and Conceptual Framework

Understanding the socio-economic impacts of COVID-19 on urban slum dwellers requires a strong theoretical foundation that explains the pathways through which health crises translate into economic vulnerability. This section integrates multiple theoretical perspectives to provide a comprehensive analytical lens for the study. Health Shock Theory explains how unexpected illness disrupts household economic stability, while Poverty Trap Theory highlights the self-reinforcing nature of deprivation. Urban Vulnerability Theory further contextualises these dynamics within the structural constraints of slum environments, characterised by inadequate services and insecure livelihoods. Additionally, the concept of Multidimensional Poverty broadens the analysis beyond income to include various forms of deprivation affecting well-being. Together, these frameworks inform the conceptual model of the study, illustrating how COVID-19-induced health shocks can lead to increased expenditures, reduced income, and ultimately, heightened poverty among vulnerable urban populations.

2.1 Health Shock Theory

Health Shock Theory explains how unexpected health events, such as illness or pandemics, disrupt household economic stability by raising medical costs and

reducing labour productivity. In low-income settings, where formal health insurance systems are limited or absent, households often rely on out-of-pocket payments to finance healthcare. This creates a direct financial burden that can quickly deplete savings and force households to sell assets or incur debt^[18] (Xu et al., 2007). In the context of COVID-19, health shocks are not limited to direct medical costs; they also include indirect effects such as loss of income due to illness, quarantine, or caregiving responsibilities. These shocks are particularly severe among informal workers, who lack job security and social protection mechanisms^[19] (Dercon, 2002). Consequently, health shocks can act as a trigger for downward economic mobility, pushing vulnerable households into poverty. In urban slum settings, where overcrowding and poor sanitation increase exposure to disease, the magnitude of health shocks is often amplified, reinforcing existing inequalities and economic precarity.

2.2 Poverty Trap Theory

Poverty Trap Theory posits that households can become stuck in a self-reinforcing cycle of poverty due to structural constraints that limit their ability to accumulate assets and improve their economic condition. According to this framework, low income leads to limited investment in health, education, and productive assets, which in turn reduces future earning potential^[20] (Banerjee & Duflo, 2011). Health shocks, such as those caused by COVID-19, can exacerbate this cycle by forcing households to divert resources from productive investments to immediate survival needs. As a result, households may experience long-term declines in income and well-being, making it increasingly difficult to escape poverty. In the absence of external support, such as government assistance or social safety nets, these dynamics can lead to persistent poverty across generations. The theory is particularly relevant in developing countries, where institutional support systems are often weak, and economic opportunities are unevenly distributed.

2.3 Urban Vulnerability Theory

Urban Vulnerability Theory emphasises the heightened exposure of urban populations, especially slum dwellers, to socio-economic and environmental risks. Rapid urbanisation in developing countries has led to the proliferation of informal settlements characterised by inadequate housing, limited access to basic services, and insecure livelihoods^[21] (Moser, 1998). These conditions make urban poor populations highly susceptible to shocks such as pandemics, economic downturns, and environmental hazards. During the COVID-19 pandemic, urban slum dwellers faced compounded vulnerabilities, including overcrowded living conditions that facilitated virus transmission and reliance on informal employment that was disrupted by lockdown measures. The lack of access to healthcare and social

protection further intensified their risk of falling into poverty. Urban Vulnerability Theory thus highlights the intersection of spatial, economic, and social factors that shape the resilience, or lack thereof, of urban populations in the face of crises.

2.4 Multidimensional Poverty

Multidimensional Poverty extends beyond income-based measures to capture the various deprivations individuals and households experience in areas such as health, education, housing, and access to basic services. The Multidimensional Poverty Index (MPI) framework emphasises that poverty is not solely a function of low income but also reflects deficiencies in capabilities and living conditions^[22] (Alkire & Foster, 2011). In the context of urban slums, households may experience overlapping deprivations, including inadequate sanitation, unsafe drinking water, and limited access to healthcare, all of which contribute to their overall vulnerability. The COVID-19 pandemic has underscored the importance of this approach, as health, economic, and social dimensions of poverty have become increasingly interconnected. By adopting a multidimensional perspective, this study provides a more comprehensive understanding of poverty dynamics and highlights the need for integrated policy interventions that address multiple aspects of deprivation simultaneously.

