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Exploring Poverty Penalties in Water and Housing Services and Their Influence on the Economic Decision-Making of Slum Households in Dhaka

S M Nazmus Sakib^{1*}, Md Tawhid², Mahira Nazniba Rodoshee³

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ABSTRACT

The disparate prices of access to key services are becoming increasingly relevant factors in urban poverty in the Global South, whereas little effort has been made to understand the combined effects of various service deprivations on household economic decisions. The paper explores the interactions between water and housing poverty penalties on the livelihoods and economic decision-making of slum dwellers in Dhaka, Bangladesh. The study combined an exploratory sequential mixed methods design, which uses 30 in-depth household interviews with a survey of 100 slum households in four settlements in Dhaka North and Dhaka South City Corporations. The results show that the poor households face a compounded poverty penalty, with insecure housing and lack of water resources imposing disproportionately heavy financial burden and implementing decreased possibilities of investment in savings, education, health, and livelihood. Households currently spend 32.7 % of monthly income on rent and water, which is above known affordability levels, and 75 % of households report having no saving ability. Correlation analysis also shows that households with low income have greater relative burdens and housing and water penalties reinforce one another. This research builds on the poverty penalty theory in the context of extending it to the issue of urban inequality, informal system of service provision and sustainable livelihoods in growing urban cities across the world. The findings suggest that water and housing poverty penalties interact to constrain household livelihood choices and reduce opportunities for saving, education, health expenditure, and productive investment.

INTRODUCTION

Dhaka is a fast-expanding megacity of the Global South and still receives a significant rural-urban migration of people. Most of the low-income immigrants end up living in overcrowded informal settlement areas with little or no formal water, sanitation, power, drainage system and safe shelter. According to Habitat for Humanity (2023), there is rampant informal settlement development in the city and attributes part of this development to displacement and livelihood stress. Low income is not the only form of deprivation in these communities. It is additionally manifested in terms of a poverty penalty: individuals with the least resources might pay higher prices, receive inferior quality, take more time to access services, or take on more risk than those served by regulated systems (Mendoza, 2011; Prahalad and Hart, 2010). The penalty thus incorporates monetary, quality, reliability, time, health and security aspects.

The lack of formal water connections and insecure tenure in Dhaka may lead residents to informal traders and intermediaries as well as unregistered rent agreements. These providers frequently fill an actual service gap, though the bargaining power of households is low, consumer protection is weak, and households have little recourse in case of unsafe water, disrupted supplies, increased rent, or denied repairs. Water-related penalties have been reported previously (Kashem *et al.*, 2023; Rahaman and Ahmed, 2016), and housing insecurity

is a well-researched issue (Amjad, 2024), yet the two burdens are typically studied individually. There is no proof that exists particularly on the joint functioning of these within the same households and the joint cost in influencing everyday economic decisions. This paper fills that knowledge gap in four settlements of the Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC).

The paper has been a conceptual and practical contribution to literature, by generalizing single-service explanations of the penalty of poverty into a cross-service explanation. It poses three questions: (1) how households feel the water and housing penalties in the chosen settlements; (2) what are the sizes of rent and water burdens in comparison to reported income; and (3) how the water and rent burdens relate to saving and spending choices. The general aim is to investigate the type, difference, and aggregate economic effect of water and housing fines amongst low-income households in Dhaka. It is aimed at informing DWASA, the two city corporations, housing and tenure actors and development organisations aiming at advancing affordable services and the Sustainable Development Goals on poverty, water and sanitation and sustainable cities.

LITERATURE REVIEW

The concept of poverty penalty describes why poor households end up paying more and less frequently.

¹ Lecturer, Department of Development Studies, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka, Bangladesh

² MSS Student, Department of Development Studies, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka, Bangladesh

³ Lecturer, Department of Development Studies, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka, Bangladesh

* Corresponding author's e-mail: nazmus.sakib@bup.edu.bd

According to Mendoza (2011), the poverty penalty refers to the extra price that poor households pay, compared with non-poor households, to get access to good of similar quality or services. Nobre *et al.* (2022) believes that poverty penalties come about due to the structural trapping of low-income households in distinct informal contracts of the poor, alternative suppliers and worse infrastructure, which collectively generate poorer outcomes at higher prices.

There is extensive but scattered evidence on poverty penalties in Dhaka. Price premiums, unreliable supply, informal intermediation and quality deficit are explained by water studies and overcrowding, insecure tenure, inadequate infrastructure and rent burdens by housing studies. This sectoral segregation confuses the house hold budget constraint: rent and water use are financed by the common income and can mutually substitute food, health care, education, debt repayment, saving and productive investment. A cross-service strategy is thus required to be cognizant of how seemingly different shortcomings add up to the household livelihoods.

Housing conditions have also been poor making people more susceptible in Hazaribag. Inhabitants of Dhaka slums are usually discovered to be living in tiny rooms where they lack privacy, ventilation, and have poor drainage and shared toilets all these are crowded with low-income families. These circumstances can have negative impacts on wellbeing and health. Tenants might also not be able to call for improvements in housing and water services due to insecure tenure and to informal rental agreements (Hanchett *et al.*, 2003; Haque *et al.*, 2020). Thus, low-income households might face a housing poverty penalty assuming that they spend much of their earnings on low quality and insecure housing. There are also issues in services of Hazaribag which are caused by changes in the environment and changes in industries. Despite the fact that Hazaribag used to be a major tanning area, it is characterized by water pollution, environmental damage, and inadequate infrastructure (Iqbal *et al.*, 2023). A large proportion of the residents rely on irregular DWASA water and might have to boil water or purchase purified water, which costs households additional money (Iqbal *et al.*, 2023). They are aggravated by low standards of housing, shared toilets and congestion in the rentals. Therefore, where the cost of official water is low, households with low incomes will experience greater effective cost of safe water and house.

