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Thesis title:

Heatwaves and Everyday Heroines: Unveiling
Gendered Adaptation Strategies in Korail Slum,
Bangladesh

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Summary

The study investigates gendered adaptation strategies to heat stress in Korail slum, the largest informal settlement of Bangladesh. The research is grounded by the theory of everyday adaptation. It examines how women, recognized as vulnerable group, responds to heat stress through their everyday practices. Along with concepts of everyday adaptation, this empirical study investigates different intersectional factors that can contribute to this gendered everyday adaptation. The study adopts a mixed-method approach to collect the primary data. A total of 220 household surveys along with eight semi-structured interviews were conducted at Korail slum whereas four experts from corresponding NGOs and local authority were interviewed to gather the primary data. Both inductive and deductive assessment have been conducted to explore women's everyday response to heat stress and its interconnectedness with other factors such as i) socio-economic conditions, ii) socio-cultural norms, iii) environmental condition, and iv) governance. The results shows that women in the Korail slum takes fifteen everyday responses to heat stress as a form of adaptation labor and value adaptation. The results indicate that women's perceived duration of heat risk and tolerance to heat stress has statistically significant influence on their everyday adaptation. Along with this, women's everyday response and adaptation decision can be influenced by their knowledge of response-cost and perceived ability to manage those adaptations. The results further suggest that perceived risk, the way they experience heat-induced difficulties and their everyday behavioral response to heat stress has various level of association with the different factors at community level. However, the community capacity is limited, and the effectiveness of community initiatives faces structural and institutional barriers. These barriers include inadequate infrastructures, resources, and the challenges of informality, all of which can hinder the individual adaptation to heat stress.

Keywords

Heatwave, heat stress, everyday adaptation, intersectionality, gender role, socio-cultural norms, Korail slum.

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Foreword

In recent years, the impact of climate change has become more evident with extreme events such as heatwaves. These pose significant challenges, especially for the urban slums, because of the dense population and lack of infrastructure. Among the slum areas, the most vulnerable population is women due to the culture of patriarchal society. However, women are crucial in managing the household and communities. They are at the forefront of taking any adaptation measures. The thesis titled “Heatwaves and Everyday Heroines: Unveiling Gendered Adaptation Strategies in Korail Slum, Bangladesh”, therefore delves into the more profound understanding of the women in the Korail slum in responding and adapting in the harsh weather like heatwaves.

This thesis research aims to shed light on the resilience of these women who are adapting to the severe effects of the heatwaves, despite the socio-economic and cultural boundaries. By narrowing down the focus on the Korail slum, one of the largest slums in Dhaka, this research provides a detailed insight into women's lived experience in the face of climate adversity.

Through the analysis of the field data, semi-structured interviews, and expert interviews, the research not only provides the measures employed by women in situ of extreme heat, but also emphasizes the importance of addressing the gender perspective and intersectionality in developing adaptation policies and strategies.

I believe this thesis will contribute to the broader understanding and importance of women's role along with men in the adaptation measures and policy initiatives in the urban informal settlement of South Asia.

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Abbreviations

Abbreviation	Full form
AL	Adaptation labor
BRAC	Bangladesh Rehabilitation Assistance Committee
EA	Everyday Adaptation
ER	Everyday response
HC	Habitual change due to extreme heat
IHS	Institute for Housing and Urban Development Studies
IPCC	Intergovernmental Panel on Climate Change
GD	Gender dimension
PMT	Protection Motivation Theory
RP	Risk perception
RT	Risk tolerance
SC	Socio-cultural
SE	Socio-economic
UDP	Urban Development Program
UHI	Urban Heat Island
UNDP	United Nations Development Programme

1. Introduction

1.1 Background

With growing concern about climate change, global warming is one of the most significant worldwide concerns. According to the Intergovernmental Panel on Climate Change's (IPCC) sixth assessment report, the frequency of heat waves can be increased more in the twenty-first century because of the increased land surface temperature (IPCC, 2023). Over the past decade, cities have become urban heat islands (UHI) with the increased intensity and frequency of heat waves (Eldesoky et al., 2022; IPCC, 2023; Zhou & Chen, 2018). Heat stress is projected to intensify more in cities along with the increased global temperature and rapid urbanization (Coffel et al., 2018; Oleson et al., 2015). Urban expansion-induced warming is expected to increase the heat risk for half of the future population in urban areas, especially in the global south (Huang et al., 2019).

Currently, cities in the global south face significant impacts of increased heat (Arsht-Rock., 2023). Dhaka, one of the considerable megacities in the global south, is no exception. The city is subject to a more robust heat island effect due to its dense population and lack of green spaces. Last year, the city experienced the highest temperature (at 40.6°C) in the past six decades, and heat waves have become a widespread phenomenon here (Khokon, 2023; Molla, 2023; The Daily Star, 2023). It threatens every aspect of city life, including health risks, economic productivity loss, lack of food security, and environmental quality.

However, the impact of heat is not equal in every part of the city. Inequality and gender shapes people's experience to heat. For instance, temperature in Dhaka's informal settlements is 12 degrees higher than the other areas (Arsht-Rock., 2023; The Daily Star, 2023) and poor, especially the outdoor workers or labors are more exposed to heat than others. The corrugated steel-style housing (tin-shade), lack of ventilation and dense population makes informal settlement more vulnerable to heat. At Korail, one of the country's largest informal settlements with more than 120,000 inhabitants, the dense tin-shade houses make the place the hottest in the summer, creating health risk of the poor people with loss of labor and productivity (Zami, 2023). Vulnerability of heat stress also varies significantly from men to women. Women spend more time in kitchen, perform physically demanding household chores in the heat and also expose to extreme sun while working outside (Scorgie et al., 2023). For instance, women working as a day laborer, coupled with inadequate sanitation and family responsibilities, may face increased exposure to heat, making them more vulnerable to heat stress (Venugopal et al. in 2016 in Sairam, 2022, p.2). Social, cultural and gender norms also limit women's mobility to go outside, even in any cooling or shaded facilities, leading to more vulnerability to heat stress (ADB, 2023; Woods, 2023).

People's adaptation needs vary depending on where they live, how they support themselves, and their roles within their families and communities (Alber,2011 in Jabeen, 2014). Ignoring these factors, frequently influenced by gender, increases the likelihood of overlooking people who require adaptation assistance the most (Dazé, 2019, para 11-12). Therefore, to adapt to such extreme heat stress, emphasis should be placed on localized and gender-sensitive adaptation planning. Unfortunately, women are not adequately consulted or rarely a token in decision-making (Alston & Mason, 2008 in Alston, 2013, p.355; Denton, 2002). Also, the planned adaptation or threshold adaption cannot address the socio-ecological vulnerability (Castro & Sen, 2022). Therefore, there is a need for a deeper understanding of the everyday practices of people, especially women, to cope with extreme heat to develop more effective adaptation strategies at the community, institutional, and policy levels (Oppermann et al., 2018).

1.2 Problem Statement

1.2.1 Research gap on heat stress adaptation strategies

Although urban climate change adaptation is a relatively new topic, many recent advancements and research have focused on vulnerable urban areas (Carter et al., 2015). Nevertheless, climate change adaptation is primarily discussed and addressed for cities, mainly focusing on sudden and severe events like floods (Ahmed et al., 2018; Araos et al., 2017; Haque, 2021; Jabeen & Johnson, 2013). They often overlook the ongoing threat of rising heat, primarily how it interacts with cities' buildings and where people live (Laue et al., 2022). At present, heat stress is one of the main climatic challenges. The issue of heat stress needs more scientific investigation (theoretical and practical) to develop effective solutions or adaptation strategies, especially regarding informal and low-income urban settlements (Laue et al., 2022). Besides, the intersectional and gender dimensions of climate change adaptation have been discussed in different sectors (Ngigi et al., 2017; S. Roy et al., 2022; Thompson-Hall et al., 2016) but rarely reflected on the issue of heat stress. Literature suggests that formal adaptation in some circumstances (especially in developing countries), leads to more vulnerability and maladaptation (Eriksen et al., 2021) partly by disrupting the local efforts (Mersha & van Laerhoven, 2018). Therefore, there is also an increased demand to examine the interplay between formal and everyday climate adaptation efforts (Lindegaard & Sen, 2022).

1.2.2 Research on Heat stress adaptation in Dhaka city and Korail slum

Much research has been conducted to analyse the urban heat island (UHI) effect, its intensity, and significant drivers causing such effect in Dhaka city (Abrar et al., 2022; Dewan et al., 2021; Uddin et al., 2022). The research shows the location-wise variance of the UHI effect in different parts of the city, as well as significant trends and drivers of extreme heat. Some researchers have analysed the heat stress vulnerability and exposure level in other sectors and for various groups such as RMG and outdoor workers, public health, and economic productivity (Chowdhury et al., 2017; Kyaw et al., 2023; Patwary et al., 2023). A few researchers have identified heat stress as a major climate change-induced vulnerability in the Korail slum.

However, research on adaptation to heat stress in Dhaka city, especially in Korail is limited or rarely addressed, explaining through either the overall cooling requirements or strategies in the city (Mastrucci et al., 2022) or grassroots coping strategies to climate variability (Jabeen et al., 2010). Some literature shows general adaptation strategies to heat stress in Dhaka city, but few talk about the climate change adaptation of the Korail slum through community-led initiatives and household-level responses (Jabeen, 2014; Jabeen & Johnson, 2013). However, there is no evidence of research on individual-level adaptation of heat stress in the Korail slum.

1.2.3 Research Problem

The previous literature shows limited research on heat stress adaptation in the urban background and individual adaptation to extreme heat in the informal settlement context. No such study has yet been conducted in the Korail slums.

The North City Corporation of Dhaka City is currently addressing the effect of heatwaves in different parts of the city, taking short-term measures of tree plantation, temporary sheds, and providing roadside drinking water. The Climate Action Plan (CAP) for Dhaka North City Corporation mentioned the overall exposure level and the vulnerability to the extreme heat in Dhaka. However, there is no evidence of addressing the informal settlement, specifically in extreme heat. Since the settlement pattern and living culture of the informal settlements like Korail slum are utterly different than the other parts of the city, it is hard to provide essential services or communication guidelines to the most affected part of the city (i.e., Korail slum) without prior survey and research on this issue. In the milieu of the extreme temperature in Dhaka, there is an urge to understand the situation, culture, and other socio-environmental

factors that exist and restrain/shape their own adaptation strategies to extreme heat in the Korail Slum.

Therefore, to shed light on the literature gap of heat stress adaptation, especially considering the informal settlement, this research explores everyday responses and practices of the urban poor people to the extreme heat residing in the Korail slum, Bangladesh's most significant informal settlement. Under this research, the most vulnerable group, particularly women from the Korail slum, will be investigated for their regular perception of heatwaves and heat stress and how it impacts their daily life response and adaptation strategies against heatwaves.

The research objective focuses on answering the following research question and sub-questions:

What are the gendered dimensions of everyday adaptation to heat stress, and how do these differ intersectionally?

- 1.1 What are the existing daily life responses (i.e., practices and strategies) employed by women to adapt to heat stress in Korail Slum, and why are they doing so?*
- 1.2 To what extent do social values contribute to risk perception and response behavior of women to heat stress?*
- 1.3 How do socio-economic and environmental factors influence the adaptation strategies of women in Korail Slum to heat stress?*
- 1.4 What is the potential and limits for community-led initiatives to enhance the everyday adaptation of women in Korail slum?*

1.3 Scientific and Societal Relevance

This study will contribute to the recent and demanding field of research on heat stress and climate change adaptation focusing on gender and low-income communities. Moreover, the study will apply an intersectional analysis to unveil the social, power and cultural dimensions that are interconnected with the women's daily life adaption decisions in the context of heat stress and climate change. Since the study area is one of the deprived and biggest informal settlements in Bangladesh, it will provide the deeper understanding of the linkages among urban poor, gender-based local adaptation efforts to heat vulnerability and its relation to overall community management which has not been widely studied yet.

The climate change and its impacts are likely to increase and there is a need for sustainable, long-term strategies addressing the sustainable development goals (SDGs). This context-specific climatic research considering the urban area, poor community, social and gender inequality can support the efforts and initiatives of SDGs such as SDG 3 (Good health and well-being), SDG 5 (Gender equality), SDG 10 (Reduced inequalities), SDG 11 (Sustainable cities and communities) and SDG 13 (Climate action). Since women are considered more vulnerable to climate change due to the existing socio-cultural norms in developing countries, this research will focus on the need and realities of those women in the informal settlement and within their community. It will also amplify on their understanding and adaptation of women in such highly exposed areas to heat which may lead to the community and city resilience to climate change.

Section two explains the justification of this study based on a rigorous review of the existing literature and develops the analytical framework, and hypothesis for assessing the gendered everyday adaptation and its interconnectedness with different intersectional factors. Section three describes about the detailed research methodology and section four presents and discusses the results of both indicative and deductive assessments. Finally, section five draws the conclusion by discussing the results in relation to the research aim and questions. It also

provides recommendations and directions for future policy interventions and research endeavours.

2 Literature review and hypotheses

2.1 Climate change adaptation

According to the IPCC Sixth Assessment Report (2022), climate change adaptation in human systems is “the process of adjustment to actual or expected climate and its effects in order to moderate harm or take advantage of beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climate and its effects; human intervention may facilitate this” (IPCC, 2022, p.5). Adaptation aims at managing the unavoidable impacts of climate changes (Laukkonen et al., 2009). Adaptation can be a “process, action or outcome in a system” (individual, community, region, country, ecosystem) that helps the system to cope up better and adapt to any changing environment, hazard, risk and also shows the new opportunities to deal with the climate change (Smit and Wandel, 2006 in Ayers & Dodman, 2010, pp.161-162). Adaptation is highly context-specific, and social and individual dimensions such as social networks, socio-economic characteristics, and even non-climatic factors can play essential roles in effective adaptation measures (Wolf, 2011).

2.2 Everyday Adaptation

This research’s understanding of “everyday adaptation” draws from Castro and Sen’s (2022) work of everyday adaption, which theorizes that the daily life actions of individuals are a form of everyday climate change adaptation. It is “small and incremental changes made by individuals in their daily lives to accommodate the shifting ecologies in which they live” (Castro & Sen, 2022, p.2).

There are two theoretical components (i.e., adaptation labor and value adaptation) of the everyday adaptation.

Adaptation Labor: Sen (2022) constructed the theory of adaptation labor based on her study of everyday work. She argues that understanding climate change adaptation must look at how people’s works change with the changing ecologies. Adaptation labor describes how family members restructure their daily work to address climate change's effects and how these changes affect their livelihood along with their social and mental set up.

Value adaptation: Castro (2022) theorizes value adaptation as the shifts in an individual’s value and priority and how it declines or adapts to the changing ecology. For instance, once a farmland, valuable to the family may not be valuable anymore to them because of the extreme drought or flood. Therefore, the family may temporarily migrate to another place leaving their asset behind and settle in another place which is suitable for agriculture.

These two theoretical components of everyday adaptation can be explained by four lifestyle logics (i.e., lifestyle stability, socio-ecological reactivity, livelihood flexibility, and community capacity) (Castro & Sen, 2022). Lifestyle stability refers to preserving the ways of daily life activities that give stability amidst climate change. Socio-economic reactivity is explained as accepting the everyday adaptation where people adapt their daily activities quickly to the observable and constant climate changes. Livelihood flexibility is the opposite of livelihood stability, where people can change or adapt their livelihoods according to climate change and ecological shifts. Community capacity explains the interconnectedness of communal capacity and how this interconnectivity helps individuals adapt more efficiently at individual and community levels.

Limitation of the everyday adaptation theory: Everyday adaptation underpins the essential components for understanding individual adaptation (who are continuously facing climate change in their daily lives) and constitutes larger-scale social responses and long-term adaptation planning projects (Castro & Sen, 2022; Lindegaard & Sen, 2022). However, it explains only four everyday logics. Other logic can influence the adaptation of labor and value adaptation. For instance, social and cultural norms, power, and gender dynamics can shape one's actions towards climate change (Brown and Westaway 2011 in Cohen et al., 2016, p.310; Roy et al., 2022). Besides, it does not explain the intersectional dimension, a significant influencer of climate change adaptation.