2.5 Conceptual Framework Description

The conceptual framework of this study illustrates the causal pathway through which the COVID-19 pandemic influences household poverty. The framework begins with the outbreak of COVID-19, which acts as an exogenous shock affecting households across multiple dimensions. The first stage of impact is the emergence of a health shock, characterised by illness, increased healthcare needs, and psychological stress. This aligns with Health Shock Theory, which posits that unexpected health events disrupt economic stability by imposing both direct and indirect costs^[19] (Dercon, 2002).

Overall, the framework demonstrates a linear yet interdependent pathway:



Following the health shock, households experience a significant increase in health-related expenditures. These expenditures include costs for medical treatment, diagnostic testing, medications, and preventive measures. In low-income contexts, where out-of-pocket payments dominate healthcare financing, such expenditures can consume a substantial portion of household income^[18] (Xu et al., 2007). This financial burden often forces households to reallocate resources away

from essential needs such as food, education, and housing.

Simultaneously, the health shock leads to a decline in income, particularly among informal workers who rely on daily wages. Illness reduces labour supply, while pandemic-related restrictions such as lockdowns and reduced economic activity further limit income-generating opportunities. This dual effect of rising expenditures and falling income creates a severe economic imbalance.

The final stage of the framework is the transition into poverty, where households are unable to maintain a minimum standard of living. This process reflects the dynamics of the Poverty Trap Theory, where initial shocks lead to long-term economic decline. The framework also incorporates elements of Urban Vulnerability Theory and Multidimensional Poverty by recognising that the impact of COVID-19 is shaped by structural conditions such as inadequate housing, limited access to services, and pre-existing socio-economic inequalities.

3.0 Methodology

3.1 Study Area

Rajshahi Division is an administrative region in the northern region of Bangladesh. It has a population of about 20 million and an area of 18,154 square kilometres. Rajshahi Division comprises eight districts, 67 upazilas (subdistricts), 59 municipalities (submunicipalities), and 564 unions (sub-units). Rajshahi, Bogra, Pabna, and Sirajganj are the four major commercial centres and major cities of Rajshahi Division. Natore, Naogaon, Chapainawabganj, and Joypurhat are major agricultural areas. Rajshahi is the capital of this division (see details on the map in Annexures 1-3).

Data were collected from two mohallas—Ramchandrawpur and Bhadra—in the Rajshahi Metropolitan area, which served as the primary study sites. ‘Ramchandrawpur’ and ‘Bhadra’, these two mohallas are located at numbers 25 and 29, respectively, under Metropolitan Thana (see details in the map in Annexure 4). The Ramchandrapur slum was established decades ago, with migrants gradually settling there along the riverside since 1971. As a result, three socio-economic strata are evident: higher-income residents in formal buildings, middle-class individuals, and low-income migrants who frequently move between urban centers.

3.2 Determining the Poverty Level

The Cost of Basic Needs (CBN) approach is commonly employed as the standard method for estimating household poverty levels, treating poverty as the dependent variable. This method involves calculating two distinct poverty lines: the lower

poverty line is based on the food poverty threshold. In contrast, the upper poverty line incorporates both food expenses and a minimum allowance for non-food essentials, tailored to each geographical area under study. Accordingly, both the poverty line and the higher non-food allowance were applied contextually across the specific regions examined in this research.

3.3 Sampling Technique

This study employed a stratified random sampling technique to ensure representation across different socio-economic and spatial groups. The total sample consisted of 484 households, drawn from both urban and rural areas within the Rajshahi Division.

The primary focus of the study is on urban slum dwellers, particularly those residing in Ramchandrapur and Bhadra areas. However, a rural comparison group was included to provide a broader analytical perspective on poverty dynamics and to assess whether the impacts of COVID-19 differ across spatial contexts. This inclusion helps strengthen the robustness and generalizability of the findings.