The same trends are observed concerning housing. Informal settlement living, like Kallyanpur, is typified by overcrowded rooms, poor ventilation and tenurial security, rents paid disproportionately by residents of formal and better-off areas (Global Center on Adaptation, 2022). Similar evidences in other countries, such as Mukuru slum in Nairobi, demonstrate a 3-4 times higher price, given to slum residents than to formal neighborhood residents, of water, sanitation, electricity and even small rental rooms, yet their inhabitants continue to reside in a crowd of poorly constructed and tenured housing

(Mwau & Sverdlík, 2020; Mutinda *et al.*, 2020). The penalty of water and housing are not isolated. Access to water and sanitation services in slums is mediated by intermediaries and local power-brokers and many slum residents rely on unregulated and, at times, informally controlled water and sanitation markets in Dhaka, according to Arias-Granada *et al.* (2018). Households in such systems benefit by receiving lower quality and riskier WASH services, but persist in paying these services on a regular basis, and have little recourse should it not receive the services. The Global Center on Adaptation (2022) suggested this pattern as a structural feature of informal settlements, rather than a group of haphazard price anomalies: formal utilities tend not to be available to informal communities due to the absence of secure tenures that create an opportunity to be filled by informal vendors, middlemen, and landlords. Accordingly, BBS (2020) definitions of communities with low incomes in the city also include the fact that those who face a water penalty are also likely to face other sanitation problems, such as lack of housing, drainage system access, water supply, and access to roads, with accompanying health and economic consequences. Also, Kashem *et al.* (2023) state that the average water expenditure of slum households amounted to over 8 percent a month. Panday (2017) correlates these outcomes with weak governance and the absence of a pro-poor policy in Dhaka that imply that improved service provision and reduced informal cost is a conditional requirement to stimulate household investment in education and income generation activities. Amjad (2024) cites that in Korail, the climate migrants do not have any land rights and are always subject to eviction, which leaves them under pressure to borrow money at a high interest rate to survive.

Haque (2019) also shows that informal arrangements and intermediaries are a significant factor in water governance in slums in Dhaka. According to the study, the slum households pay considerably higher prices on water than the households legally linked to DWASA and it has been discovered that domestic water expenditure can be as high as a quarter of household average monthly income. This shows that there is a water-pricing penalty as a result of informal water supply and bad water management. According to a study by the University of Texas at Austin (2019), more than 70% of slum dwellers in Dhaka do not own their homes, thus providing no economic motivation to invest in housing improvements as a result, they face additional costs related to safety and health issues. Rahaman and Ahmed (2016) have identified water charges in Godown, Tejgaon, and Korail against those of the official DWASA, and found that water charges in the slums are seven to fourteen times higher and the slum dwellers spend 12-15% of their monthly earnings on water. Over 10% of residents in slums point to water quality as the source of their poor health, while unsafe water and poor sanitation have been associated with under nutrition and child mortality in slums, and to consequences for human capital and household income

in the long term (NIPORT *et al.*, 2016; UNICEF, 2010). This is clearly shown in the literature that the income of slum dwellers in Dhaka is less and less they are given and that they feel less secure in services which are most valuable in health, livelihoods and for long-term planning. However, almost all the studies in existing literature concentrate on a single service water in the studies of Kashem *et al.* (2023) and Rahaman and Ahmed (2016), housing in Amjad (2024) and only measure the penalty itself without tracking its behavioral consequences. Misty, M. S., & Akther, H. (2025) start to explore this from livelihoods perspective, but in only one settlement. No study is available that looks at both water and housing penalties in the same households, the same settlements, in both city corporations and directly at how these penalties are related to household economic decision-making. This study aims to fill this void.

This study is guided by a conceptual framework that is based on three perspectives that are complementary. The Sustainable Livelihoods Approach helps to identify the situation of households with low financial and physical assets, which are most vulnerable to poverty penalties (Misty, M. S., & Akther, H. (2025)). The concept of markets of the poor offers an interpretation of the structural hindrances encountered by slum dwellers in obtaining not only informal and less regulated water and housing, often via local power brokers, but also pricier ones (Arias-Granada *et al.*, 2018). The central dependent variable in this paper is poverty Penalty Theory (Prahalad and Hart, 2010; Mendoza, 2011) which contextualizes the main independent variable of the research the extra price poor households pay to similar products and services compared to which the Sustainable Livelihoods Approach and the concept of markets of the poor are subsequently applied.

These are extended to examine the poverty penalty in basic services as the independent variable and the reduced spending in food or health, increased borrowing in the informal sector and lower savings as the dependent variable, that is, the result of the analysis. The combination

of root causes (lack of legal water connection, lack of security in land tenure, low regulation and control of water access by locals in the middle) causes the poverty penalty, which in turn leads to a set of household level economic decisions (reduced saving to water, increased informal borrowing, reduced spending on basic needs, and some housing improvement).