2.3 Gender and intersectionality

Gender refers to the significant difference in society regarding how men and women are treated. This includes rights and opportunities for the men and women, such as rights to land and resources, work opportunities, wages, and voice to the decision-making process (Annecke, 2010). Climate transitions should be for all, including stakeholders from every aspect. However, gender inequality is universally profoundly rooted in social norms, values, and power imbalances, which negatively affect women more than men (ILO, 2024). Women commonly face higher risks than men regarding climate change (Phan, Jou & Lin, 2019) and are deprived of decision-making (UNFCCC, 2024). Literature depicts women as victims and agents of climate change while describing gender justice (Tschakert & Machado, 2012). However, most of the research on gender and climate change has dictated women and their vulnerabilities without focusing on in which way the inequalities contribute to the vulnerabilities (Reggers, 2019) and, hence, fails to address the gendered dimension of climate change adaptation.

The commonly understood gendered vulnerability and adaptation to climate change inadequately addresses the intersectionality within gender inequality (Jordan, 2019). Therefore, there is a need to critically assess the intersectional dynamics of climate change (Kaijser & Kronsell, 2014), along with gendered analysis. While considering adopting intersectionality as a critical tool in climate change, intersectionality can be defined as ‘the interaction between gender, race and other categories of difference in individual lives, social practices, institutional arrangements, and cultural ideologies and the outcomes of these interactions in terms of power’ (Davis, 2008, p.68 in Kaijser & Kronsell, 2014).

2.4 Informality

Informality is not just a binary difference between regulated and unregulated; it is more complex in reality (Schofield & Gubbels, 2019). Considering the context of the global south and Bangladesh, Roy's (2009) definition of informality can be helpful for this research. Instead of being an unregulated concept, informality can be deregulated (purposefully removing regulation), creating a system where resources, wealth, and authority are allocated and accumulated differently (Roy, 2009). Urban informality is not solely “bounded space of slum” but rather “informalized production of space” that connects different parts of the city, like slums and suburbs (Roy, 2011, p.233). Slums are closely related to informality and essential to urban planning and policies (Schofield & Gubbels, 2019). By nature, they face specific challenges to climate change adaptation actions (Dodman et al., 2019).

2.5 Analytical Framework

Adaptation to climate change by government and planners tends to be a technical process, without considering the everyday realities of adaptation practices. Meanwhile, informal settlement residents often face challenges engaging themselves with governmental actions due to social drivers of vulnerability such as low-income and gender discrimination (Satterthwaite et al., 2020) and other intersecting factors. Therefore, considering the context-specific

intersectional factors and particular needs of the informal settlements, climate change adaptation must consider the “reality of everyday existence in urban informal settlements” (Myers, 2011 in Schofield & Gubbels, 2019, p.94).

The research analyses the heat stress adaptation of the Korail slum based on the analytical framework (Figure 1) developed by adopting the theory of everyday adaptation, gender intersectionality, and informality. These concepts suggest that individual everyday adaptation is essential to connect with large-scale adaptation. Nevertheless, an individual’s everyday adaptation is also influenced by informality, surrounding environment, gender, and intersectional dynamics. Besides, there is a functional interplay between formal adaptation by governments and household’s autonomous adaptation practices (Mersha & van Laerhoven, 2018). The adaptive capacity and environmental vulnerability of the people in the Korail slum, as well as its institutional structure, vary and benefit from Dhaka’s macro-institutional structures because of the social linkages between the slum community and the different urban governance actors (i.e., local government, NGOs, research organizations) (Siddique, 2015). That is why it is also crucial to examine the influence or interconnectedness of national and local governance’s adaption plans and initiatives (including semi-government organizations, NGOs and CBOs) to the household’s everyday practices in the slum.

This research adopted Mallick (2023)’s environmental non-migration framework to develop the analytical framework to investigate the everyday adaptation decision to heat stress.

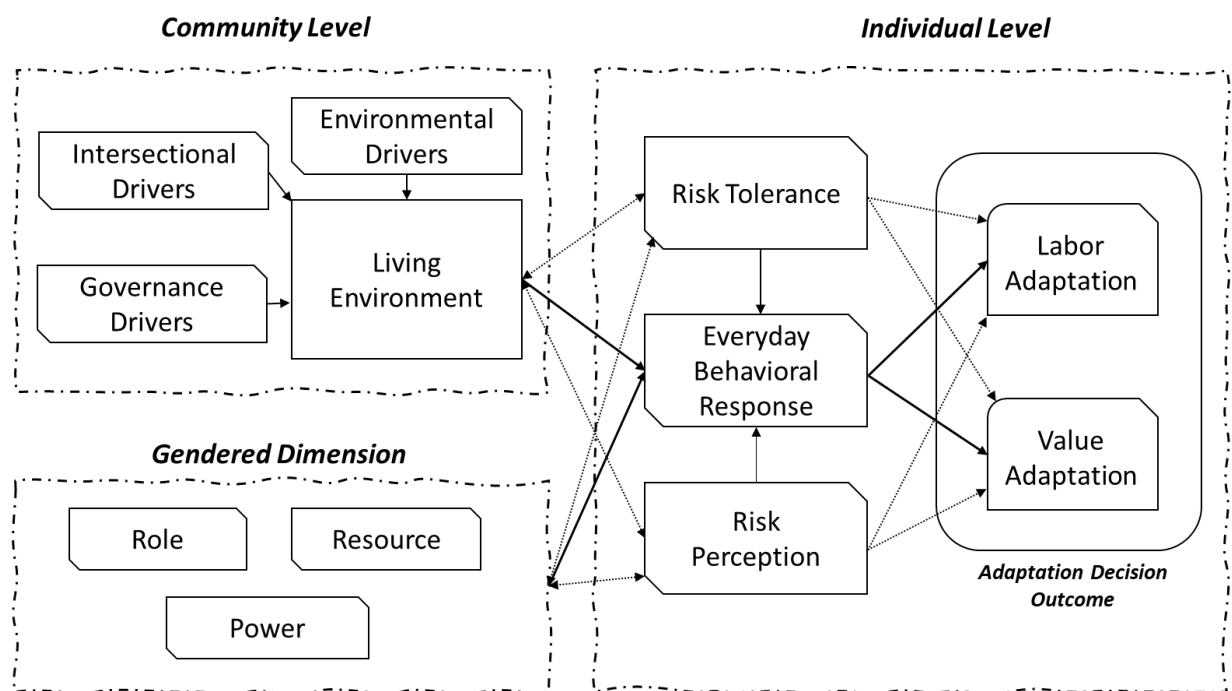


Figure 1: Analytical Framework (adopted and modified from Mallick, 2023)

Considering the concepts of this research, the analytical framework was developed to investigate the individual-level adaptation behaviour and how it might be influenced by community factor and gendered dimensions.

At the individual level, the everyday behavioural response of extreme heat would be analysed through ‘risk tolerance’ and ‘risk perception’. These two factors would be further used to investigate the individual adaptation decision in the form of ‘adaptation labor’ and ‘value adaption’ (Castro & Sen, 2022).

Understanding the living environment at the community level is crucial. People’s every activity is derived from the living environment of their communities (Mallick, 2023). Based on the concepts of this research, three factors (i.e. intersectionality, governance, and the environment) have been considered to analyse the living environment in the community level.

Understanding gender roles is another essential element since individual adaptation decisions greatly vary in the context of climate diversity and patriarchal society. For the gender analysis, three factors were chosen: role, resource, and power of women at the individual and community levels.

Table 1: Drivers, factors, variables, and their expected influences in the individual behavioral response

Attributes	Factors	Variables	Expected response
Intersectional Drivers	Social identity	-Income category -Religion	- Women who do not have any cultural restrictions (i.e., on mobility, clothing, etc.), and belong to the income class may better adapt to the heat stress vulnerability
	Power dynamics	-Decision-making ability - Occupation -Financial contribution	- Women who have better financial power and engagement in family and community decision-making can take better strategies for heat stress
	Demographic	-Age -Educational level	Women who are adults with higher education levels can perceive and respond to heat risk.
	Economic capability	-Access to credit -Own earnings -Households earnings	Women who earn and access to credit try to improve their housing conditions and adaptation strategies.
Environmental Drivers	-Extreme weather/Heat waves -Heat stress	-Frequency of heatwaves -Highest temperature -Lowest temperature -Average duration of extreme heat days	Women who have susceptible living environments due to increased temperature face different kinds of sickness and difficulties

Attributes	Factors	Variables	Expected response
		-Frequency of hazards due to extreme temperature (i.e., Drought, Heavy rainfall, flood)	
Governance driver	-Influence of national and local action plans -Trust in Governance -Accessibility to different governmental, NGOs/CBOs heat adaptation projects/activities	-Number of associations working in the community -Number of projects related to heat stress -Number of people involved from the community related to heat stress initiatives -Benefit from govt./NGO project - Informal initiatives during hazard/heatwaves	-Women engaged in different kind of governmental and non-governmental initiatives may benefit from those associations. -Informal activities in the slum community may influence the everyday adaptation strategies of the women who are involved in such kind of activities
Gendered Dimension	-Role -Resource -Power	-Family responsibilities -Role in family decision making -Access to drinking water, electricity, cooling facilities	-Women who have a significant role in the family decision-making process and proper access to the primary service facilities take better adaptation strategies
Everyday Behavioral Response	-Risk perception -Risk Tolerance	- Ways of Perception - Tolerance level to different kinds of heat risk -Severity of risk	- Women's perception and tolerance of the experienced risk of extreme heat can influence the everyday behavioral response or adaptation. Risk perception and tolerance levels may vary based on intersectional characteristics, gender roles, available resources, and different initiatives.

3 Research design, methodology

3.1 Study Area

To carry the research and accomplish the research objectives, Korail slum has been chosen as the study area. The slum is one of the Bangladesh's oldest and largest informal settlements, situated in Dhaka city. The slum is situated in some parts of Banani, Ghulshan, and Mohakhali, surrounded by wards 19 and 20 of the Dhaka City Corporation. Around 120.000 people live on 90 acres of land (Adri & Simon, 2018). There are four units (Jamai Bazar, Bou Bazar, Mosharraf Bazar and Beltola) in the main Korail slum, which is the study area of this research.

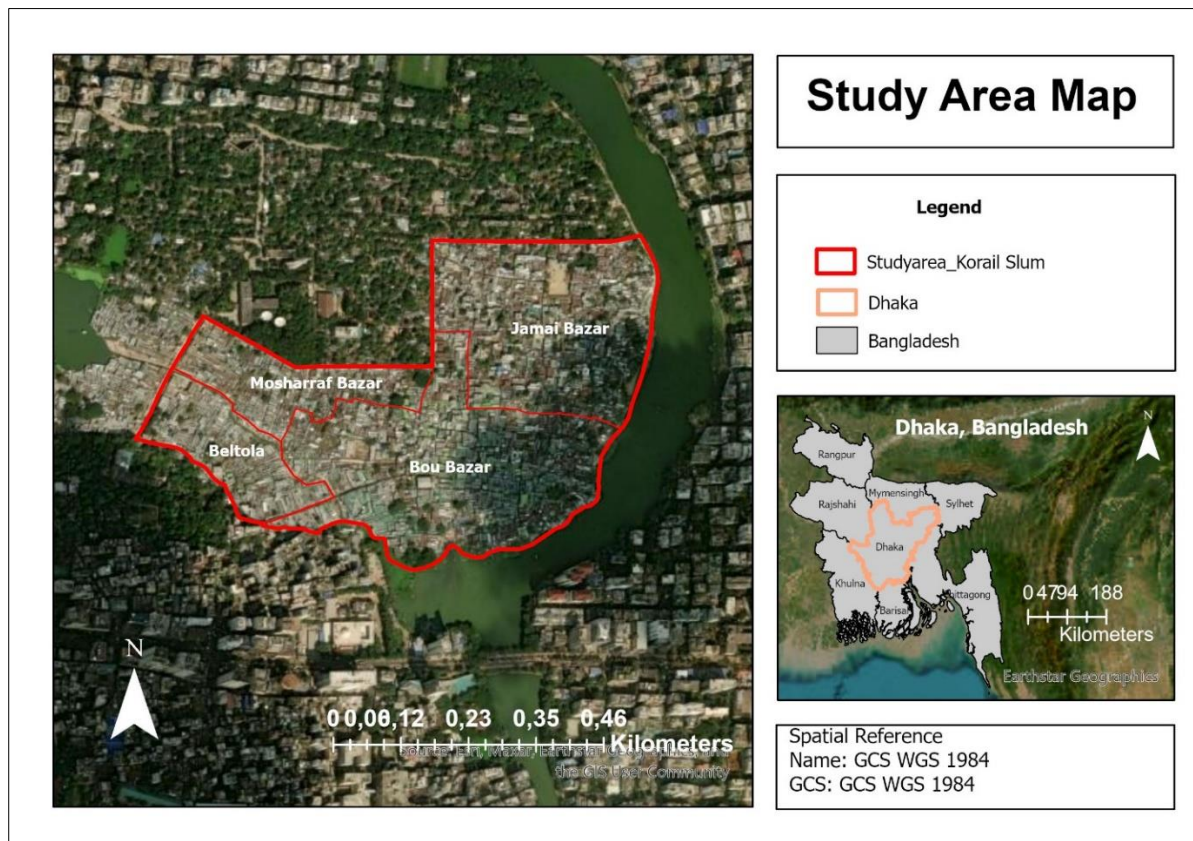


Figure 2: Location map of the study area

(Source: Author)

Four other adjacent slums are part of the greater Korail slum (i.e., T&T Bosti, Baidar Bosti, Ershadnagar and Godown Bosti). The study area's people serve the surrounding neighborhoods by providing services as housemaids, drivers, caretakers, garment workers, and helpers in retail shops (Ahmed Sinthia, 2021). Over time, the slum expanded along the bank of the water body, covering over 90 acres of land (Jabeen et al., 2010, p.419). The Korail slum is encircled by the natural waterbody (locally known as Gulshan Lake) on the east and south sides and affluent residential and commercial areas of Gulshan and Mohakhali to the west and north. Such a location alongside the waterbody makes the slum vulnerable to climate-related dangers such as flooding, waterlogging, heavy rain, and heatwaves, posing risks to the risky living conditions of the poor residents (Mohammad, 2020).

3.2 Operationalization of Variables

The operationalization of variables table (see Table A 1) provides a detail outline of the concepts and related variables chosen and what kind of data were collected for each indicator from which sources. Ten sub-variables were considered under four concepts (everyday adaptation, gender equality, intersectionality and informality) of the research. Under these sub-variables, total 14 indicators and relevant sub-indicators were considered for further data collection and analysis.

3.3 Methodological Approach

3.3.1 Sampling

Since there is no major pattern or trend in the population in the study area, but the population size is known, sample size was calculated based on Cochran's (1977) sampling method (Bartlett et al., 2001):

$$n = \frac{N \cdot z^2 \cdot \hat{p} \cdot (1 - \hat{p})}{(N - 1) \cdot E^2 + z^2 \cdot \hat{p} \cdot (1 - \hat{p})}$$

Where,

n = Sample size

Z = Z-score corresponding the desired confidence level (95%) = 1.96

p^= Estimated proportion of the population = 120.000

E = Margin of error (5%) = 0.05

N = Population size = 120.000

So, the estimated sample size is 383.

However, due to the time constraints and considering the area size, the desired sample size was ranges from 200-250. I took a median sample size of 220 and recalculated the margin error by the following equation:

$$E = \sqrt{\frac{N \cdot z^2 \cdot \hat{p} \cdot (1 - \hat{p})}{n \cdot (N - 1) + z^2 \cdot \hat{p} \cdot (1 - \hat{p})}}$$

So, the margin of error, E is approximately 0.0661, or 6.61%, for a sample size of 220. That means, in this case, there is a 95% chance that the real value is within ±6.61% of the surveyed value.