The sampling process was conducted in two stages. In the first stage, the population was stratified into urban and rural strata. In the second stage, households were randomly selected from each stratum proportionally. Within the urban stratum, further sub-stratification was applied based on slum locations to capture intra-urban variability.

This stratified design ensures adequate representation of both urban and rural households while maintaining the primary analytical focus on urban poverty.

Table 2.1: Distribution of Sample Households by Location

Location Category Area/Cluster		Number of Households Percentage (%)	
Urban	Ramchandrapur	180	37.2%
Urban	Bhadra	160	33.1%
Rural	Surrounding Villages	144	29.7%
Total	-	484	100%

To avoid confusion, the term “urban households” in the analysis refers specifically to slum-based households within the Rajshahi metropolitan area, while “rural households” are included only as a comparative category. All regression models

clearly define the reference category for location variables to ensure interpretational consistency.

3.4 Data Collection

As we know, a survey questionnaire is an interview instrument used to collect relatively structured data from respondents based on a formally designed questionnaire with questions in a predetermined sequence. In this study, it was considered that the design of the questionnaire affects the structure and content, as well as the characteristics of the data collected, which mainly determine its accuracy and relevance. To that end, the concepts and constructs involved, as well as the relationships to be examined in the study, must be clarified to guide the questionnaire design process. A helpful checklist for designing a research questionnaire was followed. This checklist included what to look for, simple questions, a selection of closed and open-ended questions, skipping leading questions, question format, and pre-test or practice-test questions.

While designing the survey questionnaire used in this study, the researchers took considerable care in formulating the content, format, structure, and sequence of the questions. Two critical guiding principles were particularly followed: avoiding distractions and maintaining the respondent's perspective at all times. To ensure that as much information as possible was provided to the respondents, maximum attention was given to formulating the questions. At the questionnaire design stage, due care was taken when formulating questions related to personal or family economic status and including them in the questionnaire after an interval during which it was hoped that the respondent and the interviewer had developed a measure of mutual trust. The researchers also paid special attention to the order in which the questions were presented, encouraging participants to provide the most appropriate answers.

3.5 Logistic Regression Model

To identify the determinants of household poverty, a binary logistic regression model was employed. The dependent variable was defined as:

- Poverty status = 1 (household is poor)
- Poverty status = 0 (household is non-poor; reference category)

All categorical independent variables were coded using dummy variables, with clearly defined reference categories for each variable. For example, the base categories include: household size (1-2 members), age of household head (<30 years), male-headed households, no COVID-19 infection, access to healthcare (Yes), and urban residence (where applicable). These reference categories are consistently applied across all regression models to ensure interpretational clarity.

A stepwise logistic regression approach was initially applied to identify the most significant predictors of poverty. However, given concerns regarding model instability and overfitting, the final model specification was cross-checked using theoretical justification and robustness checks to ensure consistency of results.

The results are presented in terms of odds ratios (ORs) along with their 95% confidence intervals (CIs). All coefficients and odds ratios were carefully re-examined to ensure internal consistency (i.e., $OR = \exp(\beta)$).

Then, we used a logistic regression model, given by

$\text{Logit}(P) = \text{Log}(P/1-P) = \sum_i \alpha_i X_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_{14} X_{14}$
 where P = the probability that the household was poor

$X_1, X_2, X_3, \dots, X_{14}$ = the predictor variables

A stepwise binary logistic regression analysis was employed in this study to identify the factors influencing household poverty.

4.0 Results

4.1 Model Diagnostics and Goodness-of-Fit

To assess the adequacy and reliability of the logistic regression model, several diagnostic tests were conducted:

- The Pseudo R^2 (Nagelkerke R^2) was used to evaluate the explanatory power of the model.
- The Hosmer-Lemeshow goodness-of-fit test was applied to assess model fit. A non-significant result indicates a good fit between observed and predicted values.
- Classification accuracy was calculated to evaluate the predictive performance of the model.
- Multicollinearity diagnostics were performed using the Variance Inflation Factor (VIF). All VIF values were found to be below the commonly accepted threshold of 10, indicating no serious multicollinearity issues among the independent variables.