MATERIALS AND METHODS

The research orientation was pragmatic since it needed to interpret the lived experience as well as quantitatively describe recurring patterns, as research problem demanded. Pragmatism also allows the combination of qualitative and quantitative data based on how much it is relevant to the research questions and does not necessitate commitment to any of the epistemological stances (Creswell & Plano Clark, 2018; Tashakkori and Teddlie, 2010). The qualitative strand determined the way residents perceived cost of services, quality, reliability and coping. The quantitative strand approximated the distribution of those experiences and was the one that tested the association between income and expenditure burdens.

An exploratory sequential mixed-methods design was used. Phase One involved 30 semi-structured household interviews, which aimed at soliciting water access, rental housing, financial strain, and coping. Themes that came out of these interviews were used to structure the wording and categories of responses in the Phase Two household questionnaire. Phase Two surveyed 100 households, 25 in each settlement. Integration was at the level of instrument development and interpretation: the mechanisms underlying the patterns in the surveys were explained by qualitative accounts, quantitative results showed how prevalent the pattern of choice selected patterns were in the study sample. The design is exploratory and lacks causal effects and prevalence of the population in the sampled settlements (Creswell & Plano Clark, 2018).

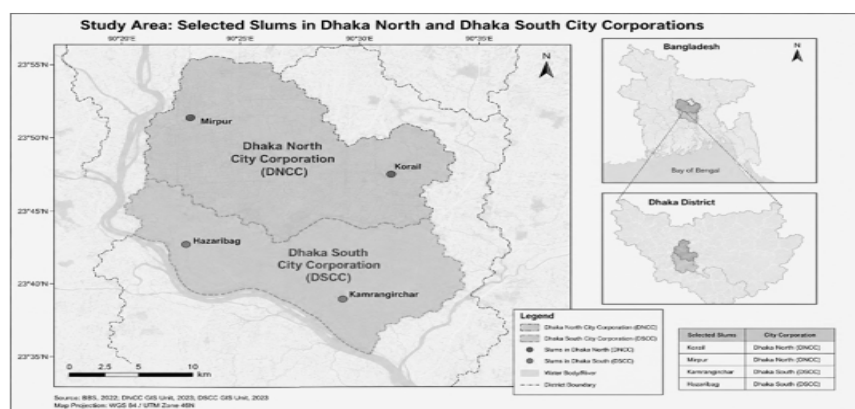


Figure 1: The selected settlements are Korail & Mirpur in Dhaka north while Kamrangirchar & Hazaribag in Dhaka South. These are chosen because they have been found in published literature to have experienced high water and housing poverty penalties and to have had illegal service markets and insecure land tenure (Kashem *et al.*, 2023; Amjad, 2024; Iqbal *et al.*, 2023).

Different sampling strategies were used for the two phases. Phase One employed purposive sampling to single out information-rich households capable of exhaustively describing water and housing constraints in detail, which aligns with the principles of qualitative sampling (Palinkas *et al.*, 2015). The sample consisted of a stratified site approach in Phase Two: half of the sample was distributed in DNCC and DSCC and half in the four selected settlements. Within each settlement, then households were recruited. Due to the lack of a complete and up-to-date household sampling frame, the quantitative sample must be interpreted as a structured comparative sample as opposed to a fully probability

based citywide sample. This explanatory clarification constrains arguments of statistical generalisability and allows meaningful comparison across the four sites.

Korail and Mirpur in DNCC and Kamrangirchar and Hazaribag in DSCC were visited. These locations were chosen due to the presence of strong water-access issues, informal service-providing arrangements, environmental pressures, or tenure uncertainties in these sites, determined by the published research (Amjad, 2024; Iqbal *et al.*, 2023; Kashem *et al.*, 2023). The four-site plan is a way of capturing institutional and infrastructural diversity in Dhaka, though not in each of the informal settlements in either city corporation.

Table 1: Overview of the Mixed-Methods Study Design and Sample Distribution in Dhaka

Study Phase	Study Area	Research Method	Sample Size
Phase One (Qualitative)	DNCC	In-depth Interviews	14 households
	DSCC	In-depth Interviews	16 households
	Total		30 households
Phase Two (Quantitative)	Dhaka North City Corporation (DNCC)	Household Survey	50 households
	Dhaka South City Corporation (DSCC)	Household Survey	50 households
	Total		100 households

There were two instruments. The qualitative phase was performed with semi-structured in-depth interviews with the four thematic blocks, which included the water penalty, the housing penalty, economic decision-making and coping, and comparative perception to obtain the rich qualitative information on poverty penalties, coping mechanisms and access to services. The quantitative was conducted by a structured household-questionnaire, which was conducted at the home of respondents, through the mobile data collection tool, Google Forms, to help with computer data input and reduce transcription mistakes.

Braun and Clarke's (2006) six-phase approach to doing thematic analysis was followed to analyse coded qualitative data: familiarization with the data, initial coding, searching for themes, reviewing themes, defining and naming themes, and producing the theme analysis. The codes were organized into themes that were related to the poverty penalty of drinking water, poverty penalty of housing and economic decisions by a household that were then compared and contrasted with the literature review and conceptual framework. Such themes were not only the primary qualitative results, but also directly influenced the construction of the Phase Two structured questionnaire, and it is based on the logic of design as the exploratory sequential design (Creswell & Plano Clark, 2018).