3.3.2 Data collection process

The research followed a mixed-method approach (quantitative and qualitative) to attain the research goal. The quantitative method was adopted for the household survey, whereas the semi-structured and expert interviews were based on the qualitative method. The survey was conducted to collect the primary data. An in-depth literature review was conducted to collect the relevant context-specific secondary information (i.e., recent projects and heat stress adaptation activities in Korail slum). Besides, the appropriate organizations (i.e., UNDP and BRAC) and governmental departments (i.e., Dhaka North City Corporation, 19 No. Ward Councillor Office and 20 No. Ward Councillor Office) were visited to collect other secondary data (i.e., government and non-government data and reports). Appointments were made to collect secondary data from the governmental offices and other related organizations, and the

relevant officials were interviewed. The official letter mentioning the research purpose and required information was communicated to the respective authorities before the fieldwork.

Quantitative Method

First of all, there was a two-day preliminary reconnaissance survey and a casual conversation with the residents to understand the community.

A questionnaire survey was conducted using the KoboToolbox (open-source survey app) to collect household data for the sample households. The questionnaire in the KoboToolbox was written in both English and Bengali. However, surveys were conducted in Bangla. A total of 56 questions (see appendix 1) were asked of the participants, who took 15-20 mins to complete. The household survey input in the KoboToolbox was then automatically translated into English by default by the app. Two experienced university graduate students supported the researcher in collecting the data to avoid challenges (i.e., time constraints and bilingual survey method).

A total of 220 sample-size household surveys was conducted in the study area. All units of the study area are not the same in size. For example, Bou Bazar is the largest area of the study area, whereas Jamai Bazar is the second largest area. Mosharraf Bazar is smaller than Jamai Bazar and Beltola is the smallest area in the study area. Therefore, the sample size was randomly distributed in the four regions of the Korail slum depending upon the unit size (Bou Bazar-75, Jamai Bazar-70, Mosgarraf Bazar-55 and Beltola-20). By this, it ensured the coverage of the entire area. The households were elected randomly, and only one woman in the household was asked to complete the survey. Each sample was taken at least 15-20 houses apart. This ensured the randomness and minimized the clustering effects while enhancing the appropriate representation of the sample and the study area.

Qualitative Method

Semi-structured and expert interviews were done with prior arrangements. For instance, I had an appointment and had to choose a convenient interview place.

A total of 8 semi-structured interviews and 4 expert interviews were conducted. Eight females (who plays important role and involves in community improvement activities) were interviewed. The age span of the participants was between 24 and 62 to understand different perspectives based on the age. Semi-structured interviews were 15-20 mins in length, and expert interviews were 45-60 mins, depending upon the availability of the experts. Two semi-structured interviewees were selected from each unit, considering their leadership role in the community.

Experts were selected from the government (Dhaka North City Corporation) and non-government organizations (NGOs) who are either actively working to develop heat adaptation strategies or leading relevant development projects in the study area.

The interview was recorded (with prior consent from the interviewees) and transcribed in English for further analysis. Well-structured questionnaires (see Appendix 1) were prepared to collect data from both interviews (i.e., semi-structured and expert interviews).

3.4 Reflection on methodological limitations

The main advantage of conducting a mixed-method approach is getting unforeseen insights from different perspectives. Conducting in-depth interviews with community leaders and experts and household surveys provided data authentication and unknown information. It helped to mitigate the biases of information.

However, approaching both household surveys and interviews was the main challenge. I had to go through proper channels (i.e., communicating with concerned authorities and obtaining

institutional permission) to start the survey. While conducting the household survey during the hot summer days, approaching women for interviews was very sensitive, and extra time was needed to make them comfortable to answer the questions. Besides, the sample population was low-income and usually had very tight daily schedules. They did not want to give that much time. Because of the nature of their occupations as well, they are not usually available at home from morning to sometimes in the late afternoon. Hence, the household survey was needed to conduct from the afternoon to the late evening. Furthermore, a few questions were sensitive and personal (i.e., income, clothing style, taking permission for work or going outside, etc.). Extra caution was taken to ask those questions.

Choosing the right person and getting their contact (both for the semi-structured and expert interviews) was the real struggle. I could not contact them earlier, particularly the community leaders, without meeting with the concerned ward councillors. Besides, it took a significant amount of time to have the appointments from the experts.

3.5 Ethical concerns

I followed the Netherlands Code of Conduct for Research Integrity and the IHS regulations regarding ethical considerations. Surveying in the informal settlement is a susceptible matter in Bangladesh. Therefore, appropriate permission from the concerned authorities was taken before the survey. The study area residents were well-informed about the purpose of the survey and the time beforehand. Before any household survey and interviews, proper consent was obtained to explain the research topic, the questions to be answered, and the nature of the study. Participants, whoever gave consent, were only approached for further interviews. Participation was entirely voluntary. In terms of the household survey, sample households were selected randomly and asked about their willingness to participate. In the case of participants who did not want to participate, they were not forced to do so by any means. The interviewees were free to withdraw from the interview at any moment. Household surveys and interviews were conducted in the participant's preferred environment.

Furthermore, permission was obtained for any photo. Whoever did not feel comfortable having any photos was not forced to do so. Recording started only after their proper consent was obtained for the semi-structured and expert interviews.

3.6 Data Analysis

Firstly, the survey data from KoboToolbox was validated and cleaned for further use in the statistical software. The interviews were transcribed from Bangla to English for qualitative analysis.

Statistical analysis

I used STATA to analyse quantitative data and visualize it in graphs and charts. By cross-tabulation and analysing the frequency and data variation, control and independent variables were selected to further hypotheses analysis through regression model and other statistics (i.e. correlation, chi-square test, descriptive statistics).

Model specification

To learn about the everyday behavioral response to heat stress, the sample population was asked about their daily response and chronic changes in adapting to extreme heat. For the model, first everyday responses (ER) were categorized as adaptation labor (AL) and value adaptation (VA) (Castro & Sen, 2022).

Adaptation labor (AL) was defined by ten (10) responses as follows: drinking plenty of water, wearing light clothes, using a wet towel, multiple showers, seeking shade outside, drinking

cold water, juice, or saline, watering the floor, staying in roadside for air, change of cooking time, working hours and occupation. Any shifts in value and priority to adapt to the heat such as using an extra fan, charging fan, AC, creating an outdoor shed, changing housing structure and facilities, etc.) were identified as value adaptation (VA). Composite indexes have been calculated to define both AL and VA.

To investigate everyday adaptation as a form of adaptation labor and value adaptation, two independent variables have been chosen: 1) Risk tolerance (RT) and 2) Risk perception (RP). Depending on the nature of dependent variables, Poisson regression model has been chosen. The regression model is, therefore, as follows:

$$\log(AL) = \alpha + \beta_1 RT_{ij} + \beta_2 RP_{ij}$$

$$\log(VA) = \acute{\alpha} + \beta_1 RT_{ij} + \beta_2 RP_{ij}$$

α and $\acute{\alpha}$ denote the constant adaptation measures, and ϵ indicates the error terms. β_1 and β_2 are the coefficients for RT and RP accordingly. RT_{ij} and RP_{ij} are the risk tolerance and risk perception in the household I in the sub-area/unit j (i.e., Bou Bazar, Jamai Bazar, Mosharraf Bazar, and Beltola).

AL and VA have been separately analysed by risk perception and risk tolerance using the regression model developed in the research.

The research also considers socio-economic (SE), socio-cultural (SC), and gender dimensions (GD) as control variables. These control variables were used to investigate the association of risk tolerance and risk perception with several influencing factors. The SE (age, educational level, employment status, types of occupation, household income), SC (clothing style while going outside and working, mobility restriction), and GD (financial contribution in family, decision-making role, access to essential services and cooling facilities, own income and taking permission before going outside) helps to understand the risk tolerance and perception from the intersectional and gender perspectives. The research did not consider religion in the analysis because 98.18% of the survey population was from the same religion. Thus, religion cannot show any variation.

Qualitative analysis

I read the transcripts several times to understand the interviewees significant statements. After that, the interview transcripts were coded under the relevant phrases or words. Open coding was performed, and the interviews and transcripts were closely examined and compared for similarities and differences of themes. Besides, based on the concepts of the research, those codes were categorized under major six codes (see Appendix 4: Codebook) i.e., i) Risk perception, ii) risk tolerance, iii) everyday adaptation (recognized as labor adaptation and value adaptation), iv) living environment, v) community initiatives (identified as potentiality and limitations of those initiatives for influencing everyday adaptation), vi) Gender dynamics (recognized as vulnerability, role and power). Few codes were splitted into more specific codes and few were merged to avoid redundancy of codes. The codes were further analysed through different query and analysis tools to explain the quantitative argument and answering the research sub-question 3.

4 Results, analysis and discussion

Korail slum is one of the heat-stricken urban areas in Dhaka where people, especially women, battle every day against the relentless sun. This chapter delves into their lives in Korail, unveiling their everyday fight and how the community, gender, and intersectional factors influence their everyday adaptation strategies.

4.1 Socio-demographic profile

The average household size in the study area is 4.7 more than the national average of 4 (BBS, 2022). 85% of the sample population are married, and around 11% are widows living with their family members. Few women are also either unmarried or divorced. The sample size age differs from 20 to 66 years old (see Figure A 1). Most of the women from the sample lie in the age group of 27-36. Only two types of religion were found in the study area, and Islam (i.e., 98.18%) is the main religion in the Korail slum.

Only 61.82% of the sample population have primary to higher education, and 38.18% are uneducated. Over half of the sample population (55% of the total sample size) has either primary (i.e., who at least completed the 5th grade of school) or secondary (i.e., who passed any class between 8-10th grade of school) education. Only 6% of the sample women went for college and university-level higher education (see Table A 2).

Around half of the sample population does not work. They are either wholly unemployed or students/housewives. Only 55.91% of the sample population are engaged in different occupations. There is a weak positive relation ($R = +0.33$) between education level and the occupation type of the sample population (Table A 23). Due to lack or limited education, women do not get a decent or high-salary job. Women primarily work as housemaids (56.15%) in the adjacent residential areas like Gulshan, Banani, and Mohakhali. Others work as garment's worker, day labor, saleswoman, caregiver, cleaner, schoolteacher in the local primary school, and few runs small-scale businesses in the study area. Selling vegetables and fruits or having a grocery store are some examples of small businesswomen involved in the Korail slum.

The average income of the sample population is USD 48.17, and a significant part of women earn from USD 42.54-85.08. Few women earn more than USD170.16 who are employed in small businesses (grocery stores) or by renting their own houses (see Figure A 2).

Roots and wings: Place attachment and social mobility

On average, people have been living in this slum for 14-15 years. However, the year of living varies from one year to forty five years. Most people in the sample size have been here for 30 years. Most came in search of jobs or better income from different districts. Marriage is also a prominent reason for their migration to the slum. Other reasons for migration are mainly slow on-set and rapid on-set natural disasters. However, some people were born here and also came for higher study. Despite being an overcrowded area and temporary tin-shade houses, people do not leave this place. Most people stay here because of place attachment, no matter their living conditions. One 34-year-old female inhabitant (interviewee) described:

“Most of us have tin shed housing. They cannot just leave this place suddenly due to the emotional attachment.”

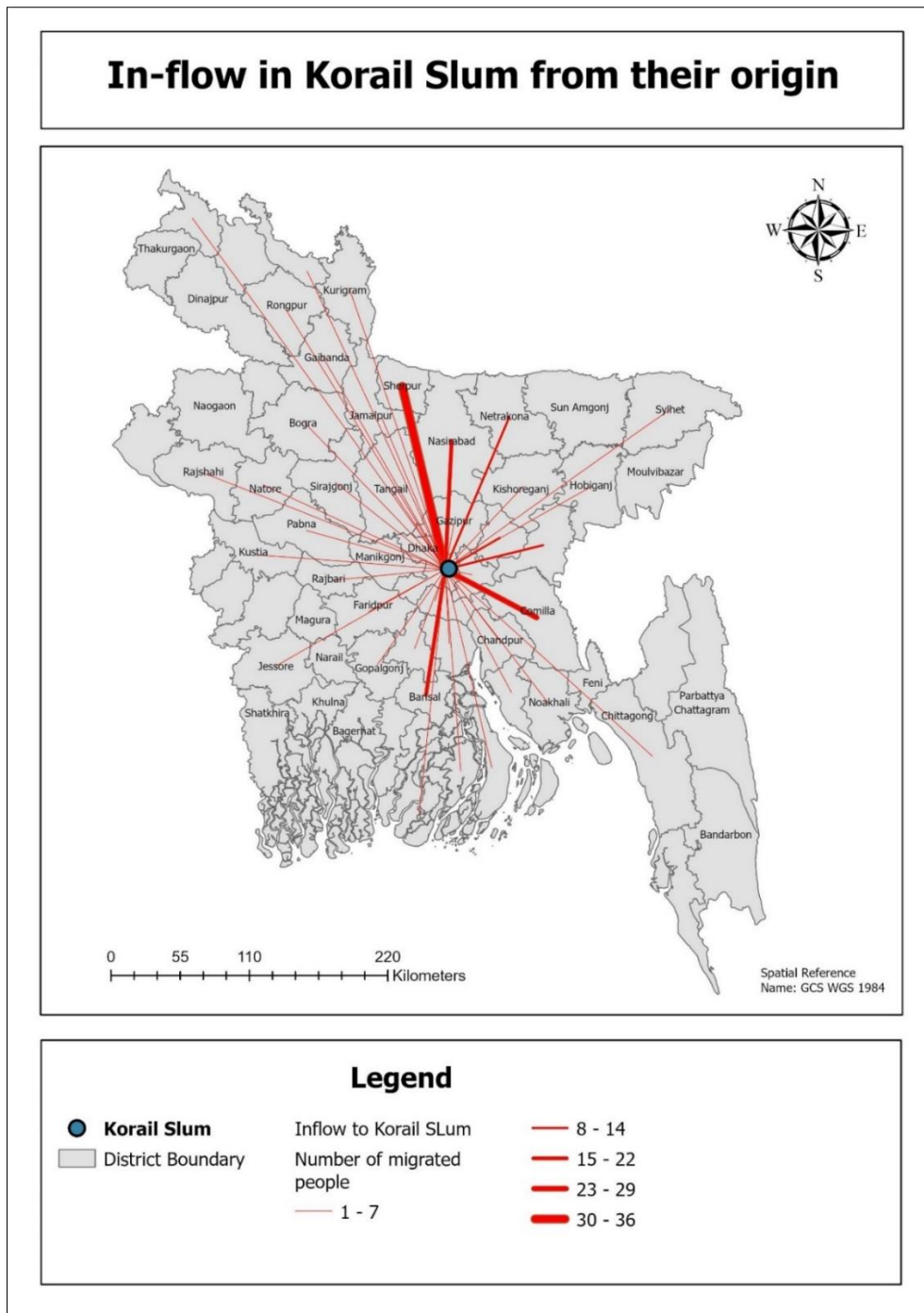


Figure 3: In-flow in Korail Slum from their origin

(Source: Author)

4.2 Feeling the heat: Risk Perception of heat stress

“It’s been several years since I have been living in Dhaka. I’ve never experienced weather as hot as it is this year.”

A 33-year-old interviewee from Beltola, Korail Slum, explained their perceived heat situation.

Risk perception is one of the essential elements to understand the behavioral response. People may perceive risk differently and respond accordingly. During the household survey and semi-structured interviews, four types of questions were asked (i.e., perceived heatwaves/heat stress, average duration of heat days, perceived maximum and lowest temperature, and level of

perceived risk) to know about women's perception regarding extreme heat and its risk at an individual level.

Perceived risk

Perceptions of extreme heat events and heat stress have some exciting variations. Around 45.91% of the women from the sample size do not realize the heat wave event or heat stress even though they feel extreme heat (see Table A 3). For women (54.09%) who have learned about heat waves, most of them experience them twice or more than twice a month. Few women also feel that heat wave events occur once a month or once in two months (see Table A 5).