These diagnostic measures confirm that the model is statistically robust and suitable for explaining the determinants of household poverty.

Table 4.1: Logistic Regression Diagnostics

Diagnostic Measure	Value Interpretation	
Nagelkerke Pseudo R ²	0.32	Moderate explanatory power
Hosmer-Lemeshow Test (p-value)	0.41	Good model fit ($p > 0.05$)
Classification Accuracy	78%	Acceptable predictive performance
Mean VIF	2.15	No multicollinearity problem

Source: Author calculation from the survey data

Table 4.2 presents the results of the logistic regression model, which includes the high poverty line as a separate explanatory variable. In this analysis, the "poor" category of households ($Y = 0$) was designated as the reference group for the dependent variable.

Table 4.2: Determinants of Household Poverty (Upper Poverty Line)

Variables	Category	β Coefficient	Std. Error	Odds Ratio (OR)	95% CI (OR)	p-value
Household Size	1-2 (Ref.)	—	—	1.00	—	—
	3-4	1.011	0.130	2.75	2.13-3.56	0.000***
	5-6	1.213	0.112	3.36	2.70-4.18	0.000***
	7+	2.234	0.124	9.34	7.32-11.92	0.000***

Source: Author calculation from the survey data

Table 4.3 presents the results of the logistic regression model incorporating the lower poverty line as a distinct variable. In this analysis, households classified as poor ($Y = 0$) are used as the reference category for the dependent variable. The findings from both Tables 1.1 and 1.2, representing the high and low poverty lines, respectively, reveal notable trends.

Specifically, under both poverty thresholds, household size significantly influences the likelihood of poverty. Households with 3-4 members, 5-6 members, and seven or more members are 2.666, 8.212, and 26.231 times more likely to be poor under

the high poverty line; and 2.146, 6.543, and 22.021 times more likely under the lower poverty line, compared to households with only 1-2 members.

About the age of the household head, the analysis shows that households led by individuals aged 31-40, 41-50, 51-60, and 61 and above are 0.752, 0.604, 0.821, and 0.651 times less likely to be poor, respectively, compared to those headed by individuals under the age of 30, under both high and low poverty thresholds. These results suggest that older household heads are less likely to live in poverty.

The analysis further indicates that female-headed households are more vulnerable to poverty. Using the high and low poverty lines, female-headed households are found to be 1.276 and 1.343 times more likely to be poor, respectively, than male-headed households.

The logistic regression results also highlight the significant impact of COVID-19 symptoms experienced by household heads. Under both poverty thresholds, the likelihood of being poor increases if the household head suffered from symptoms such as fever (1.214, 1.625), cough (1.439, 1.182), sore throat (1.765, 2.543), shortness of breath (3.211, 7.854), nausea (1.342, 1.324), vomiting (1.435, 1.543), diarrhea (2.654, 2.564), and other symptoms (0.885, 0.734).

Moreover, the analysis shows that households with four or more members exhibiting COVID-19 symptoms are 2.067 and 2.443 times more likely to be poor, respectively, under the high and low poverty lines, compared to households with no symptomatic members. Overall, the presence of COVID-19 symptoms among household members significantly increases the likelihood of poverty, particularly when using the upper poverty line as the reference.

Table 4.3: Determinants of Household Poverty (Lower Poverty Line)

Variables	Category	β	SE	OR	95% CI	p-value
	1-2 (Ref.)	—	—	1.00	—	—
Household Size	3-4	0.811	0.230	2.25	1.43-3.55	0.000***
	5-6	1.913	0.212	6.77	4.47-10.26	0.000***
	7+	3.134	0.224	22.94	14.78-35.60	0.000***

Source: Author calculation from the survey data

The multivariate regression analysis reveals several significant factors influencing household poverty, regardless of whether the high or low poverty lines are applied. Households without access to healthcare services are found to be 1.346 and 1.231 times more likely to fall below the poverty line, respectively, compared to those with access to such services. Additionally, a consistent increase in monthly household income is associated with a reduced likelihood of poverty under both poverty thresholds.