The statistical analysis of quantitative data involved descriptive (mean, percent, frequency distribution) analysis to summarize household characteristics and patterns across settlements and the city corporations and Pearson correlation analysis to test the relationship among household income, the rent burden and the water burden. The research was conducted within the confines of the basic research ethical protection in research with human participants and sensitive family financial data. The purpose of the study, the voluntary nature of participation,

and the right to decline questions or withdraw as well as the intended use of the data were explained to the respondents. Informed consent was taken either orally or through a written document prior to collection of data. All personal identifiers, such as names, were not included into the analytical dataset, and quotations were presented anonymously. There was no payment provided. These were procedures that were aimed to minimize coercion and ensure confidentiality (Bryman, 2016).

The design entailed practical constraints. The qualitative was restricted to 30 interviews and the quantitative to 100 households. Limited field time meant less time to be able to observe and interview repeatedly. Lack of a complete list of households also limited probability sampling. As a result, the study would put greater emphasis on analytical insight, the identification of patterns, and the comparison of selected settlements over an estimation of the entire city. These restrictions are seen in the inferential statistics interpretation.

RESULTS AND DISCUSSION

Socio-demographic Profile of Respondents

Socio-demographic parameters are very crucial to giving background information on slum dwellers' economic activities, socio-economic vulnerability and socio-economic consequences, financial vulnerability and financial consequences of informal sectors in the urban areas are very vulnerable. Household size, dependency ratio, income security and occupation vulnerability are the characteristics of informal sectors in the urban area.

The 100-household survey sample was evenly divided between DNCC and DSCC with 50% each, and evenly distributed across the four settlements, 25% each being from Korail, Mirpur, Hazaribag and Kamrangirchar.

Table 2: Socio-Demographic Profile

Characteristic	Category	Frequency (n)	Percentage (%)
City Corporation	DNCC	50	50.0
	DSCC	50	50.0
Slum/Settlement	Korail	25	25.0
	Mirpur	25	25.0
	Hazaribag	25	25.0
	Kamrangirchar	25	25.0
Household Size	Small (2–3 members)	20	20.0
	Medium (4–6 members)	68	68.0
	Large (7–8 members)	12	12.0
Monthly Household Income (BDT)	Below 10,000	19	19.0
	10,000–14,999	44	44.0
	15,000–19,999	26	26.0
	20,000 and above	11	11.0
Number of Earning Members per Household	1 earning member	65	65.0
	2 earning members	35	35.0
Primary Occupation of Earning Members	Street business (hawking/vending)	35	35.0
	Shopkeeper	16	16.0
	Day labourer	9	9.0
	Rickshaw puller	20	20.0
	Garments worker	12	12.0
	Helping hand (domestic/informal work)	8	8.0

Qualitative Findings by Settlement

The 30 intensive interviews (14 DNCC and 16 DSCC) have been analysed individually and three broad themes (the water poverty penalty, the housing poverty penalty and household economic coping decisions) have been identified alongside a cross-cutting difference between DNCC and DSCC in nature of the water poverty penalty. When asked, people said that they live in a very small

room that has a cupboard and a bed. Others reported having just one or two toilets used by several families in the same room or being in the same room with another family. They would be forced to stay in long queues in the toilet especially in the morning, before heading to work or school. These results are in line with previous studies indicating the sharing of sanitation facilities for multiple households in slums of Dhaka city (Haque *et al.*, 2020).

Table 3: Qualitative overview of water source, cost and housing conditions by settlement

Settlement	Primary water source(s)	Water cost (BDT/month)	House rent (BDT/month)	Core constraint
Mirpur (Kalshi)	Meter, borehole, DWASA pipe	500–1,200 (meter); 300/room (borehole)	2,000–6,000	High metered bills; unsafe DWASA water
Korail	Rationed tap (5 min/day); vendors	300/room + 2,000–2,600 (vendor top-up)	3,000–7,000	Severe time rationing; poor water quality
Kamrangirchar	Pipeline (irregular, often at night)	400/room	1,500–8,000	Unreliable timing; poor water quality
Hazaribag	DWASA supply (intermittent)	Fixed DWASA fee + outside sourcing	1,800–5,000	Frequent unavailability; high boiling cost

Mirpur has three parallel water supplies: metered connection (BDT 500-1200 per month), tube-well/borehole (a fixed BDT 300 per room) and DWASA pipeline (water is not drinkable and bought by a user or

boiled by user). They do not face any water shortage, but rather households voluntarily restrict their water usage to control their expenses, since the water bill is billed on a per-use basis. When house rent and water bills are a little

cheaper, we could afford to educate our children better, eat better, and live better, said one respondent, “If house rent and water costs were lower, we could spend more on our children’s education, buy better food, and live more comfortably. Almost everyone has loan installments to pay for. Sometimes we eat less just to save money, but by the end of the month, nothing is left.”

Along with rents of BDT 2,000-6,000 and regular toilet-sharing between families, rent and water were repeatedly reported as the biggest burden to family wellbeing: “Water is a big problem here. It is hard to get safe drinking water. If we use more water, we will have to pay more because the bill is adjusted to the meter.”

Korail is the most affected by water shortage. Each household receives water on a shared basis, with a rate of 300 per room per day, five minutes per day of water. Supply and water is purchased at the informal water vendors at a rate of 2000-2600 per month which is approximately seven to eight times the DWASA rates. Respondents cited this vendor water as a low quality and illness causing. It is made even more difficult by the housing conditions with rents ranging between BDT 3,000 -7,000 on a small, crowded room with little privacy. A newly married respondent talked about how he could not even spend some time with his wife without feeling some privacy, as they can share only one room with six people. In Mirpur, rent and water were considered as a fixed unavoidable cost by respondents: when rent and water costs were lower, I would rent another room, live more comfortably, eat better food, and purchase nice things to my wife.