Respondent may not have knowledge about heatwaves or heat stress, but they can feel the heat. Everyone experiences heat from 5 days to the entire month regardless of their realization of extreme heat events. The sample population was also asked about their perceived highest and lowest temperature during summer days. The average highest temperature reported by the sample population was 40.38 degrees Celsius.

Many factors (i.e., age, education level, occupation, essential services, and social norms) can influence their perceived risk. To investigate the association of perceived risk with other control variables and to answer the first part of the research sub-question 1.2, several statistical analyses have been conducted. Since few control variables are categorical, ordinal, or scale, chi-square, t-test, and correlation have been calculated depending on the type of data. Perceived risk was analysed in terms of realization of heat stress, perceived duration of heat day and severity of perceived risk.

Perceived heat risk shows a weak positive correlation with education and occupation, suggesting that women with higher levels of education and who are involved in the job are more likely to recognize or understand heat wave events and heat stress. Additionally, a weak negative association with age indicates that young women are more likely to aware of the heat stress than older women (see Table A 6). Similarly, age and education level have statistically significant negative influence in the perceived duration of heat days during heat wave events, significant at 95% level (see Table A 7). That means older individuals and with higher education levels tend to perceive shorter durations of heatwave events compared to young and less educated women. The severity of perceived risk shows the influence of age, education level and employment status at the 95% and 99% significance level, indicating very little association between women's level of perception and age, education level and employment status (see Table A 8). The positive influence of age means that elder women can perceive higher risk at house compared to young women. The negative influence of education suggests that women with higher education can perceive less risk than uneducated or less educated women. The positive influence of employment status indicates that employed women perceived higher risk than the unemployed women. It is also interesting that access to essential services has no or negligible negative relation with the perceived heat risk (see Table A 8).

Perception of risk varies also with the social norms in the Korail slum. Women in the study area feel riskier than men due to the patriarchal culture of the society. Since they have to work both in the house and outside, they think they are much more exposed to heat than men. A thirty-four-year-old woman from Jamai Bazar described their situation:

“Females have more sufferings. In males' case, they can go outside wearing sleeveless/short-sleeved t-shirts and a lungi. But females cannot do that.....In this hot weather, they must manage their household, care for their children, and wash their clothes. Therefore, women are in the most difficult position.”

All interviews (8 interviewees) of the semi-structured interviews in the study area blamed the cultural attire restrictions and workload for their perceived higher risk. The regular dress they

wear at home are saree, salwar kamiz and loose-fitting dress. All of the attires are full body-cover clothes which usually increases the body heat. While going outside women, most of them, wear extra layer of clothes such as scarf with salwar kamiz or another layer of clothes like borka (i.e., 41.36% of the sample population wear salwar kamiz with scarf and 40.91% wear borka/hijab while going outside). To validate the above-mentioned statement with the household survey results, regression analysis was conducted between severity of perceived risk and other variables (i.e., their traditional attire, employment status, responsibilities in family). Due to multicollinearity and insignificance, family work responsibilities were omitted from the regression model.

The traditional attire and employment status, both have positive and statistically significant influence on the perceived severity of risk, at 95% interval (see Table A 9). It suggests that certain types of clothes worn outside and being employed (compared to being unemployed) are associated with the higher perceived risk.

4.3 Bearing the effect: Risk Tolerance

Personal Battles: Individual level risk tolerance

Risk tolerance is another essential component to understand individual level risk response. Individual risk tolerance was investigated through questions of significant difficulties women face during extreme heat or due to heat stress. Women were asked about four different consequences of heat stress: i) physical sickness, ii) mental sickness, iii) changes in work habits (either work less or cannot work). Most women (94.09% of the sample population) get physical sicknesses like diarrhoea, headache, nausea, and feeling weak (see Table A 10). Interviewees from all areas in the Korail slum reported skin diseases, urine infections, and fever due to extreme temperatures. The main reasons behind this sickness or discomfort described by interviewees (from Jamai Bazar, Bou Bazar and Mosharraf Bazar) are the low quality of supply water, drinking excessive cold water, wearing the traditional clothes and also due to power cut they cannot sleep. That ultimately leads to physical sickness or mental discomfort. Sometimes, they cannot go to work. It seems that their living style and the way they deal with heat everyday also exacerbate the challenges they face during hot season.

The social norms along with other intersectional factors can influence the risk tolerance level and subsequently can influence the everyday behavioral response to heat. To find out the association with other variables, the major difficulties faced by the sample population has been statistically analysed with the same control variables as of the perceived heat risk. The control variable “age” was not considered in this analysis because of multicollinearity and effect of confounders.

Educational level, and employment status has highly significant association with the difficulties women face due to heat, with a p value of 0.004 (education level) and 0.000 (employment status), at 99% level (see Table A 11). Education level has a strong negative influence on the difficulties women faced due to heat, suggesting that women with higher level of education face less difficulties and have high risk tolerance. The strong positive influence of employment status on heat-induced difficulties suggests that employed women face more difficulties due to heat, compared to unemployed women and have less risk tolerance. Additionally, women’s clothing style during work has a marginal significance on the way women face difficulties, with the p-value of 0.066, at 90% level. The result shows a marginal negative influence of the heat difficulties, indicating that women who remove their extra clothes during work face less heat difficulties. Other variables have no significant association with risk tolerance of the sample population in the study area (see Table A 11).

The findings from risk perception and risk tolerance shows the interplay of various socio-economic and cultural factors affecting women in the Korail slum. Considering the analytical framework, now it is crucial to understand how these perceived risk and tolerance translate to the everyday behavioral response and adaptive measures.

4.4 Risk response to heat stress at the individual level

This section will delve into the everyday behavioral response at individual level and will address the research sub-question 1.1.

Depending on the perceived risk and tolerance, the sample population adopts different strategies to adapt to extreme heat. Fifteen responses (including habitual change) came from the household survey. Everyone uses fans at their houses. However, due to load-shedding, that is not enough for them to cope with the extreme heat. Apart from using fan, the four main other strategies they take are drinking plenty of water, bathing several times, drinking cold water, saline, juice, and wet towels or clothes. All interviewees from the study area also reported about the same strategies they usually take in their daily routines. One interviewee from Mosharraf Bazar, while describing about what women in the Korail slum do to deal with extreme heat, said:

“We encourage people to drink liquid food, especially water. Many people take baths multiple times a day. We take this conventional way to be safe from heat stress.”

The real-life findings from the survey and interviews aligns somewhat with the analytical framework of this research. Women’s everyday behavioral response to heat as a form of adaptation labor in Korail slum are influenced by risk perception (to some extent) and their personal experience to heat stress, at 99% significant level (see Table 2). Overall, the model is statistically significant.

Risk perception (only in terms of perceived duration of heat days) has negative influence on adaptation labor. It indicates that women, with perceived longer duration of heat risk, take less adaptation strategies as a form of AL compared to those who perceive shorter duration of the heat days.

“The temperature is given by the almighty, we cannot do much on it.”-noted by 38-year-old woman from Mosharraf Bazar. This indicates that women, who perceive longer duration of heat days, may get used to it or think as a god’s deed which cannot be changed by any action.

On the other hand, risk tolerance has a positive influence on adaptation labor, meaning women, facing more difficulties, make more adaptive decisions.

These findings suggest that women, who experience more heat-related challenges, are more likely to take more protective steps to adapt to the extreme heat.

“Sometimes they shower once, but then they notice they're sweating and feeling uncomfortable, so they take another bath. They move around to find coolness and fresh air; some go to the road, where people sit to enjoy a breeze.”- noted one interview from Jamai Bazar.

Her statement clearly explains the association between the adaptation labor and the heat risk tolerance. Depending on the level of their risk tolerance level, women take more protective measures in their daily life as a form of labor adaptation.

Risk perception and tolerance has no statistically significant influence on value adaptation measures. It does not have any association with any factors of risk perception and tolerance (see Table 2). In practical life, to take any value adaptation measures such as improving housing structure or buying new cooling facilities do not just depend on how they perceive or face the heat risk. Even though they perceive the high heat risk or cannot tolerate it, if they do not have

the capacity or ability to improve, they will not do that in the context of Korail slum. A fifty-years old interviewee from Bou Bazar area explained the reason of not taking value adaptation measures:

“We cannot do it because we don't have that much financial ability.....For constructing a ceiling under the tin-shade roof, i don't have ability now.”

Table 2: Influence of perceived risk and tolerance on individual everyday adaptation

Dependent variable	Independent variable	Probable influence
Adaptation labor (AL)	Perceived heat risk	0.290 (0.0445879)
	Perceived duration of heat risk	0.008*** (0.0041468)
	Severity of perceived heat risk	0.817 (0.0801248)
	Risk tolerance to extreme heat	0.002*** (0.026261)
Value adaptation (VA)	Perceived heat risk	0.577 (0.0655459)
	Perceived duration of heat risk	0.971 (0.0059384)
	Severity of perceived heat risk	0.957 (0.1158683)
	Risk tolerance to extreme heat	0.849 (0.0383278)

Note: standard error terms in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author's calculation)

The psychology of everyday adaptation

To investigate more about the second part of the research sub-question 1.1, which was why women response in such way or take such adaptation measures, the research applied the concept of ‘Protection Motivation Theory (PMT)’ (Rogers, 1975; Grothmann & Patt, 2005; Meso et al., 2016; Mallick et al., 2022). PMT uses to explain the motivational process behind the protective behaviors. The theory explains the cognitive response from the fear appraisals. It considers threat appraisal (i.e., perceived severity and perceived vulnerability) and coping appraisal (response-efficacy, self-efficacy and response-cost) to evaluate individual potential response to any threat.

In the research, individual mindset behind every day behavioral response against heat has been analysed through the threat and coping appraisal components of the PMT theory. My hypothesis was that perceived severity of risk and perceived vulnerability to heat stress influence the behavioral response through self-efficacy and response-cost. I did not consider the response-efficacy because of lack of data availability and less relevancy in this context. For each component of threat appraisal and coping appraisal, I considered one to three or more variables (see Table A 12).

Considering the complex relationship and latent variables, I used structural equation modelling (SEM) instead of regression analysis to test the hypothesis. The result shows a good model fit (chi-square of 0.00, calculated with maximum likelihood method). Perceived vulnerability, self-efficacy and response-cost are the significant predictors. All of these three variables have positive and statistically significant relationship with everyday behavioral response, at 95% confidence interval (see Table A 13). The perceived severity of heat risk has positive relationship with the everyday behavioral response but not statistically significant. Therefore, perceived severity of threat no has significant influence on women's everyday adaptation behavior in the Korail slum.

The findings suggest that women in the Korail slum who believe they are highly vulnerable to heat, are confident in their ability to manage heat, and knows the costs and sacrifices involved in protective behaviors, are more likely to adopt effective daily heat adaptation measures. For instance, a woman who understands the dangers of heat waves, trusts her strategies to stay cool, and acknowledges the effort needed to implement these strategies, might consistently use fans, seek shade, or alter her daily routine to avoid peak heat times. Conversely, even if a woman perceives the heat risk as severe, this perception alone does not significantly influence her daily adaptation behaviors if it is not accompanied by self-efficacy and response-cost considerations.

4.5 Navigating the Heat Stress and Response at Community Level

In the previous section, it was discussed how the women at individual level response to extreme heat based on their perception and tolerance level, which was one part of the analytical framework. This section describes other two parts of the framework at community level to understand the living environment of the Korail slum and the community capacity that may shape individual's everyday behavioral response to heat stress in Korail slum.

Living Environment at Korail Slum

The living environment is essential to understanding heat stress and adaptation strategies in Korail slum. People behave in extreme situations based on the surroundings they are in. This study defines the living environment by three interrelated conditions: environmental, political, and societal.

- *Environmental conditions*

The average highest temperature in the study area is 40 degrees Celsius, and the lowest temperature varies from 28-30 degree Celsius during the summer. The heat map (see Figure 4) proves that the study area's air temperature is higher than any other adjacent area. The temperature is comparatively lower near the waterbody (Gulshan Lake and Park) than in the study area. Many reported that the temperature varies between 38-40 degrees Celsius in Korail, and during any heat wave event, they experience extreme heat for several days.

“It usually varies between 38 to 41 degrees Celsius.....remains hot for several days. I feel exhausted.”

Sample populations were asked about any other hazards that may occur due to extreme heat or during summer. Around 72% of the respondents said their community faces different hazards during extreme heat days. Fire hazards are a significant one in the study area during summer days. Out of the total respondents who reported fire hazard, 37.01% from the Bou Bazar and 34.42% from Mosharraf Bazar area reported fire hazards in their community during summer season, marking the highest fire incidents in those areas (see Table A 14).



Figure 4: Heatmap of the study

(Source: primary data, HH survey)

○ *Political conditions*

Local governance can be crucial to reducing the heat risk in the Korail slum. However, there is little evidence of any government or non-government organization working in this slum to minimize the extreme heat.

Minimal informal and local government initiatives have been found in different parts of the study area. According to the respondents, 14.55% mentioned a few informal initiatives, while only 1.36% reported being aware of governmental or non-governmental initiatives in various parts of the study area (see Table A 15).

Recently, a temporary cooling zone has been made in this field by the Mayor of the Dhaka North City Corporation. There is a partition between men and women's sitting place with fan and chairs. (see Photograph A 1). There is an ongoing tree plantation initiative from government in Korail slum to reduce the surrounding temperature. Around 450 plants were distributed and planted. Heat reduction initiatives in Korail slum are very informal and not effective.

“No one has taken any action to reduce the heat. A few days earlier, the college student distributed juice to the public. But I think that's not the case because no one has taken anything to reduce the temperature at home, as people have to stay at home for a long time.”

Her statement points out to take appropriate and effective initiatives. There is little evidence of any organization dealing with the heat here or from the government. There is no heat action plan or project that directly involves the informal settlement in Dhaka.

Informality is one of the main concerns for the local community or other organizations. People lives here with temporary living conditions and with uncertainty about future housing condition. There is no legal basis of lands here. Locals do not improve their condition as their own. Furthermore, no governmental organization or NGOs want to take initiatives in this slum because of the high informality here. The same expert from BRAC stated that:

“There is no legal basis in the court. Some people are selling the lands as well. So, even if we want to do it, it is tough for us to do it at the individual and housing level.”

For any organization, particularly for NGOs, it is important to cover as much as target population they can by their service. However, in heat mitigation projects, they do not get that much motivation or budget. Expert of BRAC Urban Development Program (UDP) explained the limitation with an example of household insulation projects or providing any housing facilities in individual level.

“As an NGO, I have to follow one more thing clearly. How many people can I support? If I get 500 people, Maximum 250 people will get support with 1 crore rupees. But if I spend this 1 crore rupees on other interventions, then my population coverage will increase. Benefit will increase.”

This indicates that financial constraints also enhance the systematic exclusion in development project.

- *Societal conditions*

The housing structures in Korail are in miserable condition. Almost every house is made of corrugated sheet (CI sheet), making the room and surroundings hotter than usual.

“Due to the heat of the roof, which is made of tin, the room becomes intolerable to live in. Due to the sun, it is intolerable outside as well.”

The whole family is used to live in a tiny room (see Photograph A 2). Ventilation/window is often a “luxurious” word for them. In such a small room, their whole family sleeps together, making the room temperature hotter. Poverty impacts their everyday response to heat. Many reported that due to poverty, they cannot afford a bigger room or cannot improve the housing condition by making windows. It also influences their labor adaption. For instance, women living in the houses with no windows or cooling facilities, tend to go to the roa side or outside seeking cool air.

The sample population has access to basic services such as electricity, water supply and gas. However, the current scenario at Korail is different now because of inadequate supply of water, gas and electricity. Respondents complained about the frequent load -shedding and shortage of water and cooking gas. Therefore, even though they have these services, they are deprived of using these facilities. These directly influence their perceived heat risk, tolerance and adaptation behavior. One 38-year-old lady explained about their perceived heat and difficulties due to lead-shedding:

“If I have to talk about heat stress, i have to mention electricity. Load shedding is a common issue here...Like today, we passed the whole day without power and in this hot weather.....I especially have a small kid who is sick, he suffers mostly from the temperature.”