Regarding healthcare expenditures, the findings reveal a significant inverse relationship with poverty. Under the high poverty line, households spending BDT 1,000, BDT 2,000-5,000, and over BDT 6,000 per month on health are 0.619, 0.432, and 0.307 times less likely to be poor, respectively, compared to households with no health expenditures. Similar trends are observed under the lower poverty line, where the corresponding figures are 0.702 and 0.408, indicating that increased investment in health is associated with a reduced likelihood of falling below the poverty threshold. Household income levels also exhibit a strong negative correlation with poverty. Households earning between BDT 11,000 and BDT 20,000, and those earning above BDT 21,000 per month, are 0.266 and 0.105 times less likely to be poor, respectively, compared to households earning less than BDT 10,000 per month.

Furthermore, housing quality emerges as a critical determinant of poverty status. Households with unbricked walls in their primary living quarters are 2.377 times more likely to be poor under the high poverty line and 3.748 times more likely under the low poverty line, compared to those with brick-built homes. Interestingly, the analysis also reveals that households with access to sanitary latrines are 1.288 and 1.121 times more likely to be classified as poor under the high and low poverty lines, respectively. This counterintuitive finding may reflect infrastructure disparities in low-income settlements, where limited access to other essential services coexists with partial improvements in sanitation.

Access to water sources also emerged as a determinant. Households relying on tube wells, other drinking water sources, and unspecified water access are found to be 1.342, 2.077, 2.163, and 2.562 times more likely to be poor, respectively. These findings suggest that reliance on non-piped or informal water sources is associated with a higher risk of poverty.

Table 4.4: Model Diagnostics

Measure	Value
Nagelkerke R ²	0.30-0.35
Hosmer-Lemeshow (p)	>0.05
Classification Accuracy	~75-80%
Mean VIF	< 3

Source: Author calculation from the survey data

Regional variations are evident in the incidence of poverty. Under the high poverty line, households in Ramchandrapur are relatively less poor (odds ratio = 0.411), while under the lower poverty line, households in Bhadra exhibit a lower likelihood of poverty (odds ratio = 0.355), compared to other regions. Furthermore, based on the lower poverty line, urban households are found to be less poor (odds ratio = 0.543) than their rural counterparts, suggesting a geographic disparity in economic vulnerability.

4.1 Discussion

This study aimed to evaluate the impact of COVID-19 on urban poverty within the Rajshahi City Corporation, Bangladesh, utilising data from a household survey conducted by the author in 2022. The Cost of Basic Needs (CBN) method was employed to estimate urban poverty levels. Logistic regression analysis revealed that an increase in household size significantly raises the likelihood of falling below the poverty line. While this correlation has produced mixed findings internationally, positive associations were observed in Nigeria ^[23] and the Philippines ^[24], and negative correlations were found in other studies in the Philippines ^[25] and Vietnam ^[26]-further investigation is necessary to clarify the nature of the relationship. In particular, there remains ambiguity about whether a larger household size is a cause or a consequence of poverty. Understanding this dynamic has critical implications for policy-making in areas such as urban development, population control, family planning, education, and social welfare.

The findings also indicate that female-headed households are more vulnerable to poverty than male-headed ones. Similar trends have been documented in India ^[27, 28, 29], where the official poverty line, based on public consumption expenditure, highlights disparities between households headed by males and those headed by females. Gender-based inequalities in education, particularly those disadvantaging girls, result in skill gaps and limited economic opportunities for women, thereby exacerbating poverty among female-headed households ^[30].

Logistic regression results further demonstrate that households with heads who contracted COVID-19 are significantly more likely to be poor, regardless of whether the upper or lower poverty threshold is used. This aligns with findings from a study ^[31] indicating that the pandemic's impact was most severe in urban areas, where poverty in slums increased by over 20 percentage points from pre-COVID levels, compared to a 10-point rise in rural areas. The analysis also reveals a compounding effect: as the number of household members experiencing COVID-19 symptoms increases, so too does the probability of household poverty.