In Kamrangirchar, most houses will have access to the pipeline and prices of these houses will be relatively low and stable (BDT 400 per room) but in other houses the pipeline will supply water at around 1:00 a.m. which will interfere with the sleep patterns of people. On average BDT 1,500-4,000, although in the case of multi-storey housing with good quality facilities, one respondent said that he paid BDT 6,000-8,000, and that since his sons were leaving early in the morning, he had to pay higher since he needed his own toilet. Respondents associated high cost of housing directly to limited investment to the future of their children: When house rent is lower, we can better educate our children and employ good teaching staff members.

In Hazaribag, although a majority of households are formally linked to DWASA, they claim to have long periods of water interruptions, and they have to seek alternative water sources in addition to boiling it after which they use it further raising the cost of gas or firewood to formally linked households. There is considerable overcrowding and high temperatures, noise and shared sanitation, and rents range from BDT 1,800 to 5,000. There were some respondents who compromised on the quality of their homes in favor of quality of their basic consumptions, materials etc.

We would have more time to enjoy peace and even have less food but be in a better house, we could have done

that, told me, had the rent been less we could have been in a better house.

The savings are important to residents. A better house makes cleaner, more comfortable house even more critical to this household than an increase in food since they live in a better house. Implicates congestion, noise, unhygienic environments, continuous stress and most families are of the opinion that with a better house, their living standards would be greatly enhanced. The setting of all the four settlements the people described all had a chance of coping strategies with the high cost and unreliable water supply, and poor housing. These strategies were to reduce water consumption to save on water bills in Mirpur; to buy extra water from the water vendors outside of Korail, though water is costly, to get up at night to fetch water in Kamrangirchar; to pay higher rent for having their own toilet; and to reduce their food intake in return of paying rent and water bills. There were also some of the households borrowing money to make their daily lives and this means that borrowing was a common practice.

Cross-Cutting Themes

The supply of water in all four settlements was not normalized and households within the same settlement tended to use very different systems, which have been consistent with previous research that has concluded that intermediaries (not public utilities) tended to be the effective provider of water in Dhaka slums (Haque *et al.*, 2020). It is hard to hold anyone to account due to fragmentation; in the case of poor or unreliable service, residents have no way to appeal in areas where water is managed by landlords or local operators (Haque *et al.*, 2020; Hanchett *et al.*, 2003).

The two most persistent and unavoidable household expenses were rent and water, and were so significant to push off food, education, healthcare and loan repayment. The coping mechanism varied among the settlements, as it was to minimize water consumption in the metered water system in Mirpur, to pay the vendor a premium in Korail, to alter sleep patterns in Kamrangirchar and to absorb fuel costs in Hazaribag to boil water but the overall trade-off between water trade-offs and food was the same as with prior evidence, which had shown poor water governance and informal pricing systems to place a disproportionately high burden on slum households, which pay residents almost a quarter of their monthly income to get domestic water alone before housing costs are factored in (Haque, 2019).

Such low-quality housing conditions, such as overcrowding, shared sanitation, poor ventilation and heat, were reported irrespective of what the water system in the settlement was, which correlates with what the prior record of shared sanitation facilities that are present in slums in Dhaka (Haque *et al.*, 2020). The issue of water quality was also generic: DWASA connected households in Mirpur and Hazaribag did not trust the water delivered by the DWASA and added to their bills to

clean or substitute it; vendor supplied water was reported to cause illnesses and extra medical bills in Korail, and pipeline supplied water in Kamrangirchar. Although their importance is not mentioned in the interview guide, a number of respondents raised concerns about privacy and shared space, an issue a newly married Korail respondent raised regarding overcrowding, and a Kamrangirchar respondent raised regarding paying extra to use a personal toilet, gendered burden of poor sanitation especially the safety of women, hygiene and dignity.

Finally, as with every other settlement, there was a shared repertoire of coping strategies: restricting one's use of water to meet metered charges; purchasing water on-demand, despite its high prices; adjusting domestic practices to fit the unpredictable water supply; spending more to have a private sanitation system; reducing food

consumption to meet the rent and water bills; taking on debts to keep up with regular bills. The strategies demonstrate resourcefulness under constraints and as existing studies into slum livelihoods have pointed out, these coping mechanisms tend to help slum households to live with (but not out of) poverty.

Financial Burden Analysis

The quantitative survey (n=100, 25 households per settlement) was used to assess the quantitative measures of the rent burden and the water burden, in terms of percentage of household income spent on housing rent and water access respectively and the combined burden is the sum of those. These figures by settlement are given in Table 04.

Table 4: Mean income, rent burden and water burden by settlement

Settlement	n	Mean income (BDT)	Mean rent (%)	Mean water (%)	Mean combined (%)
Kamrangirchar	25	13,260	28.3	6.0	34.3
Korail	25	13,980	26.6	6.5	33.1
Mirpur	25	14,225	26.1	6.3	32.4
Hazaribag	25	13,972	25.8	5.0	30.8
Overall	100	13,859	26.7	5.95	32.7

The estimated monthly income per household of the entire sample was BDT 13,859 with expenditures of an approximate of BDT 3,700 (26.7% of income) on rent and about BDT 824 (5.95% of income) on water. An overall amount of approximately BDT 4,524 or 32.7% of monthly earnings. The average slum household in this sample is financially overburdened, which is less than the internationally recognised affordability threshold, i.e. a household that spends above 30% of gross income on shelter and basic utilities (Herbert *et al.*, 2018).