Two interviewees from Mosharraf Bazar and Jamai Bazar areas described the challenges they face every day while dealing with heat. They cannot take showers multiple times or cannot

change the cooking times due to limited water and gas supply. To cope up with this extreme heat, it is crucial to get uninterrupted access to essential services, not just basic access.

This area does not have that much open space or trees where they can rest during the power cut. Especially for women, there is no such place for women to rest during extreme warm weather. The room and the adjacent roadside are the only options for them. One interviewee explained:

“Male can go outside whenever they feel hot, females cannot. Suppose if they could go outside, sit under a tree or under the shed, but unfortunately, there is no such place for females. Also, they must work in their household when they return from work.”

4.6 The Bigger Picture

This section describes the interlinkages among different factor at community level and how they influence everyday behavioral response at individual level, while linking all levels of the analytical framework. Through picturing the overall impacts of living environment and gender dimension in the context of Korail slum, the following sub-sections addresses the research sub-question 1.2 and 1.3 subsequently.

Bound by Heat: The Impact of Social Norms on Women’s everyday Adaptation

Previously, it was discussed how the risk perception and tolerance varies due to social values (see 4.2 and 4.3), while investigating the first part of the research sub-question 1.2. To investigate the second part of that question, this sub-section discusses the association of social values with everyday adaption.

Firstly, the research inspected on how the social values (i.e., women’s cultural attire restriction, restriction on mobility) influence their everyday adaptation. The results suggest that mobility flexibility has a significant positive influence on the adaptation, significant at 95% level, indicating women with less restriction on their mobility take more adaptation measures as a form of labor adaptation (see Table A 16). This may influence their everyday responses such as going outside or staying on roadside for cool air or sitting under roadside trees.

There are no other significant predictors (social values) for everyday adaptation (see Table A 16). Even though the women’s attire in Korail has significant influence on their higher perceived risk and face more difficulties due to heat (see 4.2 and 4.3), it does not have any significant influence on the behavioural response to heat. *“Women have to wear a lot of things during summer due to culture. Not only outside, the scenario is the same even if they are inside their houses.”*- noted an interviewee from Bou Bazar. Women cannot change their clothing style according to the experienced heat due to the culture of the Korail slum.

Women’s everyday response to heat may vary in in the context of Korail slum depending on their position. Thus, women’s role (i.e., decision-making role in the family and community, family responsibilities), power (i.e., own earnings, financial contribution, access to loan) and access to resources (i.e., access to essential services and cooling facilities, women’s involvement in different heat reduction community activities and utilization of those cooling ideas in their own houses) were analysed against their everyday adaptation to investigate the association. There is no or negligible relationship between everyday adaptation measures and the above-mentioned variables (see Table A 17). The results suggest that women’s role, power and resources does not influence their everyday adaptation.

“Men and women follow the same procedures.”-reported by an interviewee from Beltola. Interviewees from Beltola and Mosharraf Bazar explained that it does not matter for male or female. If they perceive heat, they both adopt same techniques to adapt to the extreme temperature. Women’s role and power in terms of financial contribution and decision making

in the family is almost better. 83.61% women contribute their full earnings to the family and another 14.75% contribute as per the need of the family which indicates that women are indifferent to men regarding the financial power (Table A 18). Additionally, only 14.09% women does not have any involvement in family decisions. Other 85.91% women reported that all the decisions in the family are made consulting with them (see Table A 19). Furthermore, all of them have access to basic services and cooling facilities (if any nearby). Thus, it indicates that women in the Korail slum does not differ that much in the role, power or resources that may influence their everyday adaptation measures.

Impacts of living environment in everyday adaptation

In section 4.5, it was discussed how different conditions (i.e., environmental, political and societal) affect and shape the living environment at community level regarding heat stress and response. According to the analytical framework of the research, this sub-section investigates how this living environment of the community influence individuals risk perception, tolerance and everyday adaptation to heat stress, addressing the research sub-question 1.3.

Women's risk perception and tolerance can influence by the different environmental factors of the living environment. Women perceived highest temperature has weak to moderate association with their perceived risk ($R = +0.3142$) and perceived duration of risk ($R = +0.5175$) respectively (see Table A 20). It suggests that women's risk perception can increases with the perceived increased temperature in the community compared to the one who perceive low temperature.

Besides, the occurrence of heat-induced hazards can also weakly positively influence the risk tolerance level of them. The results suggest that women can face more difficulties depending on the increased frequency of hazard ($R = +0.3930$) and type of hazard ($R = +0.3515$) they face (see Table A 20). For instance, a 35-year-old interviewee from Mosharraf Bazar blamed the upcoming cyclone for her perceived high heat risk: *"I have heard that a cyclone is coming. That's why nowadays the temperature is high and there is no air flow."* This statement shows that she perceived the temperature as high .

Although risk perception (to some extent) and tolerance can influence the everyday adaptation decisions, women's everyday adaptation decision has no or negligible association the harsh environmental condition of the Korail slum (see Table A 20). It may be because of the other dominant factors (i.e., socio-economic and governance) that influence their daily adaptation measures more than the environmental factors.

The societal condition (socio-economic, access to basic and cooling services) can directly influence their everyday adaptation. For example, 79.55 % of the respondent perceives that economic solvency has impact on their daily adaptation strategies. Among them, 65.71 % respondents perceived that their economic condition has high impact on the way they adapt to the heat (see Table A 21). However, poverty is one of the main obstacles for the women in this slum. Even though they want to take extra measures for their family or children, they cannot do that, particularly with value adaptation strategies such as changing housing structures or cooling facilities. Value adaptation shows a statistically significant positive relationship ($p, 0.005 < 0.01$) with their household income, at 99% level (see Table A 22). It suggests that women with increased household income are more likely to improve their lived values (i.e., housing condition) for adapting to the heat.

"If they could have better financial condition, they could alter these things in their daily lives." But they cannot do so due to poor economic conditions." - described by one interviewee from Jamai Bazar. Interviewees from different parts of the study area blamed their financial conditions for not being able to change or improve their daily adaptation measures.

Education level does not have any statistically significant influence on the everyday adaptation measures. But it has strong positive influence ($p, 0.000 < 0.01$) on the type of job they are currently involved in, significant at 99% level (see Table A 23). Interviewees from Bou Bazar, Jamai Bazar and Mosharraf Bazar reported that due to their low education level, they do not get a better job, and there is no option for them to work less during summer. That is why it is not possible for them to take extra adaptation measures.

However, their access to essential cooling services and credits can significantly influence their value adaptation, at 95% level, meaning women with access to credits and increased access to basic cooling services are more like to take value adaptation measures in a form of improving housing structures, cooling facilities and buying extra cooling facilities (see Table A 22).

4.7 Consequence of community response at individual level

To answer the research sub-question 1.4, this section discusses about the potentials and main challenges of community initiatives that can enhance everyday adaptation behavior. In this section, community initiatives refer to the any heat reduction initiatives or projects taken by local community, government and non-government organizations in the Korail slum.

Potential for community-led initiatives

Although, there is little evidence of community initiatives, it is not enough for reducing heat in the community. Nevertheless, it has significant potential to influence the individual level adaptation strategies. Local people, especially women, have strong bonding in the Korail slum. They are well-connected. Therefore, if any initiative can be taken from government or NGOs, women in the study area would support those initiatives by community planning as well as they would implement those knowledge or ideas in their own households. One interviewee from Beltola, Korail slum said:

“I think we are well-connected in this community, familiar with each other's houses, and know each other's names. If the NGOs collaborate with us, we can easily identify and address the problematic areas.”

Women who are involved in any community initiatives has a strong positive relationship ($R = +0.68$) with their utilization of any heat reduction ideas at their household level. Besides, there is a moderate positive relation ($R = 0.55$) between women's involvement in such community initiatives and their daily adaptation strategies (see Table A 24). This relationship is also statistically significant at 95% confidence level ((see Table A 25). The results strongly suggest that women are involved in any kind of heat reduction community initiatives or received any trainings, can enhance their every adaptation strategy in individual level. Interviewees from the study area reported that if any practical initiatives taken in the community involving them, such as educating women about coping mechanism during heatwaves, they can also educate others by learning, to involve and utilize the knowledge in their daily life. One interviewee from Beltola explained about how the practical knowledge program can help them.

“I can educate people about the care they should take. For example, if they are suffering from fever or from diarrhea, on that moment I can suggest them to wipe the body with wet towel or to drink saline water.”

Limits for community-led initiatives

Although community-led initiatives have the potential to influence the everyday adaptation, several practical issues challenge the effectiveness or implementation of the community initiatives.

For instances, both the community and the organizations lack resources and motivation to take any projects. The community does not have the ability to take any initiative due to poverty and inadequate infrastructures. The community has structural limitations, such as the inability to place windows in densely packed homes or the lack of open spaces for tree planting, further exacerbate the problem.

“We cannot take any initiative alone. If any NGO or government takes any project, we can live better with our family and children.” – noted a respondent from Beltola.

Furthermore, there is often a lack of engagement or prioritization from the broader community. Even though, there is any initiative, people, especially women, do not have enough time to attend the meetings or sometimes do not participate in any kind of activities. For instances, initiatives like cooling sheds may be set up, but not everyone utilizes them. *"They hear about it but don't pay much attention; it goes in one ear and out the other,"* an interviewee from Jamai Bazar noted. Even though some women participate, they cannot implement the ideas at their own house or in their lives because of poverty and inadequate infrastructure. They cannot afford to paint their roof or buy false ceiling due to financial inability or cannot take several baths due to water scarcity.

4.8 Discussion

This thesis aimed to explore gendered everyday adaptation strategies to heat stress in the Korail slum, while highlighting the significant influence of other interconnected and intersectional factors. The findings validate the applicability of the concepts used for the research through showing the interplay among gender-specific everyday adaptation and societal, cultural, political and environmental factors in the informal urban settings.

Through the reformulated analytical framework ((Mallick, 2023), the results indicates different directions of everyday heat adaptation and interconnectedness with the living environment of the Korail slum. The hypotheses developed considering the analytical framework was compared to the actual findings of the study area (Table 3). The results suggest that some of the actual findings from the study area are aligned with the expected outcomes with different level of influence. Additionally, there are few findings that differ (i.e., in terms of women’s role, power and resource) or are not entirely aligned with the expected results.

The regression model results (see Table 2) suggest that risk perception (perceived duration of heat risk) and tolerance can significantly influence the everyday behavioral response wherever these two factors (perceived heat risk and tolerance) can vary by different factors of the living environment of the Korail slum. Depending on the result, the research pointed out the critical role of socio-economic, cultural, political and environmental factors in shaping gendered adaptation strategies of the Korail slum.

Few other multiple interpretations can also be drawn from the research findings. The positive significant influence of education and employment suggests that empowering women through these avenues can significantly increase their daily adaptation, integrating heat resilience at everyday life.

The different levels of influence of socio-economic and cultural factors found in this research indicates towards the critical role and constrains of those factors in improving women’s everyday adaptation. Along with this, the results indicate towards the significant positive influence of community initiatives and its benefit on the everyday adaptation measures. These combined findings suggest that addressing the socio-economic and cultural constraint through the community interventions can enhance women’s everyday adaptation in the Korail slum.

Table 3: Drivers, factors, variables and comparison between their expected and actual influences in the individual behavioral response

Attributes	Factors	Variables	Expected response	Actual response/results
Intersectional Drivers	Social identity	-Income category -Religion	- Women who do not have any cultural restrictions (i.e. on mobility, clothing, etc.), and belong to the income class may better adapt to the heat stress vulnerability	-Women with mobility flexibility and less restriction are more likely to take adaptation measures to heat stress -Women higher monthly household income takes more adaptation measures as a form of value adaptations.
	Power dynamics	-Decision-making ability - Occupation -Financial contribution	- Women who have better financial power and engagement in family and community decision-making can take better strategies for heat stress	-women's financial contribution and engagement in decision-making do not have any significant influence on their daily heat adaptation.
	Demographic	-Age -Educational level	Women who are adults with higher education levels can perceive and respond to heat risk.	-Women's age and education level has weak influence on their perceived heat risk, meaning young and educated women can perceive slightly higher heat risk compared to the elder and uneducated women.

Attributes	Factors	Variables	Expected response	Actual response/results
	Economic capability	-Access to credit -Own earnings -Households earnings	Women who earn and access to credit try to improve their housing conditions and adaptation strategies.	-Women with access to credit and their higher family income can significantly influence their value adaptation measures. - Women's own earning does have any significant association with their adaptation strategies.
Environmental Drivers	-Extreme weather/Heat waves -Heat stress	-Frequency of heatwaves -Highest temperature -Lowest temperature -Average duration of extreme heat days -Frequency of hazards due to extreme temperature (i.e., Drought, Heavy rainfall, flood)	Women who have susceptible living environments due to increased temperature face different kinds of sickness and difficulties	-The results that with increased temperature, increased duration of extreme heat days and frequent heat-induced hazard can have weak to moderate level of association with women's experienced heat stress. Heat stress can increase with their vulnerable living environment.
Governance driver	-Influence of national and local action plans -Trust in Governance -Accessibility to different governmental, NGOs/CBOs heat	-Number of associations working in the community -Number of projects related to heat stress -Number of people involved from the community related to heat stress initiatives	-Women engaged in different kind of governmental and non-governmental initiatives may benefit from those associations. -Informal activities in the slum community may	-Strong positive relation between women's engagement in community initiatives (formal or informal) can benefit them and significantly influence their everyday adaptation.

Attributes	Factors	Variables	Expected response	Actual response/results
	adaptation projects/activities	-Benefit from govt./NGO project - Informal initiatives during hazard/heatwaves	influence the everyday adaptation strategies of the women who are involved in such kind of activities	
Gendered Dimension	-Role -Resource -Power	-Family responsibilities -Role in family decision making -Access to drinking water, electricity, cooling facilities	-Women who have a significant role in the family decision-making process and proper access to the primary service facilities take better adaptation strategies	- Women's significant role, power and access to essential cooling services has no influence on their daily adaptation strategies in the context of Korail slum.
Everyday Behavioral Response	-Risk perception -Risk Tolerance	- Ways of Perception - Tolerance level to different kinds of heat risk -Severity of risk	- Women's perception and tolerance of the experienced risk of extreme heat can influence the everyday behavioral response or adaptation. Risk perception and tolerance levels may vary based on intersectional characteristics, gender roles, available resources, and different initiatives.	- Women's risk perception in terms of perceived duration of heat risk and tolerance significantly influence their everyday behavioral response. -Women's risk perception and experienced heat stress varies with intersectional characteristics.

Limitations of the study

This research exclusively focused on women, providing gender-specific insights. But it may sometimes, overlook the perspectives and adaptation strategies of the other household member, (i.e., male members).

The cross-sectional nature of the survey captured a snapshot in time but did not account for temporal changes in adaptation strategies and risk perceptions. This may evolve with ongoing climate impacts and socio-economic changes later on. Besides, the survey sample size represents only 0.18% of the entire population in the study area. Therefore, data shows low variance (<30%) in some analyses. This emphasises the need of further rigorous analysis with large sample size to enhance the robustness of the findings.

5. Conclusion and recommendation

5.1 Conclusion

The main focus of the research was to explore the everyday adaptation to heat stress in the Korail slum and how it differs depending on the gender-specific and intersectional factors. There were four research sub-questions to address the research's objectives. Firstly, the study explores the existing everyday response and practices to the heat stress and the reason behind their such behavioral response. Secondly, it investigates the level of influence of the existing social values to women's risk perception and everyday adaption in the Korail slum. Thirdly, the research tried to understand the ways environmental and socio-economic factors affects those everyday practices and strategies. Lastly, the research explores the potential and structural barriers of the community initiatives for enhancing women's everyday response to heat stress in the Korail slum.