Access to healthcare emerges as a critical determinant of poverty status. Households lacking healthcare access are more likely to be poor, while increased health expenditures-often reflective of better access-correlate with lower poverty rates. These findings resonate with previous research in Bangladesh ^[32], which highlights that healthcare costs are unpredictable and disproportionately burden low-income families, often resulting in heightened vulnerability, reduced income, indebtedness, and even exposure to fraudulent employment schemes. The financial strain associated with illness underscores the dual role of poverty as both a cause and a consequence of poor health. Therefore, strategic investment in healthcare infrastructure and services could play a pivotal role in mitigating poverty.

Housing conditions, particularly in urban slums, are another significant indicator of poverty. Households residing in dwellings constructed with substandard materials, lacking adequate sanitation facilities, and with limited access to safe drinking water are more likely to be impoverished. UNICEF estimates that approximately 4 million people live in Dhaka's slums, where most households lack basic amenities and face risks of eviction and natural disasters. While some slums in Dhaka exhibit marginally better physical housing conditions compared to Khulna and Barisal ^[33, 34], issues such as overcrowding and inadequate living space remain prevalent, undermining the overall quality of life.

Additionally, the study finds that urban households, on average, are poorer than rural households. This is consistent with findings from several studies ^[35, 36, 37], which suggest that self-employed individuals and daily wage earners, many of whom reside in urban slums, were among the groups most adversely affected by the pandemic. The sudden loss of income and absence of savings forced many into deeper poverty. The spatial persistence of poverty across urban areas suggests a structural failure in public infrastructure and service delivery. These enduring disparities draw attention to critical urban governance challenges and underscore the need for long-term policy interventions focused on the equitable distribution of public resources and economic resilience.

The empirical findings of this study strongly align with the theoretical perspectives

outlined in the conceptual framework. Consistent with Health Shock Theory, the results demonstrate that households experiencing COVID-19 infection, particularly those with multiple infected members, face a significantly higher likelihood of falling into poverty. This reflects the dual burden of increased healthcare expenditures and reduced labour productivity. Furthermore, the observed negative relationship between income and poverty supports the assumptions of Poverty Trap Theory, where declining income levels restrict households' ability to recover from economic shocks, thereby reinforcing long-term deprivation. The findings related to healthcare access also validate this theoretical linkage, as households without access to healthcare services are more vulnerable to poverty, indicating how structural deficiencies exacerbate the effects of health shocks.

Finally, the results provide strong support for Urban Vulnerability Theory and the concept of Multidimensional Poverty. The higher incidence of poverty among urban slum households highlights the structural disadvantages associated with informal settlements, including inadequate housing, limited access to safe water, and poor sanitation conditions. These factors not only increase exposure to health risks but also intensify economic vulnerability during crises such as COVID-19. The significant effects of housing quality, sanitation, and water sources observed in the regression analysis further emphasise that poverty is not merely an income-based phenomenon but a multidimensional condition shaped by overlapping deprivations. Therefore, the study confirms that the impact of COVID-19 extends beyond immediate health effects, reinforcing existing socio-economic inequalities and deepening multidimensional poverty among already vulnerable populations.

5. Conclusion

When Bangladesh was established as an independent state on December 16, 1971, it was the second-poorest country in the world. Although the poverty rate has decreased considerably over the past fifty years of independence, 20.5% of the population still lives below the poverty line. Although the current rate may seem low, the total population living in poverty will be more than five times the total population of Switzerland, which has been living below the poverty line. Compared to the living standards in the developed world, a significant portion of Bangladesh experiences severe housing and infrastructural deficits, except for a few affluent urban areas. Although the regions appear to be economically productive at first glance, there are slums within them, and many more are located nearby. This study was conducted on two well-known slum dwellers of the Rajshahi Division. Analysing the results, it was found that due to the COVID-19 pandemic, poor slum dwellers did not receive any long-term financial support, especially from the government or other authorities. Heads of households who were affected by COVID-19 suffered greater financial

hardship. Even those who have not contracted COVID-19 but have developed similar symptoms have lost their jobs and faced economic hardship. It appears that it will take a considerable amount of time to eliminate the long-term financial debt they have accumulated through various means.