Strain patterns can be seen at the settlement level. The settlement of Kamrangirchar has the lowest mean income (BDT 13,260) and the highest rent burden (28.3%) and highest observed combined burden (34.3%) indicating that it is the most adversely affected settlement financially with low nominal income, high relative cost of shelter. Despite the fact that Mirpur had the highest level

of mean income (BDT 14,225) the total expense of the costs of rent (26.1%) and water (6.3%) was high (32.4%). The weighted burden of 33.1% (26.6% rent and 6.5% water) of the four settlements (second-heavy burden after Kamrangirchar, 34.3%), indicates the high reliance of Korail on vendor-supplied water. The lowest combined burden is seen in Hazaribag (30.8%; rent 25.8% & water 5.0%), but it is still above the affordability limit of 30%. On an absolute basis, Kamrangirchar has the highest average rent (BDT 3,752), followed by Korail (BDT 3,719), Mirpur (BDT 3,712), and Hazaribag (BDT 3,605) that is, Kamrangirchar households afford the highest housing cost even with the least income at their disposal, which is approximately BDT 9,508 after paying the rent and compared to around BDT 10,513 that a household in Mirpur pays.

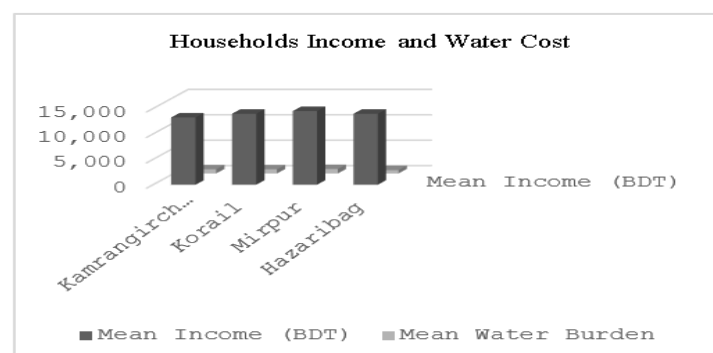


Figure 2: Showing the monthly income and water cost of the surveyed households. This comparison presented based on these questions, what is your monthly rent? And What is your monthly water cost (vendor, landlord, or utility bill)?

Korail is the highest in average monthly water usage with an amount of BDT 909 followed by Mirpur (BDT 896), Kamrangirchar (BDT 796) and Hazaribag (BDT 699) such a small amount compared to rent is however a significant percentage of disposable income of an average earning estimated at BDT 13,000-14,500 monthly. The household income and rent and water expenditure were

rather diverse amongst individual respondents and fell between about BDT 5,000 and above BDT 26,000, BDT 0 to above BDT 13,000, and BDT 0 to above BDT 2,000, respectively, and such a range of financial strain was not mutually exclusive such that numerous poor households experienced both higher than normal rent and water bills.

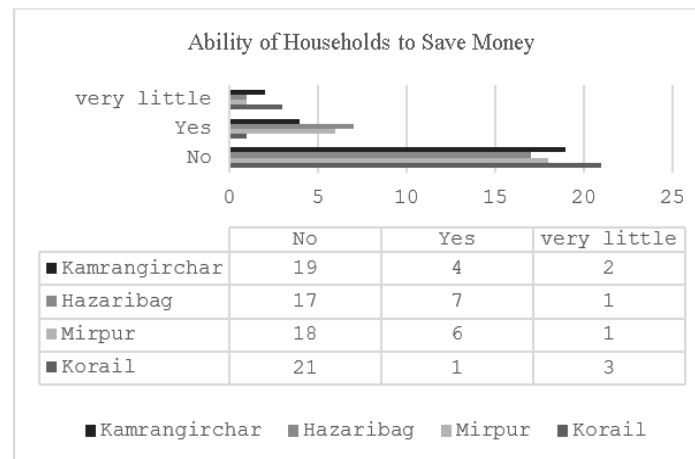


Figure 3: Illustrates the ability of surveyed households to save money after meeting their monthly expenses. Rent and water costs accumulate rather than operate independently, reducing opportunities for investment, savings and resilience.

This pressure is directly experienced in the ability to rescue the households. In general, 75 out of 100 households reported that they did not have any savings capacity, 18 households reported having some savings capacity and 7 households reported having very little savings capacity. This trend was quite comparable to all settlements, with

the highest percentage of households that were not able to save being 21 of 25 households in Korail. The findings show that the bigger part of the household income is utilized on the daily necessities. Households that do not save can only afford to handle the emergencies or to invest in education and in business to a certain extent.