Women's everyday heat adaptation strategies and the psychology behind such strategies (Research sub-question 1.1)

Everyday adaptation is "the way people live, work, eats and thinks in response to the climate realities" (Castro & Sen, 2022. p.1). In line with this, this research looked for such kind of everyday practices that women take in response to perceived heat stress in the urban slum. The findings suggest that women in the Korail slum response in at least fifteen different ways to deal with every day's heat. Among them they have eleven different everyday practices that can be recognized as Sen's (2022) adaptation labor and four value-shifted responses as Castro's (2022) value adaptation. Along with using fan, they have four main strategies to adapt to the heat stress (i.e., drinking plenty of water, taking showers multiple times, drinking cold water, juice or saline, and going to roadside or outside for cool air or breeze).

Similar to (Kemen et al., 2021; Malmquist et al., 2022), the results suggest that adaptation strategies are associated with their perceived heat strain in the Korail Slum. The research findings indicate that women, when faces more challenges due to heat stress, are intended to take more everyday adaptation strategies. The study results also support the PMT theory that women in the Korail slum take their heat adaptation strategies not only based on the way they perceive difficulties, but also depending on their individual capacity to dealt with extreme weather. Evidence shows strong positive association between the psychology of taking those daily adaptation measures and their perceived threat and coping capacity.

Social norms and Women's everyday adaptation (Research sub-question 1.2)

The results (qualitative and quantitative) indicate socio-cultural norms such as women's attires, their workload and family responsibilities in the patriarchal society of Korail, contributes to

their high heat risk perceptions. For instances, women wearing certain kind of traditional clothes can perceive high risk to heat stress and face more heat-related difficulties. At the meantime, women with extra workload (working women with family responsibilities) perceived more heat stress and challenges. The qualitative results suggest that mobility and cultural attire restriction can lead to the higher heat strain (ADB, 2023; Woods, 2023). Women in the Korail slum who cannot go outside without family head/husbands' permission and wear usual traditional clothes experiences more heat-induced difficulties.

The existing literature suggest that socio-cultural norms and power dynamics of women can shape their response and adaptation strategies to the climate change (Cohen et al., 2016; Jordan, 2019; Roy et al., 2022). Interestingly, the research results in the context of Korail slum indicates differently. The result only suggests that women having less mobility restriction, can take adaptation measures such as going outside or seeking cooling facilities.

Literature suggests that people's adaptation needs vary depending on location, means of livelihoods, and their roles within their families and communities (Jabeen, 2014). However, the research findings indicate that women's everyday adaptation has no relation with any socio-cultural factors like traditional clothing style, their role and power in the family and community. The qualitative results explains the reason behind this unexpected finding. Although women in this slum feels more heat risk and challenges due to their clothing style or extra workload both in family and at work, they do not have any option to response accordingly. They cannot avoid their work and also cannot change their clothing according to the experienced heat risk. Besides, the results suggest that women have strong financial and decision-making power (83.61% women financially contribute to their family and 85.91% are involved in any decision-making role in the family and community) in the context of the Korail slum, opposing the existing literatures' view of women's exclusion from the decision-making role and power (Alston, 2013; Denton, 2002). Therefore, it can be a reason of the non-association of gender role and power with women's everyday adaptation strategies.

Socio-economic and environmental condition and its effects on everyday adaptation (Research sub-question 1.3)

The way women perceive the heat risk in the Korail slum weakly associated with their age, education level and occupation. Depending on the age, how far they studied and what kind of occupation they are in, women's perceived risk of heat stress varies slightly. For examples, an educated woman can realize the heat wave event, perceive less duration of heat wave event compared to the uneducated women. Similarly, women's education and employment status have highly significant influence on their experienced heat difficulties. Women who work outside face more heat-related difficulties compared to the one who does not work outside. The results also strongly suggest that educated women face less difficulties and high tolerance than uneducated women in the same context.

Climate adaptation is highly-context specific and socio-economic characteristics can play important role in the adaptation measures (Wolf, 2011). The research findings also comply with findings of Wolf (2011). The monthly household income highly influences their families' value adaptation strategies (i.e., improvement of housing structure, buying or changing housing cooling facilities). The qualitative results also suggest that poverty is one of the main reasons in the Korail slum that hinders women for taking extra heat adaptation measures.

People in global south adapt to the climate change according to the way they experience and accept that change (Castro & Sen, 2022). But in the context of Korail slum, the results suggest that women's everyday heat adaptation is not influenced any environmental factors (i.e., highest temperature, frequency of heat waves, heat-induced hazard occurrence). With the

temperature variation, occurrence of heat waves and heat-induced hazards, women's risk perception and experienced difficulties can vary slight to moderately. In example, women in the Korail slum can perceive higher risk of heat stress and faces more difficulties due to increased temperature or frequent occurrence of heat-induced hazards in their community.

Possibilities and barriers between community initiatives and every adaptation (research (sub-question 1.4))

In the climate-vulnerable countries like Bangladesh, people's everyday adaptation needs vary based on their community's ability to respond to climate challenges, rather than relying solely on their individual or household capacity for adaptation (Castro & Sen, 2022). The research findings also point to the same views. Although there are inadequate community initiatives found, the results strongly suggests that women, who are involved in the community initiatives and get benefit from those initiatives as a form of trainings or any heat-reductions ideas, can improve their individual everyday adaptation strategies.

Informal settlements, often situated in high-risk areas, require integrated adaptation strategies that address immediate needs and long-term resilience, supported by significant investment in infrastructure upgrades and climate-compatible services to enhance low-income area resilience (Dodman et al., 2019). However, the informality in the Korail slum hinders the local and government/non-government initiative. The qualitative result suggests that due to the lack of legal basis, inadequate resource/budget and infrastructures, neither the community itself nor the external organization can take any heat reduction projects or activities. Additionally, the result indicates that those initiatives often lack women's participation and their ability to implement at individual level. Therefore, even though women's participation can significantly benefit their everyday heat responses, they cannot enhance their adaptation because of the interplay between community and individual level barriers.

5.2 Recommendation and future research opportunity

This research explored individual's everyday adaptation strategies to heat stress and how it may influence with the different socio-ecological, socio-cultural, socio-economic factors in the context of urban informal settlement. It also investigated the interplay between community collective actions (formal and informal actions) and individual's everyday response to understand the potentials and barriers of the community initiatives in enhancing the household level adaptation. Although the regression models in this research explain a relatively low portion of the variance in individual heat stress adaptation strategies (i.e., due to the small sample size), they highlight significant trends and relationships that warrant consideration. These findings should be viewed as preliminary insights, and future interventions should be designed with an understanding of the complex and multifaceted nature of socio-ecological and socio-economic factors in urban informal settlements.

Some considerations and recommendation for the future interventions dealing with heat stress in the urban informal and low-income settlement:

- ❖ The research showed the diverse ways in which women individually take daily heat adaptation measures in the urban informal settlement. Considering the daily-life adaptation along with gender-specific response can help the NGOs and other actors to effectively take initiatives addressing the immediate needs of the local people in the Korail slum.
- ❖ Understanding the living environment of the local level and how it can influence the individual's heat response at household level is crucial to take any collective actions at community level. These considerations, along with the gender-sensitive approach can

support NGOs and other governmental organizations to take effective and sustainable interventions addressing the long-term heat resilience for the Korail slum.

- ❖ The research findings suggest that it is crucial to consider the time availability of the locals in such informal settlement setting and ensure how they can be benefitted from such interventions. This consideration can help different actors in ensuring active community participation and heat action planning within the slum community.
- ❖ Before taking any heat reduction interventions, it is important to understand how people perceive and experience heat stress in low-income and informal settlement setting, and how it varies from the other urban context. The research findings, thus, can lead different relevant actors to take the context-specific heat reduction interventions, addressing the need of the deprived population.
- ❖ The research pointed out the main potentials and barriers for implementing any community interventions and which can ultimately improve individual adaptation. This finding can help both the government and non-government actors to solve the inhabited challenges they face and in direction they can go forward.

Opportunity and considerations for future lines of research:

- ❖ Through this research, female-specific critical issues (i.e., the different dimensions of heat stress and daily adaptation) and valuable insights can be found. There is scope of future research to compare both male and female members of a household in terms of everyday heat adaptation, in understanding different angles of gendered dimensions.
- ❖ The research recognized and considered women as the vulnerable population to investigate risk perception and adaptation to heat stress. The future research can also study the same on other vulnerable groups (i.e., children and elderly population, pregnant women and mothers).
- ❖ The research used and reformulated the analytical framework of (Mallick, 2023) to analyse the everyday adaptation to heat stress. However, it lacks the translocality and other context-specific factors that can influence the everyday adaptation behavior, urging for future research.
- ❖ The research showed the interplay between community capacity and how it can contribute to enhance individual adaptation. The future research can investigate the vice-versa on how household level informal adaptation may improve or interrupt the planned interventions, community planning and policy formulations.

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Appendix 1: Research instruments and time scheduling

1.1 Research instruments

Household Survey Questionnaire

Master's Thesis

Heatwaves and Everyday Heroines: Unveiling Gendered Adaptation Strategies in Korail Slum

Interview Guide

My name is Sultana Ashrafi. I am a master's student, studying 'Urban Management and Development' at the Institute of Housing and Urban Development Studies, Erasmus University Rotterdam. Currently, I am doing my thesis research on heat stress and how people adapt to extreme heat in their daily lives. Through this research, I am trying to understand the experiences, practices, and perceptions of slum community people regarding extreme heat. For this research purpose, I would like to interview you if you would allow me some time from your valuable and busy schedule. The interview will take a maximum of 30-35 minutes. This interview is semi-structured with flexibility. The questions are comprised of open and closed questions.

I can assure you that this interview will remain anonymous, meaning that your personal information will not be disclosed to anyone with your name or identity. This information will only be used for the research mentioned above. If you are willing to join this research, I would like to start our conversation with some background. In addition, I would like to ask you whether I can record our conversation for future data use with your full consent. The recording will not be shared with anyone except my supervisor, who closely monitors my research.

Introduction Part:

We will discuss your experience, daily practices, and responses during extreme heat. Your input is crucial for understanding the everyday adaptation strategies to heat stress in Korail Slum. Your responses will remain confidential and will only be used for research purposes.

Opening Questions:

- I. Household ID:
- II. Household's GPS Location:
- III. Household Size:

Migration:

1. How long have you been in this slum?.....
2. From where did you come from (Home district name)?.....
3. Why did you migrate from your home district?
 - a) For better income/employment
 - b) Natural disaster
 - c) River erosion
 - d) Marriage
 - e) Extreme heat stress in the home district

f) Others

Please specify others.....

Environmental drivers:

4. How frequently do you experience heat waves?
 - a) Once in a month
 - b) Twice in a month
 - c) More than twice in a month
 - d) Once in two months
 - e) Once in three months
 - f) Do not know anything about heat waves
5. On average, can you tell us how many days do you experience extreme heat during any heat wave event (in days)?.....
6. What is the highest temperature (degree Celsius) you experience during summer?.....
7. What is the average lowest temperature (degree Celsius) you experience during summer?
8. Do you face any other hazards due to extreme heat?
 - a) Yes
 - b) No
9. If yes, what kind of hazards do you face?
 - a) Fire hazard
 - b) Drought
 - c) Large-scale storm

Location-specific vulnerabilities:

10. To what extent do you feel heat at your house?
 - a) Very low
 - b) Low
 - c) Moderate
 - d) High
 - e) Very high
11. What kind of difficulties do you face during summer or due to extreme heat? (Select all that apply)
 - a) Sickness (i.e., diarrhea, headache, cold and fever, etc.)
 - b) Feels physically weak
 - c) Cannot go to work
 - d) Work less
 - e) Others

Please specify.....
12. How do you perceive the risk of heat stress in your community?
 - a) Very low
 - b) Low
 - c) Moderate

- d) High
- e) Very high

Adaptation strategies:

13. Which of the following responses to heat stress do you employ in your daily life?

(Select all that apply)

- a) Using fans
- b) Drinking plenty of water
- c) Wearing light and loose-fitting clothing
- d) Using wet towels or cloths to cool down
- e) Taking showers multiple times in a day
- f) Seeking shade when outdoors
- g) Staying indoors during peak heat hours
- h) Drinking cold water/juice/saline
- i) Stay at roadside or outside of the house for open air
- j) Using extra fan/charger fan
- k) Cooling the floor by watering
- l) Others

Please specify others

14. Is there any habitual change you adopted daily to protect yourself and your family members during extreme heat? (Select all that apply)

- a) Change of working hours
- b) Change of occupation
- c) Change of cooking place or time
- d) Change of housing structure
- e) Change of housing facilities
- f) No change

15. Are there any cooling facilities nearby to rest during load-shedding or extreme heat?

- a) Yes
- b) No

16. If yes, what kind of facilities are available?

- a) Community shaded facilities
- b) Park
- c) Big trees
- d) Waterbody
- e) Other

Please specify others

17. Do you think your family's economic solvency impacts your daily adaptation strategies?

- a) Yes
- b) No

18. To what extent do your family's economic solvency impact your daily adaptation strategies?

- a) Very low
- b) Low
- c) Moderate
- d) High
- e) Very high

Community Initiatives

19. Is there any informal initiative to combat heat stress in the slum community?
- a) Yes
 - b) No
20. If yes, what kind of informal initiatives are available in your community? (Select all that apply)
- a) Community gardening
 - b) Installing shaded/ cooling facilities
 - c) Watering streets
 - d) Awareness program
 - e) Others
- Please specify others.....
21. Are you involved in any of these community-led initiatives (informal) addressing heat stress adaptation in Korail Slum?
- a) Yes
 - b) No
22. If yes, what kind of involvement? (Select all that apply)
- a) Community gardening
 - b) Installing shaded/ cooling facilities
 - c) Watering streets
 - d) Awareness program
 - e) Others
23. Have you utilized any ideas or communal cooling facilities to help cope with extreme heat?
- a) Yes
 - b) No
24. If yes, what ideas or communal facilities did you adopt in your house? (Select all that apply)
- a) Household gardening
 - b) Cooling the floor
 - c) Using cooling material for roof
 - d) Creating shaded outdoor areas
25. Have you received any training or knowledge information from any NGOs or government-led organizations on how to respond during heatwaves?
- a) Yes
 - b) No
26. If yes, please specify what kind of training or knowledge information you received.
- a) Training on daily adaptation strategies

- b) Training of rooftop or household gardening
- c) Knowledge sharing workshop
- d) Others

Please specify others.....

Influence of local governance:

27. Is any governmental or non-government organization currently working to reduce heat in the slum?
- a) Yes
 - b) No
28. If yes, as per your knowledge, how many organizations currently work within the community (in number)?
29. As per your knowledge, how many heat stress adaptation projects are being implemented or previously implemented by those organizations?
30. What kind of initiatives or projects did they take or are currently implementing?
- a) Providing cooling material
 - b) Communal cooling facilities
 - c) Communal gardening
 - d) Others
- Please specify others.....
31. How many people from your community are involved in implementing those projects (in number)?