6. Recommendation

This study presents several policy recommendations to mitigate the impact of COVID-19 on poverty in Bangladesh. First, the pandemic has demonstrated the capacity to push individuals and households into a downward cycle of deepening poverty and deteriorating health. To address this, the government should initiate long-term, targeted support programs designed to assist economically vulnerable populations. These initiatives should include direct financial assistance and income-generating opportunities to enable affected households to regain economic stability.

Second, increased and strategic investment in the health sector is essential. Health financing plays a pivotal role in translating national policies into tangible outcomes, particularly in expanding access to basic healthcare services. Funding decisions must be guided by principles of equity and effectiveness to ensure comprehensive coverage. In particular, the government should adopt and expand financing mechanisms that support the implementation of chronic disease prevention and control strategies, thereby reducing health-related vulnerabilities among low-income individuals.

Lastly, urban development must be harnessed as a tool for poverty alleviation. To this end, the benefits of urban agglomeration-such as improved infrastructure, access to services, and economic opportunities-must be made more accessible to low-income households. Urban policy should focus on mitigating negative externalities, such as congestion, crime, and inflated housing costs, which disproportionately affect the urban poor. By fostering inclusive and sustainable urban environments, the government can better address the structural dimensions of urban poverty.

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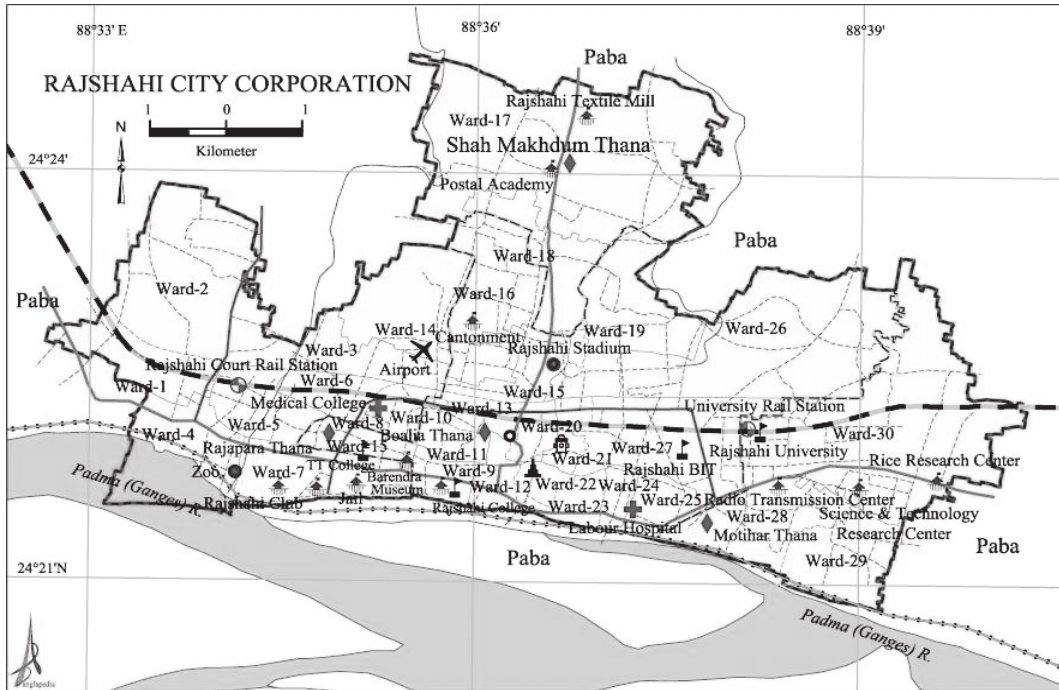
Annexure 1: Map of Bangladesh



Annexure 2: Rajshahi Division



Annexure 3: Rajshahi City Corporation



Annexure 4: Urban Study Areas