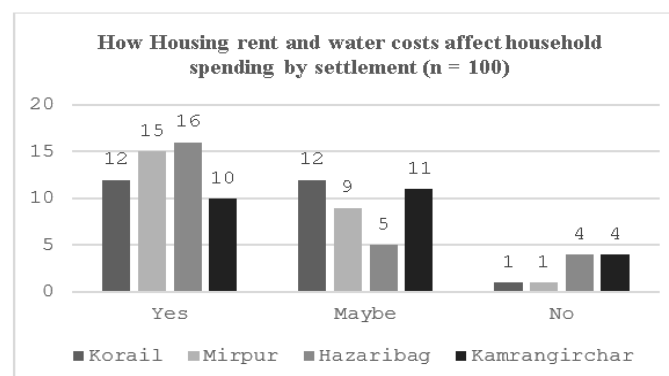


Figure 4: Presents the proportion of households affected by high housing rent and water cost based on this question “Does the cost of high housing rent and water prevent you from spending money on essential needs such as education, food, business investment, or savings?”. (Table 05 presents same data).

Table 5: How housing rent and water costs affect household spending by settlement (n = 100)

Settlement	Yes	Maybe	No
Korail	12	12	1
Mirpur	15	9	1
Hazaribag	16	5	4
Kamrangirchar	10	11	4
Total	53	37	10

Participants were also questioned directly whether it was because of high rent and water prices that they could not spend to get an education and feed and also on whether they could not invest in business or save money. When questioned regarding financial limitation caused by housing and water bills, 53 % of the households responded affirmatively, 37 % responded possibly and only 10 percent responded negative that mean about 90 % of households felt that they were financially constrained by housing and water bills. Although Hazaribag had lower combined burden, it was perceived as the highest burden (16 out of 25 households answered yes) indicating that the subjective burden of these costs does not depend solely on the percentage of income expenditure.

The results show that a significant percentage of families are struggling with high housing and water bills, which are also compelling them to reduce their expenditure on other necessities in their homes such as funding their children to school and purchasing healthy food, save and invest in their small enterprises. The results show that increased reported rent and water burdens are linked with limited household economic options, such as less savings and expenditure trade-offs.

Correlational Analysis

Linear relationships between monthly household income, rent burden and water burden were analysed by Pearson correlations. Income was negatively associated with rent burden ($r = -.62, p < .001$) and water burden ($r = -.47, p < .001$). In this sample, those households that reported a lower income thus had a bigger portion of income that they allocated to both services. There was a moderate co-occurrence between rent and water burdens ($r = .24, p < .05$). These coefficients are a measure of association, not causation; they can also be due to common dependence on income in the denominator of the two measures of burden. Rent Burden was calculated to be the monthly rent divided by reported monthly household income and then multiplied by 100. Total monthly water expenditure, including spending on utilities, landlords or vendors, was used to compute water burden in a similar manner. The two percentages were added together to make combined burden. These indicators focus on direct cash expenditure but not time of collection, treatment fuel, sickness, broken work or risk of tenure insecurity. Saving capacity and perceptions of respondents on whether rent and water expenditures limited basic expenditure were also captured in the questionnaire. Comparisons of descriptive results were made between settlements and interview themes were utilized to explain why the same level of expenditure may yield different experiences. Lack of accuracy on self-reported income and expenditure was considered a limitation of measurements and not rectified using unjustified imputation. Statistical significance was evaluated at the .05 level and effect size and substantive meaning were also evaluated with p values.

The Existence and Scale of the Poverty Penalty

The findings clearly indicate that the slum households in Dhaka pay a heavy price in terms of water and housing in terms of poverty. The housing and water burden of the typical slum household of $2.31/32.7 = 32.7\%$ of the monthly earnings in the sample is above the globally established 30/30 affordability standard, that is, the typical slum household in this sample is stretched to the limit when it comes to housing and water costs, before it even puts any money into food, education, clothing or healthcare supplies (Herbert *et al.*, 2018). It supports the earlier findings of Prahalad and Hart (2010) and Mendoza (2011) who have argued the poverty penalty theory, which postulated that the poor households pay more percentage of their incomes towards water and basic goods and services compared to the rich households, and builds on the previous findings of Kashem *et al.* (2023) on the poverty penalty on water and housing costs in Dhaka, showing that the two penalties are not independent but reinforcing.

This pattern is supported by correlational findings. The relationship between income and the rent burden and water burden are both significantly negative ($r = -.62$ and $r = -.47$, respectively) indicating that the poorest households face penalties in terms of their relative cost of the services they consume, according to Mendoza (2011). The positive but weak positive relationship that exists between water and housing poverty penalties ($r = 0.24$) also implies that water and housing poverty penalties are closely related, and most households are subjected to both.

Variation Across Settlements

There is a high overall poverty penalty in all four settlements but with different compositions and origins. The average income of the four sites is not equally divided e.g. Kamrangirchar is the lowest observed average income, however the highest number of rent burden; Mirpur is the highest average income, however not the lowest number of rent burden. This means that the household income level does not necessarily affect household welfare when a big portion of that income is used to acquire basic services, which is also consistent with general evidence that the welfare of the people living in informal settlements is determined by access to services and a sense of security in tenure more than by income level alone (Global Center on Adaptation, 2022). The qualitative results give insight into why such a diversity of causes can be the origin of similar costs. In Korail, there is the problem of lack of water: people have to use money to buy water on vendors as people can hardly gather water within five minutes a day. In Mirpur, the limitation is the price sensitivity and they minimize their consumption through a metered system. The constraint of reliability is in Kamrangirchar and Hazaribag since the water is either coming at the wrong

time or the time is not predictable and the people must adjust their ways of consuming water in accordance with it. It is a local variation of the water poverty penalty that follows the existing literature on the water poverty penalty which has largely considered the water poverty penalty as a one-size-fits-all problem (Kashem *et al.*, 2023; Rahaman & Ahmed, 2016), suggesting the severity of the water poverty penalty could vary radically across the same city as a result of the local water governance arrangement.