Cultural restriction:

32. Does your family head or husband allow you to go outside without permission?

For work	<ul style="list-style-type: none"> a) Yes b) No c) Sometimes
To relatives' house/ meeting community people	<ul style="list-style-type: none"> a) Yes b) No c) Sometimes
For shopping/groceries	<ul style="list-style-type: none"> a) Yes b) No c) Sometimes

33. What kind of clothes do you wear when you go outside during the summer season?

- a) Salwar Kamiz
- b) Saree
- c) Borka
- d) Hijab

34. Do you work with extra clothes while working or remove them before work during summer?

- a) Yes

- b) No

Access to essential services:

- 35. From where do you get drinking water?
 - a) Own tap/tube well
 - b) Supply water
 - c) Community Tap water/tube well
 - d) Other
- 36. Do you have electricity in your house?
 - a) Yes
 - b) No
- 37. Do you have a fan/cooling shade in your house?
 - a) Yes
 - b) No
- 38. Do you have a refrigerator in your house?
 - a) Yes
 - b) No

Socio-economic information

- 39. Do you work?
 - a) Unemployed
 - b) Employed
 - c) Students
 - d) Homemakers
- 40. What is your occupation?
 - a) Housemaid
 - b) Caregiver
 - c) Garment's worker
 - d) Day laborer
 - e) Small business
 - f) Saleswomen in a shop
 - g) Other
- 41. When do you work in a day?.....
- 42. How many hours do you work in a day?.....
- 43. May I know what is your monthly expenditure (in taka)?.....
How do you manage this expenditure? May I know what is your family monthly income (in taka)?.....
- 44. May I know what your approximate monthly income (in taka) is?.....
- 45. How much do you spend on food per week (in taka)?.....
- 46. What other expenses do you have? (Select all that apply)
 - a) Medicine
 - b) Children's education
 - c) Clothes
 - d) Transports

- e) Utilities
 - f) House rent
47. Do you contribute to your family financially?
- a) Never
 - b) Occasionally
 - a) Always
48. If yes, how much do you need to contribute?
- a) Full of the earning
 - b) Half of the earning
 - c) As per needed
49. Is there any financial institutions or NGOs from where you can borrow money?
- a) Yes
 - b) No
50. What kind of responsibilities do you have in your family?
- a) Cooking
 - b) Cooking and raising children
 - c) Every household chore
51. Do your husband/ family head consult with you before taking any family decision (i.e., for children's schooling, buying stuff for the house)?
- a) Never
 - b) Occasionally
 - c) Always
52. Do you attend any community meetings and share your ideas?
- a) Never
 - b) Always
 - c) Occasionally

Demographic Information:

53. What is your age?
54. What is your marital status?
- a) Unmarried
 - b) Married
 - c) Divorced
 - d) Widow
55. What is your educational level?
- a) None
 - b) Primary
 - c) Secondary
 - d) Higher Secondary
 - e) Graduation or above
56. What is your religion?
- a) Islam
 - b) Hindu
 - c) Christian

- d) Buddha
- e) Others

Thank you very much for your valuable information. I appreciate your valuable time and opinion in this regard.

Semi-structured Interview Questionnaire

Master's Thesis

Heatwaves and Everyday Heroines: Unveiling Gendered Adaptation Strategies in Korail Slum

Interview Guide

I am a student at Institute of Housing and Urban Development Studies, Erasmus University Rotterdam, currently doing my master's on Urban Management and Development. My name is Sultana Ashrafi. Currently, I am doing my thesis research on heat stress and how people adapt to the extreme heat in their daily lives. Through this research, I am trying to understand the experience, practices and perceptions of slum community people to extreme heat. This interview aims to explore your perspectives and experiences related to heat stress adaptation strategies among women in the Korail Slum community. For this research purpose, I would like to interview you if you allow me sometime from your valuable and busy schedule. The interview will take maximum 15-20 minutes. This interview is semi-structured with flexibility. The questions are comprised of open questions.

I can assure that this interview will remain anonymous meaning that your personal information will not be disclosed with anyone with your name or identity. This information will only be used for the above-mentioned research purpose. If you are fine to join in this research, I would like to start our conversation with little background of the topic. In addition, I would like to ask you whether I can record our conversation for future data use with your full consent. The recording will not be shared with anyone except my supervisor who is closely monitoring my research.

Introduction Part

Thank you for participating in this interview. Your expertise and insights are invaluable for understanding the gendered dimension of everyday adaptation to heat stress in Korail Slum. Your responses will remain confidential and will only be used for research purposes. If you feel uncomfortable for any kind of questions or want to stop the interview, you are free to do that.

Section 1: Personal Background

1. Age:
2. Occupation (if any):
3. How long have you been living in Korail Slum?
4. What kind of leadership roles do you hold in the community?

Section 2: Existing Responses to Heat Stress

5. What are the common practices and strategies employed by women in Korail Slum to adapt to heat stress in their daily lives?
6. Can you provide examples of specific adaptation practices and explain why women in the community employ them?

Section 3: Gendered dimension and intersectionality of everyday adaptation

7. Do you think everyday practices and responses to heat stress varies between man and women? If yes, can you give any examples of how does it influence the adoption of adaptation strategies among women in the community?
8. Do you think gender intersects with other factors, such as age, socio-economic status, education, or access to resources in shaping adaptation strategies? If yes, in what ways do you think it influences?
9. How do you perceive the role of social values (i.e. cultural norms, work culture, mobility, community culture, religious beliefs) in shaping women's risk perception and response behavior to heat stress adaptation?
10. Can you share any instances where social values influenced the adoption or rejection of specific adaptation strategies among women in the community?

Section 4: Environmental Factors

11. In what ways do environmental factors, such as housing conditions or access to green spaces or cooling facilities (i.e., shaded area) influence women's ability to adapt to heat stress?

Section 5: Community-Led Initiatives

12. Are there any community-led initiatives aimed at addressing heat stress adaptation in Korail Slum? If yes, could you explain your involvement and the impact of these initiatives?
13. How do you think these community-led initiatives enhance the everyday adaptation of women in Korail Slum, particularly those in leadership roles?

Conclusion Remarks

14. In your experience, can you discuss any challenges or opportunities that you have encountered or observed in women's adaptation to heat stress?

Thank you for sharing your valuable insights and experiences with us. Your perspectives will contribute significantly to our understanding of gendered adaptation strategies to heat stress in Korail Slum. If you have any additional comments or suggestions, please feel free to share them below.

Additional Comments/Suggestions:

Expert Interview Questionnaire

Master's Thesis

Heatwaves and Everyday Heroines: Unveiling Gendered Adaptation Strategies in Korail Slum

Interview Guide

I am a student at Institute of Housing and Urban Development Studies, Erasmus University Rotterdam, currently doing my master's on Urban Management and Development. My name is Sultana Ashrafi. Currently, I am doing my thesis research on heat stress and how people adapt to the extreme heat in their daily lives. Through this research, I am trying to understand the experience, practices and perceptions of slum community people to extreme heat. This interview aims to explore your organization's perspectives and experiences related to heat stress adaptation strategies among women in the Korail Slum community. For this research purpose, I would like to interview you if you allow me sometime from your valuable and busy schedule. The interview will take maximum 20 minutes. This interview is semi-structured with flexibility. The questions are comprised of open and closed questions.

I can assure that this interview will remain anonymous meaning that your personal information will not be disclosed with anyone with your name or identity. This information will only be used for the above-mentioned research purpose. If you are fine to join in this research, I would like to start our conversation with little background of the topic. In addition, I would like to ask you whether I can record our conversation for future data use with your full consent. The recording will not be shared with anyone except my supervisor who is closely monitoring my research.

Introduction Part

Thank you for participating in this interview. Your expertise and insights are invaluable for understanding the gendered dimension of everyday adaptation to heat stress in Korail Slum. Your responses will remain confidential and will only be used for research purposes. If you feel uncomfortable for any kind of questions or want to stop the interview, you are free to do that.

Section 1: Organization Information

1. Name of Organization:
2. Position/Role in the Organization:
3. How long has the organization been working in Korail Slum?
4. Can you provide an overview of the organization's objectives and activities related to community development and climate resilience in Korail Slum?

Section 2: Existing response to heat stress

5. In your experience, what are some of the existing responses or adaptation practices employed by women in Korail Slum to cope with heat stress in their daily lives?
6. From your observations, what are the primary reasons or motivations behind women's adoption of these adaptation strategies?

Section 3: Environmental Factors

7. In your experience, what environmental factors play a significant role in shaping women's ability to adapt to heat stress in the community?

Section 4: Informality, Gendered Dimension, and Intersectionality

8. How does the informality of the settlement in Korail Slum impact women's adaptation to heat stress?
9. Do you think that socio-economic factors, such as income level or access to resources, or power in family or community influence women's adaptation strategies to heat stress in Korail Slum? If yes, could you please explain how does it affect everyday adaption?
10. To what extent do you think social values (i.e., cultural norms, work culture, mobility, community culture, religious beliefs) contribute to the risk perception and response behavior of women in Korail Slum regarding heat stress adaptation?
 - a) No influence
 - b) Slightly influential
 - c) Moderately influential
 - d) Highly influential
 - e) Extremely influential
11. In your experience, how do these social values influence the adoption of adaptation strategies among women in the community?

Section 5: Community-Led Initiatives

12. Are there any community-led initiatives aimed at addressing heat stress adaptation in Korail Slum that your organization is involved in or aware of?
13. In your experience, is there any impact of these community-led initiatives on the everyday adaptation of women in Korail Slum? If yes, could you please explain how does it affect everyday adaption?

Section 6: Governmental and NGO/CBO Heat Adaptation Projects/Activities

14. Have you observed any specific initiatives or programs by government at the local level that have been influenced by national action plans related to climate resilience and heat stress adaptation?
15. How accessible are governmental heat adaptation projects or activities to women in Korail Slum?
16. Can you identify any barriers or facilitators that affect women's access to government, NGO/CBO-led heat adaptation projects or activities in the community?
17. Have there been any notable instances where trust in governance has facilitated or hindered the implementation of heat stress adaptation projects in Korail Slum?
18. From your perspective, what factors contribute to building trust between the community and government authorities or agencies involved in climate resilience efforts?
19. In your opinion, what are the strengths and weaknesses of the current national and local action plans in addressing heat stress adaptation in Korail Slum?

Conclusion Remarks

20. Can you discuss any other challenges or opportunities that your organization has encountered in promoting adaptation strategies to heat stress in the community?

Thank you for sharing your valuable insights and expertise with us. Your perspectives will contribute significantly to our understanding of gendered adaptation strategies to heat stress in Korail Slum. If you have any additional comments or suggestions, please feel free to share with us.

Additional Comments/Suggestions:

1.2 Timeline

SL	Activity	Date
1	Develop questionnaire (Household survey, semi-structured interview and expert interview) for primary data collection	April 17-April 28, 2024
2	Share the draft questionnaire with the supervisor for feedback	April 28, 2024
3	Collect the secondary data	April 29- May 15, 2024
4	Finalize the questionnaires	May 6, 2024
5	Take necessary permission for field survey in the study area	April 28- May 12, 2024
6	Field data collection	May 13 -May 31, 2024
	Reconnaissance survey	May 13-May 14, 2024
	Test survey	May 14- May 15, 2024
	Household survey	May 16- 20 May, 2024
	Semi-structured interview	May 20- May 24, 2024
	Expert interviews	May 25- May 31, 2024
7	Data cleaning and transcription	June 1- June 5, 2024
8	Data analysis	June 6-June 30, 2024
9	Report writing	June 10-June 30, 2024
10	Share the draft report with the supervisor	July 1, 2024
11	Revise the report	July 2- July 9, 2024
12	Submission of the final draft report to IHS	July 10, 2024
13	Incorporating the feedback from the draft report	July 16, 2024
14	Submission of the final report to IHS	August 2, 2024

Appendix 2: IHS copyright form

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Appendix 3: Data and results tables

Table A 1: Operationalization of variables

Concept	Sub-variables	Indicators	Sub-indicators	Data type	Data source
Everyday adaptation	-Labor adaptation -Value adaptation (Castro and Sen, 2022)	-Lifestyle stability -Socio-ecological reactivity -Lifestyle flexibility -Community capacity (Castro and Sen, 2022)	-Specific daily practices as a response to heat stress -Any specific habitual change due to extreme heat -Cooling facilities and activities - Daily risk perception of heat stress	Primary	Household survey and semi-structured interview
Gender equality	-Role -Resource -Power (Annecke, 2010)	-Poverty and household dynamics -Health and well-being - Workplace, and decision-making (SeAll., n.d.)	-Literacy level - Financial stability -Access to basic service and infrastructure - Access to cooling services -Role and responsibilities in family - Type of employment -Participation in decision making (in family and community)	Primary	Household survey and semi-structured interview

Concept	Sub-variables	Indicators	Sub-indicators	Data type	Data source
Intersectionality	<ul style="list-style-type: none"> -Social identity -Power dynamics -Learning, action, social change (Jordan, 2018; Walker, Culham, Fletcher & Reed, 2019;)	<ul style="list-style-type: none"> -Scio-economic status - Racism -Power relation in family and community -Sociocultural norms (Jordan, 2018; Walker, Culham, Fletcher & Reed, 2019;)	<ul style="list-style-type: none"> - Household size - Age -Income status -Religion - Marital status -Financial power in family - Responsibilities in family -Cultural restrictions/prohibitions on mobility and clothing -Engagement in family and community meetings 	Primary and secondary	Household survey, semi-structured interview and Bangladesh Bureau of Statistics
Informality	<ul style="list-style-type: none"> -Informal settlements -Deregulation (Schofield & Gubbels, 2019; Roy, 2009)	<ul style="list-style-type: none"> - Vulnerabilities to environmental degradation - Interconnection with formal climate adaption plan, policy and rule -Formal and informal adaptation initiatives 	<ul style="list-style-type: none"> -Location specific vulnerabilities to extreme heat -Current rules, regulations and actions existed in the slum regarding climate change actions - Formal and informal community adaptation to heat stress 	Primary and secondary	Household survey, semi-structured interview and expert interviews

Table A 2: Demographic summary table

Demographic Characteristics	Frequency of the sample population	Percent (%) of the sample population
Education Level		
None	84	38.18
Primary	76	34.55
Secondary	45	20.45
Higher Secondary	13	5.91
Graduation or above	2	0.91
Total	220	100.00
Employment Status		
Unemployed	97	44.09
Employed	123	55.91
Total	220	100.00
Occupation Type		
Housemaid	69	56.10
Caregiver	1	0.81
Garment's worker	24	19.51
Day Laborer	2	1.63
Small business	18	14.63
Saleswoman in a shop	9	7.32
Other	20	16.26
Total	123	100.00
Religion		
Islam	216	98.18
Hindu	4	1.82
Total		100

(Source: Primary data, 2024)

Table A 3: Realization about heatwave and heat stress

Perceived heat risk at houses	Frequency of the sample population	Percent (%) of the sample population
Not realized heat stress	101	45.91
Realized heat stress	11	54.09
Total	220	100.00

Table A 4: Perceived heat risk at individual's house

Perceived heat risk at houses	Frequency of the sample population	Percent (%) of the sample population
Normal	20	9.09
Extreme	200	90.91
Total	220	100.00

(Source: Primary data, 2024)

Table A 5: Knowledge perception of heat wave event

Knowledge about heat wave event	Frequency of the sample population	Percent (%) of the sample population
Once in a month	23	10.45
Twice in a month	46	20.91
More than twice in a month	46	20.91
Once in two months	4	1.82
Do not know anything about heat wave event	101	45.91
Total	220	100.00

(Source: Primary data, 2024)

Table A 6: Correlation of perceived heat risk to heat stress to age, educational level and occupation type

Dependent variables	Control variables	Correlation value	Type of relationship (R)
Perceived heat stress	Age	- 0.1971	Weak negative relation
	Education level	+0.2265	Weak positive relation
	Employment status	+ 0.0821	No or negligible positive relation
	Types of occupation	+0.1966	Weak positive relation
	Access to basic services	+0.063	No or negligible positive relation

(Source: Author's calculation)

Table A 7: Level of influence between duration of perceived heat risk during any heat wave event and the control variables

Dependent variables	Independent/control variables	Level of influence or association
Duration of perceived heat	Age	0.001*** (0.0639676)
	Education level	0.021** (0.6386382)
	Types of occupation	0.074* (0.2013784)
	Access to basic services	0.989 (0.9124494)

Note: Standard error terms in parentheses

P***<0.01, P**<0.05, P*<0.1

Employment status was not considered due to multicollinearity

(Source: Author’s calculation)

Table A 8: Level of influence of different intersectional factors on perceived severity of risk at individual household

Dependent variables	Independent/control variables	Level of influence or association
Perceived level of heat risk at individual houses	Age	0.023** (0.0019968)
	Education	0.009*** (0.0201605)
	Employment status	0.049** (0.0388667)
	Types of occupation	0.525 (chi2= 5.1473)
	Household income	0.930 (1.35e-06)
	Access to basic services	0.421 (0.0368666)

Note: Standard error terms and chi-square value in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author’s calculation)

Table A 9: Level of influence of social norms on perceived severity of risk at individual household

<i>Dependent variables</i>	<i>Independent variables</i>	<i>Level of influence</i>
<i>Severity of perceived risk</i>	<i>Cultural attire</i>	0.044** (0.0176364)
	<i>Employment status</i>	0.043** (0.038601)

Note: standard error terms in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author’s calculation)

Table A 10: Major difficulties faced by the sample population due to extreme heat

Knowledge about heat wave event	Frequency of the sample population	Percent (%) of responses	Percent (%) of cases
Physical sickness	207	36.38	94.09
Mental sickness	202	35.50	91.82
Change in work habit	160	28.12	72.73
Total	569	100.00	258.64

(Source: Primary data, 2024)

Table A 11: Level of influence of different intersectional factors on individual risk tolerance

Dependent variables	Independent/control variables	Level of influence or association
Perceived difficulties due to heat stress	Education	0.004*** (0.0582082)
	Employment status	0.000*** (0.1193729)
	Types of occupation	0.341 (chi2 = 19.8576)
	Household income	0.668 (1.74e-06)
	Access to basic services	0.650 (chi2 = 4.1968)
	Clothing style while going outside	0.401 (chi2 = 9.4067)
	Clothing style during work	0.066*

Dependent variables	Independent/control variables	Level of influence or association
		(0.1663652)

Note: standard error terms and chi-square values in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author's calculation)

Table A 12: Variables and sub-variables considered under PMT theory

Appraisal category	Variables	Sub-variables
Threat appraisal	Perceived severity	Severity of heat risk at house
	Perceived vulnerability	Difficulties faces due to extreme heat
Coping appraisal	Self-efficacy	-Education -Any training received to deal heat stress - Utilization of any heat reduction ideas from the community initiatives at household level
	Response-cost	-Utility bill - Access to loan services - Use of cooling facilities like fan, refrigerator and electricity - financial solvency i.e., earnings -medical expense

Table A 13: SEM modelling of everyday adaptation with the threat and coping appraisals

Dependent variables	Independent/control variables	Level of influence or association
Everyday adaptation	Perceived severity	0.238 (0.3955578)
	Perceived vulnerability	0.000*** (0.1319882)
	Self-efficacy	0.003*** (0.1711143)
	Response-cost	0.000*** (0.2573522)

Note: Standard error terms in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author's calculation)

Table A 14: Different kinds of hazards occurred during summer season by area in the Korail Slum

Type of Hazard	Area				
	Beltola	Bou Bazar	Jamai Bazar	Mosharraaf Bazar	Total
Fire Hazard	19 (12.34%)	57 (37.01%)	25 (16.23%)	53 (34.42%)	154 (100.00%)
Drought	8 (25.00%)	18 (56.25%)	0 (00.00%)	6 (18.75%)	32 (100.00%)
Thunderstorm	10 (16.67%)	35 (58.33%)	3 (5.00%)	12 (20.00%)	60 (100.00%)
Total cases	37 (15.04%)	110 (44.71%)	28 (11.38%)	71 (28.865)	246 (100.00%)
Total responses	19 (11.87%)	62 (38.75%)	26 (16.25%)	53 (33.12%)	160 (100.00)

(Source: Primary data, 2024)

Table A 15: Knowledge about any formal or informal initiatives in the study area

Types of initiatives	Initiatives in the community (% of the total respondents)	
	Yes	No
Informal initiatives by the community	14.55	85.45
Govt. or non-govt. initiatives	1.36	98.64

(Source: Primary data, 2024)

Table A 16: Relation between everyday adaptation and social values in the study area

Dependent variables	Independent variables	Level of influence/association
Everyday Adaptation		
Adaptation labor	Mobility flexibility	0.006 *** (0.046791)
	Clothing while going outside	0.222 (chi2 = 4.3932)
	Remove extra cloth during work	0.981 (0.3192183)
Value adaptation	Mobility flexibility	0.735

Dependent variables	Independent variables	Level of influence/association
Everyday Adaptation		(0.0145617)
	Clothing while going outside	0.791 (chi2 = 1.0425)
	Remove extra cloth during work	0.161 (0.0922453)

Note: standard error terms and chi-square values in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author's calculation)

Table A 17: Correlation between Everyday adaptation and gendered dynamics

Everyday adaptation	Independent/control variables	Correlation value (R)	Type of Relationship
Adaptation labor	Role in family and community decision-making	-0.0205	No or negligible negative relation
	Financial power	+0.1688	No or negligible negative relation
	Family responsibilities	-0.0592	No or negligible negative
	Access to basic services	+0.0574	No or negligible positive relation
	Access to colling facilities nearby	+0.0085	No or negligible positive relation
	Involvement in community initiatives	+0.0362	No or negligible positive relation
	Utilization of ideas from community initiatives at houses	+0.0462	No or negligible positive relation
Value adaptation	Role in family and community decision-making	+0.1101	No or negligible positive relation
	Financial power	+0.0696	No or negligible positive relation
	Family responsibilities	-0.1296	No or negligible negative relation
	Access to basic services	+0.1564	No or negligible positive relation
	Access to colling facilities nearby	-0.0089	No or negligible negative relation
	Involvement in community initiatives	+0.0367	No or negligible

Everyday adaptation	Independent/control variables	Correlation value (R)	Type of Relationship
			positive relation
	Utilization of ideas from community initiatives at houses	+0.1387	No or negligible positive relation

(Source: Author's calculation)

Table A 18: Women's financial contribution to their family

Level of contribution	Frequency of the sample population	Percent (%) of responses
Full of the earning	102	83.61
Half if the earning	2	1.64
As per needed	18	14.75
Total	122	100.00

(Source: Primary data, 2024)

Table A 19: Women's decision-making role in their family

Level of contribution	Frequency of the sample population	Percent (%) of responses
Always	153	69.55
Occasionally	36	16.36
Never	31	14.09
Total	220	100.00

(Source: Primary data, 2024)

Table A 20: Level of influence of environmental factors on individual risk perception, tolerance and everyday adaptation in the study area

Dependent variables	Independent variables	Correlation value (R)	Type of Relationship	
Heat risk perception	Perceived risk	Perceived highest temperature	+ 0.3142	Weak positive relation
		Perceived lowest temperature	+ 0.1927	No or negligible positive relation
		Occurrence of any hazards due during summer	- 0.0112	No or negligible negative relation
		Types of hazards	+ 0.1394	No or negligible positive relation
	Perceived duration of heat risk	Perceived highest temperature	+ 0.5175	Moderate positive relationship
		Perceived lowest temperature	+ 0.3196	Weak positive relation

Dependent variables	Independent variables	Correlation value (R)	Type of Relationship	
		Occurrence of any hazards due during summer	- 0.1945	No or negligible negative relation
		Types of hazards	+ 0.0617	No or negligible positive relation
	Severity of perceived risk	Perceived highest temperature	- 0.2394	No or negligible negative relation
		Perceived lowest temperature	- 0.1542	No or negligible negative relation
		Occurrence of any hazards due during summer	+ 0.0904	No or negligible positive relation
		Types of hazards	+ 0.0930	No or negligible positive relation
Risk tolerance to heat	Difficulties faced due to extreme heat	Perceived highest temperature	+ 0.0199	No or negligible positive relation
		Perceived lowest temperature	+ 0.1209	No or negligible positive relation
		Occurrence of any hazards due during summer	+ 0.3930	Weak positive relation
		Types of hazards	+ 0.3515	Weak positive relation
Everyday adaptation	Adaptation labor	Perceived highest temperature	- 0.0509	No or negligible negative relation
		Perceived lowest temperature	+ 0.0140	No or negligible positive relation
		Occurrence of any hazards due during summer	+ 0.1920	No or negligible positive relation
		Types of hazards	+ 0.1442	No or negligible positive relation
	Value adaptation	Perceived highest temperature	- 0.0140	No or negligible negative relation
		Perceived lowest temperature	- 0.0363	No or negligible negative relation
		Occurrence of any hazards due during summer	+ 0.0598	No or negligible positive relation
		Types of hazards	- 0.0254	No or negligible negative relation

(Source: Author's calculation)

Table A 21: Perceived impact of economic solvency in everyday adaptation

Level of impact	Frequency of the sample population	Percent (%) of responses
Low	6	3.43
Moderate	54	30.86
High	115	65.71
Total	220	100.00

(Source: Primary data, 2024)

Table A 22: Level of influence of socio-economic factors to women's everyday adaptation

Everyday Adaptation	Socio-economic factor	Level of influence
Adaptation labor	Households monthly average income	0.615 (5.49e-07)
	Education level	0.159 (chi2=6.5905)
	Access to essential services	0.431 (0.0148815)
	Access to credit	0.259 (0.0165037)
Value adaptation	Hoiseholds monthly average income	0.005** (2.23e-06)
	Education level	0.197 (chi2= 6.0309)
	Access to essential services	0.026** (0.0605954)
	Access to credit	0.031** (0.0672007)

Note: standard error terms and chi-square values in parentheses

P***<0.01, P**<0.05, P*<0.1

(Source: Author's calculation)

Table A 23: Correlation between education level and types of occupation

Dependent variables	Independent variables	Correlation value	Type of relation	Level of influence
Type of occupation	Education Level	+0.3287	Weak positive relation	0.000*** (0.030589)

Note: standard error terms in parentheses

P***<0.01

(Source: Author's calculation)

Table A 24: Correlation between the involvement in community initiatives and utilization of ideas in everyday life

Dependent variables	Independent variables	Correlation value (R)	Type of association	Level of influence
Everyday adaptation	Involvement in any community initiatives	0.6814	Strong positive relation	0.012*** (0.4429188)
	Use of any heat reduction ideas	0.5497	Moderate positive relation	0.001*** (00.001)

Table A 25: Level of influence of governance factors to women's everyday adaptation

Everyday Adaptation	Governance factor	Level of influence
Adaptation labor	Community initiatives (local and organizational)	0.661 (0.0234873)
	Indirect benefit of community initiatives	0.65 (0.0206336)
Value adaptation	Community initiatives (local and organizational)	0.729 (0.0958612)
	Indirect benefit of community initiatives	0.022** (0.0842141)

Appendix 4: Codebook

Code	Comment	Code Group 1	Code Group 2	Code Group 3	Code Group 4	Code Group 5	Code Group 6
Community suggestions		Community initiatives					
Cooling facilities nearby		Community initiatives					
Cultural restrictions				Gender Dynamics			
Effect of economic solvency					Living environment		
Environmental condition					Living environment		
Everyday adaptation: Labor adaptation			Everyday adaptation				
Everyday adaptation: Value adaptation			Everyday adaptation				
Gender vulnerability				Gender Dynamics			
Gender-based response				Gender Dynamics			
Government/NGO initiative		Community initiatives					
Influence of education					Living environment		
informal initiatives		Community initiatives					
Limitation of community initiatives		Community initiatives					
Potential of community initiatives		Community initiatives					
Religious belief				Gender Dynamics			
Risk perception						Risk Perception	
Risk tolerance: Mental sickness							Risk tolerance
Risk tolerance: Physical difficulties							Risk tolerance

			Beltola 2 46	Bou Bazar 2 29	Jamai Bazar 3 51	Mosharraf B... 2 28	Totals
Community initiatives	6	54	14	8	23	9	54
Everyday adaptation	2	23	9	6	4	4	23
Gender Dynamics	4	23	8	2	8	5	23
Living environment	3	34	10	8	9	7	34
Risk Perception	1	4	2	1	1		4
Risk tolerance	2	13	3	3	4	3	13
Totals			46	28	49	28	151

			Beltola 2 46	Bou Bazar 2 29	Jamai Bazar 3 51	Mosharraf Bazar 2 28	Totals
Effect of economic solvency		13	2	3	6	2	13
Environmental condition		17	8	4	1	4	17
Everyday adaptation: Labor adaptation		20	8	4	4	4	20
Everyday adaptation: Value adaptation		3	1	2			3
Gender vulnerability		16	3	2	7	4	16
Gender-based response		5	4			1	5
Government/NGO initiative		20	6	1	10	3	20
Influence of education		4		1	2	1	4
informal initiatives		1				1	1
Limitation of community initiatives		19	3	5	9	2	19
Potential of community initiatives		9	3	2	2	2	9
Religious belief		1	1				1
Risk perception		4	2	1	1		4
Risk tolerance: Mental sickness		2			1	1	2
Risk tolerance: Physical difficulties		11	3	3	3	2	11
Totals			46	28	49	28	151

Appendix 5: Graphics

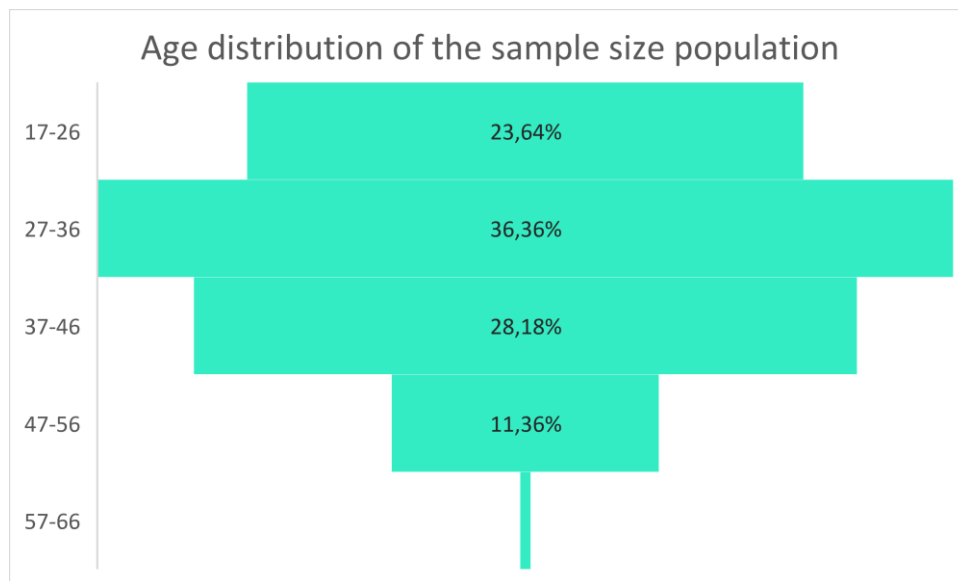


Figure A 1: Age distribution of the sample size population in the study area (Source: Survey data, May 2024)

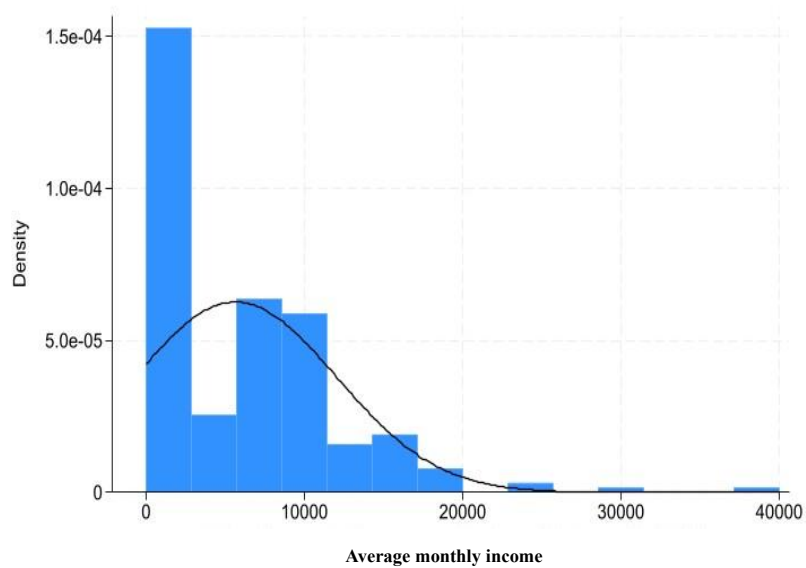


Figure A 2: Household income distribution among sample population

Appendix 6: Photographs



Photograph A 1: Temporary cooling zone at Ershadnagar field, Jamai Bazar, Korail Slum

(Source: Primary data, 2024)



Photograph A 2: Living condition inside tiny rooms at Korail Slum

(Source: Primary data, 2024)