Linking Poverty Penalties to Household Economic Decisions

Previous researches shed light on either water or housing penury, where instead the current analysis relates both service pressure to the identical domestic budget. Three-quarters of households surveyed said that they had no ability to save and 90 % of the households said yes or maybe on whether high rent and water charges limited spending on education, food, saving or investment in their small business. Interview accounts provided plausible sources: some families cut food expenditures to pay rent, postponed housing repair, delayed spending on health care or education, or took out an informal loan. Due to the cross-sectional nature and some of this evidence being self-reported, these trends are to be viewed as reported restrictions and statistical relationships but not proven causal impacts.

These findings can be explained through a sustainable-livelihoods explanation. In situations where financial resources are lean and critical payments are uncompromising, a rise in one service cost will decrease what is available to other capabilities and can lead to borrowing or selling assets. The positive correlation is also indicative of accumulation: a household with a high housing burden might find it more difficult to absorb irregular costs of water, and unreliable water can increase time and health expenses to an already restricted tenancy. The implication of the study is not then a statement that one penalty is a mechanical cause of the other, but is that the two are encountered in a common and strictly limited decision situation.

Comparing Dhaka North and Dhaka South

The areas in which service disadvantages were present were both the city-corporation areas, but they were set differently by settlement. Korail respondents in DNCC highlighted harsh time rationing and purchases with the vendor, whereas Mirpur respondents talked about multiple simultaneous supply schemes and responsiveness to charged rates. At DSCC, Kamrangirchar and Hazaribag respondents expressed more frequently that it was an unreliable timing, that there were gaps in the flow and that making water usable was expensive. Hazaribag had the shortest mean combined burden and the highest number of unequivocal yes to the spending-constraint question. This comparison demonstrates that only expenditure shares cannot represent quality, predictability, health risk, or perceived hardship.

Theoretical Implications

Three theoretical approaches applied in this study have some evidence provided by the results. They champion Poverty Penalty Theory (Prahalad and Hart, 2010; Mendoza, 2011) where slum households incur much more in the cost of basic services compared to other households and that such costs are compounded when multiple services are hit simultaneously. Second, the findings hold with Sustainable Livelihoods Approach, where households with the least financial and physical resources are the most susceptible to the shocks of an increase in the rent and water costs and most likely to cut expenditure on food, education and health. Third, the results confirm the idea of the so-called markets of the poor, suggested by Nóbrega (2022), where the informal landlord and water provider set the price and quality of these services, which is effective, rather than the formal, regulated landlord and water providers.

Practical and Policy implications.

The results are in favour of coordinated and settlement sensitive intervention. The prevailing local constraint, longer and more predictable collection windows and less reliance on vendors in Korail, open, affordable metering and quality assurance in Mirpur, predictable, continuous, and quality water treatment in Kamrangirchar and Hazaribag should be incorporated in water measures. Housing policy must enhance security of tenure, transparency in rentals, sanitation, ventilation, drainage and in other ways whereby security and sanitation can be demanded by tenants without retaliation. Since three-quarters of households surveyed said they had no savings ability, even the slightest amount of decrease in the inescapable service expenses would broaden the buffer capacity to food, education, health care, debt repayment, and emergencies. Service reform can be reinforced by community savings schemes and appropriately regulated small loans; however, credit cannot replace the need to correct the inflated or unreliable essential-service markets.

Limitations

These findings must be viewed in the light of a number of limitations. The sample of 100 households used in the survey, though sufficient to carry out descriptive and correlational analysis, might not be reflective of the entire population of slum households in Dhaka and the results should be generalized with care about other settlements in Dhaka. Since the qualitative sample was purposely chosen to gather information on the rich cases, the experiences of the information obtained in the interviews could be worse than that of the general population of the slum. The cross-sectional design is also only a spot in time and cannot record the development of household financial situations or coping mechanisms over time or through reaction to shocks like sickness, flooding or eviction.

CONCLUSION

This paper has explored the interaction between water

and housing poverty penalties and household economic choice among four informal settlements in Dhaka. A sequential mixed-method design of 30 interviews was mixed with 100-household survey. Households surveyed had a mean of 26.7% of reported monthly income spent on rent and 5.95% on water creating a total mean burden of 32.7%. Three-quarters said that they had no ability to save. The negative association between income and rent, as well as between income and water burdens were observed, whereas there was a moderate negative relationship between the two burdens. In combination with the accounts obtained in the interview, these findings illustrate that the essential-service payments can diminish the options related to food, healthcare, education, borrowing, saving, and housing improvement. The analysis recognizes trends and processes in the chosen locations; it does not purport causal implications, or statistical coverage of all informality in Dhaka. Settlement water punishment differs widely, with some settlements (such as the extreme water rationing in Korail) responding to metered charges in Mirpur) responding inconsistently at night in Kamrangirchar and Hazaribag. This difference indicates that citywide poverty policies notwithstanding, there is indeed no uniformity in the poverty penalty due to local water governance and housing arrangements, and the poverty penalty to the DNCC is not the same as to the DSCC. The outcomes of relevant surveys and interviews demonstrate that there is a definite correlation between elevated rent and water bills and reduced expenditure on food, medical care and education of children, deferral in home improvement and increment in informal borrowing.

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